

Multilateral trade liberalisation and developing countries: A North-South perspective on agriculture and processing sectors

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This paper assesses the impact of further trade liberalisation on prototypical groups of developing countries, with special attention to the linkages between trade and development of the agri-food sector. The findings of this paper are based on a new country classification approach, which uses a combination of income and trade criteria. A distinction is made between developing countries whose producers compete with OECD producers in primary and/or processed agricultural products versus those countries that are not competing. Based on simulations with the GTAP model, the quantitative impact of further trade liberalisation on developing countries is studied. The study identifies diverging and common interests among groups of developing countries, based on the new country classification.

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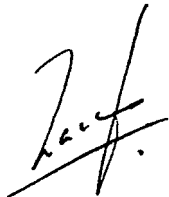
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Preface

A necessary condition for the successful start of a new round of negotiations on multilateral trade liberalisation will be the serious recognition of developing country interests. Developing countries do not represent a homogeneous group with common interests and common policy goals. This study attempts to contribute to the current trade liberalisation debate by first classifying countries into country groupings based on a combination of trade-related and income-related criteria. Second, this study makes a quantitative, model-based assessment of effects of a new WTO round, with special focus on the prospects for agri-processing industries in developing countries. In view of a new WTO round currently gaining momentum, after a sluggish start at the 1999 Seattle Ministerial, we believe that this study makes a timely contribution to a policy debate which is of such great importance to developing countries.

This study has been prepared on behalf of the Dutch Ministry of Agriculture, Nature Management and Fisheries under its North-South programme. The research has been carried out by Hans van Meijl and Frank van Tongeren. They have benefited from comments and discussions with the advisory committee, especially Mrs. Laurens Smits and Gerrit Meester. The content of this report is the sole responsibility of the authors and does not in any way represent the views of the Ministry.

The managing director,

A handwritten signature in black ink, appearing to be 'L.C. Zachariasse', written over a horizontal line.

Prof. Dr. L.C. Zachariasse

Summary

This paper assesses the impact of further trade liberalisation on prototypical groups of developing countries, with special attention to the linkages between trade and development of the agri-food sector. The findings of this paper are based on a new country classification approach, which uses a combination of income- and trade criteria. We distinguish between developing countries whose producers compete with OECD producers in primary and/or processed agricultural products versus those countries that are not competing. We are also able to single out countries which are potentially able to develop their agricultural sector and those that will in all likelihood never be able to do so.

In a second step, a quantitative study is conducted of the impact of further liberalisation on developing countries. Here, we are able to pinpoint diverging (and common) interests among (groups of) developing countries, based on our novel country classification. The quantitative assessment uses the GTAP modelling framework as a tool, with a recent version (5.2 pre-release) of the GTAP database.

Partial agricultural trade liberalisation is expected to generate positive economic effects in general. An important exception is the low-income exporters of primary agricultural commodities, which see a fall in net-exports as a result of stiffer competition in their key markets.

Extending liberalisation in trade alone to *reforms of domestic agricultural policies in high-income countries* is not as advantageous to developing countries as often thought. While our findings support the widely held view that developing country importers are expected to face higher import prices, we also find that policy reform in high income countries may lead to production shifts away from currently supported crops towards other activities which compete directly and indirectly with developing country exports (e.g. horticultural products).

Including *trade liberalisation in agri-processing industries* is expected to lead to significant gains for developing countries. Among other things, these gains are relatively high because the processing sectors in high-income countries are even more protected by import barriers than primary agriculture. The partial elimination of tariff escalation avails improved trade opportunities to both current agri-processing exporters from developing countries and to developing country exporters of primary commodities.

A *comprehensive liberalisation* that includes also textiles, manufacturing and services best enables economies to adjust their production structure to their comparative advantage. An important exception is some low-income agricultural exporters. The economic structure of these countries is heavily dependent on trade with a few high-income countries in a selected set of commodities. With a global lowering of trade barriers the value of existing preferences is eroded and other, more efficient producers take over.

1. Introduction

Great expectations have been voiced prior to the 1999 WTO ministerial meeting in Seattle to make the new round of WTO trade negotiations a 'Development round'. The political realities turned out to be different, and the role of developing countries in defining the new agenda has been marginal. Developing countries have again been faced with an agenda that is dominated by the interests of industrialised countries. A necessary condition for the successful start of a new round will be the serious recognition of developing country interests. As the trade commissioner of the Commission of the European Union, Mr. Pascal Lamy puts it:

'We must get ready to go further towards a position acceptable to less developed countries, as it is clear that these countries are not yet convinced [about the benefits of a new round]'. http://europa.eu.int/comm/trade/2000_round/index_en.htm

It is indeed widely accepted that further liberalisation of global trade will globally lead to positive economic welfare gains. However, many global studies that hammer on the developing country gains from liberalisation are hampered by a lack of depth in terms of commodity coverage and specific country detail. As a result, concerns of specific countries are rarely taken into account and the reluctance of developing countries to accept an agenda for the new round is understandable.

Against this background, the objective of this study is to make an assessment of the impact of further liberalisation on prototypical groups of developing countries, with special attention to the linkages between trade and development of the agri-food sector¹.

The two polar widely held views that trade liberalisation is either 'bad' or 'good' for The Developing Countries certainly warrants qualification. In particular, when taking into account indirect effects on world market price developments and behavioural responses in OECD countries to the changing policy framework, we find that some low-income *agricultural exporting* countries may not be gaining as much from freer agricultural trade as is often expected. On the other hand, we also note that some of the low-income *food importing* countries may not be as adversely affected as sometimes thought. Specifically, we are able to show that a higher import bill for food importing developing countries, which emerge as a consequence of reduced domestic support in OECD countries, may be compensated by increased export earnings in manufacturing and services industries. This highlights the importance of extending the trade negotiations beyond the agricultural sector, as the 'losers' from a partial agricultural liberalisation may be able to gain in processing and low skilled manufacturing sectors where they possess more comparative advantage. Extending the liberalisation from trade in primary agricultural commodities to the agri-processing sector is expected to deliver significant gains, both to current *agri-processing*

¹ For a summary account of current (April 2001) positions of developing countries see www.wto.org.

exporters from developing countries and to developing country exporters of primary commodities. Some of these latter countries are able to benefit from the surge in processing activities in other low- and middle-income countries. However, as the trade pattern of some low income exporters of primary agriculture is biased towards trade with the European Union and the United States, these countries are not expected to gain much from the processing expansion in other developing regions.

Furthermore, we are tracing the effects of world price changes to income-, production- and consumption effects. Hence, we are contributing to insights into food access in Low Income Food Deficit Countries. This paper shows how changes in the functional distribution of income affect the food purchasing power of different population groups in developing countries.

The findings of this paper are based on a new approach, which explicitly distinguishes several prototypical groups of countries, based on a combination of income- and trade criteria. In doing so, we distinguish between developing countries whose producers compete with OECD producers in primary and/or processed agricultural products versus those countries that are not competing. We are also able to single out countries, which are potentially able to develop their agricultural sector and those that will never be able to do so, because of a weak natural resource base. It turns out that our classification scheme, is a very powerful tool to identify the interests and possible negotiation positions in a new WTO round.

In a second step, a quantitative study is conducted of the impact of further liberalisation on developing countries. Here, we are able to pinpoint diverging (and common) interests among (groups of) developing countries, based on our novel country classification. The quantitative assessment uses the GTAP modelling framework as a tool, which is also the basis for many recent liberalisation assessments such as those, listed in Figure 2.1. We utilise a recent version (5.2 pre-release) of the GTAP database, which *inter alia* includes recent protection information and new estimates of OECD domestic support to agriculture. This feature of the database takes into account the US FAIR Act 1996 as well as the EU Mac Sharry reforms. By using the multi-sector general equilibrium framework of GTAP we are able to highlight macro-economic effects which escape from partial analysis of agricultural liberalisation alone.

Our quantitative assessment focuses on the static gains from trade liberalisation. We do not deny the great importance of factors such as increased saving rates and greater capital accumulation, the utilisation of unexploited economies of scale, the importance of technology improvements and the benefits obtained from improving the commercial infrastructure and institutions that support agricultural development. However, we believe that it is first of all important to highlight the gains that can be achieved from better resource allocation.

2. Some recent welfare estimates of trade liberalisation

Figure 2.1 below shows some recent estimates of welfare effects resulting from multilateral trade liberalisation. During the preparations for the WTO Seattle meeting, a number of studies have emerged that attempt to quantify the global gains from further multilateral trade liberalisation. Such studies typically estimate the gains from a 50% reduction of trade protective measure in agriculture to be around of USD 50 - 70 billion annually, and USD 400 billion for liberalisation in all agricultural, manufacturing and services sectors. To put this number in perspective, it means that more free trade would free up as many resources as to make a once and for all addition to the world economy which is comparable to the size of the Dutch economy.

It is interesting to note that the ex-ante calculations for the WTO2000 round appear to be twice the size of the ex-post UR estimate. This can be attributed to three factors. First, the ex-post UR estimate takes into account the fact that the UR delivered considerable 'dirty tariffication', which results from tariff bindings at tariff levels above current applied rates. Hence, the tariff reductions of 36% (24% for developing countries) that have been agreed over the implementation period of 6 years (10 years for developing countries) are not effectively 'biting' and consequently, the welfare gains are smaller than estimated prior to the UR agreement. Second, recent estimates frequently take into account increasing returns to scale in production, trade costs, capital accumulation, technology improvements and other 'non-standard' features, which result in increased estimates of welfare gains from freer trade. Third, taking into account liberalisation in services trade delivers huge positive welfare effects. For a more complete account of the economy-wide UR estimates see Martin and Winters (1996) and Francois et al. (1996).

As far as regional distribution of welfare gains is concerned, the cited studies show that the largest gains relative to GDP are obtained in developing countries. Obviously, given the size of the OECD economies, the highest gains in absolute (USD) terms, is obtained in high-income regions. The contribution of liberalisation in agriculture alone to the total gains from a comprehensive liberalisation differs across the various studies, and depends critically on the degree of agricultural commodity detail versus non-agricultural sectors covered in the data (see also Francois et al., 1996). While existence of potential global gains from liberalisation are largely undisputed, there are also developing countries that may not benefit. Existing studies identify as potential losers those countries that currently receive preferential access to particular export markets in high income countries, net food importing countries and countries for which food security is a major concern (ABARE, 2000).

	Global welfare effects (additional annual world income)	Assumptions
	<i>Uruguay round</i>	
OECD 1997	EV USD 200 bln.	Implementation UR
	<i>Ex-ante estimates WTO 2000 round</i>	
1 Australian dept. of Foreign Affairs and Trade, 1999	EV USD 90 bln. USD 400 bln.	50% reduction agricultural protection 50% reduction agricultural protection + services + manufacturing industries
2 European Commission 1999	EV USD 385 bln. (1.4% world GDP)	50% reduction agricultural protection + reduction trade barriers in all sectors through trade facilitation.
3 Anderson et al. 1999	EV USD 260 bln. (1/3 rd attributed to agriculture)	Full liberalisation all countries, all sectors.
4 Hertel et al. 1999	EV USD 70 bln. USD 494 bln.	40% reduction agricultural protection (incl. domestic support) 40% reduction agricultural protection (incl. domestic support) + services + manufacturing industries
5 ABARE 2000	GDP in 2010 USD 53 bln (13bln to developing countries) USD 94 bln (45 bln to developing countries) USD 123 bln (68 bln to developing countries)	50% reduction agricultural support 50% reduction agricultural support + 50% reduction import protection all other sectors (comprehensive liberalisation) comprehensive liberalisation + exogenous productivity gains (0.01% increase manufacturing productivity for each 0.024% drop in effective protection in developed economies, catch-up hypothesis)
6 USDA/ERS 2001	EV USD 56 bln, of which 31 bln static resource allocation gains, 5 bln investment gains, 20 bln productivity gains. USD 21 bln to developing countries: 3bln static gains, 4 bln investment, 14 bln. Productivity gains.	Full removal of agricultural policy distortions (tariffs, export subsidies and domestic support) Productivity growth positively related to export growth

Figure 2.1 *Some recent estimates of global welfare effects. Note: EV denotes equivalent variation.*

Other studies have focussed on trade in agriculture and food alone (FAO, UNCTAD, IFPRI). While not being able to generate economy-wide welfare estimates, these studies typically focus on net trade impacts, world food prices, and on transmission of world prices to domestic food markets.

Some notes on welfare measurements

Welfare estimates as those presented in Figure 2.1 have to be carefully interpreted. Economy-wide welfare estimation is deeply rooted in welfare economics, and is indeed a very powerful tool to assess in a summary figure the net effects of a policy change from the viewpoint of society as a whole. It should be kept in mind though that these estimates show

the room to achieve a *potential* welfare improvement. That is, it answers the question whether a policy change generates enough additional income (through the release of previously under-utilised resources) such that the 'winners' can potentially compensate the 'losers'. The equivalent variation measure (EV) translates the potential gains in utility, obtainable from a policy change, into an equivalent change in income, measured in money terms.

Welfare estimates as those presented in Figure 2.1 have to be understood against this background. The numbers are always about assessing the policy move in isolation from other policy changes or other events. For example, the Asia crisis (1997/98) has had an important downward impact on agricultural commodity prices, which complicates the ex-post assessment of the UR achievements. It is by no means certain that the 200-400 billion is actually realised.

Welfare indicators give us information about the economic efficiency of certain policy change, they are silent on distributional questions. It is obvious that a radical reduction, or even complete elimination, of trade barriers in agricultural products will in the long run lead to significant shifts in the structure of production. The distribution of production between countries will change, as non-distorted price signals will lead to more efficient patterns of specialisation. As a result, also the domestic production patterns will be affected, which lead to changes in prices of production factors and product shifts, which has an impact on the income distribution within countries.

3. Classification of countries

The interest of developing countries in multilateral trade negotiations is by no means homogeneous. The issues at stake depend not only on the level of development, but also on the existing structure of the economies, the structure of trade and the prevailing patterns of trade barriers. Of specific concern to this study is the potential for development of the domestic agricultural sector and the potential to develop first- and second stage processing industries. Depending on the current and potential export package, specific developing countries will have an interest in improving access to specific developed country markets for primary products, while other countries will have an interest in improving access for their processed agricultural products. Yet other countries might not be worrying about market access, but are rather more concerned about maintaining low world food prices, especially cereals, to reduce their import bills. We first review briefly existing and widely used country classification schemes. Thereafter an alternative scheme is presented which attempts to group countries in to homogeneous groups in terms of nature of their trade relations and in terms of their level of income.

Customary classifications

Four classification-systems of developing countries are widely used, none of which is completely satisfactory for our purposes, see also Valdes and McCalla (1999) and OECD (2000) for a discussion of classification schemes.

The most straightforward system is that of the World Bank, which distinguishes countries according to their per capita income. Developing countries are Low Income Countries (LICs), Lower Middle Income Countries (LMICs), or even Upper Middle Income Countries (UMICs).

An approach followed by the International Monetary Fund (IMF) is based on the source of export earnings (IMF, 2000). An export-earning source is considered the main source if more than half of the export earnings of a country stem from the exports of only one product group¹. Countries without a main export-earning source are classified as 'diversified'.

The classification of the Food and Agricultural Organisation (FAO) is based on trade positions in agriculture and food. The categories are Net Food Importing Countries (NFIM), Net Food Exporting Countries (NFEX), Net Agricultural Importing Countries (NAIM), and Net Agricultural Exporting Countries (NAEX).

The United Nations (UN) defines four special cases of developing countries: Least Developed Countries (LDC), Low Income Food Deficit Countries (LIFDC), Transition

¹ The groups are: fuel, manufactures, primary products, and services/income/private transfers.

economies (TRANS), and Small Island Developing Countries (SIDC). Furthermore, the UN classifies countries according to their regional distribution¹.

The systems of classification mentioned above are either one-dimensional (e.g. income) or permit one country to be a member of more than one class. For the purpose of clarifying the interests of groups of countries in trade negotiations these systems are not sufficient. One-dimensional systems are inadequate because most countries have more than one interest to pursue. An improved system will have to be multidimensional, and should ensure that the criteria are mutually exclusive, so that a country belongs to one group exclusively. Below, an alternative system of classification is proposed.

A new classification scheme

In order to differentiate among the interest of developing countries, we define prototypical groups of countries, based on two main dimensions: 1) the level of development, and 2) the nature of the trade relation with developed (read: OECD) countries.

The first dimension is important because of the economic weight of the various sectors. Generally speaking the policy mix that a country may pursue is correlated to the level of development. For example, concerns about food security typically arise in low-income countries². Low and middle-income countries tend to emphasise development of their agricultural sector, followed by policies targeted at promotion of food-processing activities. The prototypical higher middle income country is in transition from a predominantly agrarian society to an economy that is based on labour-intensive manufacturing. At the higher end of the income scale, developed countries are in movement to a knowledge-intensive/service based economy.

The second dimension in our country classification, is the nature of the trade relations. This is important because it provides an indication of the potential impact of trade liberalisation on different groups of countries. It is widely accepted for example, that the liberalisation impact on exporting countries is different from the effects on importers. Because a reduction in import barriers alone will lead to a rise in world market prices which benefits exporters and leads to higher import bill for importing countries. This effect is magnified if in addition export subsidies (and export credits) are dismantled. See chapter 4 below. With regard to the nature of trade relation we take the following sub-dimensions into account:

The *net- trade position*: A country may be a net exporter or a net importer.

In as far as trade liberalisation results in the generation of greater trade volumes, exporting countries will benefit from freer trade. Next to the impact on volumes, the effects on their export revenues will depend on the development of world prices in the wake of trade liberalisation. Both the level and the volatility of world prices are of crucial importance, especially in as far as a developing country depends on a very few commodities for its export earnings. It is generally thought that more liberal agricultural trade policies generate more stable world markets, while the price level can be expected to rise.

¹ The categories are: Latin America and Caribbean, Sub-Saharan Africa, East Asia and Pacific, Europe and Central Asia, Middle East and North Africa, and South Asia.

² A country classification that explicitly considers food security issues is provided by Diaz-Bonilla et al. (2000). This classification is based on a formal statistical cluster analysis.

For net importing economies, the anticipated impacts of further liberalisation of trade are more complex. It is generally accepted that a unilateral reduction of trade barriers would lead to lower domestic prices in the liberalising country, and will therefore benefit domestic consumers, while hurting domestic producers. In the context of multilateral liberalisation of agricultural trade- and domestic policies, however, world food prices can be expected to increase which will be disadvantageous to the trade balance of food importing countries. This is a special concern to the so called low-income food deficit countries (see below).

Source of exports earnings: Which sectors are responsible for export earnings: primary agricultural products, processed food products, unskilled manufacturing, skilled manufacturing, services. It is obvious that the weight that countries attach to the various items on the agenda of a possible broad (multisectoral) round of trade negotiations depends on the domestic economic importance of certain sectors. Countries, which largely depend on primary agricultural commodities for their export earnings will put more emphasis on these aspects than, say, liberalisation in services.

Whether a country exports products that are *competing* with developed country products. Protective arrangements in developed countries exist primarily for commodities which are produced in the same developed countries, while trade barriers for non-competing products vis a vis developing countries typically tend to be low already. Non-competing agricultural products may for example be tropical zone products that are not at all grown in developed countries (e.g. tropical fruits, tropical beverages), or it may be products that are grown in both tropical- and temperate climates but, the tropical exporter utilises a different seasonal pattern (e.g. cut flowers). It is especially in the area of competing products where tensions arise and where certain developing countries have an interest in achieving better access to high-income markets. The move from production and export of primary commodities towards more value added generating processing activities in developing countries is often hampered by protective measures in high-income countries, including tariff escalation.

Preferential treatment: A country may receive preferential treatment of its exports. Preferential access by developing country exporters exists for commodities like sugar, bananas and beef. For example, the EU (still) grants preferential access to its markets to the so-called ACP countries. These countries face lower (often zero) tariffs for their exports to the EU than other countries. Especially the sugar market is distorted by the arrangements that the EU has with ACP countries and India, and by tariff quota restrictions into the US (Borell, 1999). Such preferences are more far reaching than the GSP system that exists under the WTO. This dimension is important because it indicates whether a general (global) reduction in tariff rates may lead to preference erosion, and hence to a diversion of trade away from the countries that currently receives preferential treatment. This shift of trade patterns will especially be significant if the original preferential access is granted to a relatively high cost producer.

Potential for self-sufficiency: For net-importers of primary agriculture it matters whether they might be potentially self sufficient in the future or whether development of certain sectors is not possible. This dimension of trade is relevant as a policy target in the context of possible adverse effects on the trade balance in the wake of global liberalisation

of agricultural policies. In addition, large portions of agricultural activities in the least developed countries occur in subsistence production. Subsistence farmers may not be directly affected by trade policy reforms as they are not integrated in the market system (and hence also escape the attention of statistics). However, the development of an infrastructure to support commercial farming could very well be fostered by trade liberalisation.

Operationalisation of the new classification scheme

The previous paragraph laid down some general principles and desiderata behind the classification scheme. When it comes to operationalising these ideas, some restrictions with regard to data have to be taken into account.

The level of development is proxied by the World Bank criterion of income per capita. Four levels of development are distinguished: Low Income Countries (LICs), Lower Middle Income Countries (LMICs), Upper Middle Income Countries (UMICs) and high-income countries (HIC).

With regard to the nature of trade dimension, the 'sources of export earnings' that are separated in this paper are primary agricultural commodities and processed food products. In this paper we use a broad definition of primary agriculture, which, includes both food and non-food products such as wood and timber. Concentrating on food alone would result in a different classification, which will be closer to the FAO classification. The advantage of our classification is that it provides for a broader development perspective than the food security perspective alone.

The 'trade position' sub-dimension in combination with the focus on agricultural and processed food products gives four sub-groups in which a country may be a net exporter or a net importer in one or both categories (see figure 3.1). Net exports for both agriculture and food products are calculated with 1997 FAOSTAT data. In Figure 3.1 we have added the 'competing' and 'self-sufficiency' dimensions. The 'competing' dimension is added only in the case of a country is a net exporter of primary agricultural products¹.

The 'potential self-sufficiency' dimension is most relevant when a country is both a net importer of both primary agricultural and food products.

¹ This is not to say that we assume food-processing exporters to be always competing by default. Lack of suitable data and our focus on agriculture have lead us to put this aspect aside. The 'competing'/'non-competing' dimension could also be added in the case of net exporters of processed products.

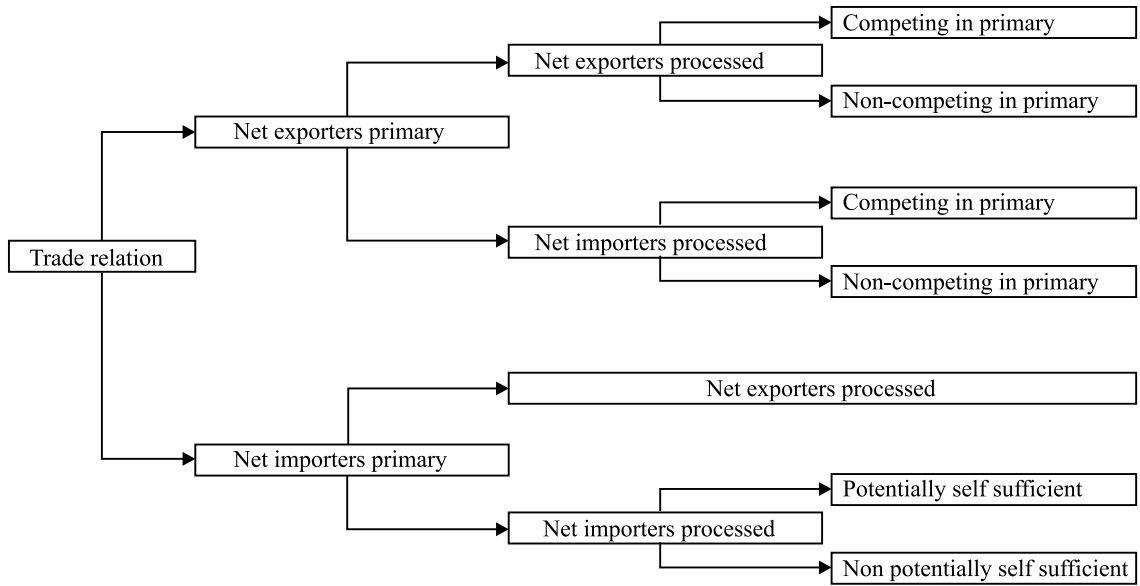


Figure 3.1 Classification scheme of trade dimension

A competition index is constructed to find out whether or not products are competing with products from developed countries. This index combines the importance of exports of a certain primary commodity for a certain country with the importance of that commodity for developed countries. This is achieved by multiplying the export share of commodity j in country i with the developed country share in world production:

$$Q_i = \sum_j [X_{j,i} / X_i * Y_{j,DC} / Y_{j,world}]$$

i = country, j = product and j is an element of primary agriculture

Q_i = Competition index for composite sector s in country

$X_{j,i}$ = export value of product j in country i

X_i = total export value in country i

$Y_{j,DC}$ = production of product j in developed countries

$Y_{j,world}$ = production of product j in the world

This index is calculated for primary agricultural products by using export value and production (MT) quantity data for 1997 from FAOSTAT¹. If the commodity has a large share in the export portfolio of a certain developing country, and if in addition the particular commodity has a large share in developed countries' output, then the commodity/country pair is deemed to be competing². On the other hand, if either the commodity has a small

¹ Index is not calculated for processed food products because production quantity indices are missing in FAOSTAT. In principle the index could be constructed using value data.

² See the last row of Figure 3.2 for the set of developed countries.

share in the export portfolio, or the commodity is insignificant for developed countries, then the commodity/country pair is considered non-competing. In practice we took a cut-off value of 0.17¹. If the index is higher than 0.17 the country is classified as competing with developed countries in primary agricultural products.

The 'potentially self-sufficiency' index is defined as the percentage of total use covered by domestic production. The self-sufficiency index for country *i* then becomes:²

$$S_i = Y_i / C_i = Y_i / (Y_i - X_i + M_i)$$

M_i = import of primary agricultural commodities in country *i*

X_i = export of primary agricultural commodities in country *i*

Y_i = production of primary agricultural commodities in country *i*

C_i = total use

This index is calculated for primary agricultural products by using export, import and production (MT) quantity data for 1997 from FAOSTAT. If the index is lower than 0.75 the country is classified as not-potentially self-sufficient. The cut-off point of 0.75 is chosen arbitrarily.

These criteria combined lead to 7 X 4 (=28) groups of countries, as shown in Figure 3.2.

The preferential treatment dimension is treated rather simplistic in this paper, by only indicating ACP country status vis a vis the European Union by printing the country name in italics in Figure 3.2. A more extended classification could for example take into account more existing (non-GSP) preferences that high-income countries grant to developing country export.³

One of the possible applications of the country classification is to position existing and emerging coalitions in the trade negotiations. For example, the countries that belong to the so called Cairns group, which emerged during the Uruguay Round talks on agriculture are indicated in bold print. Except for the Philippines, all of the Cairns group countries are net exporters. The biggest players in the group are those that are classified as being competing net exporters of primary agricultural commodities. These countries clearly have a common interest in improved market access to and reduction of export subsidies by high-income countries.

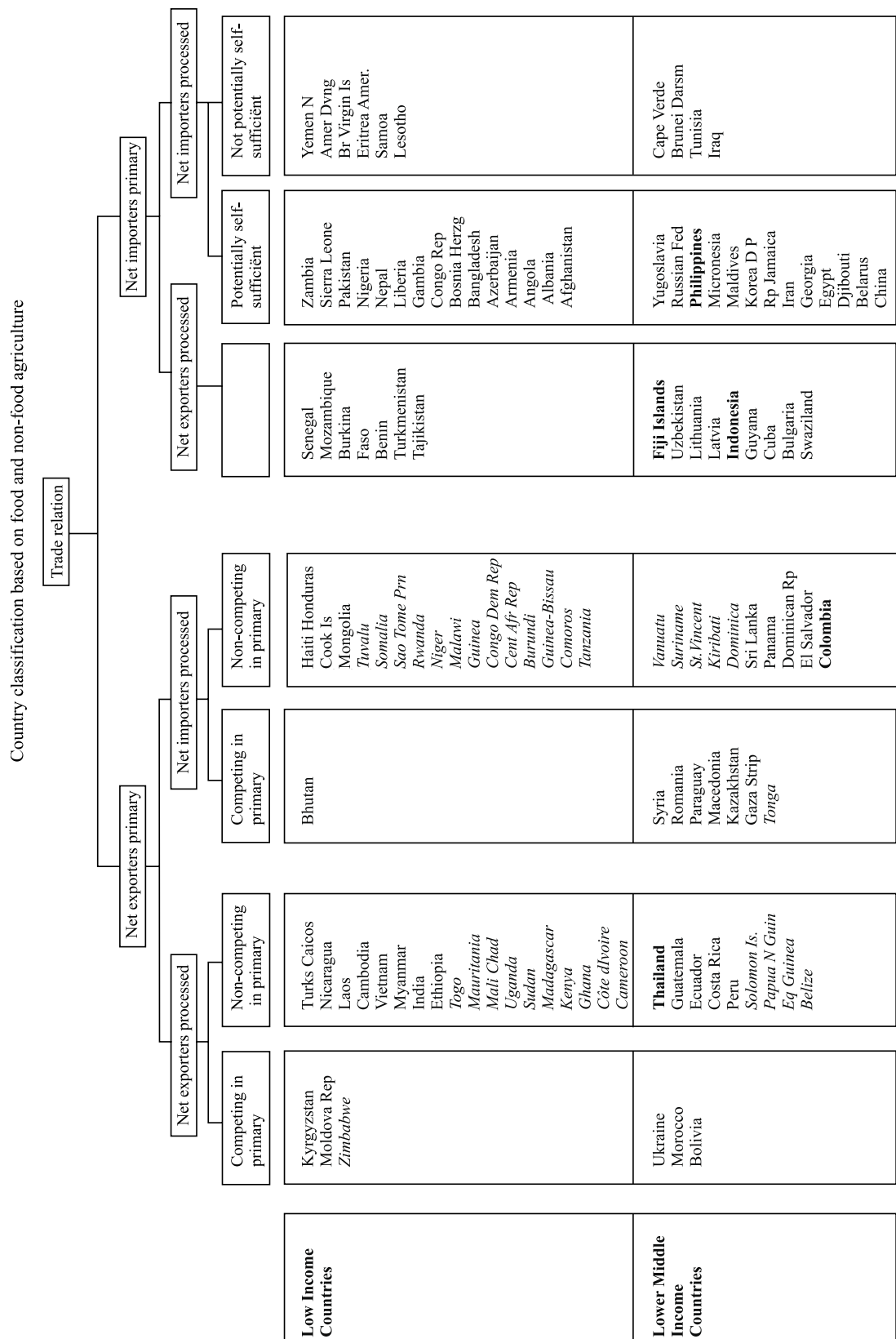
The classification scheme can be narrowed down and extended in various respects. A narrower definition of commodities to food commodities would yield a classification, which is specifically suited for food security analysis.

¹ This cut-off value is chosen, rather arbitrarily, equal to the value of the competitiveness index for the country group 'Developing countries' (FAO definition).

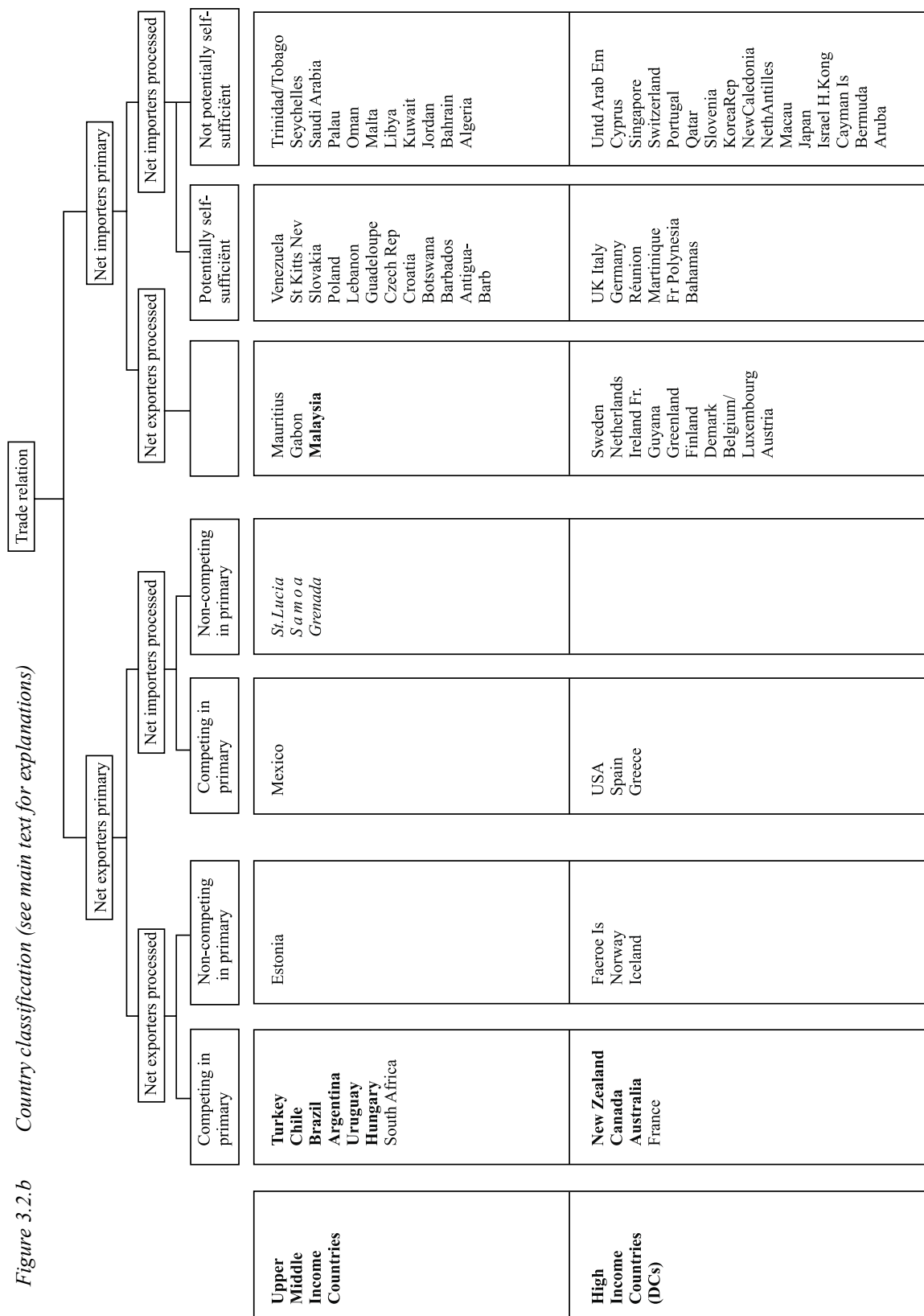
² Using the accounting identity $Y = C + X - M$, we approximate domestic use in volume terms as $C = Y - X + M$.

³ Developing countries also enjoy GSP preferences within the WTO framework, see Michalopoulos (n.d.) and Tangermann (2001) for a concise discussion.

Figure 3.2.a Country classification (see main text for explanations)



Trade relation



4 Common wisdom: how poor country agri-food development is affected by more liberal policies in rich countries

Standard trade theory predicts that a lowering of import barriers will in the first place benefit the country that reduces its tariffs, provided that the country is small enough relative to world markets such that it is a price taker for its import products. However, also world prices and exporters will be affected by such a policy move. The increase in demand following more liberal import regimes will exert an upward pressure on world prices. This in turn will benefit producers in exporting countries that were facing relatively high barriers for their exports. Rising export prices, and improved terms of trade induce them to increase production and export volumes, resulting in positive welfare gains for producers. However, as the higher demand for domestic resources will bid up domestic prices in exporting countries, this implies a welfare loss for consumers in these countries. In spite of this, the overall effect on welfare will be positive.

It is clearly important to take the initial structure of protection -and export support- into account when making ex ante assessments. Figure 4.1 summarises the effects.

Turning first to the effects of eliminating import barriers, Figure 4.1 shows that for an exporting country which is currently facing high tariffs the evaluation is clear cut, and follows the conclusions from standard textbook assessment. On the other hand, for an exporting country that is not currently facing high tariffs on its export markets, the evaluation is inconclusive. If these countries are enjoying preferential access, and if they are non-competitive (i.e. high cost) producers on world markets, then a global reduction of import tariffs may lead to some diversion of trade towards other exporters that were facing higher tariffs in the current situation. An often cited instance of this configuration is the EU import quota regime for bananas from ACP countries, which restrict the export possibilities for cheaper producers in Latin America.

The current structure of tariffs that exporters from developing countries are facing is characterised by some degree of tariff escalation (Finger et al, 1996; Laird, 1999; Wainio et al, 1999). The height of the barrier increases with the degree of processing. While not denying the importance of improved market access for primary agricultural commodities, the foregoing arguments imply that developing countries as a group might experience substantially higher gains from reducing the currently high barriers on processed agricultural products and low skilled manufacturing products.

An importing country that currently imposes zero -or very low- tariffs will witness different effects compared to an importer that is currently significantly protecting its domestic markets. The low tariff importer can be expected to see rising world prices, which immediately translate into higher domestic prices. This means that consumers will have to pay higher prices for imported goods, while domestic producers have an incentive to expand production.

In the classical case of high initial import barriers, the elimination of the tariff wedge between world prices and domestic prices translates into lower domestic prices. This bene-

fits consumers, while producers will lose. Many countries use import restrictions as a means to manage domestic food supplies and to support domestic producers. The above arguments show that indeed domestic producers may be hit by a reduction of import barriers. However, the use of import restrictions to protect the domestic food sector may be in conflict with other policy objectives such as ensuring low food prices for urban consumers and where countries are concerned about food security.

Import tax receipts will decline after a tariff cut, which is a concern for many developing countries that have limited options to generate tax revenues in other ways, e.g. through domestic sales- or income taxes (see Matusz and Tarr, 1999). However, if the initial trade barriers are in the form of Non-Tariff-Barriers (NTBs), there is no tariff revenue to loose from the trade policy change.

If the country in question is a small importer relative to world markets, such that it has to take world prices as given, the so called terms of trade effect vanishes, and the overall welfare evaluation is undoubtedly positive. If the small country assumption does not hold, then the reduction of import tariffs induces an additional upward effect on import prices, which implies a negative terms of trade effect on the welfare measures.

Turning next to the ex-ante assessment of a global reduction of export support, Figure 4.1 indicates an expected rise in world prices. Many high-income countries provide support for agricultural exports in the form of export subsidies and export credits. This type of policy helps to clear domestic markets in those countries, which attempt to support farm income through policy mixes that maintain domestic price levels above world market levels. Especially the markets for cereals, beef and dairy products are affected by this practice, which is to in varying degrees by all OECD countries (see OECD, 2001).

It is obvious that subsidised exports distort world markets by depressing world prices and increasing export volumes from OECD countries, and that a reduction of export subsidies will lead to the reverse effect. There is no doubt that the aggregate welfare effect of subsidy reduction will be positive for exporting countries that make significant use of export subsidies, see Figure 4.1. Consumers will benefit through lower domestic prices, terms of trade will improve and the government will save subsidy expenditures. It is primarily the adverse effects on domestic farmers in exporting countries, which makes these countries reluctant about reducing subsidies on exports. Export subsidies can not be eliminated without changing domestic farm policies.

In the aggregate, importers of agricultural products will be negatively affected by reduction of export subsidies granted in exporting countries. Import prices and domestic prices will increase, implying a deterioration of terms of trade. Domestic producers, however, will face an incentive to increase production, in the face of higher undistorted price levels. Reducing export subsidies may also have an additional positive effect by reducing volatility on world markets, which would lead to more stable market signals for domestic producers and to more predictability of import costs for importing countries.

Obviously, the reduction of subsidised exports from OECD countries is a concern to low income food importing countries, especially those that see no scope to increase domestic food production because of an inadequate natural resource base.

Impact of lower import tariffs		
	Activity and prices	Welfare
World price	Higher due to increased demand	
Exporter (facing high tariffs)	Export, production, domestic- and export prices increase	Consumer: - Producer: + Terms of trade: + Total: +
Exporter (facing low tariffs)	Export prices? domestic prices?, export?, production?	Consumer: ? Producer: ? Terms of trade: ? Total: ?
Importer Imposing zero (or low) initial tariffs	Import and domestic prices up, production up	Consumer: - Producer: + Terms of trade: - Total: -
Importer Imposing significant initial tariffs	Import prices up, but domestic prices down, production down	Consumer: + Producer: - Terms of trade: - Government: - Total: ? (small country +) (Non Tariff Barrier +)
Impact of lower export subsidies		
	Activity and prices	Welfare
World price	Higher due to less supply	
Exporter Using significant initial export subsidies	Export prices up and domestic prices down, production down	Consumer: + Producer: - Terms of trade: + Government: + Total: +
Exporter Using zero (or low) initial export subsidies	Export prices, domestic prices, production and export up	Consumer: - Producer: + Terms of trade: + Total: +
Importer	Import prices up, domestic prices up, production up	Consumer: - Producer: + Terms of trade: - Total: -

Figure 4.1 Overview of main effects from reducing trade distortions

5 Less common wisdom: a quantitative assessment

In this chapter we obtain a quantitative assessment of the impact of further liberalisation on developing countries. Here, we use the new classification scheme to study diverging (and common) interests among (groups of) developing countries. The quantitative assessment uses the GTAP modelling framework as a tool, and the new classification scheme and the GTAP simulations are based on a recent version (5.2 pre-release, November 2000) of the GTAP database.

GTAP classification based on new classification scheme

The GTAP dataset covers global production, trade and income and divides the world into 65 individual countries and/or country groupings. For the purposes of this study, we aggregate the GTAP regions into 15 country groups to match our classification scheme set out in Chapter 0.

The development dimension is again taken from the World Bank, and four levels of development are distinguished. The nature of trade dimension is simplified for the quantitative analyses. For the GTAP classification we use the 'source', 'trade position' and 'potentially self sufficiency' sub-dimensions, and recalculate our indices using GTAP data (FAO data where used in chapter 3). The 'competing' and preferential treatment dimensions are not taken into account because the GTAP product and country levels are too aggregated and we want to limit the number of country groups. However, for the subsequent analyses and interpretations of the results we will use both sub-dimensions, using the trade weighted average import tariffs a country receives on exports. If this tariff is relatively low we assume that a country receives a kind of preferential treatment or has not-competing products.

Operationalisation of these criteria with the GTAP data results in the classification scheme given in Figure 5.1¹. Based on this classification scheme we distinguished the following: 8 groups of developing countries plus India and China as separate countries, four groups of developed countries and the rest of the world. The developing country groups are:

- LIEXP Low Income exporters in both primary agricultural and processed food products
- LIAEXP Low Income exporters in primary agricultural (and importers of processed food products)
- LIIMP Low Income importers of both primary agricultural and processed food products

¹ Primary agriculture contains foodgrains, feedgrains, oilseeds, primary animal products, other primary products; Processed food contains processed animal products, sugar, other processed products.

- MIEXP Middle Income (both lower and upper middle) exporters in both primary agricultural and processed food products
- MIAEXP Middle Income (both lower and upper middle) exporters in primary agricultural (and importers of processed food products)
- MIFEXP Middle Income (both lower and upper middle) exporters of processed food products (and importers of primary agricultural products)
- LMIIMP Lower Middle Income importers of both primary agricultural and processed food products
- UMIIMP Upper Middle Income importers of both primary agricultural and processed food products

Separate countries

China People's Republic of China (mainland, excluding Hong Kong)
 India India

Developed Country Groups

EU European Union (EU15)
 NAFTA North American Free Trade Area
 AusNz Australia and New Zealand
 JPNNIC Japan Group

All other countries

ROW Rest of World contains GTAP regions: Rest of World, Rest of Efta and Switzerland

Trade relation	Level of development				
	Low Income Countries	Lower Middle Income Countries	Lower Middle Income Countries	Lower Middle Income Countries	High Income Countries
Net-exporters of both primary agriculture and processed food	Vietnam India Zimbabwe Zambia Malawi Mozambique LJEXP	<i>Rest Andean pact</i>	Argentina Uruguay Brazil Botswana MIEXP	Chile Hungary	Australia New Zealand France Canada Denmark Ireland Netherlands
Net-exporters of primary agriculture and Net-importer of processed food	Tanzania Uganda <i>Rest of Sub-Saharan Africa</i> LIAEXP	Sri Lanka Columbia <i>Central America</i> <i>Rest of South America</i> FSU	<i>Rest of Sacu (RSA)</i>		US Greece Spain
Net-importers of primary agriculture and Net-exporter of processed food		Indonesia Thailand Peru Morocco	Malaysia Turkey MIFEXP		Belgium & Luxembourg <i>Rest of Efta</i>
Net-importers of both primary agriculture and processed food, potentially self-sufficient	Bangladesh <i>Other Southern Africa</i> <i>Rest South East Asia</i> LIIMP	China Philippines <i>Rest Middle East</i> <i>Rest North Africa</i> LMIIMP	Mexico(1) Venezuela Poland <i>Rest of CEEC</i> UMIIMP		Italy UK Korea Taiwan Switzerland Germany Portugal Sweden Finland Austria
Net-importers of both primary agriculture and processed food, not potentially self-sufficient					Hong Kong Japan Singapore

(1) In our GTAP classification Mexico is not in the UMMIIP group but in NAFTA group.

Figure 5.1 Classification scheme for GTAP simulations

The developed country groups are based on the classification scheme and on official arrangements such as free trade areas or custom unions. We distinguish the EU, NAFTA, Australia-New Zealand (AusNZL) and Japan and the NICS (JPNNICS).

Characteristics of country groups

Table 5.1 and Figure 5.2 highlight some macro economic characteristics of our country groups. The three largest groups of economies account for 76% of world GDP, while low-income countries, including India, account for only 3%. Export earnings are at least as important for developing countries as for high-income countries, as seen from the ratio of exports to GDP in 1997, see Figure 5.2. Their participation in world trade is obviously smaller, accounting for 3% of global exports and 3.4% of global imports, compared to 62% and 61% for high-income countries.

Table 5.2 shows the correlation between the importance of certain sectors and the level of development. The weight of primary agricultural sectors is relatively high in low-income countries (output share varies between 16% and 18%) and gets smaller the richer the countries are (output share in rich countries varies between 1% and 4%). For the middle income countries textiles, extraction sectors and manufacturing are relatively important and for the high-income countries the service sectors is most important.

Table 5.1 Domestic product

	GDP billion USD 1997	GDP share (%)
nafta	8965	30.9
EU	7962	27.5
jpnnic	5221	18.0
miexp	1284	4.4
miaexp	939	3.2
china	854	2.9
lmiimp	769	2.7
mifexp	764	2.6
row	687	2.4
ausnzl	458	1.6
india	400	1.4
umiimp	340	1.2
liaexp	170	0.6
liimp	128	0.4
liexp	38	0.1

Source: GTAP pre-release 5.2.

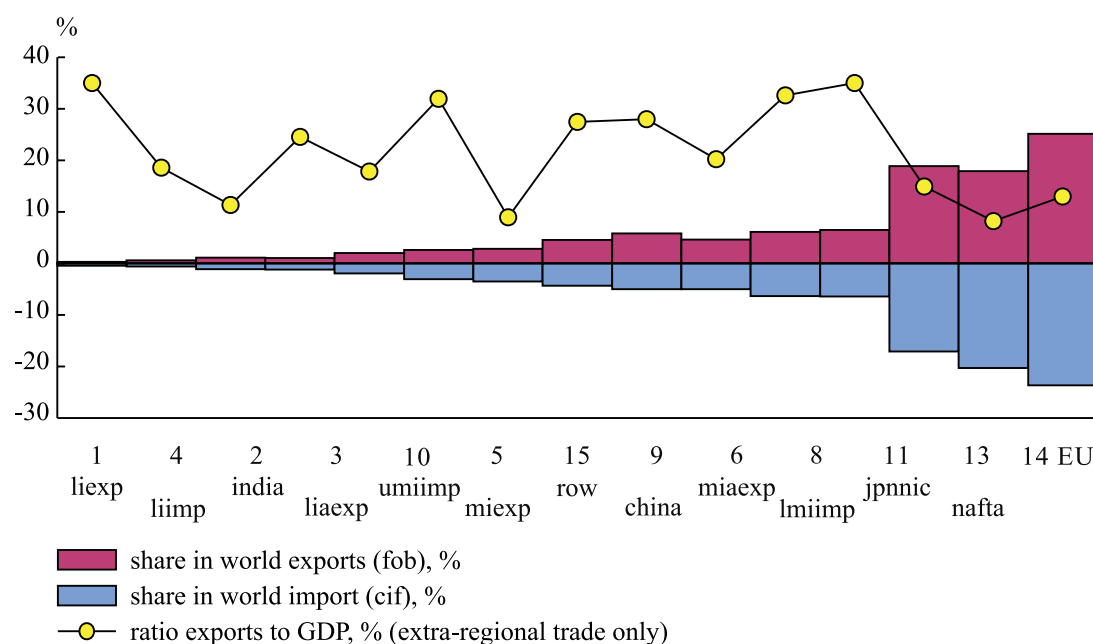


Figure 5.2 Participation in world trade (extra-regional trade only)

Table 5.2 Output-shares (percentage of total output)

	li	India	lia	li	Mi	Mia	mif	Lmi	chin	umi	Jpn	aus	nafta	EU	Row	Tot
	exp		exp	Imp	Exp	exp	exp	imp		imp	nic	nzl				
Food-grains	3.5	5.4	3.6	5.5	0.6	0.5	1.7	1.1	2.4	0.4	0.3	0.4	0.1	0.2	0.7	0.5
Feed-grains	1.4	0.9	1.4	0.6	0.4	0.3	0.5	0.4	0.7	0.5	0.0	0.2	0.3	0.1	0.3	0.3
Oil-seeds	0.2	2.9	0.5	1.6	0.6	0.2	0.3	0.1	0.2	0.1	0.0	0.0	0.1	0.1	0.2	0.2
AnimalPrim	1.4	5.2	2.8	4.0	2.0	1.7	2.1	2.0	3.7	2.9	0.4	1.6	0.9	1.2	2.2	1.3
OtherPrim	12.0	6.0	8.4	5.3	3.2	2.2	4.0	2.5	4.4	2.3	0.7	1.5	0.6	0.7	1.8	1.3
Total primary agriculture	18.5	20.4	16.7	17.0	6.8	4.9	8.6	6.1	11.4	6.2	1.4	3.7	2.0	2.3	5.2	3.6
AnimalProc	1.1	0.3	0.9	0.3	2.7	1.9	1.0	1.4	0.6	2.8	0.7	2.5	1.5	2.0	2.5	1.5
Sugar	0.4	1.7	0.6	1.4	0.7	0.4	0.5	0.6	0.2	0.4	0.1	0.3	0.1	0.2	0.3	0.2
OtherProc	8.2	2.7	10.4	6.8	5.7	4.5	7.3	4.6	4.9	6.7	3.8	2.9	3.1	3.3	5.0	3.8
Total processed agriculture	9.7	4.7	11.9	8.5	9.1	6.8	8.8	6.6	5.7	9.9	4.6	5.7	4.7	5.5	7.8	5.5
Tex	7.8	8.9	3.4	11.7	4.9	3.4	5.5	3.4	7.8	5.0	2.1	1.6	2.0	2.1	2.2	2.8
Extract	5.6	2.4	10.6	5.7	3.0	5.9	4.3	10.7	4.0	5.2	0.7	4.2	1.6	0.7	3.5	2.0
Manu	15.9	22.4	10.9	13.6	29.7	26.1	27.2	21.9	37.9	28.5	30.9	18.6	26.2	27.8	24.9	27.7
Svces	42.8	41.0	46.6	43.4	46.5	53.0	45.5	51.4	33.3	45.3	60.4	66.3	63.6	61.6	56.4	58.5
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: GTAP pre-release 5.2.

Table 5.3 Self-sufficiency (percentage)

	li exp	India	lia exp	li imp	mi exp	Mia exp	mif exp	Lmi Imp	china	umi imp	jpnnic	Ausnzt	nafta	EU	row
Foodgrains	99	100	93	93	104	89	92	74	99	82	83	299	166	99	95
Feedgrains	106	100	94	99	118	88	88	68	101	87	11	117	112	102	91
Oilseeds	115	101	111	96	111	147	74	66	74	86	7	153	145	70	87
AnimalPrim	104	100	101	100	101	102	97	97	101	100	91	112	101	99	99
OtherPrim	129	101	133	93	108	122	101	95	99	87	84	141	96	82	88
AnimalProc	97	102	79	67	105	80	90	69	97	100	77	167	101	103	90
Sugar	190	101	79	102	110	112	98	81	96	94	88	131	86	96	95
OtherProc	107	111	98	92	109	87	110	82	97	94	90	103	99	100	94
Tex	111	119	83	135	99	89	134	84	130	96	99	81	81	89	82
Extract	157	78	219	134	102	136	106	324	96	110	43	144	86	54	223
Manu	50	82	60	65	91	88	81	75	96	87	107	83	97	103	94
Svces	100	101	92	101	99	101	102	98	100	102	101	101	101	101	102

Source: GTAP pre-release 5.2

With regard to the trade dimension, Table 5.3 shows the self-sufficiency rates for all the country groups¹. If the self-sufficiency rate is 100 the country group is just self-sufficient, if the rate is lower than 100 it is a net-importer of this product and when this rate is larger than 100 it is a net-exporter of this product. In addition to the general classification scheme as given in Figure 4.1, this figure indicates the net trade position at a lower aggregation level and it shows the relative importance of commodity trade. For example the LIAEXP countries import cereals but export oilseeds and other primary products.

Table 5.4 Trade weighted tariff rates on exports 1997 (percentage, excl. intra-regional trade)

	li exp	Lia Exp	li imp	mi exp	mia exp	mif exp	lmi imp	umi imp	Jpnni	ausnzt	nafta	EU	row
Foodgrains	15	59	36	37	42	62	53	28	17	45	65	42	64
Feedgrains	22	24	26	39	15	36	25	28	21	79	42	32	18
Oilseeds	18	50	29	22	15	17	11	5	16	68	42	25	26
AnimalPrim	7	16	12	13	10	15	18	24	11	17	16	29	10
OtherPrim	12	10	17	14	12	19	17	14	25	13	20	30	19
AnimalProc	54	64	31	57	84	56	69	38	33	53	45	60	70
Sugar	61	66	74	22	52	48	50	34	26	31	37	20	63
OtherProc	31	28	21	24	26	28	21	21	25	29	32	34	29
Tex	5	7	9	6	13	10	10	8	17	8	15	12	9
Extract	0	1	1	2	1	2	1	2	7	1	1	2	1
Manu	6	3	6	4	5	4	6	5	8	6	6	8	4

Source: GTAP pre-release 5.2.

Table 5.4 shows the trade weighted applied tariffs that country groups encounter on their exports. The tariff distortions are given in ad-valorem terms, i.e. all specific rates,

¹ Self-sufficiency is defined as in chapter 3 as the percentage of total use covered from domestic production.

combinations of specific and ad-valorem artes and TRQs are translated to ad-valorem equivalents. These numbers give a first indication of the direct impact of a multilateral tariff reduction on a country's exports. The higher the initial tariff rates the more a country will gain from tariff reductions. These rates can also be seen as a proxy for the preferential treatment and competing sub-dimensions of our classification. This table shows that low-income countries meet lower tariff rates on their exports than developed countries. Consequently, a multilateral trade liberalisation may lead to larger expansion of exports for developed countries than for developing countries in some sectors. Furthermore, this table shows tariff escalation for low-income countries; the tariffs they face on primary agricultural products are generally lower than for their processed food products.

Table 5.5 Trade weighted applied tariffs on imports 1997 (excl. intra-regional trade)

	li exp	Lia Exp	li imp	mi exp	Mia Exp	mif exp	lmi imp	umi imp	jpnnic	Ausn zl	Nafta	EU	row
Foodgrains	3	43	6	8	12	6	46	33	169	0	8	63	72
Feedgrains	2	11	6	9	12	9	31	23	81	1	1	39	36
Oilseeds	4	19	44	6	8	14	40	12	74	1	10	0	69
AnimalPrim	5	15	34	9	12	15	52	29	14	1	2	12	69
OtherPrim	13	15	45	11	10	20	59	20	25	3	14	7	56
AnimalProc	14	19	32	23	20	35	89	57	61	7	29	69	117
Sugar	13	10	41	14	12	30	14	59	59	11	43	76	45
OtherProc	45	18	40	21	17	27	57	40	31	6	11	23	68
Tex	28	31	64	13	20	24	20	10	4	19	13	7	7
Extract	6	12	10	4	6	10	7	1	1	0	0	0	1
Manu	10	18	24	11	10	14	14	10	3	4	2	3	3
Svces	2	2	1	0	2	0	0	0	0	0	0	0	0

Source: GTAP pre-release 5.2.

Table 5.5 gives the trade weighted applied tariffs on imports in a country group. In general it is the case that the higher the initial tariffs the more a country group can gain from trade liberalisation. It is striking to note a negative correlation between the degree of self-sufficiency and the height of tariffs. Generally speaking, lower levels of self-sufficiency coincide with higher levels of import barriers.

Figure 5.3 reveals another aspect of the agricultural trade relations between rich and poor countries. This figure show the primary and processed trade balance in 1997 between the EU, Nafta and the AUSNZL composite vis a vis all low income countries distinguished. While the rich countries where net exporters of processed agriculture to low-income countries, all except the EU are also net exporters of primary agriculture to those countries.

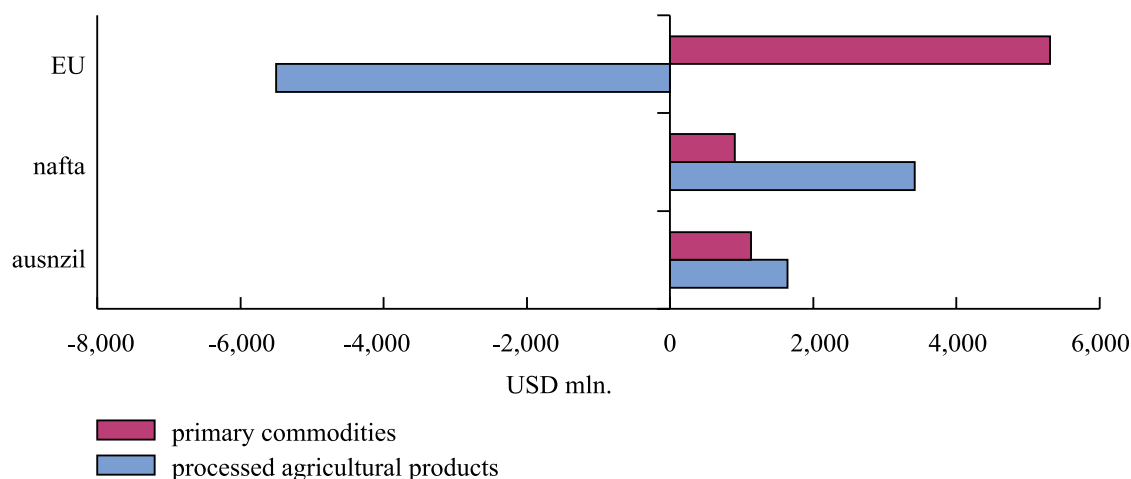


Figure 5.3 Trade balance with low and middle income countries (1997)

Policy experiments

In this chapter we discuss the impact of three trade liberalisation experiments on the distinguished groups of developed countries. We study the impact on the macro-economic development, the agricultural development and on food security. We performed five policy experiments:

1. Trade liberalisation in primary products: reduction of all import tariffs and export subsidies with 50% in all countries (ac50)
2. Trade liberalisation in primary products and reduction of domestic agricultural support: in addition to the first experiment input and output subsidies in developed countries are reduced with 50% (acd50)
3. Trade liberalisation in primary and processed agricultural products and reduction of domestic agricultural support. All reductions are 50% (acpd50)
4. Trade liberalisation in all products and reduction of domestic agricultural support: in addition to the second experiment all import tariffs and export subsidies in non-agricultural sectors are reduced with 50% in all countries (aad50)
5. Trade liberalisation in all products and reduction of domestic agricultural support as in experiment 4. In addition the trade balance of low-income countries is fixed at base year levels. (aadTB50)

The reductions of distortion rates are all from their applied 1997 levels. Hence, we may be overstating the effects from tariff reductions, as we do not distinguish between reductions in bound tariffs and reductions in applied tariffs (which are usually below bound rates). The reduction percentage of 50% is somewhat arbitrary, but as likely as other reductions in the absence of clear further progress in the WTO talks.

Global developments

The development of world prices, shown in Table 5.6 is important to understand the impact of the various trade liberalisation scenarios on exporters and importers. As expected, liber-

alisation in agriculture (AC50) leads to higher world prices for food- and feed-grains; products that received the highest level of protection within primary agriculture (see Table 5.5 for import tariffs). The increase in the world price of the heavily supported food- and feedgrains sectors is much bigger when domestic agricultural support is reduced (ACD50). The higher prices of feedgrains in combination with trade liberalisation in the processed sectors (ACPD50) lead to an increase in the world price of processed animal products. Liberalisation in all sectors (Aad50) leads to global price drops because the allocation of production factors becomes more efficient. Exceptions are the increases in prices in a few agricultural products that were highly supported by production or export subsidies.¹

Table 5.6 Percentage change in world export price and export quantities

	Price index of global exports				Volume of global exports			
	AC50	ACD50	ACPD50	AAD50	AC50	ACD50	ACPD50	AAD50
Foodgrains	1	8	9	8	19	13	10	11
Feedgrains	1	7	7	7	3	1	-1	-1
Oilseeds	-1	1	1	1	7	11	9	9
AnimalPrim	-1	1	1	0	10	10	8	9
OtherPrim	-1	-3	-3	-3	10	9	8	9
AnimalProc	0	1	3	2	0	-1	10	11
Sugar	0	0	-1	-2	0	-1	17	18
OtherProc	0	0	-1	-2	-1	-1	19	19
Tex	0	0	0	-2	0	0	0	11
Extract	0	0	0	-1	0	0	0	2
Manu	0	0	0	-1	0	0	0	5
Sves	0	0	0	-1	0	0	1	3

Source: model simulations, author's calculations

Table 5.6 also shows that the developments in the volume of global exports match expectations, because trade expands in sectors that are liberalised. Liberalisation in primary agriculture (AC50) and processed food (ACPD50) induce an expansion in global primary and processed trade, respectively. Reduction of domestic support (ACD50) reduces the trade volume of especially foodgrains and increases the volume of oilseeds, because resources are shifted from cereals to the less distorted oilseed sector.

¹ We may note that the pattern of price changes is similar to the results obtained by USDA/ERS (2001). They also find relatively larger changes in grains, and more modest changes in processing. This latter effect is partially explained by the fact that inputs from primary agriculture represent only a small portion in total processing costs. Contrary to our results, the USDA/ERS study does not find price declines –but price rises– in sugar, and other processing under their liberalisation scenario which comes closest to our AAD50 specification.

Table 5.7 *Change in trade balance (USD mln., 1997)*

	AC50				AAD50				AAD50TB			
	To-taal	Prim	Proc	Oth	Totaal	Prim	Proc	Oth	Totaal	Prim	Proc	Oth
Liexp	54	211	-92	-64	-1031	-72	49	-1008	0	67	196	-391
India	451	1226	-278	-497	-2814	558	4068	-7440	0	668	3869	-4062
Liaexp	60	-104	1	163	-750	-214	395	-931	0	-416	175	316
Liimp	-119	-315	42	154	-878	-263	-345	-270	0	-149	-276	310
Miexp	46	2455	-893	-1516	-4097	1650	4795	-10541	-4357	1596	4528	-7895
Miaexp	280	234	-158	204	-2332	-297	1339	-3375	-2523	-398	911	-729
Mifexp	-98	160	-352	94	-9987	-1028	676	-9635	-10131	-577	2918	-2719
Lmiimp	-1695	-1710	599	-584	-21001	-1002	-5030	-14970	-21185	-797	-4680	3502
China	-476	-247	48	-278	-2549	-593	-1869	-87	-2716	83	-1427	498
Umiimp	-127	-162	89	-54	-4843	-209	-126	-4507	-4938	-126	34	-412
Jpnnic	-2300	-2377	2434	-2357	1562	-2185	-9679	13426	320	-1837	-8645	7195
Ausnzl	143	798	-430	-225	223	278	4043	-4098	136	113	3784	-4202
Nafta	2274	1733	-1220	1761	21061	3313	7052	10696	19639	2612	5989	-7401
EU	1987	-2457	-197	4641	28110	-492	-9797	38400	26544	-1346	-11695	21655
Row	-479	-1034	587	-32	-674	-704	179	-150	-788	-734	89	-193
World	0	-1590	178	1411	0	-1259	-4251	5510	0	-1242	-4229	5471

Source: model simulations, author's calculations

Macro economic impact

The trade balance is directly affected by trade liberalisation; it is there where we start the macro-economic story. Conforming to expectations, in case of liberalisation in primary agriculture (AC50) the trade balance in primary agricultural products improves for exporters and deteriorates for importers of primary agricultural products. The only exception is that the trade balance in primary agricultural products for LIAEXP countries deteriorates (This country group comprises some of the Sub-Saharan countries, such as Tanzania and Uganda). This unexpected result can be explained by looking at the production and trade structure. LIAEXP countries import cereals and export mainly other primary products (horticulture, plant-based fibbers and sugarcane), see Table 5.3. This observation in combination with the development in world market prices shows that the terms of trade develops unfavourably for these countries because their import prices increase and export prices decline. Furthermore, trade liberalisation induces more imports of food grains, because LIAEXPs have relatively high initial import tariffs on food grains, and lead to a small increase in their exports because they encounter a very low tariff on their exports of other primary products. Therefore, the trade balance in primary agricultural products can even deteriorate for exporters of primary agricultural products. If we look at the total trade balance we see the expected picture. One exception is the EU in which the deteriorating agricultural trade balance is compensated through increased exports of non-agricultural products

Table 5.8 *Macro economic indicators*

	Real GDP (percentage change)					Equivalent variation, as percentage of GDP				
	AC50	ACD50	ACPD50	AAD50	AAD50TB	AC50	ACD50	ACPD50	AAD50	AAD50TB
										B
Liexp	0.0	0.0	0.4	1.2	1.1	0.0	-0.1	0.6	1.3	0.7
India	0.1	0.1	0.8	2.1	2.0	0.0	0.0	0.6	1.5	1.3
Liaexp	0.1	0.0	0.2	0.5	0.5	0.0	-0.1	0.2	0.1	0.0
Liimp	0.2	0.2	0.5	2.0	2.0	0.1	0.1	0.5	1.7	1.5
Miexp	0.1	0.1	0.2	0.7	0.7	0.1	0.1	0.3	0.7	0.7
Miaexp	0.0	0.0	0.1	0.3	0.3	0.0	0.0	0.0	0.1	0.2
Mifexp	0.0	0.0	0.2	0.8	0.8	0.0	0.0	0.2	0.6	0.6
Lmiimp	0.2	0.2	0.6	0.9	0.9	0.2	0.1	0.4	0.8	0.8
China	0.1	0.1	0.2	0.6	0.6	0.1	0.1	0.2	0.5	0.5
Umiimp	0.1	0.1	0.3	0.7	0.7	0.0	0.1	0.3	0.8	0.8
Jpnnic	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.4	0.4
Ausnzi	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.3
Nafta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EU	0.0	0.1	0.2	0.2	0.2	0.0	0.1	0.2	0.2	0.2
Row	0.1	0.1	0.6	0.8	0.8	0.1	0.1	0.6	0.8	0.8
World	0.0	0.1	0.2	0.3	0.3	0.0	0.1	0.2	0.3	0.3
World a)	11442	17031	5442	77915	78530	11490	17253	44477	78348	78010

a) Change in million USD

Source: model simulations, author's calculations

Trade liberalisation in all products (AAD50) improves the trade balance in all developed countries but leads to a deterioration of the trade balance in all developing countries. For the low-income countries the question arises whether they can obtain the foreign exchange to pay for this deficit. If this is not the case, the results of these experiments will be too optimistic for these countries. Therefore, we performed another experiment where we fixed the trade balance for all low-income countries to their initial levels (AAD50TB).

All trade liberalisation experiments have a positive impact on real GDP and welfare (measured in equivalent variation) for the world and almost all-individual country groups. A broad round generates about 78 billion USD gains each year. This result is comparable to the findings of ABARE (2000), but some distance away from some other studies cited in chapter 2. Note that about 22% of the overall effect can be attributed to liberalisation in agriculture and another 36% can be attributed to liberalisation in food processing. Therefore liberalisation in primary and processed agriculture are important because together they contribute 58% of a broad round.¹ A comparison of Table 5.7 and Table 5.8 shows that a positive trade balance effect does not imply a positive welfare effect and vice versa.

¹ We need to mention one important caveat: Since our commodity grouping is heavily biased towards agriculture, while manufacturing and services deserve less attention, it comes at no surprise that a large portion of the simulated liberalisation gains occurs in agriculture. It would be interesting to see how the results vary under alternative commodity aggregations schemes that put more detail in manufacturing and services. An additional area for improvement is certainly the poor availability of protection data in the services sectors.

Low-income countries receive relatively large gains from a broad round. The welfare gains in terms of GDP are around 1.5%, whereas for the world the average is 0.3%. The only exception are again the LIAEXP countries whose gains from a broad round are very modest (0.1% of GDP). Restricting the trade balance (AAD50TB) has a large adverse effect on the welfare gains for the low-income exporters (LIEXP). These gains are reduced from about 1.3% to about 0.7% from a broad round.

The only negative welfare effects on low-income countries (LIEXP, LIAEXP) are obtained when domestic support (ACD50) is reduced in developed countries. In view of this group being exporters this is a surprising result. This is mainly caused by adverse terms of trade effects for this group of developing countries. As depicted in Table 5.6 world prices of their main import products (food- and feedgrains) increase and prices of their main export product (other primary products) decrease. A more in depth analysis of this result is given in the next chapter on agricultural development.

Agricultural development

Trade liberalisation in agriculture (ac50) is expected to lead to an expansion of the primary sector for net exporters of primary products and a decline of processing and manufacturing following trade liberalisation. Importers would see the reverse pattern. This is true by and large, with again the important exception of LIAEXP countries, see Table 5.9. Their loss in international market share is translated into a decline in domestic primary production, which also leads to drops in domestic supply prices. Hence, their agricultural sector experiences clearly negative effects from this partial liberalisation scenario.

If domestic agricultural protection in high-income countries is reduced (acd50), this does not lead to dramatic additional effects for the growth prospects of developing country agriculture. Quite surprisingly this result also holds for agricultural exporting developing countries. Primary agricultural output contracts in the heavily supported EU and Japan (& NICs) which leads to an upward pressure on world prices through higher import demand and contracting exports by the EU. Developing country exporters, however, are not able to increase their market shares significantly. It are mainly the farmers in NAFTA and AUSNZL who see better market prospects and are able to expand production. In the US we see a shift in the US from heavily supported cereals to 'other primary' production. This leads to a positive (!) growth in primary output in the US, increased exports and more fierce world market competition in this commodity group. As a result, world prices decline and especially the LIAEXP are facing declining prospects for their largest export commodity group. It is also interesting to note that the agri-processing industries in the EU are implicitly subsidised. The elimination of domestic subsidies to agriculture leads to an increase in their domestic input costs, which translates to a drop in output in the processing sectors. In the face of rising world prices, farmers in net-importing developing countries are expected to see a marginal improvement in the profitability of production.

In terms of sectoral growth prospects, the most dramatic effects are simulated if trade barriers in the agri-processing industries are reduced on top of agricultural trade - and domestic policy reforms (acpd50). To appreciate this result, it is helpful to realise that border

protection is relatively high in these sectors, compared to primary developing country exports. Consequently larger shifts in trade and production can be expected, with high income country processing sectors declining and middle income countries expanding their processing sectors. This pattern is clearly visible in Table 5.9, and indicates possibilities for global relocations of processing industries.

Also, primary production is expanding significantly in low- and middle income exporting countries -especially in Latin America, because they are able to benefit from the growth of domestic processing sectors as well as benefiting from improved export possibilities to other middle income countries that expand their processing sectors. Low-income exporters (LIEXP) are also benefiting from this expansion, as they have close trade relations with middle income food exporters (MIFEXP).

This stands in stark contrast with low-income primary agricultural exporters (LIAEXP), which are not able to share equally in the improved market prospects. This is a consequence of the fact that their trade pattern is biased towards trade with the EU, which is expected to decrease import demand of primary agriculture in the wake of shrinking processing activities. The biggest gainers in this simulation are farmers and processing firms in AUSNZL.

Finally, the comprehensive simulation (aad50) illustrates some of the global shifts in production that might occur if trade in all sectors of the economy would be less exposed to barriers. Middle income developing countries which are currently exporting and which now also liberalise their own protected manufacturing industries, specialise more in agriculture and agri-processing industries. This is possible under a simulated broad round, because resources are freed from inefficient manufacturing industries in developing countries and move to agri-processing activities. However, this is not the case for low income exporting countries. Net importing developing countries, which also have limited potential to develop their agricultural sectors, are somewhat moving towards low-skilled manufacturing activities such as textiles.

Food security

We use an indicator of *food access*, defined as the change in purchasing power to obtain primary food products. The indicator is calculated for factor incomes obtained from unskilled labour and for factor incomes obtained from Land ownership. This allows us to approximate the distinction between those households that obtain their income from labour services (landless) and those that are landowners, although the GTAP model does not contain information on the institutional income distribution.

According to the theory embedded in the model, factor earnings will rise for those production factors that are used relatively intensively in expanding sectors. This is especially true for sector specific factors earnings of factors that are sluggish or not perfectly mobile between sectors¹. In as far as unskilled labour is used intensively in farming, and as

¹ In this application unskilled labour is assumed perfectly mobile and land is assumed to be sluggish. With regard to labour this is a long run assumption, which maybe a bit extreme in the case of some less developed countries where especially in the short run the mobility between agricultural sectors and other sectors maybe limited for unskilled labour. The latter could be introduced by market segmentation within the unskilled labour market.

agriculture expands in exporting countries following a trade liberalisation, this might lead to higher unskilled wages. The sector specific rent of the sluggish production factor land will increase if a sector expands. However, the food purchasing power for those factor incomes does only improve if, in addition, domestic food prices grow slower than factor payments.

Table 5.9 Percentage change in output

	AC50			ACD50			ACPD50			AAD50		
	Agri	Food	Oth	Agri	Food	Oth	Agri	Food	Oth	Agri	Food	Oth
liexp	1.5	-1.9	-0.5	1.1	-1.3	-0.3	1.2	1.2	-0.9	-0.1	-1.4	-0.1
india	0.6	-1.2	-0.3	0.6	-1.0	-0.3	1.1	9.5	-1.1	1.6	10.3	-2.1
liaexp	-0.3	0.1	0.1	-0.7	0.3	0.2	-0.7	-0.3	0.3	-0.2	0.4	-0.5
liimp	-0.8	0.6	0.4	-0.7	0.4	0.3	-1.1	-3.9	0.7	-0.7	-3.7	0.0
miexp	1.4	-0.6	-0.2	1.4	-0.5	-0.2	2.2	2.2	-0.5	2.4	2.5	-0.7
miaexp	0.1	-0.2	0.0	0.0	0.2	0.0	0.5	1.4	-0.1	0.7	1.8	-0.2
mifexp	-0.1	-0.2	0.0	-0.2	0.0	0.0	0.2	2.5	-0.3	-1.1	-0.2	0.3
lmiimp	-2.5	1.7	0.2	-2.1	1.4	0.2	-3.7	-7.8	0.7	-4.2	-8.3	0.4
china	-0.2	0.4	0.1	-0.1	0.5	0.0	-0.2	-1.6	0.1	0.2	-1.9	0.4
umiimp	-0.4	0.4	0.0	-0.2	0.6	0.0	0.0	-0.2	0.0	-0.2	-0.2	-0.1
jpnnc	-3.0	2.0	0.0	-3.3	1.7	0.0	-4.7	-1.7	0.2	-5.1	-1.9	0.3
ausnzl	2.0	-1.2	-0.1	2.2	-1.0	-0.1	5.4	8.5	-0.6	6.2	9.3	-0.7
nafta	0.4	-0.3	0.0	0.8	-0.2	0.0	1.3	1.0	-0.1	1.5	1.2	-0.1
EU	-1.1	0.1	0.1	-1.6	-0.3	0.1	-3.8	-3.1	0.3	-3.4	-2.8	0.3
row	-2.0	1.7	0.1	-1.9	2.1	0.1	-2.9	-1.7	0.3	-2.8	-1.6	0.2

Source: model simulations, author's calculations

Looking at Table 5.10, we observe that the partial trade liberalisation scenario ac50, gives some reason for food security (i.e. food access) concerns. In low and middle income exporting countries (LIEXP, India, MIEXP, MIAEXP) the food access index for unskilled labour declines, which indicates that these household groups face problems with respect to food access. The main reason for this is the increase in domestic foodprices. As the domestic agricultural sectors expand in order to serve the exports markets, domestic prices are bid up, which translates into higher domestic food prices. On the other hand, landowners see an increase in land rents due to expansion of agriculture¹.

For importing countries we unexpectedly see the reverse. Unexpectedly, because we expect world prices and, therefore, domestic prices in food importing countries to rise due to liberalisation. However, conform chapter 4 this is as expected when importing countries have high initial tariffs. Reducing tariffs implies domestic prices to go down, which improves the access to food for poor parts of the population². Landowners witness a decline in

¹ With market segmentation for unskilled labour between agriculture and other sectors, the wages of unskilled labour in agriculture (other sectors) would have increased more (less) due to the expansion of agriculture (shrimp of other sectors). The food access problems would be less severe for unskilled labour in other sectors.

² With market segmentation for unskilled labour between agriculture and other sectors, the wages of unskilled labour in agriculture (other sectors) would have increased less (more) due to the shrimp of agriculture

rents, as a consequence of decreasing domestic production due to the lower domestic prices. (EU, LIIMP, LMIIP, UMIIP).

The comprehensive liberalisation scenario (aad50) is expected to yield the most beneficial results to those countries where food security is a main concern. The LIIMP group, and to some extent the LIEXP group would see a significant improvement in the food access index for unskilled labour. Even if higher import cost cannot be borne, due to balance of payments restrictions, then this index improves, albeit to a lesser extent.

Table 5.10 Percentage change in food purchasing power

	AC50		ACD50		ACPD50		AAD50		AAD50TB	
	UnSkLab	Land	UnSkLab	Land	UnSkLab	Land	UnSkLab	Land	UnSkLab	Land
liexp	-1.7	7.0	-1.2	4.7	-0.9	5.2	3.0	1.1	1.9	3.6
india	-1.5	3.3	-1.5	3.2	-2.6	6.0	-2.7	9.1	-3.0	9.5
liaexp	0.1	-1.1	0.2	-3.2	0.3	-3.1	0.8	-0.3	0.6	0.4
liimp	2.0	-4.2	1.7	-3.5	3.0	-5.3	3.4	-2.3	3.0	-1.6
miexp	-0.9	6.4	-0.9	7.3	-1.4	11.2	-1.1	12.5	-1.0	12.3
miaexp	-0.2	0.9	0.2	-0.6	-0.2	1.7	-0.1	3.1	-0.1	3.0
mifexp	0.3	-0.4	0.5	-0.7	0.1	1.5	3.1	-3.5	3.2	-3.6
lmiimp	2.3	-11.1	1.9	-9.4	3.1	-14.5	4.7	-15.7	4.7	-15.8
china	0.5	-0.9	0.3	-0.5	0.7	-0.9	0.8	1.4	0.8	1.4
umiimp	1.0	-2.9	0.8	-2.0	1.1	-1.2	2.4	-1.1	2.4	-1.2

Source: model simulations, author's calculations

(expansion of other sectors). The food access problems would be more severe for unskilled labour within agriculture and less severe for unskilled labour in other sectors.

6 Conclusions

Partial agricultural trade liberalisation is expected to generate positive economic effects in general. An important exception is the low-income exporters of primary agricultural commodities, which see a fall in net-exports. This country group comprises some of the Sub-Saharan countries, such as Tanzania and Uganda. Following trade liberalisation, the competition on world grain markets becomes stiffer, with the big exporters from NAFTA and Australia experiencing a surge in their market shares. The deterioration in the grains trade balance in low-income exporters is somewhat compensated in increased exports of horticulture, sugar and plant based fibres which have a big share in their exports package.

According to our estimates, extending liberalisation trade alone to *reforms of domestic agricultural policies in high-income countries* is not as advantageous to developing countries as often thought. Developing country importers are expected to face higher import prices, which impedes their ability to generate resources to expand production in non-agricultural activities. While this effect is widely accepted, we also find that policy reform in high-income countries may lead to production shifts away from currently supported crops towards other activities, which compete directly and indirectly with developing country exports. As a result, agricultural exporters may face stiffer competition and depressed prices on world markets. In the US, for example, lower support for grains may lead to a shift of area towards sugar and horticultural products, which become relatively more profitable. Since the current US policies do not link area payments to specific crops (as in the EU), such shifts are not unlikely to occur.

Including *trade liberalisation in agri-processing* industries is expected to lead to significant gains for developing countries. Among other things, these gains are relatively high because the processing sectors in high-income countries are even more protected by import barriers than primary agriculture. The partial elimination of tariff escalation avails improved trade opportunities to both current agri-processing exporters from developing countries and to developing country exporters of primary commodities. Low- and middle-income countries, especially Latin American exporters, are able to benefit from the surge in processing activities in other low- and middle-income countries. However, as the trade pattern of some low income exporters of primary agriculture is based towards trade with the European Union and the United States, these countries are not expected to gain much from the processing expansion in other developing regions.

A *comprehensive liberalisation* that includes also textiles, manufacturing and services best enables economies to adjust their production structure to their comparative advantage. Current net-importers of agricultural products further specialise in non-agricultural activities. Current exporters further specialise in agriculture, with -again- the important exception of some low-income agricultural exporters. The mechanism behind this disappointing result is the same as in the previous case. The economic structures of these countries are heavily dependent on trade with a few high-income countries in a se-

lected set of commodities. With a global lowering of trade barriers the value of existing preferences is eroded and other, more efficient producers take over.

Our study shows that the aggregation of countries into country groupings matters considerably for the results. The results literally prompt for detailed country studies and commodity level studies to further desegregate and test the assertions obtained from our modelling exercise.

The current study has focussed on static liberalisation gains. A further fruitful line of research will be the inclusion of dynamic gains from trade liberalisation. Such gains relate to capital accumulation as well as to technology improvements.

References

Abare, *The impact of agricultural trade liberalisation on developing countries*. Canberra: ABARE research report 2000.6 (2000).

Abbott, P. and A. Morse, *TRQ implementation in Developing Countries*. WTO/WB conference on Agriculture and the New Trade Agenda from a Development Perspective: Interests and options in the WTO 2000 negotiations, Geneva, Switzerland (1999).

Anderson, K., B. Hoekman et al., *Agriculture and the WTO; Next steps*. Second Annual Conference on Global Economic Analysis, Aversaes, Denmark 30-21 June (1999).

Australian Department of Foreign Affairs and Trade (1999), *Global Trade Reform: maintaining momentum*. Canberra, <http://www/dfat.gov.au>

Bagwell, K. en R.W. Staiger, An economic theory of GATT, *The American Economic Review*, vol. 89, No. 1, page 215-248.

Borell, WB/WTO conference paper on sugar. 1999.

Commission of the European Community (1999), *The millenium round: an economic appraisal*, DG trade, Economic papers No. 139.

Diaz-Bonilla, E., M. Thomas, S. Robinson, A. Cattaneo (2000), *Food security and trade negotiations in the World Trade Organization: A cluster analysis of country Groups*, Washington DC.: International Food Policy Research Institute, TMD Discussion paper No. 59.

Elbehri, A., M. Ingco, T. Hertel en K. Pearson, *Agriculture and WTO 2000: quantiative assessment of multilateral liberalization of agricultural policies*. Paper presented at The World Bank-WTO conference on agriculture and the new trade agenda in the WTO 2000 negotiations. Geneva October 1-2, 1999.

USDA/ERS (2001), Mary Burfisher (ed.), *The road ahead: agricultural policy reform in the WTO- Summary report*. Washington DC.: Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculre, Agricultural Economic Report 797.

FAO, *Assessment of the impact of the Uruguay Round on Agricultural markets and food security*. Rome: Food and Agricultural Organisation of the United Nations, CCP 99/12 Rev. (update to CCP document no. 99/12, october 1999).

Finger, M.J., M. Ingco, and U. Reincke, , *The Uruguay Round: Statistics on Tariff Concessions Given and Received*. (World Bank), 1996.

Francois J.F., B. McDonald, H. Norström, *A users'guide to the Uruguay Round Assessments*. World Trade Organisation, Working paper No. ERAD-96-003, 1996.

Gorter, H. de, *Market Access, Export Subsidies and Domestic Support Measures: Issues and Suggestions for New Rules*, WTO/WB conference on Agriculture and the New Trade Agenda from a Development Perspective: Interests and options in the WTO 2000 negotiations, Geneva, Switzerland 1999.

Hertel, T.W. (ed) *Global Trade Analysis: Modelling and Applications*. Cambridge University Press, 1997.

Hertel, T.W., K. Anderson, J.F. Francois, B. Hoekman en W. Martin, *Agriculture and non-agricultural liberalization in the millenium round*. Paper presented at The World Bank - WTO conference on agriculture and the new trade agenda in the WTO 2000 negotiations. Geneva October 1-2, 1999.

IMF, *World Economic Outlook*, Washinton DC.: IMF, 2000.

Laird, S. (1999), *Patterns of protection and approaches to liberalization*, paper presented at CEPR workshop on New Issues in the World Trading System, London, 19-20 February 1999.

Martin W. and A. Winters, eds., *The Uruguay Round and developing economies*. New York: Cambridge University Press, 1996.

Matusz, S. J. en D.G. Tarr, *Adjusting to trade policy reform*. World Bank. Policy Research Working Paper No. 2142, 1999.

Michalopoulos, C. (n.d.), *The role of special and differential treatment for developing countries in GATT and the World Trade Organisation*. (mimeo) Washington DC, The World Bank.

OECD, *The Uruguay Round Agreement on agriculture and processed agricultural products*. Paris: OECD, 1997.

OECD, *The impact of further trade liberalisation on the food security situation in developing countries*. Joint Working Party of the Committee for Agriculture and the Trade Committee, Paris: OECD, COM/AGR/TD/WP(2000)93, 2000.

OECD, *An analysis of officially supported export credits for agriculture*. Paris: OECD. 2001. (www.oecd.org/agr)

Roberts, D., D. Orden, et al., *WTO Disciplines on Technical Barriers to Trade: Progress, Prospects and Implications for Developing Countries*, WTO/WB conference on Agriculture and the New Trade Agenda from a Development Perspective: Interests and options in the WTO 2000 negotiations, Geneva, Switzerland, 1999.

Safadi, R. en S. Laird, *The Uruguay Round Agreements: Impact on developing countries*, *World Development*, vol 24, no. 7:1113-1242, 1996.

Tangermann, S., *The future of preferential trade arrangements for developing countries and the current round of WTO negotiations on agriculture*. FAO Geneva round table on selected agricultural trade policy issues. Discussionpaper no.3, Rome: FAO (2001).

UNCTAD, *Preparing for future multilateral trade negotiations: Issues and reset needs from a development perspective*. New York and Geneva, UNCTAD, (1999).

Valdés, A. and A. F. McCalla, *Issues, interests and options of developing countries*. WTO/WB conference on Agriculture and the New Trade Agenda from a Development Perspective: Interests and options in the WTO 2000 negotiations, Geneva, Switzerland, 1999.

Wainio, J., P. Gibson, D.B. Whitley, *Implementation of Uruguay Round tariff reductions*, *ERS/USDA Agricultural Outlook* (nov.): 26-30.

Watal, J., *Intellectual Property Rights and Agriculture: Interests of Developing Countries*. WTO/WB conference on Agriculture and the New Trade Agenda from a Development Perspective: Interests and options in the WTO 2000 negotiations, Geneva, Switzerland, 1999.

World Trade Organisation, *Background document for High level symposium on trade and development*. Geneva March 17-18, WTO development division, 1999a.

World Trade Organisation, *Market access for least developed countries: compilation of information*, Sub-committee on least developed countries, WT/COMTD/LDC/W/16, 1999b.

Database sources for country classification analysis

Trade data: PC/TAS 98 cd-rom of the UNCTAD/WTO

Production data: FAOSTAT 98 cd-rom

GDP data: World Bank (www.worldbank.org)

Appendix 1 The GTAP model

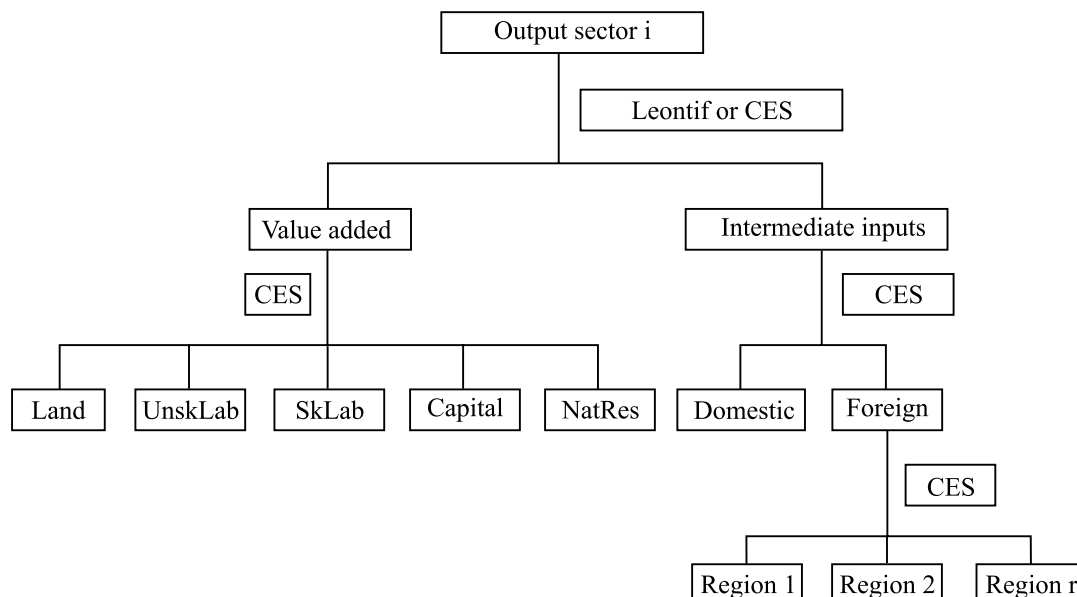
Our simulations use the GTAP multi-sector multi-region AGE model, see Hertel (1997) for a comprehensive documentation. GTAP was initiated with the goal of supporting high level quantitative analysis of international trade, resource, and environmental issues in an economy wide context. The GTAP project is supported by the leading international agencies in trade and development policy, as well as a number of national agencies with active research programmes on these issues (see www.gtap.org for more information on the consortium).

Model characteristics

There are basically two strands of quantitative modelling in policy analysis. One approach is to build issue-specific models, depending on the question at hand. These models will usually be capable of capturing many relevant aspects of one specific policy question, but are of less use in a different policy context. The other approach sets out to construct more general and flexible models, which do not necessarily attempt to capture all detail but are flexible enough to allow elaborations in face of specific policy questions. Such a modelling framework is provided by the Global Trade Analysis Project (GTAP).

The standard GTAP model is a multi-region, computable general equilibrium model, with perfect competition and constant returns to scale. In the standard GTAP model each single region is modelled along relatively standard lines of multi-sector AGE models. All sectors are producing under constant returns to scale, and perfect competition on factor markets and output markets is assumed.

Figure 6.1 Production structure of standard GTAP model



Firms combine intermediate inputs and primary factors land, labour (skilled and unskilled) and capital. Intermediate inputs are used in fixed proportions, but are themselves Constant Elasticities of Substitution (CES) composites of domestic and foreign components (see figure 6.1). In addition, the foreign component is differentiated by region of origin (Armington assumption), which permits the modelling of bilateral (intra-industry) trade flows, depending on the ease of substitution between products from different regions. Primary factors are combined according to a CES function. Regional endowments of land, labour and capital are fixed. Labour and capital are perfectly mobile across domestic sectors. Land, on the other hand, is imperfectly mobile across alternative agricultural uses, hence sustaining rent differentials.

Each region is equipped with one regional household, which distributes income across savings and consumption expenditures according to fixed budget shares. Consumption expenditures are allocated across commodities according to a non-homothetic Constant Differences of Elasticity's (CDE) expenditure function. Furthermore, there is an explicit treatment of international trade and transport margins, and a global banking sector, which intermediates between global savings and consumption. The standard model also gives users a wide range of closure options (i.e. which variables are treated endogenous or exogenous in the model), including a selection of partial equilibrium closures, which facilitate comparison of results to studies based on partial equilibrium assumptions. This model is documented in the GTAP book (Hertel, 1997). Various issues relating to the model are regularly discussed on the GTAP-I mailing list. The model is implemented using the GEMPACK software suite.

Adaptations of the standard model have been developed by various GTAP users. Such elaborations, include increasing returns to scale and imperfect competition, dynamic equilibrium formulations and incorporation of non-continuous policy instruments such as formulated in GATT commitments.

Data

The GTAP database contains detailed bilateral trade, transport and protection data characterising economic linkages among regions, linked together with individual country input-output data bases which account for intersectoral linkages among the 57 sectors within each of 65. All monetary values of the data are in DUS millions and the base year for Version 5 is 1997. The bilateral trade data are derived from United Nations Trade Statistics and support- and protection data from various sources (e.g. UNCTAD TRAINS database for tariff information, OECD's PSE database for agricultural support). Version 4 is fully documented in 'McDougall, R., A. Elbehri, and T. Truong, Global Trade, Assistance, and Protection: The GTAP 4 Data Base, 1998' Version 5 GTAP data base is scheduled for public release in 2001.