4. Macroeconomic impacts of agricultural trade reform

The agricultural and trade policy landscape described in Chapter 3 is complex. So too are the proposals for their reform. Assessing the economic effects of these proposed reforms is equally complex.[8] Simply observing the situation before and after a policy change is not sufficient to understand its impact. In reality, many changes – for example relating to other policies, the weather, technology – happen at the same time so the effects of any specific policy change can be difficult to disentangle.

Sophisticated econometric techniques are used to isolate the effects of policy changes *ex post*, or after the fact. But policy-makers often need to understand the potential impacts of alternative policy options *ex ante*, before they occur. *Ex ante* assessments of such options help identify potential winners and losers and aim to inform the policy debate. This chapter is concerned particularly with *ex ante* assessments of agricultural policy changes against the background of the ongoing Doha Round of multilateral trade policy negotiations.

The first section of this chapter describes some of the modelling approaches used in *ex ante* policy assessments, explaining their strengths and limitations. Several of the more recent attempts to predict the economy-wide impact of agricultural trade policy liberalization are discussed in the second section. More detailed commodity market impact studies based on agriculture sector models are described in the third section.

These modelling approaches yield some general indications about the likely winners and losers in the reform process at the national level, but they are less helpful in describing the distributional effects within a country. Chapters 5 and 6 extend the analysis to the household level, examining the impacts of trade policy reform on poverty and food security.

Modelling trade policy reform

Ex ante policy assessment is concerned with evaluating a situation with a proposed policy change against a situation without the policy change; economists therefore use models that simulate the structure of the economy and the ways in which different economic agents respond to policy changes. Economic models start from a portrait of an existing situation, and then proceed to paint a counterfactual world that includes the proposed policy changes.

The most commonly used models are market equilibrium models, containing equations that represent the responses of buyers and suppliers to changes in prices. Demand and supply are specified as functions of income, prices and elasticities. Prices adjust until markets clear, with demand and supply in equilibrium.

The behavioural response of suppliers and buyers is typically derived from optimizing assumptions. For a given production technology, the suppliers choose a combination of inputs such that costs are minimized for a given level of output. For a given set of consumer preferences, the buyers determine the combination of items that maximizes their utility for a given level of expenditure. These models typically assume constant returns technology, homothetic preferences (i.e. demand does not depend on the distribution of income), and markets characterized by perfect competition.

Depending on assumptions made about the flexibility of production factors (e.g. land, labour and capital), market equilibrium models can be classified as short-term, medium-term or long-term. In short-term

[8] This chapter is based on background papers prepared by van Tongeren (2005) and Francois, van Meijl and van Tongeren (2005).

models, some production factors are fixed, i.e. they are not allowed to move between alternative uses. Capital and agricultural land are usually held fixed in short-term models and agricultural labour is sometimes fixed. As the time frame of the model is extended, factors of production are gradually allowed to shift between uses. In long-term models, most factors can move between alternative uses.

Market equilibrium models can be further classified as partial or general equilibrium models, depending on whether they attempt to depict a single sector of the economy or the economy as a whole.

Partial equilibrium trade models treat individual international markets for selected traded goods. Such models for agricultural trade generally focus on trade in primary commodities. They capture agricultural supply, demand and trade for unprocessed or first-stage processed agricultural products without taking into account trade in processed food products, despite the fact that the latter commodities represent an increasing share of world trade. The economy-wide models, or general equilibrium models, attempt to account for the linkages with the rest of the economy.

The main area of application of partial equilibrium models is detailed trade policy analysis for specific products that represent a small portion of the economy in question. Policy-induced changes to a small sector are assumed to have little impact on the rest of the economy. While agriculture typically represents only a small portion of GDP in industrial countries, this is certainly not true in much of the developing world, where agriculture is often the dominant source of income and employment. A more complete representation of these economies is required to understand the likely impacts of agricultural trade reforms.

Economy-wide general equilibrium models provide a more complete representation of national economies. This requires the explicit specification of factor markets for land, labour and capital. In other words, the essential general equilibrium features are captured by including factor movements between sectors in addition to allowing for demand interactions. Economy-wide models capture implications of international trade for the economy as a whole, covering the circular flow of income and expenditure and accounting for interactions among different sectors of the economy.

At their core, computable general equilibrium (CGE) models (see Box 5) are concerned with resource allocation. This means tracking how the allocation of land, labour and capital responds to policy changes or exogenous developments. International trade is an arena where such effects can be an important outcome of policy choices. In the face of changing international prices, resources move between alternative uses within the domestic economy, or even between economies if production factors are internationally mobile.

CGE models attempt to measure the increase in economic welfare due to allocative efficiency improvement. Dynamic models attempt to measure the productivity gains that can arise from greater exposure to world markets, for example through economies of scale, improved technology and capital investment. Market imperfections such as partial price transmission, monopolistic market structures and similar frictions that abound in the agricultural markets of developing countries are, with the exception of imperfect competition, rarely included in CGE analyses.[9]

The main weakness of general equilibrium models is a direct consequence of their broader coverage. Because there is a trade-off between keeping the model workable and making it realistic enough to be useful to the policy community, CGE models are often constructed at fairly high levels of geographical and sector aggregation,[10] thus country- and commodity-specific detail

[9] For a recent example, see Roland-Holst (2004), who examines distance from market in Viet Nam and its impact on transmission of changes in prices at the international border.

[10] In recent years, the database compiled by the Global Trade Analysis Project (GTAP), a consortium involving international organizations such as FAO and World Bank, as well as governmental organizations and research institutes, has become the de facto standard for this type of analysis. All the studies considered here rely on this database. Some use the standard comparative-static perfectly competitive model provided by the GTAP consortium; others modify the model to include dynamic features and increasing returns to scale in non-agricultural sectors. More information is available at http://www.gtap.org.

BOX 5
Key features of computable general equilibrium models

The main features of CGE models are summarized below.

- Within each regional economy a standard CGE model covers inter-industry linkages through an input–output structure. Demand for factors of production is derived from cost minimization, given a sectoral production function that allows for substitution between inputs. Typically, substitution is allowed only between primary factors – land, labour, capital – while intermediate inputs are used in fixed proportion with output (Leontief technology).
- The production structure is typically characterized as exhibiting constant returns to scale, and perfect competition is assumed to prevail in all markets. Each sector produces one homogeneous good that is perfectly substitutable domestically but substitutes imperfectly with foreign goods (Armington assumption). In addition to the distinction between domestic versus foreign goods, the multiregional nature of the model enables traded commodities to be differentiated according to their region of origin. In other words, bilateral trade flows are captured.
- Factor markets for land, labour and capital are included in the model, and endowments for these primary factors are given and the factors are fully employed. Labour and capital are assumed to be fully mobile across domestic sectors, while land is imperfectly mobile and tied to agricultural production.
- Consumer demand is derived from utility maximization under a budget constraint, and consumers allocate their expenditures over domestic and foreign goods. All factor markets and commodity markets are assumed to clear, which yields equilibrium solutions to factor and commodity prices as well as the corresponding equilibrium quantities.
- Government policies are represented by various types of indirect taxes and subsidies, including import tariffs and export subsidies. In CGE models, policy measurement has converged on the concept of *ad valorem* price wedges, and all policy instruments are typically specified in this way
- All regional economies are linked through bilateral commodity trade and through interregional investment flows. If a constant current account balance in all regions is assumed,

may be lost. Partial equilibrium models, in contrast, are often used to assess the commodity-specific impacts of reform. The two approaches are complementary, as each has its strengths and weaknesses.

Computable general equilibrium model results

Once the economy adjusts to the policy change, a new set of equilibrium conditions prevail. These new conditions are typically reported in terms of income or welfare effects, changes in trade flows and changes in returns to factors of production (e.g. wage rates). The sections below review the results from several CGE trade liberalization studies.

Welfare effects

Table 6 summarizes the welfare results of several recent CGE analyses of trade liberalization. The results of these studies are not completely comparable for a number of reasons. All use CGE models, but some use the standard GTAP model while others use customized models that allow for dynamic changes in productivity growth or departures from the standard assumption of perfect competition.

All of these studies rely on Version 5 of the GTAP database, except for Francois, van Meijl and van Tongeren (2005), which uses

then the difference between regional savings and investments is essentially predetermined; as a consequence, the aggregate level of the savings–investment balance is also predetermined. If endogenous determination of the current account balance is to be allowed for, the model must include a mechanism to redistribute aggregate savings over regions.

- Some models include a recursive sequence of temporary equilibria. Recursive models do generate time paths for endogenous variables, but there is no behavioural linkage among periods. As a result, the equilibrium solution in each period can be calculated without reference to earlier or later periods.
- Market imperfections are typically ignored in standard CGE models. Information problems, lack of infrastructure, monopolistic market structures and similar frictions abound in agricultural markets, especially in developing countries. However, CGE models rarely include those in the analysis. Only so-called "second-generation" models add increasing returns and imperfect competition in some of the sectors, allowing for estimates of scale and variety effects.
- The comparative-static analysis performed with CGE models does not reveal adjustment processes and possible adjustment costs involved when far-reaching policy changes are implemented. Policy-induced resource shifts will always entail income losses and adjustment processes for some people. The comparative-static CGE analysis typically sidesteps these issues and concentrates on the features of the new equilibrium in which the system settles after the policy change has been implemented.
- Relatively recent methodological developments have resulted in so-called "third-generation" models that include time-consistent forward-looking behaviour and endogenous savings rates, hence allowing for the modelling of short-run dynamics. While these models focus on savings–investment issues, including international capital flows, they could in principle be adapted to capture short- to medium-term real adjustment processes.

Source: Kehoe and Kehoe, 1994.

the newer Version 6. Version 6 differs in several important respects: it includes more countries and regions, is benchmarked to the year 2001 (instead of 1997) and uses more sophisticated measurement of levels of protection. Specifically, it includes existing preferential trade agreements and the conversion of specific tariffs to *ad valorem* equivalents. Therefore the new database captures the liberalization efforts that have been ongoing in the wake of the Uruguay Round as well as autonomous liberalization undertaken by many countries, especially in Asia after the Asian financial crisis of the late 1990s.

The studies reported in Table 6 look at different trade liberalization scenarios. Some concentrate on agricultural trade liberalization alone while others take a broader view and include non-agricultural market access, services and trade facilitation. Other studies assume that all barriers to agricultural trade are removed. These 100 percent liberalization scenarios assume that all forms of border protection, export subsidies and trade-distorting domestic support are eliminated. Others assume only a 50 percent cut in these trade barriers, while some focus only on tariffs, excluding other forms of support and protection.

Furthermore, the studies differ regarding which countries and regions liberalize. The most common scenarios in this regard are for global liberalization as opposed

TABLE 6
Welfare gains from CGE studies of trade liberalization

Study	Liberalization scenario	Notes	Welfare gains *(billion $ 1997)*				
			Global benefits from reforms			Benefits from agricultural reforms	
			All reforms	Non-agricultural reforms	Agricultural reforms	Developing countries	Developed countries
Anderson *et al.* (2001), GTAP	100 percent, all countries, all sectors, all policies		254	90	164	43	121
	Developing countries only		…	…	42	31	11
	Developed countries only		…	…	122	12	110
USDA (2001), CGE	100 percent, all countries, agriculture only, all policies	Static	…	…	31	3	28
		Dynamic	…	…	56	21	35
Francois, van Meijl and van Tongeren (2003), GTAP v5	100 percent, all countries, all sectors, all tariffs	Increasing returns to scale	366	257[1,2]	109	…	…
	50 percent, all countries, all sectors, all tariffs	Static	132	104[1,2]	28	11	17
		Dynamic	…	…	57	27	30
	50 percent, developing countries only	Static	…	…	11	6	5
		Dynamic	…	…	32	28	4
	50 percent, developed countries only	Static	…	…	17	5	12
		Dynamic	…	…	24	–0.7	25
Francois, van Meijl and van Tongeren (2005), GTAP v6[3]	50 percent, all countries, all sectors, all tariffs	Increasing returns to scale	168	138	30	7	24
	Developing countries only		…	…	10	10	0.5
	Developed countries only		…	…	20	–3	23
World Bank (2003)	100 percent, all countries, all sectors, all policies	Static	291	98	193	101	91
		Dynamic	518	156	358	240	117
	Developing countries only	Static	…	…	103	80	23
		Dynamic	…	…	185	167	19
	Developed countries only	Static	…	…	84	20	64
		Dynamic	…	…	174	75	100
IMF and World Bank (2002), GTAP	100 percent, all countries, agriculture only, all policies		…	…	128	30	98
	Developing countries only		…	…	27	22	5
	Developed countries only		…	…	102	9	93

[1] Includes services.
[2] Includes trade facilitation.
[3] Gains expressed in 2001 US dollar terms (billions).

to liberalization on the part of developed countries or developing countries only.

While these differences make direct comparisons of different model results problematic, the table nevertheless provides a useful overview of the range of potential welfare gains that may be possible from trade liberalization. Some general observations may be derived from these studies.

It should be noted that the income or welfare results from CGE models are typically expressed using a measure of economic welfare called "equivalent variation" (EV). The EV measures the change in income that would be equivalent to the proposed policy change – in other words, how much income should be given to (or taken away from) households to achieve the same welfare as the proposed policy change.[11]

The EV measures the potential change in welfare at the national level, but it does not consider distributive effects. Often, a policy change means that some people gain and others lose – rarely does everyone win. In fact, a positive EV means simply that the winners gain more than the losers lose. In economic terms, enough benefits will be generated by the policy change for the winners potentially to be able to compensate the losers.

The first three columns of Table 6 identify the model, the liberalization scenario, and the static or dynamic nature of the gains being reported. The remaining columns report the potential welfare gains arising from alternative liberalization scenarios. The fourth column reports the global welfare gains that are potentially available from liberalization in all sectors. The fifth and sixth columns show the potential gains from non-agricultural and agricultural liberalization, respectively. The final two columns report how the potential gains from agricultural liberalization would be distributed between developing countries and developed countries.

Comprehensive global trade liberalization

The two most comparable studies of comprehensive global trade liberalization are the first scenarios reported for Anderson *et al.* (2001) and the World Bank (2003). Both of these studies consider 100 percent elimination of all trade barriers in all sectors, using static models with standard economic assumptions. The potential global benefits in these studies range from $254 billion to $291 billion.[12]

Francois, van Meijl and van Tongeren (2003) found higher potential welfare gains of $366 billion in their comprehensive global liberalization scenario because their model allows for increasing returns to scale (firms are assumed to become more efficient as their size or scale of operation increases). The World Bank's (2003) dynamic model yields the highest potential welfare gains of all the major CGE trade studies to date, at $518 billion. The dynamic model goes beyond the simple static efficiency gains made possible by reallocating resources to more valuable activities. It supplements these efficiency gains with productivity gains that accrue when liberalization stimulates investment, for example in productivity-enhancing technology.

All the studies discussed so far assume comprehensive trade liberalization, i.e. 100 percent elimination of all trade barriers in all sectors by all countries. Francois, van Meijl and van Tongeren (2003; 2005) consider the potential welfare gains from less radical reforms. In these studies, trade barriers are reduced by only 50 percent. Not surprisingly, the potential gains are correspondingly smaller ($132 billion in their standard static model; $168 billion with increasing returns to scale).

Agriculture's contribution

Many CGE studies allow a comparison of the potential welfare gains arising from the liberalization of different sectors of the

[11] While the EV takes the new situation as a reference, an alternative measure known as "compensating variation" takes the old situation as the reference. It asks the hypothetical question: "What is the minimum amount of compensation after the price change in order to be as well off as before the change?"

[12] The World Bank (2005b) has revised its original study using the new Version 6 GTAP database. The global welfare impact from this revised model (not reported in Table 6) is $263 billion, slightly lower than their original estimate of $291 billion, reflecting among other things the liberalization that has occurred since the Version 5 database was released.

global economy or by different groups of countries. They also allow the gains to be disaggregated by region and country. The estimates of the potential benefits from agricultural liberalization differ markedly, depending on the model specification and the liberalization scenario, but some generalizations can be made.

Estimates of the potential static welfare gains from complete liberalization of the agriculture sector in the context of comprehensive reform range from $109 billion (Francois, van Meijl and van Tongeren, 2003) to $193 billion (World Bank, 2003). The USDA study (2001) found considerably smaller gains from reform of the agriculture sector ($31 billion in their static model). This study differs from the others in a number of key ways: it models agricultural liberalization only; it includes only WTO Members (China, which was not a Member at that time, was excluded) and it assumes that direct payments to farmers were completely decoupled from production.

The estimated gains in welfare from liberalizing all sectors range from one-third to two-thirds higher than from agricultural liberalization alone. In all the studies except those by Francois, van Meijl and van Tongeren (2003; 2005), agricultural reform yields a greater share of the overall gains than do non-agricultural reforms. The results obtained by Francois, van Meijl and van Tongeren can be explained by their more comprehensive treatment of non-agricultural reform (including services and trade facilitation) and their assumption of increasing returns to scale.

The largest share of estimated global income gains from agricultural liberalization accrues to industrial countries because these countries tend to have a higher incidence of economically inefficient agricultural policies in the first place, and they are the primary victims, economically speaking, of their own policies. Reduction, or even removal, of these distorting policy interventions leads to more economically efficient resource allocation, which is counted as a welfare gain.

Although the largest absolute gains (in US dollar terms) accrue to industrial countries, the largest relative gains in terms of GDP are consistently obtained by developing countries. Static welfare benefits for developing countries vary between $3 billion and $43 billion in the non-World Bank studies. This is equal to 0.2 percent and 0.7 percent of the GDP, respectively, of developing countries. In the World Bank study, welfare effects vary between $101 billion (static) and $240 billion (dynamic). The most optimistic World Bank scenario adds 1.7 percent to the GDP of developing countries.[13]

Even these larger GDP gains are fairly modest and are not sufficient to reduce significantly the average incidence of poverty in developing countries. This suggests that while trade liberalization benefits developing countries, liberalization alone will not enable them to achieve their Millennium Development Goals (MDGs) relating to poverty and hunger.

For developing countries, between 70 and 85 percent of the potential gains result from their own agricultural policy reforms. Lowering trade barriers among developing countries would open up increased opportunities for exports.

Finally, the model results show that some countries lose in the agricultural liberalization scenarios, even in the long run. Most countries gain but there are important exceptions. Net food-importing countries experience negative effects on their terms of trade as world food prices rise in the wake of policy changes. Current beneficiaries of preferential trade arrangements also lose as the value of the preferences are eroded. For these countries, the losses are not outweighed by efficiency gains from reallocating resources in agriculture alone. Such results highlight the importance of improved market access for non-agricultural exports from these countries.

Trade effects[14]

In addition to the welfare effects discussed above, another important dimension of the CGE modelling approach is the pattern of international trade. Indeed, some of these studies particularly stress the importance of tapping the potential for increased

[13] More recent unpublished estimates by the World Bank, in the context of ongoing work on trade and poverty, yield the same basic qualitative pattern of results. See, for example, Anderson and Martin (2005) and Hertel and Winters (2005).

[14] This section draws heavily on Francois, van Meijl and van Tongeren (2005).

TABLE 7
Bilateral trade: percentage change in value of bilateral import volumes

From ↓ To →	Global trade round – All commodities				OECD-based trade round – All commodities			
	EU-25	Developing countries	Other OECD	Total	EU-25	Developing countries	Other OECD	Total
EU-25	–2	17	10	4	–1	7	11	3
Developing countries	16	26	21	21	7	–2	8	5
Other OECD	12	22	6	12	11	9	7	8
Total	**4**	**22**	**11**	**11**	**3**	**5**	**8**	**5**
From ↓ To →	Agriculture and food				Agriculture and food			
	EU-25	Developing countries	Other OECD	Total	EU-25	Developing countries	Other OECD	Total
EU-25	–1	31	24	6	–1	3	12	1
Developing countries	25	44	24	32	17	5	16	12
Other OECD	31	36	25	29	27	14	22	21
Total	**8**	**39**	**24**	**21**	**6**	**8**	**18**	**10**

Source: Francois, van Meijl and van Tongeren, 2005.

South–South trade. Although volumes of trade among developing countries have displayed a remarkable rising trend in recent years, especially African–Asian trade, it is still the case that developing country exports are biased towards trade with the EU and the United States. Lowering trade barriers among developing countries would generate increased opportunities for South–South trade.

Francois, van Meijl and van Tongeren (2005) provides a good example of these results. Table 7 presents the estimated changes in bilateral trade flows for three groups of countries: the EU-25, developing countries and other OECD countries. Two scenarios are considered: a global trade round scenario, in which all countries liberalize all sectors, and an OECD-based scenario, in which only OECD countries engage in reforms. Finally, results are shown for trade in all goods and trade in agriculture and food.

The upper left panel of Table 7 shows changes in total trade flows under the global trade round scenario. Global trade expands by 11 percent while intra-EU trade declines by 2 percent. As a consequence of diminishing intra-EU trade preferences, suppliers from developing countries expand their exports to the EU by 16 percent, and realize the most impressive growth in market share on European markets.

Developing countries obtain the highest overall growth in exports (21 percent). They are stimulated to expand exports to all destinations, but the greatest surge is observed in trade among developing countries themselves.

In the lower-left part of the table agricultural trade is presented separately from the aggregate. By comparing these numbers with those for all goods it can be seen that developing country exports are mainly driven by agricultural exports. Developing country agricultural exports expand by 32 percent, with by far the largest growth occurring in trade among developing countries.

Other OECD countries also see strong growth in agricultural exports, especially to the EU and the developing countries. This group comprises Australia, New Zealand and the United States, which are themselves important agricultural exporters.

Turning to the right-hand panel of Table 7, an OECD-based round, with developing countries not participating in reform, trade growth is reduced for both country groups but especially for developing countries. Intra-developing country trade shrinks relative to the base. This points to yet more

TABLE 8
Effects of trade liberalization on unskilled wages by sector and scenario (percentage change)

	Total		Global trade round				OECD-based trade round			
	Global reform	OECD-based reform	Agriculture	Manufac.[1] tariffs	Service	Trade facilitation	Agriculture	Manufac. tariffs	Service	Trade facilitation
Europe										
France	1.3	1.2	0.4	0.3	0.5	0.1	0.5	0.1	0.5	0.1
Germany	1.3	1.1	0.4	0.5	0.3	0.2	0.4	0.3	0.3	0.1
Netherlands	1.3	1.1	0.5	0.5	–0.1	0.4	0.5	0.4	–0.1	0.3
Rest of EU-15	0.9	0.7	0.4	0.3	0.0	0.2	0.4	0.2	0.0	0.1
EU-10	0.3	0.3	0.3	–0.1	0.1	0.1	0.3	–0.1	0.1	0.1
Africa and the Near East										
Mediterranean region	1.6	0.0	0.4	0.7	0.1	0.4	–0.1	0.0	0.1	0.1
South Africa	2.0	0.7	0.0	0.7	0.7	0.5	–0.2	0.1	0.6	0.1
Sub-Saharan Africa	3.1	0.9	0.8	0.8	1.0	0.5	0.0	–0.1	0.9	0.2
Americas										
North America	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1
South America	0.4	–0.1	–0.1	0.2	0.2	0.2	–0.3	0.1	0.1	0.0
Asia and the Pacific										
China	–0.3	–0.6	0.1	–0.7	0.2	0.2	–0.2	–0.5	0.1	0.0
India	3.1	0.2	0.9	1.2	0.8	0.3	–0.1	0.2	0.0	0.1
High-income Asia	1.6	1.3	0.7	0.4	0.1	0.3	0.7	0.3	0.1	0.3
Other Asian and Pacific countries	4.5	0.5	0.4	2.4	0.0	1.7	–0.2	0.3	0.0	0.5
Australia and New Zealand	1.3	1.1	0.1	0.5	0.4	0.3	0.1	0.4	0.4	0.3
Rest of world	0.2	0.1	–0.3	0.2	0.1	0.2	–0.3	0.0	0.1	0.2

[1] Manufactures.
Source: Based on simulation results from Francois, van Meijl and van Tongeren, 2003.

trade diversion effects in the face of OECD countries lowering their trade barriers while non-OECD barriers remain in place.

In the OECD-based scenario, developing country exports to developed economies expand at a slower pace than in the broader liberalization scenario. This is because failure to engage in their own reforms precludes specialization, and insufficient resources are freed to allow expansion in export-oriented industries. The slower export growth implies that insufficient foreign exchange is earned to finance an expansion in imports.[15]

[15] A technical term in trade theory, Lerner symmetry, is relevant here. Import barriers ultimately suppress exports. This is very evident in the pattern of developing country exports.

Wage effects

Table 8 reports the impact of trade policy reform on unskilled wages, one of the key avenues through which trade influences poverty. This CGE study by Francois, van Meijl and van Tongeren (2003) considers a 50 percent reduction in domestic support, export subsidies and import protection in agriculture as well as manufacturing and services. This approach allows the broader impact of trade policy on incomes (and hence on income-related aspects of food security) to be gauged.

In general, for the middle- and low-income groupings shown, agriculture is far more important for unskilled labour earnings in developing countries than it is in the OECD countries. At the same time,

TABLE 9
Impacts of policy reform on world commodity prices

	Partial policy reform (phase-out of market price support)	Complete policy reform (phase-out of all support)
	(Change in real prices relative to baseline[1])	
Cereals	103	111
Wheat	104	119
Rice	104	111
Maize	99	106
Milk and dairy products	111	117
Beef	106	108
Sheep and goat meat	104	105
Pig meat	102	103
Poultry meat	103	104

[1] Baseline = 100.
Source: FAO, 2003a.

though, it is liberalization outside the OECD countries – primarily own-policy reform – that leads to the bulk of agriculture-related wage gains for developing countries. What really matters will vary for different countries and regions. Hence, for North Africa and the Near East, unskilled workers stand to gain the most from agricultural policy reform at home. The same is also true in South Africa. In India, on the other hand, manufacturing liberalization (such as clothing tariffs in middle-income countries) is at least as important as agriculture. The same holds for the group of other Asian and Pacific countries.

The wage results in CGE studies provide a bridge to the household impact of agricultural trade, the topic of the next chapter. It should be noted that unskilled workers are not necessarily agricultural workers; in fact, unskilled wages often underpin the income of urban households in low- and lower-middle-income countries. As such, rising unskilled labour earnings in urban households may go hand-in-hand with falling earnings in rural households. Unravelling this mix of rural and urban households within CGE studies requires a move to models that include household data.

One conclusion that can be drawn at this stage is that agricultural trade can have a significant impact on household wage earnings. However, non-agricultural trade can have an equal or even greater impact on wage earnings. To the extent that food security is a function of incomes and the ability to secure sufficient food through monetary means, then food security depends on trade outside agriculture as well as on trade in agricultural products.

Agriculture sector model results

As mentioned above, partial equilibrium agriculture sector models can provide a more detailed picture of the effects of trade liberalization on individual commodity markets. FAO conducted a detailed assessment of the potential commodity-level impacts of agricultural reform, taking as its baseline a consistent set of long-run production and trade projections. This model takes into consideration the potential of countries to respond to policy changes for different types of commodity (FAO, 2003a).

Table 9 reports the results of two liberalization scenarios. In the first, all market price support to agriculture is phased out. In the second, all support and protection to agriculture is phased out in developed and developing countries. As in the CGE analyses discussed above, the majority of the benefits under this scenario accrue to the OECD countries in the form of lower consumer prices for previously protected products.

Even in the more complete policy reform scenario, the price impacts are likely to be modest. The most significant commodity market changes are expected to occur for temperate-zone commodities such as cereals, meat and dairy products that account for the majority of OECD policy distortions. Production of these

commodities would fall in the currently subsidizing countries and expand in the non-subsidizing countries, primarily other OECD producers such as Australia and New Zealand and some developing countries where temperate zone commodities are produced competitively, such as Argentina, Brazil and Thailand.

Products such as rice and sugar, which are highly subsidized and for which many developing countries are competitive producers, could yield particularly large gains for developing countries. On balance, world prices for temperate zone commodities would increase by 5–20 percent, depending on the initial level of market distortion and the capacity of other producers to expand output. These price effects are relatively small because considerable production potential exists for most commodities and because the simultaneous liberalization of all commodities would tend to have offsetting effects.

Developing countries would gain relatively little from further liberalization of tropical commodities such as coffee and cocoa because import barriers in the OECD countries are already fairly low and consumption is saturated. There is some potential for gains for these commodities in other developing countries, where import barriers are relatively high. The ability of farmers in developing countries to benefit from liberalization depends to a great extent on the domestic agricultural policies of their own countries, which often place them at a disadvantage through high effective rates of taxation, poor infrastructure and inefficient marketing systems (FAO, 2003a).

Key findings

The economic benefits that could result from comprehensive reform of agricultural policies are potentially important, particularly when combined with reforms in other sectors. But the reform process will necessarily involve adjustment costs. Policy-makers need to understand the likely impacts of agricultural trade policy reforms before they are agreed, so that proper policies can be put in place to assist in the adjustment process.

While the various economic models used to assess the potential impacts of trade liberalization differ in their details, a number of general observations are fairly consistent across a wide variety of models and practitioners.

- Trade liberalization in agriculture is likely to generate positive economic benefits at the global level and for most – but not all – participating countries. Liberalization scenarios that involve all sectors and all regions tend to generate higher benefits than scenarios where some sectors or regions are excluded.
- The largest absolute gains from agricultural liberalization accrue to the developed countries where agricultural markets are most distorted. These gains go primarily to consumers in OECD countries where import barriers are currently high and to exporters in other OECD countries.
- Developing countries gain more as a share of current GDP because agriculture is much more important in their economies. Some developing country exporters of temperate zone agricultural products gain from OECD liberalization, but the biggest gains for developing countries derive from liberalization among themselves. Virtually all of the growth in agricultural markets over the next 30 years will occur in developing countries, so the potential gains from further opening these markets are substantial.
- Some developing countries, particularly NFIDCs and countries currently receiving preferential access to OECD markets, lose from the OECD liberalization, even in the long run. The special circumstances of these countries must be taken into consideration.
- The potential global welfare gains from trade liberalization are, on the whole, relatively modest compared with global GDP. Dynamic gains are worth about twice as much as static gains alone, and developing countries stand to gain proportionately more from these dynamic gains. Countries should pursue aggressive pro-poor growth strategies to take advantage of these potential dynamic gains.

- Trade liberalization in agriculture and other sectors could contribute significantly to raising the wages of unskilled and low-skilled workers in developing countries, who are often among the poorest of the poor. As the next chapter illustrates, labour markets are one of the most important avenues through which trade liberalization affects poverty at the household level. The ability of poor people in developing countries to take advantage of the opportunities generated by trade reform depends crucially on the policy environment created by their own governments.