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**Consequences of Agricultural
Trade Liberalization for Developing
Economies Assisted by AID**

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A Report to AID/PPC/EA Under the Macroeconomic Services IQC.

A Macroeconomic Services Partnership

**CONSEQUENCES OF AGRICULTURAL TRADE LIBERALIZATION
FOR DEVELOPING ECONOMIES ASSISTED BY AID**

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EXECUTIVE SUMMARY

Consequences of Agricultural Trade Liberalization for Developing Economies Assisted by AID

I. Scope of Liberalization Efforts

Although there is growing appreciation of the economic arguments for more liberalized trade among the developed nations (particularly the unsustainable budgetary costs of open-ended support programs), the difficulty of coordinating OECD domestic policy adjustments has stalled the lifting of agricultural trade barriers in these economies. More bothersome however is the fact that despite the strong importance of agricultural trade to LDCs, the individual developing countries are by and large price takers and have very little influence on world agricultural markets. Yet, as the World Bank (1986) reports, the gains to the LDCs from lifting agricultural trade barriers in the developed countries can be substantial, i.e., even larger than the benefits of such measures as international commodity agreements, special trade preferences, compensatory financing mechanisms, and food aid.

While broad based agricultural trade liberalization is not considered likely, recent developments such as growing budgetary difficulties for the EC and trade deficits for the U.S. have increased the likelihood of more sweeping and deeper changes than considered possible in the past. With this emerging possibility of some agricultural trade liberalization in the industrial economies, which if it does occur would have serious economic consequences for developing countries, it is important to analyze, first, what the consequences might be for developing countries and, second, how these LDCs can and should respond either unilaterally or in trade negotiations once the policy action has been taken.

II. World Price and Trade Effects

An in-depth review of existing studies [Tyers and Anderson (1987); IIASA (1986); OECD (1987); Roningen, Sullivan, and Wainio (1987); Valdes and Zietz (1980); and Zietz and Valdes (1985)], which develop and employ global supply/demand system models to simulate the impact of agriculture policy liberalization on world prices and trade, yields several lessons.

- (1) The existing models demonstrate how the policies of the industrialized countries can drive down world prices of most agricultural commodities.
 - (i) Exporting countries do this by subsidizing exports of policy generated surpluses.
 - (ii) Importing countries do this by limiting their international purchases.

- (2) However, not much confidence can be placed on the quantitative estimates of the impact of agricultural trade liberalization on world prices.
 - (i) The studies, while using similar methods, have generated a fairly wide range of results and it is not clear which, if any, is best for forecasting the effects of liberalization in the late 1980s. Most of these differences can be attributed to assumptions regarding:
 - (a) the type of agricultural protection,
 - (b) the initial level of protection and the method of measuring that level of protection,
 - (c) elasticities of supply and demand,
 - (d) cross-price elasticities (if even considered), and
 - (e) price transmission elasticities.
 - (ii) The models are likely to miss the short term dynamics of a large policy shock.
 - (iii) Simulations are based on rates of protection of the late 1970s. Current rates of protection are much higher.
- (3) Items for further research which will enhance the quality of the estimates of the world price and trade effects include, in order of importance:
 - (i) better estimates of protection rates as of 1987 in both the industrial and the developing countries,
 - (ii) expansion of commodity coverage, especially to include tropical products,
 - (iii) expansion of country detail, especially for developing countries which are important in international markets,
 - (iv) better estimates of price transmission elasticities for countries that do not liberalize in a liberalization scenario involving a subset of countries, and
 - (v) better estimates of specific commodity and cross-commodity price elasticities in both supply and demand for each country.
- (4) Other changes in future modeling efforts should include:
 - (i) revision of modeling approach to address the problem of commodities with strong region- or country-specific markets such as rice,
 - (ii) better measures of protectionism, taking into account such market distortions as input subsidies and currency overvaluation.

Despite the shortcomings of the global simulations, limitations of time and resources may make it impossible for AID to carry out further research to refine the results of the global simulations. Instead, AID would be well advised to rely on existing studies of the world price effects while helping AID-assisted countries to obtain better estimates of their own commodity protection rates, price transmission elasticities, and supply and demand elasticities.

To this end we recommend using:

- (1) Zietz and Valdes (1985) for the commodities they cover (beef, sugar, wheat and corn). They (i) use more recent protection levels(i.e., 1983), (ii) have the most detailed country coverage, (iii) provide full documentation of elasticities and other assumptions, and (iv) have a clearly structured supply-demand model.
- (2) Tyers and Anderson (1986) for rice, dairy and meats other than beef. They share points (iii) and (iv) with Zietz and Valdes (1985).
- (3) Valdes and Zietz (1980) for commodities other than those listed in (1) and (2) above. While they use older protection rates, their analysis is clear and the results are sensible.

III. Consequences for AID-Assisted Economies

Recent balance of payments histories of AID-assisted countries and their dependence on a narrow range of commodities for export earnings clearly demonstrate the vulnerability of these economies to changes in world commodities prices. Estimates of the world prices effects of industrial country agricultural trade liberalization (reviewed in the first section of this study) indicate that the world price changes are likely to be substantial.

Clearly, in terms of foreign exchange earnings, the LDC exporters will gain, if world prices of the commodities increase. However, the magnitude of that gain, as well as the internal adjustment and distributional consequences of a change in world price, is far from clear. For importers, even the direction of the foreign exchange impact is far from certain.

Using (a) the world price effects derived from specific studies selected from among the global studies reviewed in section 1 and (b) the country and commodity specific demand and supply elasticities obtained from the same global studies as well as other sources, and assuming a price transmission factor equal to one, estimates of the impact of OECD agricultural trade liberalization on AID-assisted countries are derived for seven commodities. More specifically, estimates of (1) the foreign exchange impact, (2) the internal changes in quantities supplied and demanded, and (3) the welfare implications of these domestic supply/demand changes, are obtained for each AID-assisted country by commodity. The commodities examined (wheat,

maize, rice, sugar, coffee, soybean oil and palm oil) represent a cross section of traded agricultural commodities. They include the superior grains for which the world price impact is likely to be large and some tropical commodities for which a more modest price impact is projected.

In reviewing the results of the simulation it is useful to distinguish the results as to: (1) the external (or trade and foreign exchange) consequences of trade liberalization for an AID-assisted country and (2) the internal (or domestic distributional and welfare) consequences for the AID-assisted LDC.

In regard to the foreign exchange implications by commodity, the simulation results confirm that with liberalization, LDCs exporting the commodity whose trade is liberalized enjoy an increase in export revenue, the magnitudes of which are often substantial. Of even greater significance however, is that many importing LDCs may end up better off in terms of foreign exchange. For these importers, the negative foreign exchange impact of a world price increase is more than offset by declines in the quantity of imports demanded. This arises because of increases in domestic supply and decreases in demand in response to the higher price. In the simulations, this was particularly true for the grains and sugar, where the projected world price increases were large, but was much less likely to be the case for coffee, soybean oil and palm oil. Finally, for many of the countries that were import losers in the grains (i.e., their grain import bills increased with the world price increase) their estimated export revenue gains in sugar and coffee alone would be sufficient to offset their foreign exchange losses in the grains.

In regard to the internal consequences, the analysis is not nearly as simple. Although the supply and demand and producer/consumer welfare consequences are examined, these results give only a preliminary indication of the internal distributional consequences. The true distributional impact would depend on the initial distribution of agricultural consumption and of the returns to agricultural production across the total domestic population.

It is of course clear that with higher domestic commodity prices arising from liberalization, consumers will lose while producers will gain. Yet, in assessing the internal supply/demand and domestic producer/consumer welfare implications to an LDC, there are two key questions: (1) is the magnitude of the increase in domestic supply larger than the magnitude of the accompanying decrease in demand and, if not, (2) is the welfare value gain from the change in domestic supply (and price) larger than the welfare value loss in consumption. The answers to these questions will enable policy makers to determine whether the gains of producers would be large enough to outweigh the losses of consumers.

The results of our simulations can be summarized by the following conclusions:

- (1) There are few AID-assisted countries in which the magnitude of the supply increase is greater than the magnitude of the demand

decrease. This is particularly true for rice, wheat, and soybean oil, the commodities for which most AID-assisted countries are importers. In contrast, for the tropical products (coffee and sugar), almost all of the AID-assisted countries experience greater gains in supply than losses in demand. However, when the welfare value of the gains and losses are compared instead of just the quantity gains and losses, there are far more cases in which the welfare gains to producers are greater than the welfare losses to consumers.

- (2) Industrial country liberalized trade in tropical commodities, in contrast to cereals, would better benefit AID-assisted economies.
 - (i) LDC producer gains are more likely to be greater than consumer losses for the tropical commodities than for the grains.
 - (ii) Most AID-assisted countries, with the exception of a few African countries, are likely to be net gainers in terms of export earnings if tropical products are liberalized along with the grains. With liberalization, their export revenue gains from tropical commodities are large enough to offset their losses in imported grains.
- (3) It is clear that with trade liberalization, the short-run internal adjustment problems for most AID-assisted countries will be substantial for most of the commodities examined. This implies that it will be important to pay attention to the adjustment process. i.e., who gains and who loses in the transition. However, in order to better understand the gains and losses to LDCs (and in order to structure adjustment policies and adjustment assistance packages) more precise estimates of the supply and demand consequences are needed.

The precision of estimates of gains and losses during the adjustment to liberalization would be greatly enhanced by:

- (i) better domestic price data,
 - (ii) better country-specific estimates of price transmission elasticities, and
 - (iii) better estimates of supply and demand elasticities for each country and commodity.
- (4) AID assistance during the transition to liberalization should consist of:
 - (i) technical assistance to help LDCs assess the potential impact of liberalization on their countries, both in terms of foreign exchange earnings and in terms of domestic internal adjustments, and
 - (ii) food aid to help the disadvantaged groups (i.e., the rural landless labor and the urban poor) during the difficult adjustment period.

The Consequences for Policy in Developing Countries

The actual impact of agricultural trade liberalization on a developing country's supply, demand and trade will depend on that nation's policy response. The World Bank (1986) estimates that if the developing countries fail to liberalize their own agricultural policies when the OECD countries liberalize, the developing countries as a group would be worse off by \$12 billion annually. However, the developing countries stand to gain \$18 billion annually, if they liberalize their policies jointly with the OECD.

A developing nation's policy response to OECD trade liberalization will depend on different factors including, among others:

- (1) the LDC's net trade position in the commodities affected by the liberalizations,
- (2) for exporting LDCs, their factor endowments and production technology,
- (3) for importing LDCs, their resource constraints, especially foreign exchange availability,
- (4) the magnitude of internal disharmonies the nation is likely to experience as a result of the liberalization,
- (5) domestic macroeconomic policies (such as exchange rate policies) that will influence the extent to which the world price change is transmitted to the domestic economy,

In general, the more the country perceives it has to gain and the easier it is for the nation to alter agricultural production to manage the adjustment process, the more likely the nation is to pass the change in the world price through to the domestic economy and to liberalize its own agricultural policies.

IV. Long-Term Consequences

The potential long-term consequences of OECD agricultural trade liberalization for AID-assisted economies are many. These include:

- (1) greater world price stability,
- (2) wider market access,
- (3) improved domestic incentives for investment in agricultural infrastructure, research and extension for long-run agricultural growth,
- (4) decreased reliance on domestic buffer stocking operations,
- (5) decreased importance of international food aid,
- (6) possible shifts from importing to exporting liberalized commodities.

While no attempt is made to summarize the discussions of the potential consequences here, it is important to note that once again

the degree to which specific AID-assisted countries would benefit from such developments would depend largely on their domestic policies and resources.

V. Managing the Transition

Currently, the GATT appears to be the only avenue for developing countries to influence the world agricultural trade environment. However, given the lack of influence GATT has had on agricultural trade in the past and the diverse interests of the developing countries, it will not be easy for the LDCs to exercise much influence. Nevertheless, it is important for the LDCs to work for the removal of all non-tariff and discriminatory tariff barriers to commodity trade in the developed countries. It is also in the LDCs' interest to limit the role of GATT exceptions. Furthermore, GATT needs to be given powers to enact and enforce rules. In pursuing these ends, the LDCs' bargaining position would be greatly enhanced if they, in turn, offered some reciprocal trade concessions, including the lifting of some of their own trade barriers, even those on non-agricultural goods.

Consequences of Agricultural Trade Liberalization for Developing Economies Assisted by AID

Although there is growing appreciation of the economic arguments for more liberalized trade among the developed nations (particularly the unsustainable budgetary costs of open-ended support programs), the difficulty of coordinating OECD domestic policy adjustments has stalled the lifting of agricultural trade barriers in these economies. More bothersome however is the fact that despite the strong importance of agricultural trade to LDCs, the individual developing countries are by and large price takers and have very little economic influence on world agricultural markets. Neither do they have any political bargaining power that can influence the nature and extent of any likely agricultural trade liberalization in the industrial countries. Still, all LDCs continue to be encouraged into greater integration into the world trade system. So far, measures such as international commodity agreements, special trade preferences, compensatory financing mechanisms, and even food aid have been used to increase LDC participation and benefits from trade. However, the benefits of these measures remain small compared to what can be potentially gained from the lifting of agricultural trade barriers in the developed countries (World Bank (1986)).

The United States has recently reemphasized its desire for joint agricultural trade liberalization and policy reform by the industrial countries. The basic argument is that all these countries, through tariff and non-tariff barriers and through domestic agricultural production subsidies, are creating domestic agricultural surpluses which are ultimately dumped on world markets. While the costs of protection keep increasing as surpluses mount, the consequent low market prices make it politically difficult for these countries to abandon their farmers to the market. Yet if all industrial countries would stop subsidizing agriculture jointly, it is argued that surpluses would abate and world prices would rise such that each country's farmers would feel much less pain when protection is withdrawn.

But what would the consequences be for developing countries? As price-takers in world markets they are subject to the price changes caused by industrial country action. Higher world food prices could severely harm the lowest-income countries who are food importers. With scarce foreign exchange even dietary adequacy of the poor could suffer. At the same time, agricultural exporting industries in developed and developing countries could be stimulated. The purpose of this paper is to assess these issues, with particular reference to countries assisted by AID. We draw on existing studies of world price effects under various liberalization alternatives, and attempt to gauge the short- and long-term implications for the developing countries.

The paper is organized as follows. First the types of prospective liberalization are briefly discussed. Second, the consequences for world market prices and trade of the most likely

liberalization scenarios are reviewed, with particular reference to recent analytical simulations of such liberalization. The remainder of the paper considers the implications for countries assisted by AID programs. This topic is analyzed first from the viewpoint of the immediate gains and losses imposed on these countries owing to their situations as importers or exporters of the affected commodities. The discussion then turns to the longer-term consequences of trade liberalization, as developing countries alter their policies and the effects of agricultural changes on nonagricultural sectors become observable. These longer-term consequences are more disparate and uncertain, and little can be said about them with confidence. But they are too important to ignore. In this part of the paper especially we attempt to develop an agenda of research that will permit more solid answers to questions about the interests of developing countries in a more liberal agricultural trade regime.

I. Scope of Liberalization Efforts

Informal suggestions and more formal proposals for agricultural trade liberalization and policy reform in the industrial countries have been put forth throughout the 1980s. The Trilateral Commission (1985) and OECD (1987) reports are examples. These efforts gained practical policy relevance when the United States in 1986 argued successfully that agriculture should be included in the upcoming "Uruguay Round" of GATT negotiations, and when the Tokyo summit of 1986 and the Venice summit of 1987 produced agreement in principle among the leaders of the U.S., Japan, France, West Germany, and Britain that coordinated efforts at agricultural policy reform should be undertaken. A concrete manifestation of this multilateral interest is the mandate of the OECD to its Committees on Agriculture and Trade to undertake "an analysis of the approaches and methods for a balanced and gradual reduction of protection for agriculture, and the fuller integration of agriculture within the open multilateral trading system..." (OECD, 1987, p. 5).

The likelihood of significant international policy reform actually occurring in the near future is open to question, as are all the details of reform or liberalization proposals. Still it is not too soon to see the broad outlines that will likely constitute liberalization and reform. Important elements are domestic farm policy changes in industrial countries that impinge on developing country agricultural exports. The outstanding example in the United States is the sugar program which establishes the U.S. domestic price of raw sugar at 3 to 5 times the comparable world price (range during 1980-87). This program has resulted in the United States moving from being an importer of about half its sugar consumption 10 years ago to being almost self-sufficient in sugar in 1987/88. Because the United States has relied on restrictions on sugar imports to keep U.S. producers' prices at support levels, this change has involved substantial reductions in import quotas for sugar into the United States, from about 5 million tons 10 years ago to 1 million tons in 1987. The resulting loss of market has been a serious problem for some countries which sell sugar to the United States, and the quota tightening has caused a decline in the world sugar price which has harmed all sugar exporters (see Ferguson, 1984). Consequently, for

sugar in particular, we can expect unilateral and bilateral commodity policy and trade negotiations to continue.

The past year and a half has seen an increased likelihood of more sweeping and deeper changes -- more comprehensive multilateral liberalization negotiated over a longer period and on a more permanent basis. The main economic forces behind the changed negotiating environment have arisen in the United States and the EC. The United States has had serious difficulties with a large overall trade deficit, and in agriculture in particular a loss of export market since 1981. Cushioning the U.S. farm sector from adverse world prices has been costing the U.S. Treasury about \$25 billion annually in outlays during 1986-87, with little chance for significant improvement. The EC has been accustomed for many years to a high budget for agricultural support, and to dumping of surpluses on world markets. However, two new events have given impetus to ideas of policy reform in the EC. The first is EC enlargement to include Spain and Portugal. Second, the U.S. policy changes in the Food Security Act of 1985 caused consternation in the EC. This Act, first effective with 1986 crops, established mechanisms by which U.S. farmers' receipts would be maintained by means of cash ("deficiency") payments, while market prices are permitted to fall. This was accomplished by freezing "target" prices but cutting CCC loan prices which support the market. This step was carried furthest in rice, where the loan support was completely withdrawn. As a result, the U.S. price of exported rice fell by roughly half, from about \$8.00 per hundredweight in 1985 to less than \$4.00 per hundredweight in 1986-87. Were similar steps to be taken in U.S. wheat and feed grains policy, the results would be disastrous for EC policy. Such pressures led to the OECD's interest in global agricultural protection and to the agreement to place agriculture on the table in GATT.

With respect to commodity and country coverage of liberalization efforts, the prospects in various forums depend on the circumstances that are bringing the parties together. The Summit and OECD processes would lead, if successful, to joint changes in protection of domestic producers by the EC, the United States, and Japan (also Canada, Australia, and New Zealand, but these countries are already pricing internally at nearer the world market prices). The commodities affected most directly would be wheat, feed grain, dairy products, and perhaps beef and sugar. The potential problem for the developing countries is that the outcome could be a rise in world prices of products that they as a group import (grains) but not in the prices of products that they export (sugar, coffee, cocoa, and other tropical products).

GATT negotiations involve a broader group of countries, 93 at present, excluding the Soviet Union but soon to include China. These negotiations can cover a broader array of topics and the interests of the developing countries will be brought more directly to bear. A problem with the GATT is that it has not been used as a forum for negotiating domestic policies. But in agriculture, trade barriers are typically just handmaidens to domestic support programs.

The negotiations are complex and potentially far-reaching,

requiring major effort by all parties to gain acceptance by protected groups within the countries. Therefore it is not clear how much liberalization will be accomplished in the next couple of years and over the 10-year horizon that the United States set as a goal for a complete phase-out of agricultural protection. Nonetheless, there is a nonnegligible probability that some liberalization will occur. If it does, it could have major economic consequences for developing countries.

II. World Prices and Trade Effects of Liberalization

The World Bank, in its World Development Report (WDR) of 1986, made a strongly stated case for agricultural policy reform and trade liberalization in both the industrial and developing countries. Citing Tyers and Anderson (1986), the WDR estimated that global liberalization of trade in the main temperate-zone commodities would increase the aggregate income of the developing countries by \$18 billion annually. However, this gain is entirely attributable to liberalization of the policies of developing countries themselves. If only the industrial countries were to eliminate agricultural protection, the developing countries would as a group be worse off by \$12 billion annually (World Bank, p. 131). The sources of these estimated gains and losses are principally the changes in world commodity prices and trade flows that liberalization would cause.

The price effects of liberalization depend upon: (1) the set of countries that liberalize, (2) the commodities covered, (3) the mechanism of protection used (e.g., internal subsidies or border protection via tariffs), (4) the initial level of protection from which liberalization starts, (5) how far the liberalization goes in removing protection, and (6) the demand and supply responses to the removal of protection. The trade effects associated with these price changes are mutually determined with the price changes, and depend on demand and supply responses not only by the liberalizing countries but also in the countries who simply react to other countries' policy changes. For example, the less able these reacting countries are to increase their own agricultural output when world prices rise, the more the world price will rise when the liberalizing countries cease dumping surpluses.

Estimating the world price effects of a liberalization scenario is a complex analytical task. Several attempts to do so have obtained varying results, although there are encouraging areas of agreement. The main reasons for varying results are different assumptions about items (1) to (6) listed above. In order to spell out the issues, the treatment of Tyers and Anderson (1986, 1987) is presented in some detail. Then the findings of some other studies are compared. Tyers and Anderson analyze as separate economic entities the following countries and groups of countries:

Industrial and centrally planned economies: Australia, Canada, EC-10 (EC-12 in their 1987 paper), other Western Europe, Japan, New Zealand, United States, U.S.S.R., Other Eastern Europe.

Developing economies: Egypt, Nigeria, South Africa, Other

Sub-Saharan Africa, Middle East and North Africa except Egypt, Bangladesh, China, India, Indonesia, South Korea, Pakistan, Philippines, Taiwan, Thailand, Other Asia, Argentina, Brazil, Cuba, Mexico, other Latin America.

Seven commodities and commodity groups are modeled for each country: wheat, feed grains, rice, beef and pork, poultry and sheep, dairy, and sugar. Tropical products are excluded, except cane sugar. Thus, the model is best suited for analysis of liberalization by the industrial countries along the lines the Summit countries have proposed.

Tyers and Anderson follow the typical practice of measuring the effects of existing policies by the use of "nominal protection coefficients" (NPCs). A list of NPCs for some developed and less developed countries is presented in Table 1. The NPC for a country is the domestic price for a commodity divided by the world price for that commodity. With no border distortions or other policies that cause these prices to differ, we should see an NPC equal to 1.0. However, there are serious problems of measurement. World prices at a reference point such as Rotterdam will differ from any particular country's prices because of transportation costs. Therefore, the world price is measured at a port of the country in question, the "border" price. But this price, too, differs from internal prices received by farmers and paid by consumers because of transportation costs. Moreover, and more difficult to adjust for in published data, the stage of processing of goods is often different for farm-level and border prices, which are essentially wholesale prices. In addition, the margins between internal and border prices are not fixed -- they vary from week to week and year to year. For example, a relatively stable relationship exists between the price of wheat received by a farmer in Kansas and the f.o.b. price of #1 hard red winter wheat at New Orleans. But even here the margin varies enough that adjusting the Kansas price upward by the average farm-Gulf difference would result in an NPC that would average 1.0 but would vary roughly from 0.9 to 1.1 depending on when the two prices are observed. For developing countries and for less standardized commodities in any country the problem of spurious NPCs is greater. Conceptually, NPCs are flawed in that they omit domestic policies such as input subsidies. They also omit the effects of domestic policies in large countries, such as U.S. acreage controls, that influence world market prices without introducing any difference between the domestic and world market price. More comprehensive measures of protection are discussed later.

To see how the NPC estimates fit in with the simulation of liberalization, consider Figure 1. If there were no intervention, the world price would be P^* (all prices adjusted for transportation costs to a common base pricing point, say Rotterdam). At price P^* the excess supply ($Q^*_p - Q^*_c$) in the industrial countries, just equals the excess demand in the developing countries ($q^*_c - q^*_p$). This trade equilibrium is shown by the excess demand and supply schedules in the middle "trade" panel, where Q^*_t is the equated excess supply and excess demand from the two trading partners.

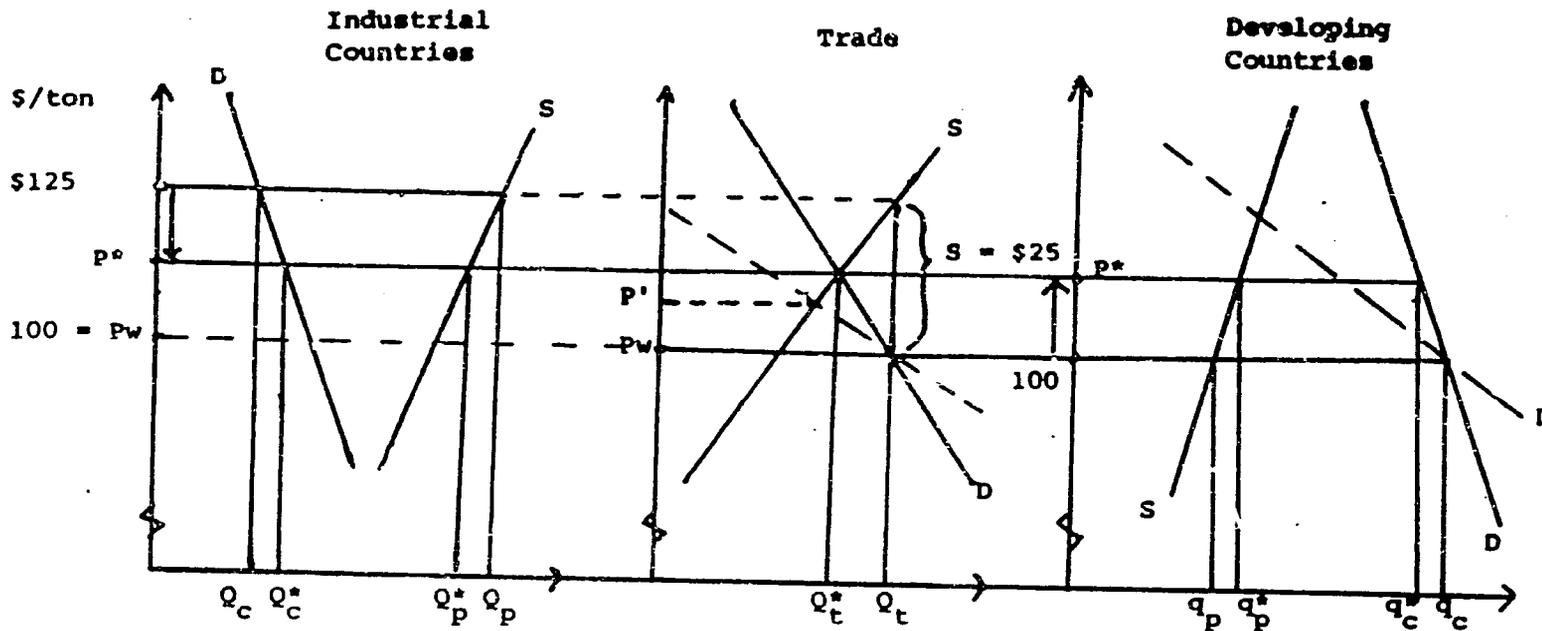
Table 1: Estimated Producer-to-Border Price Ratios (NPCs)

Products	Wheat	Coarse grain	Rice	Dairy Products	Sugar	Weighted Average ¹
Industrial-Market Economies						
Australia	1.04	1.00	1.15	1.30	1.00	1.04
Canada	1.15	1.00	1.00	1.95	1.30	1.17
EC-10	1.25	1.40	1.40	1.75	1.50	1.54
EFTA-5	1.70	1.45	1.00	2.40	1.80	1.84
Japan	3.80	4.30	3.30	2.90	3.00	2.44
Spain & Portugal	1.20	1.30	1.00	1.80	1.70	1.33
U.S.	1.15	1.00	1.30	2.00	1.40	1.18
Developing Economies						
Egypt	.60	.75	.50	2.50	.90	1.17
Nigeria	2.20	2.00	1.90	3.00	1.50	1.88
South Africa	1.50	1.10	1.00	2.30	.90	1.19
Bangladesh	.90	1.00	1.00	1.70	.75	1.02
China	1.50	1.30	.90	2.80	1.15	1.05
India	1.00	1.00	.90	1.80	.85	1.07
Indonesia	1.00	1.30	1.00	2.00	2.60	1.20
Korea, Rep.	2.30	2.35	2.55	3.00	1.00	2.74
Pakistan	.90	1.00	.70	2.00	.75	1.12
Philippines	1.00	1.00	1.00	2.00	.75	1.04
Taiwan	1.90	1.90	2.45	3.00	1.00	1.57
Thailand	1.00	1.00	.90	1.80	.90	.89
Argentina	1.00	.90	1.00	1.00	.90	.91
Brazil	1.30	.90	.80	1.60	.30	.96
Mexico	.90	1.30	1.00	2.80	.70	1.46

Source: Tyers and Anderson (1986)

1/ An average including meats as well as the commodities shown here. Thailand's average, for example, is lower than any commodity shown because of high negative protection of meats.

Figure 1. Effects of liberalization



The industrial countries intervene in their domestic market. They raise the producer price to a support level of \$125 per ton. This results in higher production and lower consumption, increasing the excess supply. If the industrial countries stockpiled this surplus, as the U.S. has done from time to time, the world price would be raised also. But over any sustained period the surpluses cannot be stockpiled except at prohibitive costs. So we get a policy of the EC pattern in which surpluses are dumped on the world market by means of an export subsidy to make up the difference between the world price and \$125. Given the demand from developing countries, the added surplus can be only sold at a lower world price, $P_w = \$100$ in the diagram.

Now when we observe a world in which the industrial countries are already intervening, we observe a world market price of \$100 that developing countries pay, and we observe the support level of \$125 in the industrial countries that their farmers receive, but we do not observe the price P^* that would exist if the industrial countries ceased intervention. The NPC is the wedge between the support and market price, S , in this case \$25 per ton.

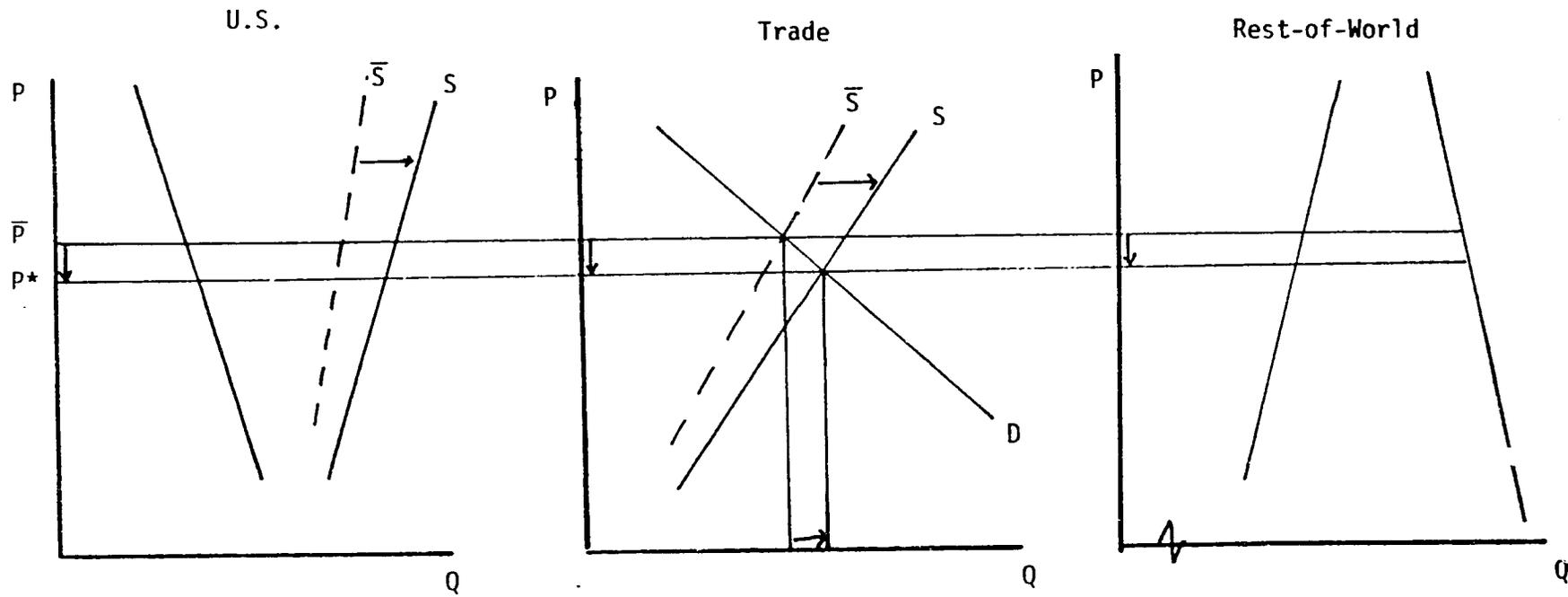
The diagram illustrates three general aspects of intervention: (1) the level of the NPC is driven by the level of the support price in the instigating countries. (2) The larger the NPC, the lower the world price. (3) The higher the NPC in the industrial countries, the lower the market price paid in the developing countries.

The size of the price effects and the quantity responses depends on the elasticities of both supply and demand in both groups of countries. Suppose for example that the developing country demand curve that passes through q_c at $P_w = 100$ is more elastic, as shown by the dashed curve D' . Then an end to intervention in the industrial countries would move us along the more elastic (dashed) import demand curve in the trade sector, yielding no-intervention world price P' instead of P^* .

Liberalization of U.S. acreage controls has quite different effects, as illustrated in Figure 2. When the acreage controls are in effect, both the U.S. price and the dollar-equivalent world price are at the level P , where the dashed excess supply curve \bar{S} in the trade sector equals demand from the rest of the world, D . There is no tariff, quota, or subsidy, to cause the U.S. producer price to differ from the world market price. If U.S. acreage controls were to be relaxed as part of a liberalization effort, supply would shift from \bar{S} to S in the United States, increasing the excess supply in the trade sector. Because the United States is a large country, the demand for its exports is not perfectly elastic, so the increased supply drives down both the U.S. internal price and the world market price to P^* . Thus, the price effects of liberalization on world prices are opposite in sign compared to the case illustrated in Figure 1. Tyers and Anderson have attempted to incorporate U.S. agriculture controls in their model.

Tyers and Anderson provide us with is a set of simulated P^* and associated Q^*_c Q^*_p and Q^*_t 's for each country in their model. With

Figure 2. Acreage Controls; Liberalization in U.S. reduces world price



many countries, commodities, and intervention in each country and commodity simultaneously, the analysis of P^* with no (or reduced) intervention is vastly more complicated than shown in Figure 1. But the essential economics of what is going on is the same. The answers depend on the type of intervention, the initial NPCs, and the elasticities.

Some Simulation Results

Some results of Tyers and Anderson are shown in Table 2, along with similar results from three other multi-country simulation studies available. These others are: (i) a 10-year research project conducted by the International Institute for Applied Systems Analysis (IIASA), with results of trade liberalization scenarios reported in Parikh et al (1986); (ii) a study by the OECD in response to its Ministerial Mandate on Agricultural Trade; and (iii) a study by economists in the Economic Research Service of the U.S. Department of Agriculture, with preliminary results reported in Roningen, Sullivan, and Wainio (1987). These world agricultural trade simulation studies however are not the only ones available in the literature. Two other studies deserve mention but whose results are not reported in Table 2. These are the (a) a study commissioned by the European Economic Community whose results remain preliminary and cannot be quoted and (b) a broad based 99-commodity study by Valdes and Zeitz (1980). This latter study will be reviewed in a later section.

While there are many differences of detail -- in some instances important detail -- all the four studies reported in Table 2 use the supply-demand system approach earlier outlined to judge what would happen under agricultural policy and trade reform. In brief, all four studies use demand and supply elasticity estimates to capture country and/or regional responses to world agricultural price changes. They also impose price wedges between world prices and domestic border prices (or estimates of NPCs as already mentioned for the Tyers and Anderson study) which are then selectively removed to simulate various trade liberalization cases.

In view of the similar supply-demand approach of the Table 2 studies, it is surprising how different some of their results on the world price effects are. While the ranges of price increases from 27% to 44% for dairy and from 10% to 21% for beef are quite narrow, the feed price effects are somewhat different.

All the models agree that a substantial increase in world dairy prices would occur if the industrial countries stopped protecting their milk producers by dumping surplus dairy products and restricting dairy imports. The agreement on beef, too, is well within the range of uncertainty that could be caused by differing assumptions about elasticities or initial protection levels. The grains, however, present a different picture. Tyers and Anderson and IIASA obtain the same kind of results as for dairy and beef, and what the earlier discussion (Figure 1) indicated as being appropriate for grains, i.e., liberalization can be expected to raise world grain prices because grain prices are presently driven down by industrial country subsidies of grain exports and their restrictions of grain imports. However

Table 2. Simulated Price Effects of Agricultural Liberalization by the Industrial Countries

Percentage Change in World Price

Commodity	Tyers and Anderson	IIASA	OECD*	USDA -ERS
wheat	9	18	- 1	10
rice	10	21	1	10
coarse grains	3	11	- 1	7
beef	21	17	15	10
sheep	21	17	22	10
pork	7	0	3	
poultry	7	0	3	
dairy products	38	31	44	27
sugar	10	n.r.	n.r.	n.r.
protein feeds (soybeans)	n.r.	13	-10	3
manioc	n.r.	n.r.	-29	n.r.
Average over all commodities	14	9	n.r.	10

n.r. means not reported

* OECD reports results of a 10 percent reduction in protection, which is multiplied by 10 for comparability with the other simulations.

Sources: Tyers and Anderson (1987, T. 8, p. 42), IIASA (1986, Table 5.1), OECD (1987, Annex IV, Table 7).

IIASA estimates twice as large a price increase in wheat and rice, and over three times as large a price increase in coarse grains compared with the Tyers and Anderson results. Even more striking, OECD estimates essentially no change in world wheat and rice prices, and a substantial price decline for coarse grains and protein feeds.

Why the Differences in Simulation Results?

It is worth exploring these differences because they provide the best way to get a feel for the theoretical and practical difficulties of estimating the effects of trade liberalization on world market prices. Consider the rice result since it will influence some developing countries, notably Thailand as an exporter and Bangladesh, Peru, and Senegal as importers. IIASA projects that industrial country liberalization will raise the world price of rice 21%, while Tyers and Anderson estimate 10% and OECD 1%. Why these differences? Following the earlier discussion, possible sources of difference are: the type of policy liberalization, initial protection levels, elasticities, and intercommodity relationships.

A. Differences in Measures of Initial Protection Levels and Elasticities

Table 3 shows the protection levels for rice in the three studies. The OECD values are quite different and average about two-thirds the NPC of Tyers and Anderson. Protection of rice has varied substantially over time, and choice of a time period for the base protection levels could make an important difference. However, OECD uses a 1979-81 base period and Tyers and Anderson 1980-82. The IIASA reference point is a simulation of 1980 policies carried forward to 2000 (by a model or mechanism that is not clearly specified). The estimates of protection levels for all commodities are unrealistically low as compared with 1985-87 conditions. For example, the U.S. target price of rice in 1986-87 is \$11.90 per hundredweight compared to a border price of about \$4.00. This indicates an NPC for U.S. rice of about 3.0, much higher than the 1.00 to 1.30 range that Table 3 shows. For this reason all three liberalization scenarios understate the world price effects of free trade under current conditions.

An important reason for differences between the OECD and the IIASA/Tyers-Anderson protection estimates is in their use of different measures of protection. The latter two studies use NPCs as defined earlier. OECD uses a "producer subsidy equivalent" (PSE), a variant of an approach developed by Josling (1980). The PSE makes a broader attempt to incorporate input subsidies, tax breaks, even public research, and other nontrade policies that benefit agriculture in accounting for price differences between domestic and world prices. Conceptually this is desirable but it also involves much more conjectural data than does the NPC's comparison of internal and border (external) prices. For details concerning calculation of PSEs, see USDA (1987) and Chattin (1987).

Substantial as the differences in rice protection rates are, they are not sufficient to explain why OECD finds a world price effect of liberalization of only 1% compared to 10% to 21% in Tyers-Anderson and

Table 3. Protection Coefficients for Rice

	Tyers and Anderson (NPC)	IIASA (NPC)	OECD (PSE)
Australia	1.15	1.25	1.144
Canada	1.00	.92	1.0
EEC-10	1.40	1.61	1.136
Japan	3.35*	3.54	1.688
U.S.	1.30	1.00	1.054
Spain and Portugal	1.15*		1.419***
Other Europe	1.00	.95**	1.0
Overall	2.52		1.61

*Values differ from Table 1, which uses Tyers and Anderson (1986)

**Austria

***Includes Turkey

Sources: Tyers and Anderson (1987, T.7), OECD (Annex II, T.2, p.18), IIASA (1986, T.4.13).

IIASA. Some aspect of supply-demand responsiveness must also be involved. However, OECD does not provide the elasticities necessary to investigate the issue.

B. Differences in the Treatment of Existing Policies

The OECD study does provide a discussion of results even more striking than those for rice, namely wheat and coarse grains, where the world market price is estimated to decline with liberalization (Table 2). The OECD report explains this result as follows: "In the EEC, coarse grain policies alone tend to depress the world price but this effect is more than offset by assistance to livestock producers . . ." (see Table 4). Reinforced by U.S. acreage controls, which also tend to support world prices, the result is obtained that OECD policies tend slightly to increase the world market price. Although OECD does not provide the detailed evidence on which their judgment is based, they have an a priori plausible case. The studies using NPCs unfortunately do not show the effect of U.S. acreage controls because these raise both internal U.S. and border prices, and do not place a wedge between them.

It may be U.S. acreage controls rather than beef as compared to grain protection levels that explains the OECD as compared to Tyers-Anderson results. Both studies in fact have about the same base period ratio of beef to coarse grain protection (see Table 4). Since U.S. acreage controls were substantially greater, in coarse grain especially, in 1983-87 than in 1979-82, the story for liberalization starting from current policies is even more likely to go in OECD's direction now than it was starting from their 1979-81 base period. On the other hand USDA-ERS (Roningen, Sullivan, and Wainio) also use PSEs as a measure of protection, and use 1984 protection levels. This gives them higher U.S. protection rates for grains (9% for feed grains and 43% for food grains) than the other three studies. Yet the price effects they obtain are more like Tyers and Anderson than like OECD (Table 2).

With respect to the role of elasticities in generating the simulated price effects, the size of net trade changes under liberalization offers some indications. These are shown in Table 5, for the trade effects corresponding to the prices in Table 2. Interpreting this data is a little tricky. When agricultural protection is characterized by export subsidies, then liberalization raises world trading prices and reduces traded quantities, as in the example diagrammed in Figure 1. But if protection is characterized by import restraints (tariffs or quotas, as beef or sugar), then liberalization raises world prices and increases traded quantities. The IIASA and Tyers and Anderson simulations show the latter to be the case for rice, meats, dairy, and sugar, but the former (trade-reducing liberalization) to characterize wheat. The two studies disagree on coarse grains. The OECD study has disagreements in cases where the other two studies agree, in part because its trade quantities refer not to the world as a whole but between the OECD countries and all others.

Why the varying results? One reason is that many commodities

Table 4. Nominal Protection Coefficients for Beef and Coarse Grains

	Tyers and Anderson		IIASA		OECD	
	Beef	Grain	Beef	Grain	Beef	Grain
Australia	1.00	1.00	0.90	1.39	1.040	1.029
Canada	1.10	1.00	1.06	1.21	1.131	1.133
EEC-10	1.95	1.40	1.12	1.37	1.527	1.279
Japan	2.80	4.30	1.56	1.39	1.549	2.071
U.S.	1.10	1.00	1.25	1.00	1.095	1.131
Spain and Portugal	1.65	1.30			1.176	1.148
Other Europe	2.30	1.40			1.616	1.547
Overall	1.50	1.25			1.30	1.19

Sources: Tyers and Anderson (1987, T.7), OECD (Annex II, T.2, p.18), IIASA (1986, T.4.13).

Table 5. Simulated World Trade Quantity Effects of Liberalization by All Industrial Countries

Commodity	Percentage Change in Quantity Traded		
	Tyers and Anderson	IIASA	OECD*
Wheat	-6	-2	1
Rice	15	37	-2
Coarse Grains	9	-5	1
Beef	63	35	-25
Sheep	63	35	-8
Pork	44	17	1
Poultry	44	17	-2
Dairy	39	13	-5
Sugar	3		20
Protein feeds (Soybeans)		5	-12
Manioc			0

* Net exports by OECD countries only.

Sources: Tyers and Anderson (1987, T.7), OECD (Annex II, T.2, p.18), IIASA (1986, T.4.13).

have both import restraints and export promotion, by different countries, e.g., rice in Japan and the United States. Indeed, protection of some agricultural commodities has gone so far in some countries that importers have become more than self-sufficient and subsidize the export of policy-created surpluses. The United States in dairy and the EC in dairy, wheat, and sugar are examples. As a result of country differences in policy approaches, quantitative changes in world-aggregate trade results can arise from qualitative differences in judgements about effects in different countries. For example, Tyers and Anderson can obtain increased coarse grain trade with liberalization because they give more weight to the United States ending acreage controls and thus exporting more, while IIASA gives more weight to the EC and United States ending subsidized grain exports. (On this issue the IIASA assumption is probably correct for 1980-82, but Tyers and Anderson are more likely correct for 1983-87, because U.S. acreage set-asides were substantially larger in the latter period.) This connection between changes in traded quantities and elasticities can be seen by comparing the Table 2 and 5 results. For rice, Tyers and Anderson find a 10% rise in world price associated with a 15% rise in traded quantities. This could be generated by a net shift in demand for traded rice when policies are liberalized, principally because Japan imports more and produces less, and a net excess supply elasticity (including both supply and demand response in developing countries) of $15/10 = 1.5$. Similar calculations for the IIASA results give $37/21 = 1.7$. Both studies agree quite closely on an elastic world-market supply. For other commodities, however, agreement is less close.

World Price Effects of Liberalization and LDC Policy Response

The changes caused by liberalization in supply and demand depend on the extent to which developing countries permit world price changes to be transmitted to their farmers and consumers. If developing countries react to changing world prices under OECD-country liberalization by reducing their own border protection, then consumption and production within these countries will respond, and there will be a more elastic worldwide response. This means the ultimate world price effects will be smaller. But if developing countries raise or lower tariffs or export taxes or otherwise respond to insulate their domestic economies from world price changes, then traded quantities will not change so much in response to liberalization by the industrial countries, and world price effects will be larger.

The simulation studies have done little to incorporate these LDC policy responses. The responses are quantified in the models by means of price transmission elasticities. These measure the percentage change in an internal producer or consumer price induced by a 1% change in the world market price. They are very difficult to estimate for developing countries and for centrally planned countries in any way that gives us much confidence of predicting what would happen under industrial-country liberalization. The importance of having the appropriate price transmissions has been examined in several papers in attempting to estimate the rest-of-world export demand elasticity for U.S. commodities. Bredahl, Meyers, and Collins (1979) specify for

several commodities whether the price transmission elasticities arising from certain countries' policies are 0 or 1. For example, in soybeans the EC and Japan are said to have a price transmission elasticity of 1 because they permit their domestic price to move proportionally with the world price, while Eastern Europe, the U.S.S.R., and Brazil are given an elasticity of 0 because their policies are designed to maintain a given domestic price regardless of world market prices. Of course, countries which liberalize are given price transmission elasticities of 1, since liberalization means no insulation from the world market. Actually, most price transmission values are probably between 0 and 1 -- nonliberalizing countries do not completely insulate themselves from world price changes, but they do try to cushion their domestic industries to some extent. While Tyers and Anderson, IIASA, and other studies discuss possibilities for estimating transmission elasticities empirically, in their simulations of industrial country liberalization, they all simply assume that developing countries maintain their pre-liberalization rates of protection. If a developing country's internal price was \$80 per ton when the world price was \$100, and the world price under OECD liberalization rises to \$125, then it is assumed that the internal developing country price is allowed to rise to \$100. Thus, the price transmission elasticity is 1 -- the world market and internal prices both rise by 25%.

Some Specific Issues: The U.S Food Security Act of 1985

Because of the conflicting estimates of what would happen under liberalization that the three large-scale studies came up with, it may be worth considering a couple of specific issues that have been addressed in smaller-scale, more focused research, for example, studies of the U.S. Food Security Act of 1985. One particularly contentious issue is the effects of changes in the U.S. grains programs, which were significantly modified in the 1985 Act. The scenarios of the large-scale studies, based on 1980-82 conditions, do not take these changes into account.

The principal change was to cut the U.S. market support prices (CCC loan rates). This step in itself had some dramatic effects on world market prices, particularly in rice and cotton where CCC support was removed entirely, but also in wheat and corn. The border price of rice fell by half between 1985 and 1986 (see Table 6). This decline of 50% is much larger than obtained by any of the liberalization scenarios we have been discussing. In part this result is expected because some countries' current policies are offsetting. U.S. liberalization of rice results in increased U.S. marketed supplies, hence a lower world price. Thus the policy is like the reduction in acreage controls of Figure 2 rather than the export subsidy of Figure 1. But Japanese liberalization would increase its imports and hence tend to raise the world price. So simultaneous liberalization should have a smaller downward price effect than unilateral U.S. liberalization. Still, some of the simulation studies did consider U.S. unilateral liberalization, and they estimated much smaller world price effects than have actually been observed.

In rice, IIASA estimates a 1% world price decline due to U.S.

Table 6. U.S. Farm-Level Market Prices of Corn, Wheat, and Rice Following the Food Security Act of 1985.

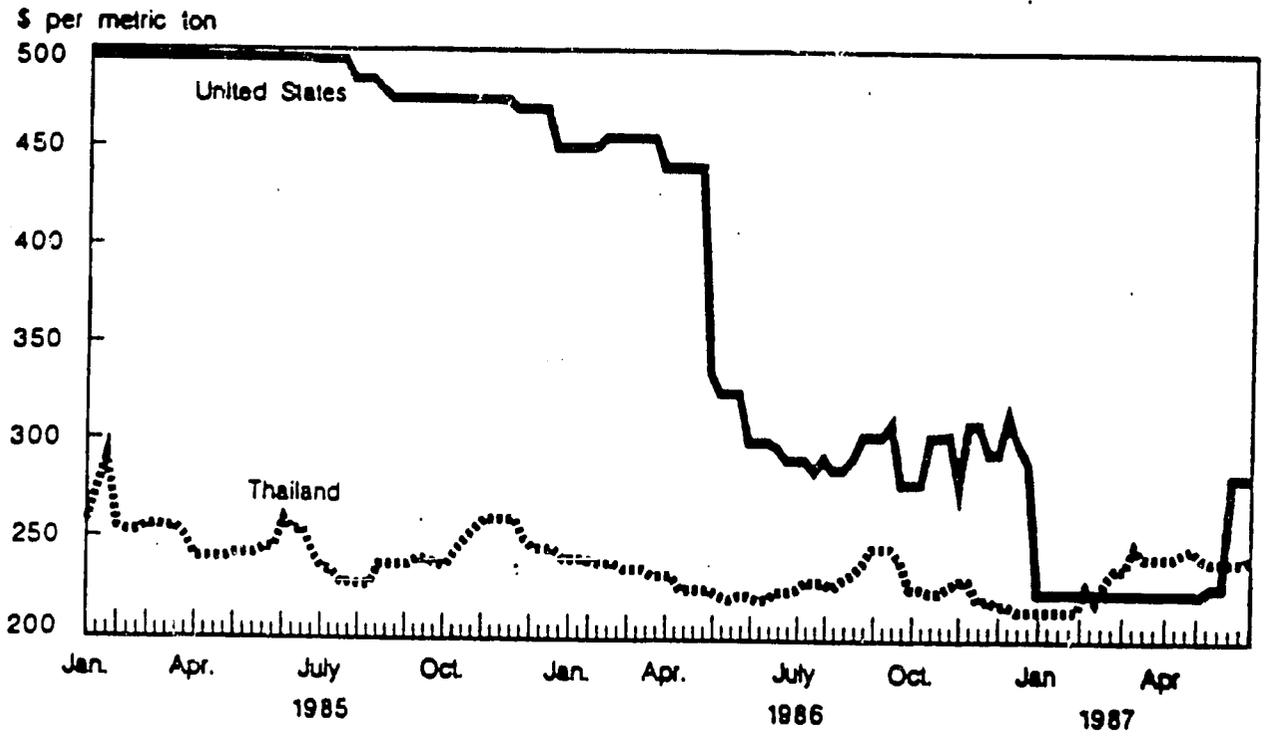
	Month	Corn	Wheat	Rice
		(- - - \$ per bushel - - -)		\$ per cwt.
1985:	Jul.	2.60	2.93	7.54
	Aug.	2.44	2.89	7.86
	Sept.	2.29	3.01	7.55
	Oct.	2.12	3.09	7.73
	Nov.	2.20	3.23	7.84
1986:	Dec.	2.29	3.25	7.71
	Jan.	2.33	3.10	7.75
	Feb.	2.32	3.15	7.86
	Mar.	2.29	3.28	7.60
	Apr.*	2.29	3.36	5.80*
	May	2.39	3.02	5.01
	Jun.*	2.32	2.48*	4.83
	Jul.	2.00	2.25	4.47
	Aug.	1.73	2.26	3.82
	Sept.*	1.44*	2.28	3.82
	Oct.	1.40	2.30	3.90
	Nov.	1.47	2.43	3.93
1987:	Dec.	1.50	2.49	3.76
	Jan.	1.47	2.53	3.61
	Feb.	1.42	2.58	3.80
	Mar.	1.47	2.58	3.68
	Apr.	1.52	2.62	3.64

* Introduction of 1985 Act provisions in rice (April), wheat (June), and corn (Sept.).

Source: U.S. Dept. of Agriculture, Agricultural Outlook.

Figure 3

World rice prices: Weekly quotations, Rotterdam



Source: U.S. Department of Agriculture

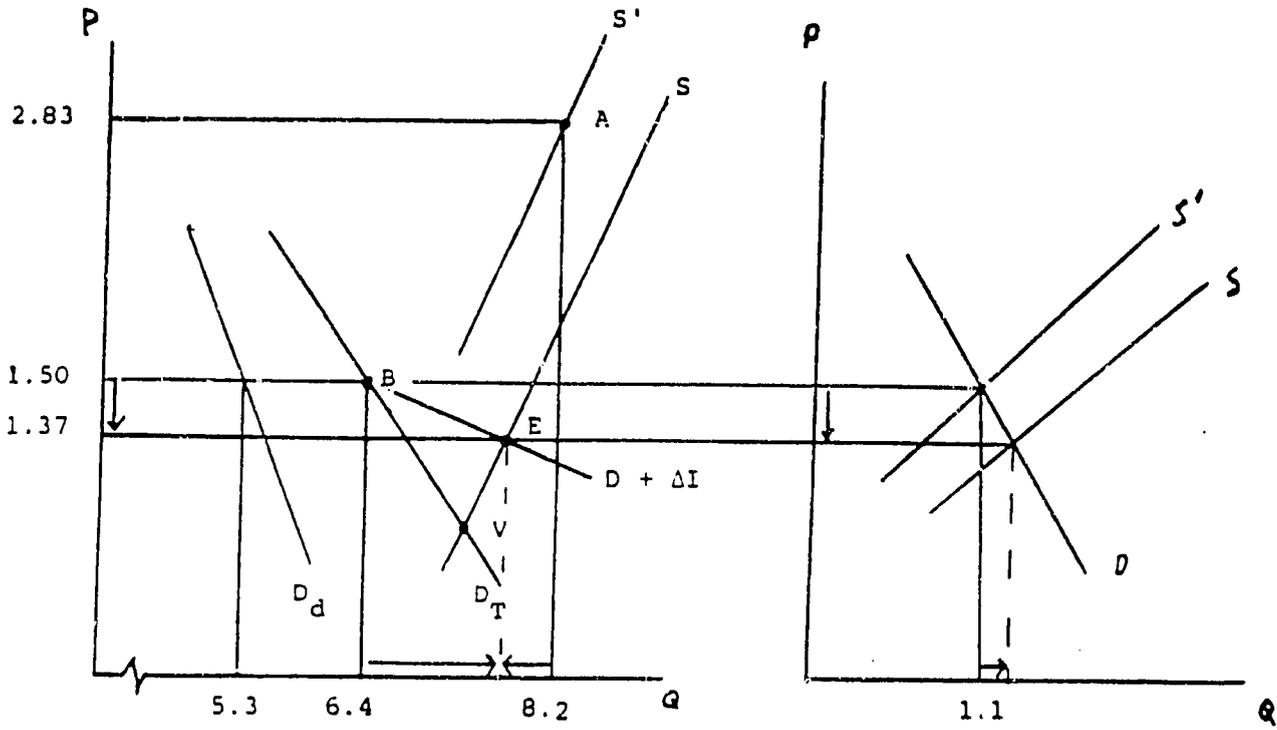
unilateral liberalization, and Tyers and Anderson estimate a zero effect, while the actual decline was 50% between late 1985 and mid-1986. What are the simulation studies missing? One factor is the earlier data of the simulation studies (1980-82), when U.S. rice protection was about 30% rather than 100%. In addition, it could be that the short-run supply and demand elasticities are substantially smaller than the elasticities used in the simulation studies. The U.S. experience is for one year, while the studies consider a longer period of adjustment -- up to 20 years in IASA. Indeed, the case of U.S. cotton liberalization shows that even a two-year period adjustment can make a big difference as compared to one year. The world cotton price fell in 1986 almost as much as rice when the United States abandoned support. But the price climbed back above 1985 (pre-reform) levels in 1987. However, the rice price remained low through the summer of 1987.

The rice experience calls into question another aspect of the simulation studies, namely their assumption that the prices of the same commodity from different countries will move together under liberalization, differing only by fixed transportation and quality adjustment factors. However, as Figure 3 shows, U.S. liberalization in rice greatly changed the relationship of the world price of U.S. rice as compared to the world price of Thai rice. The simulation models would have had U.S. and Thai rice at Rotterdam changing by close to the same percentage. It has to be admitted that no economic approach would predict that U.S. rice could fall in price by one-half and at the same time show as little effect on Thai rice as this diagram shows; and despite these data, the Thais have every right to be exceedingly worried about U.S. rice policy.

Another complication is that the 1985-Act changes did not amount to full liberalization. Target prices were essentially frozen, keeping farmers' guaranteed receipts largely intact; acreage controls were continued and even tightened in 1986 and 1987. Marketings have been maintained by releasing CCC stocks. Full liberalization in U.S. grains would have three features: (i) further cuts in CCC loan rates, (ii) an end to acreage controls, and (iii) ending (or phasing out) target price payments. Analysis of the world price effects is made difficult by the fact that items (i) to (iii) cause world prices to move in different directions. Reforms (i) and (ii) would cause world prices to fall, but (iii) would cause world prices to rise.

To see how the three features interact, consider Figure 4, which diagrams the 1986/87 corn program. The analysis follows Lin and Starbird (1987). They estimate that the incentive price to corn producers in 1986 was \$2.83 per bushel, at which price farmers produced 8.2 billion bushels with acreage idled that placed them on the restricted supply curve S'. This production (point A) is observed in the data. The observed domestic use of 5.3 billion bushels plus 1.1 billion bushels of exports adds up to 6.4 billion bushels total market demand for U.S. corn at the market price of \$1.50 (point B). This price is established by the government's commitment to accept corn at the "loan" price. The 1.8 billion bushel difference between production and consumption at the supported price level was added to CCC stocks.

Figure 4. World price effect of ending U.S. corn program



ΔI is added private stocks

The liberalization steps would be: (i) the CCC loan rate cut would permit market price to fall and demand for corn to expand along D_t at lower prices. (ii) An end to acreage controls would allow supply to shift to S , producing more output at any given price. (iii) However, the absence of target price protection would cause farmers to move to less output along S as they only receive the market price. The net result would be the new market price where D_T and S intersect, at point V , except that privately held stocks would replace some of the CCC activity. Lin and Starbird place the final liberalized equilibrium at point E . This point is obtained by adding private demand for carryover stocks to D_T . The liberalized (internal and border) price is \$1.37 per bushel. U.S. output of corn is lower but more is put on the market rather than added to CCC stocks.

The international implications are shown in the supply and demand for traded corn (U.S. exports) in the right-hand panel of Figure 4. The demand function for these exports comes from other countries, and is unchanged by U.S. liberalization. (Non-U.S. exports are netted out so that the residual demand shown as D in the right-hand panel is the demand for imports specifically from the United States.) U.S. liberalization increases the supply of U.S. exports because an end to acreage controls increases U.S. excess supply at every price. Therefore, traded quantities increase, and the world price falls. In the Lin-Starbird scenario the price decline is 9% due to unilateral U.S. liberalization.

Other Agricultural Trade Liberalization Simulation Studies

The preceding analysis contains many conjectural elements but nonetheless incorporates more of the economic detail of the corn program than the NPCs of IIASA and Tyers-Anderson, or the PSEs of the OECD study. Also, it is better tuned to the current (1986/87) situation.

An important lesson in working through such analytical exercises is how many opportunities for error there are, and how little confidence one is justified in having about the estimated price effects. This is a good reason for having several alternative sets of assumptions, i.e., models, to choose from and compare. One additional study that has not been mentioned yet because only preliminary results are available and cannot be quoted. This is a study commissioned by the Commission of the European Community, done by several eminent European and U.S. agricultural economists. The striking aspect of their findings is that they reach results quite similar to those of the OECD study, which otherwise has been an outlier with respect to grains at least.

Even if there were a definitive study along the lines of those reviewed here, a major gap still remains in assessing the world market situation facing developing countries under liberalization; namely, what consequences will there be in the markets for tropical products? While many developing countries are importers of grains and other temperate zone commodities, they are exporters of tropical products. The industrial countries often do not protect domestic producers of these commodities, simply because there is no significant domestic

Table 7. Export Revenue Gains in Developing Countries When Industrial Countries Liberalize

Commodity	Increase in Export Revenue (\$ million)	Increase in Commodity Price (percent)
Sugar	683	7.7
Beef	243	6.8
Coffee	210	2.3
Cocoa*	147	7.0
Tobacco	140	3.4
Soybeans*	140	3.0
Coarse grains*	129	4.0
Wheat	79	4.9
Palm oil	44	2.9

*These products have been aggregated from closely related individual items in Valdes and Zietz (1980).

Source: Valdes and Zietz (1980), pp. 34, 36.

industry producing coffee, cocoa, bananas, rubber, cassava, palm oil, or jute. However, the industrial countries do protect commodities which substitute for these products in uses as vegetable oils, protein feeds, or fibers.

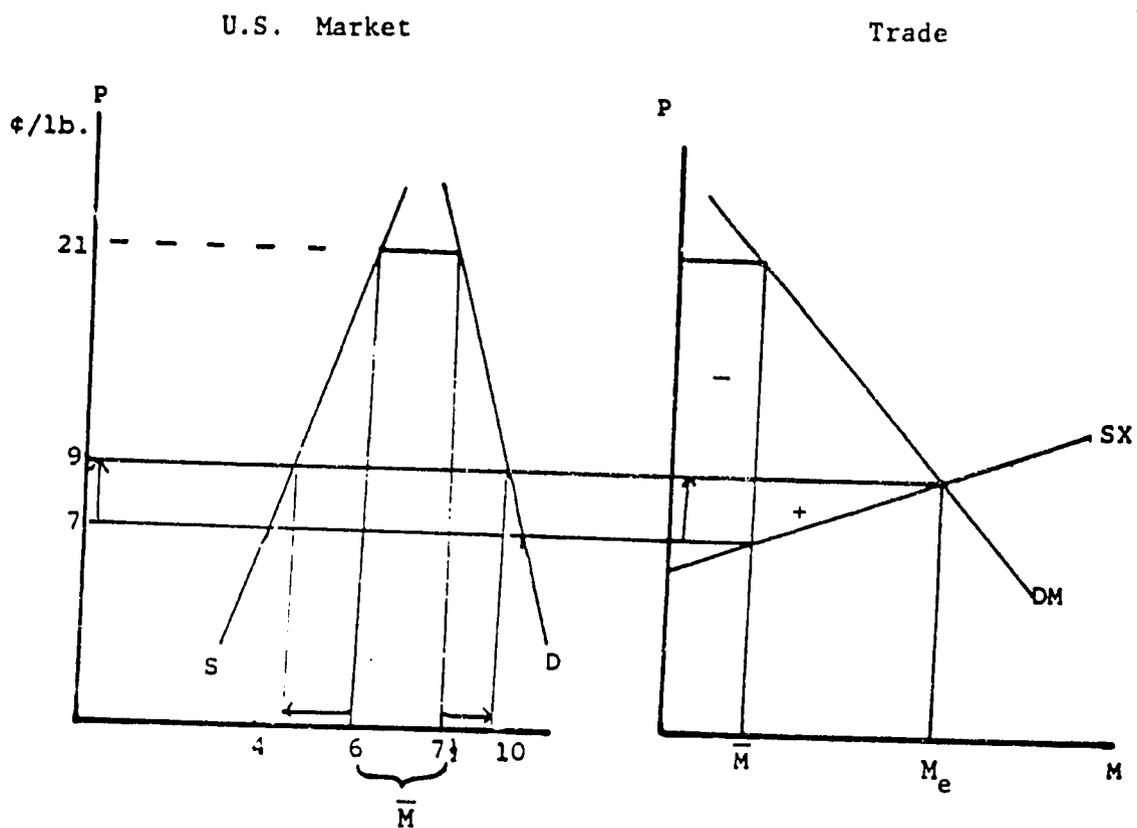
The only broad-based study that includes such commodities is that of Valdes and Zietz (1980). They consider 99 commodities. The price they pay for this breadth is the use of single-product supply-demand models, highly aggregated over countries. Also, they use protection rates from the 1970s. Still the results tell us something about important omissions from the simulation studies we have been discussing. Table 7 shows commodities ranked by the amount of potential export revenue gain for all developing countries. It turns out that the two leading export revenue gains are from commodities that have been covered earlier, sugar and beef. Moreover, the price effects used by Valdes and Zietz are smaller than those of Tyms and Anderson or the others shown for beef in Table 4 above. In a later study Zietz and Valdes (1985) estimate larger price effects in beef and sugar, using 1979-81 protection rates so that the potential gains of developing country exporters are larger, roughly twice as large.

Some Consequences for Trade in Tropical Products

Table 7 shows that the potential export revenue gains to developing countries from trade liberalization in tropical products (coffee, cocoa, tobacco and sugar) is large. But the treatment of these tropical products pose some special problems that have not arisen in the discussion so far. Coffee and cocoa depart from free-trade conditions because of protective tariffs in industrial countries and because of international commodity agreements -- now in abeyance for cocoa but still influencing coffee exports. In tobacco there is a special problem in that the most influential industrial-country policy is the U.S. tobacco program, not tariff protection. This program is the most restrictive of U.S. production control programs, and supports both the U.S. and world prices. Sumner and Alston (1985) provide evidence that the U.S. tobacco program has both reduced U.S. tobacco exports and increased U.S. tobacco imports substantially over the whole period 1970-85. Since Valdes and Zietz do not consider this aspect of tobacco market intervention, the LDC gains as estimated in Table 7 are substantially overstated as far as tobacco is concerned, which is important for Malawi and Zimbabwe. A similar problem arises with respect to feed grain substitutes, such as manioc (tapioca) from Indonesia and Thailand. Under EC policy, these commodities have entered duty free and with soybeans, have experienced an expanding market as EC protection against imported grain intensified. This market would be greatly reduced under EC liberalization.

Finally, the situation with respect to sugar is more complex than the simulations as discussed so far indicate. While protection of domestic producers by industrial countries has driven down world prices, both the U.S. and the EC have given developing countries access to industrial country markets at the supported internal prices. So for some developing countries a lower export quantity may be offset by a higher price. The situation is illustrated in Figure 5 with

Figure 5. The U.S. Sugar Program, 1987



respect to the U.S. sugar program. In 1985-87 U.S. legislation mandated a price of sugar of about 21 cents per pound (New York raw basis). This is achieved by restricting imports via quotas sufficiently to drive the U.S. sugar price up to 21 cents. This requires a quota, M , of about 1-1/2 million tons, with the U.S. consuming about 7-1/2 million tons and producing 6 million tons. If the U.S. were to abandon its quota of M , Figure 5 indicates that U.S. imports would rise to M_e , and the world market clearing price would rise from 7 cents to 9 cents per pound. Suppliers of sugar to the United States would gain producers' surplus of the area marked "+" in Figure 5 or \$90 million, on the added exports. But they would receive $(21 - 9) = 12$ cents per pound less on the 1.5 million tons that was shipped to the United States at the protected price under the quota regime. The loss, the area labelled "-", is \$360 million under the conditions shown. However, developing country exporters would also gain 2 cents per pound sold to countries other than the United States since the price rise is world-wide. With aggregate developing country exports of about 7 million tons (Zietz and Valdes) the gain is about \$280 million, still a little less than the loss of quota value under liberalization.

Another factor, however, is that maintaining the high U.S. internal price has steadily eroded the need for sugar imports as output expanded and corn sweeteners substituted for sugar. So U.S. sugar imports have fallen dramatically in the past 10 years and could easily fall to zero in the next few years. Were this to occur, the quotas would shrink to zero and the developing countries would clearly be better off with a liberalized sugar market.

Conclusions and Implications for Further Research

The lessons from this review of agricultural policy liberalization simulations are as follows. First, the models have been useful in illustrating how the policies of the industrial countries have tended to drive down world prices of agricultural commodities. Importers of food commodities (e.g., Japan) have done this by limiting their international purchases. Exporters (e.g., the EEC) have done this by subsidizing exports of policy-generated surpluses. The quantitative simulation studies have confirmed these general tendencies, with the possible exception of feed grains in the OECD study, and have provided quantitative estimates of the price effects. The second conclusion, however, is that not much confidence can be placed in the quantitative estimates. Studies using basically similar methods have generated a fairly wide range of results, and it is not clear which, if any of them, is best for forecasting the effects of liberalization in the late 1980s. It is particularly disquieting that the closest approximation to an actual liberalization experiment that we have, the dramatic drop in market support prices in the U.S. Food Security Act of 1985, had quite different world price effects from what the simulation models would have predicted. In addition, the more modest changes in the 1986 corn program seem to have caused world corn prices to decline in 1986 by much more than would have been possible according to any of the models. Still, the models may be better at projecting longer-term price effects, as the case of cotton suggests. When the U.S. cotton support price was cut

by almost one-half, the export price of cotton fell almost as much in the first year (1986) but rebounded sharply in 1987. Thus, it appears that what the models are most likely to miss are the short-run dynamics of a large policy shock. On the other hand, the models would not be able to forecast price effects over a long-term period because the many exogenous factors that they hold constant, such as technical change, would be likely to change.

Given the achievements and shortcomings of the analytical work on liberalization, what further research efforts are likely to be most productive? The most important results for carrying on with developing country consequences are the price effects of Table 2. These estimates vary uncomfortably from study to study, and we have discussed reasons why liberalization in the mid-1980s could even yield results outside the ranges shown. The items of further work in refining the supply-demand simulation models, in order of importance according to our judgment, are:

1. Better estimates of protection rates as of 1987 in both the industrial and the developing countries.
2. Expansion of commodity coverage, especially to include tropical products.
3. Expansion of country detail, especially for developing countries which are important in international markets -- China, India, and Latin American countries in some commodities.
4. Better estimates of price transmission elasticities for countries that do not liberalize in a liberalization scenario involving a subset of countries.
5. Better estimates of own-price elasticities and cross-commodity elasticities in both supply and demand for each country.

To undertake work in any of these areas involves a substantial analytical and data-collecting effort. More fundamental changes in the modeling approach should also have high priority but these are even more difficult to carry out. The most notable weakness in the models' basic approach is the fact that the "same" commodity, e.g., rice at Rotterdam from the United States and rice at Rotterdam from Thailand can actually behave as two quite distinct commodities with substantial changes in their relative prices as market conditions change. An example of the rewards and difficulties of modeling country-specific commodities is the interesting work of Grennes, Johnson, and Thursby (1977) on the world wheat market.

With respect to estimating rates of protection, one issue is how far to go toward the producer subsidy equivalent (PSE) measure. Certainly there is a basic problem with the nominal protection coefficients as used by Tyers and Anderson and by IIASA. The main omissions are input subsidies and currency overvaluation, especially in the developing countries. A high priority set of projects, one for

each developing country, would be to estimate the extent of input subsidies and how they modify the measured protection rates of agriculture. This has to be done separately for consumer and producer protection in the many countries that pay their farmers different prices than they charge consumers. It is typically a major data collection as well as analytical task to obtain the appropriate internal and border prices. But it has to be done before policy liberalization simulations can be put forth with any confidence.

Bringing in exchange rate policies is still a more difficult problem, not really addressed in the simulation studies. If the border price and internal prices are both measured in terms of the local currency, this problem does not arise, but typically the border prices are in U.S. dollars and the internal prices in local currency.

Full-fledged PSEs go so far as to count governmental support of research as a subsidy element. This is practically impossible to measure because we know little about the cost-reduction payoff per dollar spent, and less about the time pattern and duration of the cost reductions. But in any case this element of a PSE is irrelevant for trade and policy liberalization because the liberalization, within GATT or unilaterally, would typically not include an end to public sector agricultural research. Therefore, a PSE that included such subsidies would give the wrong answer to questions about trade or commodity policy liberalizations.

Because of the difficulties of improving the global simulation models, only items (1) and (2) on page 28 are likely to be worth undertaking. The thrust in (1) should be toward updating NPCs for 1987/88 conditions rather than attempting more sophisticated measures such as PSEs. Expansion of commodity coverage (2) is important for different countries on an individual basis, e.g., manioc in the case of Indonesia.

Limitations of time and resources may make it impossible for AID to carry out further research on global simulations of liberalization. When assisting a developing country in impact analysis therefore, AID would be better off relying on existing studies of world price effects while helping the country obtain better estimates of its own commodity protection rates, price transmission elasticities, and supply and demand elasticities. Our choice among the existing studies is the following: For the commodities they cover (beef, sugar, wheat, and corn) we recommend using Zietz and Valdes (1985). They use more recent protection levels (1983) in some of their work, and have the most detailed country coverage. For rice, dairy, and meats other than beef we recommend using the price effects of Tyers and Anderson (1986). Both Zietz-Valdes and Tyers-Anderson provide full documentation of elasticities and other assumptions used and have a clearly structured supply-demand model. The IIASA model is more of a "black box" particularly on the supply side. The OECD model could turn out well but as it stands, it has too many unexplained results and is not as well documented as the others. For commodities other than the seven just listed there is no choice but Valdes and Zietz (1980). This study uses the oldest protection rates and has the simplest supply-demand structure, with no cross-commodity effects. But

its method of analysis is clear and its results are sensible.

III. Immediate Consequences for Countries Assisted by AID

The past three years have seen dramatic declines in world commodity prices. Except for sugar, coffee and animal hides, primary nonfuel commodity prices have fallen sharply. Whether this is part of the long term trend of real agricultural price declines remains uncertain. However, what is clear are its significant negative effects on the ability of LDCs to purchase capital goods for development and/or to finance their burgeoning foreign debts. As Table 8 shows, many AID assisted economies have suffered as a result of these price drops. Particularly hurt have been the economies that rely on commodities such as cotton, jute, tobacco, tea and cocoa for considerable percentages of their total foreign exchange earnings. These include mostly African countries like Chad and Burkina Faso for cotton (61% and 45% respectively) Malawi and Zimbabwe for tobacco (50% and 17% respectively), Equatorial Guinea and Ghana for cocoa (72% and 64% respectively), and some Asian economies such as Sri Lanka for tea (31%), and Bangladesh for jute (57%).

LDC exporters that have benefitted from the price increases of coffee, sugar and animal hides the past three years are not exempt from the significant downward price movements that can happen at any time. This is particularly true of coffee and sugar whose past histories show considerable world price fluctuations. The countries most likely to be hurt by a downward drift in these prices include Uganda (with 94% of its export earnings from coffee), Burundi (91%), Rwanda (67%), Ethiopia (62%), El Salvador (57%). For sugar, the most vulnerable AID assisted countries include Mauritius (60%), Fiji (48%), Dominican Republic (38%), Belize (36%) and Swaziland (35%). While some of the latter countries presently enjoy preferential treatment for their sugar exports to developed countries, they are nonetheless vulnerable to the removal of these preferences if and when significant world price declines make these preferences too costly for importing nations to maintain.

In this section we attempt to measure the potential impact of agricultural trade liberalization in OECD economies on individual AID-assisted less developed countries. Assuming the OECD liberalizes its trade in any one of 7 agricultural commodities, we calculate the likely consequences for domestic demand, supply, net exports, net export revenues, consumer welfare and producer welfare in each of 52 AID-assisted economies. Our choice of the seven commodities (sugar, wheat, maize, coffee, rice, soybean oil and palm oil) for analysis was based on (a) the available data on production, consumption, exports and imports by commodity and by country from the USDA Foreign Agricultural Service (USDA-FAS), (b) the commodity composition of the simulation studies from which the world price effects are obtained, and (c) the desire to illustrate the potential gains and losses of OECD agricultural trade liberalization on as wide a coverage of AID-assisted economies as possible. Indeed, our present analysis can be extended to include other commodities which are covered by the USDA-FAS (in particular cotton, beef, pork, poultry, groundnuts, and other oilseeds) without much difficulty. These other commodities

Table 8. Agricultural Commodity Price Changes (1984-1986)
and Some AID-Assisted LDC Exporters Most Affected

Commodity	% Change in Price 1984-86	LDC Exporter	% Share of the Commodity in the Country's Export Earnings
Maize	-31	Thailand	5
		Zimbabwe	4
Rice	-15	Nepal	26
		Thailand	15
		Pakistan	15
		Guyana	10
Sugar*	+19	Mauritius	60
		Fiji	48
		Dominican Republic	38
		Belize	36
		Swaziland	35
		Haiti	34
		Malawi	20
		Panama	12
Bananas	-3	Barbados	10
		St. Lucia	38
		St. Vincent	38
		Honduras	28
		Costa Rica	25
		Panama	23
Coffee	+27	Grenada	18
		Uganda	94
		Burundi	91
		Rwanda	67
		Ethiopia	62
		El Salvador	57
		Madagascar	33
		Guatemala	29
		Central African Rep.	29
		Haiti	25
		Costa Rica	25
		Kenya	24
		Honduras	23
		Cameroon	17
Sierra Leone	11		
Togo	11		

Table 8 (cont'd)

Commodity	% Price Change	LDC Exporter	% Share in Export Earnings
Cocoa	-13	Sao Tome and Principe	84
		Equatorial Guinea	72
		Ghana	64
		Grenada	31
		Cameroon	15
		Sierra Leone	11
		Togo	11
Tea	-45	Sri Lanka	31
		Malawi	17
		Kenya	16
Coconut Oil	-77	Philippines	10
Groundnut Oil	-43	Gambia	80
		Guinea-Bissau	27
		Senegal	21
		Sudan	11
Fish Meal	-15	Peru	5
Beef	-9	Uruguay	19
		Botswana	14
Tobacco	-11	Malawi	50
		Zimbabwe	21
		Turkey	6
Cotton	-44	Chad	61
		Burkina Faso	45
		Mali	39
		Sudan	28
		Egypt	14
		Pakistan	13
Wool	-10	Lesotho	13
		Uruguay	11
Jute	-40	Bangladesh	57
		Nepal	16
		India	3
Hides	+8	Yemen	23
		Nepal	17
		Ethiopia	7

Table 8 (cont'd)

Commodity	% Price Change	LDC Exporter	% Share in Export Earnings
Rubber	-17	Liberia	15
		Sri Lanka	12
Logs	-3	Central African Rep.	25
		Nepal	11

* free market prices.

however are not as important to the AID-assisted LDCs as the 7 commodities we analyze. Their exclusion should not alter the general conclusions that can be drawn from this preliminary study.

Clearly, LDC exporters will gain from a liberalization of agricultural trade by the developed countries, if, as most of the studies discussed above indicate, world prices of the commodities increase. However, as already noted, the magnitude of that gain is far from clear. For importers, the direction of the impact is not even clear. In general, the magnitude of the foreign exchange impact on a developing country will depend on, among other things, the degree to which the change in the world price is transmitted to the domestic market, the supply and demand elasticities in the individual importing countries, and the magnitude of the change in the world price.

The Analytical Framework

In order to obtain estimates of the potential impacts of industrial country agricultural trade liberalization on AID-assisted countries, we first take the world price effects of industrial country trade liberalization in each of the seven agricultural commodities we consider from Zietz and Valdes (1985), Tyers and Anderson (1987), and Valdes and Zietz (1980). We then estimate the individual LDC supply and demand responses (and therefore their trade responses) to changes in world prices using LDC commodity specific demand and supply elasticities obtained from the same global studies as well as other sources. We assume a price transmission factor equal to one, that is, LDC domestic prices are assumed to change by the same percentage and in the same direction as world prices. As already discussed above, the actual price transmission factor for a particular country will depend on the nation's trade, agricultural and macroeconomic policies. In Appendix I, we list and explain all the equations, assumptions, and data sources used to calculate the LDC gains and losses reported in this section.

What commodity-specific liberalization measures are likely to create the largest gains (smallest losses) for AID-assisted LDCs? The analysis of this section attempts to answer this question. However, there are several important points which should be mentioned about our analytical procedure and which should be borne in mind when in interpreting our simulation results. These qualifications are very similar to the caveats that go with the existing trade liberalization simulations as reviewed in the first part of this paper. Nonetheless, in most instances, they indicate important research areas for analysts who intend more in depth analysis of country or region specific effects of agricultural trade liberalization in industrial economies.

o The analysis is static, partial equilibrium. Among other things, cross supply and demand elasticities are not used to take account of the partially offsetting impacts on supply and demand of simultaneous increases in the prices of commodities within individual developing countries. Production constraints such as available cultivable land are not built into the analysis. The links of the changes in the external sector to the rest of the economy, such as the impact on the exchange rate, are not considered. The consequences for

government revenues (in the case of agricultural export taxes) and expenditures (in the case of agricultural import subsidies) are also not considered.

o For many nations, the actual price transmission factor is far from one. In the extreme, zero price transmission would prevent any domestic supply or demand response. In such a case, the impact on the nation's import bill of the commodity will be an increase of the same percentage as the world price increase or (assuming government control over imports) at most equal to what they can afford given their existing foreign exchange constraints. For exporting nations, the impact on export earnings would be limited to an increase of the same percentage as the world price increase. Since world prices are not transmitted to the domestic economy, domestic production remains unchanged and the government obtains all the gains from the world price increase. How the government will affect domestic producer/consumer behavior, given its lower (in the case of importing countries) or higher (in the case of exporting countries) foreign exchange resources, remains uncertain.

o Numerous case studies show that there are often substantial differences between domestic (border) prices in LDCs and world market prices. Thus, the actual price transmission factor could also be significantly greater than one, that is, the percentage increase in an LDC's domestic (border) price can be larger than the actual percentage increase in the world market. No attempt is made to analyze such a situation.

o No adjustment is made for the quota rents some developing nation exporters receive in the U.S. and E.E.C. markets. These rents would be lost with complete liberalization of the developed nation's markets. This loss would reduce the export revenue gain of the developing nations which currently receive such rents. The impact would be particularly strong in the sugar market.

o Likewise, no adjustment is made for the price subsidized imports of grains by some of the AID-assisted countries. These price subsidies are likely to disappear with the reduction in developed nations' surplus grain supplies that is likely to follow complete agricultural trade liberalization by the developed nations.

o Our assumptions on the world price changes resulting from agricultural trade liberalization are from three different studies. The world price change for rice is from Tyers and Anderson (1987), while the world price changes for the other six commodities are from Valdes and Zietz (1980) and Zietz and Valdes (1986). Whereas the Tyers and Anderson's study considers some important commodity interlinkages in their analysis of industrial country trade liberalization in all commodities, the two studies by Valdes and Zietz do not explicitly model the interdependencies among the commodity markets. As such, while we are not likely to be too far off in our price assumption for rice, the individual commodity price changes from liberalization that we assume in our analysis are close to what would happen with commodity specific trade liberalization measures in the industrial countries.

o The domestic income distribution effects, although relevant, are not thoroughly examined here. While the simulations calculate the gains and losses to both domestic producers and consumers, how these translate to a real income distribution among individuals who are often both producers and consumers is not carried out.

o All demand and supply elasticities are short- to medium-term estimates and are assumed to be constant. All demand and supply curves are assumed to be linear.

o All quantity data used in this analysis are 1984-86 averages for the individual LDCs. Most of the world price assumptions are based on 1979-82 levels of protection. Levels of protection are generally higher now, thus the world price effect of liberalization could be greater.

Simulation Results for AID-Assisted Economies

Tables 9 to 24 lists the effects of industrial country trade liberalization by commodity and by AID-assisted country. For each commodity, we report two basic tables. The first set of tables (Tables 10 to 16) shows the likely changes in net trade quantities and net revenues resulting from industrial country agricultural trade liberalization. The second set (Tables 18 to 24) provides estimates of demand and supply changes and welfare gains and losses for within the AID-assisted economy.

Table 9 summarizes some general trade results of our simulations. Results indicate that for many AID-assisted commodity importers, the negative foreign exchange impact of an increase in the world price will be more than offset by declines in import demand which are produced by changes in domestic supply and demand (with domestic supply more price responsive than domestic demand). This is true particularly for the grains and for sugar because the likely world price changes arising from OECD agricultural trade liberalization are relatively high (between 10-17% as opposed to 2-3% for coffee, soybean oil and palm oil, see Appendix Table 1). For example, as shown in Table 9, only six of the 27 AID assisted maize importers experience an increase in their import bill despite an 11.7% increase in world prices. Twelve remain importers but experience a lowering of their maize import bill. And not coincidentally, the higher world maize prices lead to significant trade reversals that one third of the AID-assisted maize importers become exporters. This pattern is repeated, albeit to a lesser degree, in other commodities. (Note however that our analysis is unable to capture the possibility of a non-producer of a commodity reverting to a commodity exporter). As shown in Table 9, 11 out of 48 wheat importers, 22 out of the 36 sugar importers, and 21 out of 36 rice importers benefit from industrial country trade liberalization either because they experience a lowering of their import bill of the commodity or because they become exporters of the product. Table 9 shows that there are no coffee importers from among the AID-assisted countries we consider. Also, there are hardly any gains to importers of soybean oil and of palm oil because, as already noted, the percentage increases in world prices on account of

Table 9. Summary of the Impact of Trade Liberalization in Developing Countries on Export-Import Status of AID-Assisted Economies

		Number of AID-Assisted Economies			
Commodity/ Region	Number of Importers*	Number that Remain Importers & Experience		Number of Reversals (Become Exporters)	
		Higher Import Bill	Lower Import Bill		
Wheat:					
Latin America	10 (12)	9	1	0	
Asia	15 (16)	7	5	3	
Africa	23 (24)	21	2	0	
Sugar:					
Latin America	5	1	1	3	
Asia	15	5	8	2	
Africa	16	8	5	3	
Coffee:					
Latin America	0	0	0	0	
Asia	0	0	0	0	
Africa	0	0	0	0	
Maize:					
Latin America	7	2	4	1	
Asia	6	3	2	1	
Africa	14	1	6	7	
Rice:					
Latin America	10	2	5	3	
Asia	7	3	1	3	
Africa	19	10	9	0	
Soybean oil:					
Latin America	11	11	0	0	
Asia	10	10	0	0	
Africa	6	5	1	0	
Palm oil:					
Latin America	0	0	0	0	
Asia	11	10	1	0	
Africa	7	7	0	0	

* In parenthesis are the number of countries in each region.

Source: Tables 10 to 16.

Table 10. Rice:
Net Trade Effects of Agricultural Trade Liberalization in Industrial Economies:

	(1) 1984-86 Avg. Net Exports (1000 tonnes)	(2) Change in Net Exports w/Lib. (1000 tonnes)	(3)=(1)+(2) Net Export after Lib. (1000 tonnes)	(4) Change in Export Revenue or Import Cost (US\$ Thousands) *
ASIAN MARKET	5214.9	9362.3	14577.2	2452046
Afghanistan	-15.0	23.0	8.0	5384
Bangladesh	-278.7	959.2	680.6	232803
Burma	562.0	650.8	1212.8	174956
Egypt	34.3	77.7	112.0	20139
Fiji				
India	191.7	4412.7	4604.4	1104356
Indonesia	167.3	1615.8	1783.1	406586
Jordan	-58.3	2.0	-56.3	-820
Morocco	-13.0	1.0	-12.0	-48
Nepal	0.0	128.7	128.7	32079
Pakistan	1069.3	126.9	1196.2	55862
Philippines	-198.3	548.5	350.2	132238
Sri Lanka	-205.0	111.3	-93.7	23111
Thailand	4010.3	702.8	4713.2	266089
Tunisia	0.0	0.0	0.0	0
Yemen	-51.7	1.9	-49.7	-689
LATIN AMERICAN MARKET	-47.4	139.2	91.8	54613
Bolivia	-19.3	1.1	-18.2	-270
Costa Rica	15.3	8.6	23.9	4030
Dominican Repub.	-54.0	22.5	-31.5	7111
Ecuador	-21.3	19.6	-1.8	7136
El Salvador	-7.0	2.9	-4.1	920
Guatemala	-1.7	2.0	0.3	749
Haiti	-19.7	8.0	-11.7	2513
Honduras	-1.7	2.7	1.0	1020
Jamaica	-56.7	2.6	-54.1	-1038
Panama	0.0	8.8	8.8	3585
Peru	-117.0	49.1	-67.9	15578
Uruguay	235.7	11.3	247.0	13279
AFRICAN MARKET	-1450.3	162.8	-1287.5	12574
Burundi				
Cameroon	-55.0	7.3	-47.7	922
Chad	-20.0	1.2	-18.8	-235
Gabon	-10.0	0.4	-9.6	-206
Gambia	-50.0	3.5	-46.5	-441
Guinea	-122.7	27.1	-95.6	6448
Kenya	-17.3	2.7	-14.6	475
Liberia	-80.3	15.9	-64.4	3501
Malawi	0.0	1.7	1.7	680
Mali	-122.7	13.7	-109.0	1024
Mauritania	-83.3	4.3	-79.1	-1347
Mauritius	-96.7	3.9	-92.7	-1967
Mozambique	-123.3	7.5	-115.8	-1498
Niger	-30.0	3.9	-26.1	485
Rwanda				
Senegal	-348.3	20.0	-328.3	-4715
Sierra Leone	-102.3	27.0	-75.3	7187
Somali Republic	-95.0	4.1	-90.9	-1851
Sudan	-6.7	1.1	-5.6	205
Togo	-25.0	1.8	-23.2	-100
Uganda	0.0	0.0	0.0	0
Zaire	-51.7	14.9	-36.8	4129
Zambia	-10.0	0.8	-9.2	-42
Zimbabwe	0.0	0.0	0.0	0

* Asian Market (Pre-Liberalization US\$/Metric Ton = 226.62)
Latin American Market (Pre-Liberalization US\$/Metric Ton = 368.35)
African Market (Pre-Liberalization US\$/Metric Ton = 368.35)

Table 11. Wheat:
Net Trade Effects of Agricultural Trade Liberalization in Industrial Economics:

	(1)	(2)	(3)=(1)+(2)	(4)
	1984-86 Avg. Net Exports (1000 Tonnes)	Change in Net Exports w/Lib. (1000 Tonnes)	Net Exports after Lib. (1000 Tonnes)	Change in Export Revenue or Import Cost (US\$ Thousand) *
ASIAN MARKET	-16262.0	7877.4	-8384.6	916124
Afghanistan	-350.0	302.6	-47.4	39884
Bangladesh	-1487.3	238.9	-1248.4	10805
Burma	10.0	22.3	12.3	3201
Egypt	-6290.0	510.5	-5779.5	-30057
Fiji	-50.0	2.5	-47.5	-469
India	21.7	4609.4	4631.0	698959
Indonesia	-1451.0	222.7	-1228.3	8972
Jordan	-402.0	23.8	-378.2	-3265
Morocco	-1989.7	345.6	-1644.0	18404
Nepal	-0.3	59.7	59.4	9046
Pakistan	-1041.7	1266.2	224.5	174106
Philippines	-901.7	43.8	-857.9	-8768
Sri Lanka	-637.0	52.2	-584.8	-2973
Thailand	-184.7	9.7	-175.0	-1691
Tunisia	-880.0	130.5	-749.5	4747
Yemen	-608.3	37.0	-571.3	-4777
LATIN AMERICAN MARKET	-2475.2	171.3	-2304.1	-16317
Bolivia				
Costa Rica	-122.3	6.2	-116.1	-1147
Dominican Republic	-238.7	11.6	-227.1	-2316
Ecuador	-370.3	20.2	-350.2	-3268
El Salvador				
Guatemala	-141.3	12.3	-129.0	-548
Haiti	-183.3	9.1	-174.2	-1748
Honduras	-113.3	5.1	-108.3	-1166
Jamaica	-200.0	10.2	-189.8	-1876
Panama	-74.0	3.5	-70.5	-735
Peru	-987.0	58.7	-928.3	-7959
Uruguay	-45.0	34.4	-10.6	4446
AFRICAN MARKET	-2410.6	177.1	-2233.4	-10556
Burundi	-10.0	0.5	-9.5	-94
Cameroon	-158.3	8.0	-150.3	-1485
Chad	-57.3	3.3	-54.0	-476
Gabon	-40.0	2.0	-38.0	-375
Gambia				
Guinea	-43.3	2.2	-41.1	-406
Kenya	-232.0	32.8	-199.2	1006
Liberia	-16.7	0.8	-15.8	-156
Malawi	-10.0	0.5	-9.5	-94
Mali	-43.3	2.2	-41.1	-406
Mauritania	-130.0	6.6	-123.4	-1219
Mauritius	-85.0	4.3	-80.7	-797
Mozambique	-138.3	7.3	-131.0	-1251
Niger	-33.7	1.7	-32.0	-316
Rwanda	-11.3	0.6	-10.8	-106
Senegal	-130.7	6.6	-124.0	-1226
Sierra Leone	-40.0	2.0	-38.0	-375
Somali Republic	-146.7	7.5	-139.2	-1376
Sudan	-600.0	44.2	-555.8	-3554
Togo	-60.0	3.0	-57.0	-563
Uganda	-60.0	3.0	-57.0	-563
Zaire	-215.0	11.9	-203.1	-1868
Zambia	-69.0	5.3	-63.7	-375
Zimbabwe	-80.0	20.8	-59.2	1783

* All Markets (Pre-Liberalization US\$/Metric Ton = 134.48)

Table 12. Maize:
Net Trade Effects of Agricultural Trade Liberalization in Industrial Economies:

	(1)	(2)	(3)=(1)+(2)	(4)
	1984-86 Avg. Net Exports (1000 Tonnes)	Change in Net Exports w/Lib. (1000 Tonnes)	Net Exports after Lib. (1000 Tonnes)	Change in Export Revenue or Import Cost (US\$ Thousand) *
ASIAN MARKET	913.7	2525.9	3439.6	327385
Afghanistan	0.0	73.2	73.2	9145
Bangladesh				
Burma	25.0	31.2	56.2	4217
Egypt	-1816.0	454.1	-1361.9	32954
Fiji				
India	5.3	928.6	933.9	116035
Indonesia	27.0	331.2	358.2	41719
Jordan	-196.3	8.0	-188.4	-1573
Morocco	0.0	0.3	0.3	43
Nepal	0.0	79.1	79.1	9873
Pakistan	0.0	65.0	65.0	8119
Philippines	-108.0	339.3	231.3	40959
Sri Lanka	-20.0	0.8	-19.2	-164
Thailand	3244.3	200.1	3444.4	67428
Tunisia	-230.3	10.1	-220.2	-1751
Yemen	-17.3	4.9	-12.5	381
LATIN AMERICAN MARKET	-772.7	331.3	-441.4	31279
Bolivia				
Costa Rica	-24.0	10.9	-13.1	1050
Dominican Repub.	-183.3	18.6	-164.7	-76
Ecuador	13.3	24.7	38.0	3260
El Salvador				
Guatemala	-40.0	103.0	63.0	12342
Haiti	-20.0	14.8	-5.2	1583
Honduras	2.3	45.7	48.0	5739
Jamaica	-153.7	7.7	-146.0	-1050
Panama	-48.3	8.5	-39.8	430
Peru	-319.0	83.4	-235.6	6248
Uruguay	0.0	14.0	14.0	1753
AFRICAN MARKET	-38.1	920.7	882.6	114490
Burundi	0.0	12.9	12.9	1617
Cameroon	-20.0	45.1	25.1	5372
Chad	-19.7	3.7	-16.0	204
Gabon				
Gambia	0.0	1.6	1.6	199
Guinea	0.0	5.1	5.1	643
Kenya	-2.0	217.4	215.4	27121
Liberia				
Malawi	166.7	123.9	290.5	17648
Mali	-77.7	13.9	-63.7	724
Mauritania	0.0	0.3	0.3	43
Mauritius				
Mozambique	-166.7	30.9	-135.8	1677
Niger	-37.3	1.7	-35.6	-278
Rwanda	-6.7	9.3	2.6	1074
Senegal	-25.0	11.2	-13.8	1066
Sierra Leone	-0.3	1.3	1.0	161
Somali Republic	-39.3	31.5	-7.8	3425
Sudan				
Togo	-10.0	17.3	7.3	2030
Uganda	-36.7	43.2	6.6	4921
Zaire	-60.0	70.9	10.9	8069
Zambia	-101.7	101.2	-0.5	11302
Zimbabwe	398.3	178.3	576.6	27472

* All Markets (Pre-Liberalization US\$/Metric Ton = 111.80)

Table 13. Sugar:
Net Trade Effects of Agricultural Trade Liberalization in Industrial Economies:

	(1) 1984-86 Avg. Net Exports (1000 Tonnes)	(2) Change in Net Exports w/lib. (1000 Tonnes)	(3)=(1)+(2) Net Export after Lib. (1000 Tonnes)	(4) Change in Export Revenue or Import Cost (US\$ Thousands) *
ASIAN MARKET	-172.7	4946.4	4773.7	763908
Afghanistan	-70.0	6.7	-63.3	-508
Bangladesh	-176.7	30.7	-146.0	833
Burma	-20.0	10.9	-9.1	1241
Egypt	-745.3	202.1	-543.2	14821
Fiji	264.0	30.6	294.6	10612
India	-808.3	3402.7	2594.4	510189
Indonesia	0.0	295.8	295.8	45915
Jordan	-110.0	7.7	-102.3	-1241
Morocco	-285.0	96.5	-188.5	8652
Nepal				
Pakistan	-149.0	218.3	69.3	30570
Philippines	710.3	302.5	1012.8	62729
Sri Lanka	-205.0	19.4	-185.6	-1547
Thailand	1782.3	297.4	2079.7	85750
Tunisia	-260.0	16.7	-243.3	-3183
Yemen	-100.0	8.4	-91.7	-925
LATIN AMERICAN MARKET	1244.1	491.0	1735.1	103845
Bolivia	-6.0	0.5	-5.5	-61
Coasta Rica	78.7	33.8	112.4	6990
Dominican Repub.	726.7	118.4	845.1	34523
Ecuador	-44.7	47.6	2.9	6388
El Salvador				
Guatemala	311.0	76.7	387.7	18812
Haiti	-20.3	9.1	-11.2	967
Honduras	103.3	30.1	133.4	6964
Jamaica	87.7	27.6	115.2	6226
Panama	82.0	24.6	106.6	5647
Peru	-65.3	105.5	40.2	14929
Uruguay	-9.0	17.1	8.1	2460
AFRICAN MARKET	694.3	394.2	1088.5	76594
Burundi	-7.0	0.5	-6.5	-73
Cameroon	0.0	12.5	12.5	1944
Chad	0.0	4.2	4.2	648
Gabon	8.0	3.9	11.9	789
Gambia	-21.0	1.4	-19.6	-249
Guinea	-5.0	4.1	-0.9	521
Kenya	-22.0	60.0	38.0	8817
Liberia	-8.0	0.5	-7.5	-95
Malawi	135.0	22.5	157.5	6498
Mali	-30.0	3.7	-26.3	-96
Mauritania	-20.0	1.7	-18.3	-185
Mauritius	624.0	66.9	690.9	24238
Mozambique	10.0	17.7	27.7	2970
Niger	-6.0	0.5	-5.5	-61
Rwanda	-2.0	0.5	-1.5	28
Senegal	-8.0	13.7	5.7	1953
Sierra Leone	-16.0	1.5	-14.5	-122
Somali Republic	-10.0	10.6	0.6	1416
Sudan	-100.0	69.1	-30.9	8510
Togo	-26.0	1.7	-24.3	-308
Uganda	-20.0	5.4	-14.6	390
Zaire	-29.0	10.5	-18.5	986
Zambia	0.0	17.9	17.9	2773
Zimbabwe	247.3	63.2	310.5	15302

* All Markets (Pre-Liberalization US\$/Ton = 133.00)

Table 14. Coffee:
Net Trade Effects of Agricultural Trade Liberalization in Industrial Economies:

	(1) 1984-86 Avg. Net Exports (1000 Tonnes)	(2) Change in Net Exports w/lib. (1000 Tonnes)	(3)=(1)+(2) Net Exports after Lib. (1000 Tonnes)	(4) Change in Export Revenue or Import Cost (US\$ Thousands) *
ASIAN MARKET	411.0	1.5	412.5	36031
Afghanistan				
Bangladesh				
Burma				
Egypt				
Fiji				
India	75.4	0.5	75.9	7371
Indonesia	280.8	0.6	281.4	23210
Jordan				
Morocco				
Nepal				
Pakistan				
Philippines	31.5	0.3	31.8	3492
Sri Lanka	4.0	0.0	4.0	311
Thailand	16.9	0.1	17.0	1466
Tunisia				
Yemen	2.4	0.0	2.4	181
LATIN AMERICAN MARKET	684.2	2.0	686.4	58372
Bolivia				
Costa Rica	105.8	0.5	106.3	9584
Dominican Repub.	30.5	0.3	30.8	3331
Ecuador	77.5	0.3	77.8	6775
El Salvador	156.3	0.3	156.6	12858
Guatemala	147.7	0.2	147.9	11720
Haiti	20.3	0.0	20.3	1567
Honduras	76.2	0.2	76.5	6463
Jamaica	1.3	0.0	1.3	108
Panama	7.4	0.0	7.4	593
Peru	61.2	0.2	61.5	5373
Uruguay				
AFRICAN MARKET	549.0	2.5	551.5	50122
Burundi	33.5	0.1	33.6	2707
Cameroon	104.7	0.3	105.0	8918
Chad				
Gabon	1.9	0.0	1.9	144
Gambia				
Guinea	3.2	0.0	3.2	263
Kenya	103.7	0.5	104.3	9523
Liberia	7.7	0.0	7.7	646
Malawi	2.2	0.0	2.2	179
Mali				
Mauritania				
Mauritius				
Mozambique				
Niger				
Rwanda	32.0	0.0	32.0	2537
Senegal				
Sierra Leone	5.6	0.0	5.6	421
Somali Republic				
Sudan				
Togo	14.9	0.0	14.9	1165
Uganda	148.5	1.2	149.7	15177
Zaire	81.6	0.4	82.1	7642
Zambia	0.2	0.0	0.2	31
Zimbabwe	9.3	0.0	9.3	769

* All Markets (Pre-Liberalization US\$/Metric Ton = 3270.11)

Table 15. Palm Oil:
Net Trade Effects of Agricultural Trade Liberalization in Industrial Economies:

	(1)	(2)	(3)=(1)+(2)	(4)
	1984-86 Avg. Net Exports (1000 Tonnes)	Change in Net Exports w/Lib. (1000 Tonnes)	Net Export after Lib. (1000 Tonnes)	Change in Export Revenue or Import Cost (US\$ Thousands) *
ASIAN MARKET	-1051.64	36.62	-1015.02	3562
Afghanistan	-10.00	0.10	-9.90	-95
Bangladesh	-141.33	1.08	-140.25	-1480
Burma	-23.33	0.22	-23.11	-221
Egypt	-47.00	0.45	-46.55	-446
Fiji				
India	-695.00	6.43	-688.57	-6711
Indonesia	490.67	20.93	511.59	17723
Jordan	-60.00	0.57	-59.43	-569
Morocco	-4.00	0.04	-3.96	-38
Nepal				
Pakistan	-502.33	4.37	-497.96	-4989
Philippines	-7.33	0.45	-6.88	124
Sri Lanka	-8.33	0.08	-8.25	-79
Thailand	3.67	1.45	5.11	791
Tunisia				
Yemen	-47.33	0.45	-46.88	-449
LATIN AMERICAN MARKET	9.00	3.40	12.40	1861
Bolivia				
Costa Rica	0.00	0.88	0.88	450
Dominican Republic	0.00	0.02	0.02	9
Ecuador	0.67	1.87	2.54	965
El Salvador				
Guatemala				
Haiti				
Honduras	7.00	0.43	7.43	318
Jamaica				
Panama				
Peru	1.33	0.20	1.53	119
Uruguay				
AFRICAN MARKET	-136.01	9.49	-126.52	2891
Burundi				
Cameroon	8.33	1.79	10.12	1033
Chad				
Gabon	-3.00	0.07	-2.93	-7
Gambia	0.00	0.04	0.04	22
Guinea	0.00	0.88	0.88	450
Kenya	-98.67	0.94	-97.72	-937
Liberia	5.33	0.67	6.00	418
Malawi				
Mali				
Mauritania				
Mauritius	-6.33	0.06	-6.27	-60
Mozambique	-8.00	0.08	-7.92	-76
Niger	-4.33	0.04	-4.29	-41
Rwanda				
Senegal	-7.00	0.07	-6.93	-66
Sierra Leone	0.00	0.85	0.85	435
Somali Republic				
Sudan	-26.67	0.26	-26.41	-253
Togo	1.00	0.41	1.41	225
Uganda	0.00	0.00	0.00	0
Zaire	3.33	3.33	6.67	1748
Zambia				
Zimbabwe				

* All Markets (Pre-Liberalization US\$/Metric Ton = 495.58)

Table 16. Soybean Oil:
Net Trade Effects of Agricultural Trade Liberalization in Industrial Economies:

	(1) 1984-86 Avg. Net Exports (1000 Tonnes)	(2) Change in Net Exports w/lib. (1000 Tonnes)	(3)=(1)+(2) Net Exports after Lib. (1000 Tonnes)	(4) Change in Export Revenue or Import Cost (US\$ Thousands) *
ASIAN MARKET	-1043.2	14.5	-1028.7	-8941
Afghanistan				
Bangladesh	-43.0	0.4	-42.6	-470
Burma				
Egypt	-36.0	1.1	-34.9	46
Fiji				
India	-492.0	7.6	-484.4	-3791
Indonesia	-5.3	0.1	-5.3	-58
Jordan	-5.0	0.0	-5.0	-54
Morocco	-105.3	1.7	-103.6	-771
Nepal				
Pakistan	-268.0	2.3	-265.7	-3112
Philippines	-6.3	0.1	-6.3	-60
Sri Lanka	-0.3	0.0	-0.3	-4
Thailand	-23.7	0.7	-23.0	-16
Tunisia	-58.3	0.5	-57.8	-651
Yemen				
LATIN AMERICAN MARKET	-229.1	2.9	-226.2	-2081
Bolivia				
Costa Rica	-1.7	0.0	-1.6	-2
Dominican Repub.	-51.0	0.5	-50.5	-538
Ecuador	-54.0	0.7	-53.3	-479
El Salvador	-9.7	0.1	-9.6	-93
Guatemala	-10.7	0.1	-10.6	-116
Haiti	-18.7	0.3	-18.3	-118
Honduras	-2.3	0.0	-2.3	-25
Jamaica	-6.3	0.3	-6.1	49
Panama	-26.0	0.3	-25.7	-282
Peru	-46.7	0.5	-46.2	-476
Uruguay	-2.0	0.1	-1.9	-1
AFRICAN MARKET	-102.32	1.37	-100.95	-904
Burundi				
Cameroon				
Chad				
Gabon				
Gambia				
Guinea				
Kenya	-1.33	0.01	-1.32	-14
Liberia				
Malawi				
Mali				
Mauritania				
Mauritius	-13.00	0.13	-12.87	-141
Mozambique				
Niger				
Rwanda				
Senegal	-60.00	0.59	-59.41	-651
Sierra Leone				
Somali Republic	-13.33	0.13	-13.20	-145
Sudan				
Togo				
Uganda				
Zaire				
Zambia	-14.33	0.19	-14.15	-131
Zimbabwe	-0.33	0.32	-0.01	178

* All Markets (Pre-Liberalization US\$/Metric Ton = 547.86)

OECD agricultural trade liberalization are relatively low for these commodities.

A comparison across Tables 10 to 16 shows that among all commodities, the largest trade effects in terms of export revenue or import costs happen in grains. This is again largely because in our simulations, rice, wheat, and maize are expected to have the largest price increases when industrial countries liberalize their agricultural trade. For rice (Table 10), for example, India can potentially gain over US\$1.1 billion from increased rice exports. In contrast, Senegal may have to pay US\$4.7 million more for its rice imports, even though its total rice imports drop by 20000 tonnes, because of the higher world rice price. The largest potential gainers among all AID-assisted countries in terms of export revenue are the Asian rice-producing economies (Bangladesh, Burma, India, Indonesia, the Philippines and Thailand), while the largest potential losers are African economies (Mauritius, Mauritania, Mozambique, Senegal and Somalia). For wheat (Table 11), the large South Asian producers, notably Afghanistan, Bangladesh, India, Morocco and Pakistan, are the largest revenue gainers. Among all countries, Egypt, the largest wheat importer, suffers the most in terms of import costs for wheat. All of the Latin American countries (except Uruguay) and some countries in Africa who are also wheat importers (Cameroon, Mauritania, Mozambique, Senegal, Sierra Leone, Sudan, and Zaire) also lose from higher world wheat prices. For maize (Table 12), the AID-assisted economies in Asia (except Jordan, Sri Lanka, and Tunisia), Latin America (except Jamaica), and Africa all gain.

Although the effects of trade liberalization on export revenues (or import costs) are the largest for the grains, the same trade effects are not trivial for tropical products particularly sugar and coffee. These are shown in Tables 13 and 14. Indeed if with total liberalization the increase in costs of grain imports were partially offset by the export gains in sugar and coffee alone, then fewer countries (Chad, Gambia, Mauritania, Senegal, Sudan) would suffer net increases in their trade costs. All other countries are net revenue gainers.

If the trade effects of more commodities, such as oilseeds, were considered then the overall picture changes. For palm oil (Table 15) and soybean oil (Table 16) in particular, the principal importers (India and Pakistan in Asia; the Dominican Republic, El Salvador, Guatemala, and Panama in Latin America; and Kenya, Mauritius, Senegal, Somalia, Sudan and Zambia in Africa) will have to pay higher import costs while the principal exporters (Indonesia in Asia; Honduras in Latin America; and Cameroon, Guinea, Liberia, Sierra Leone, Togo and Zaire) will gain in revenue terms. In sum however, the potential LDC gains in the individual oilseeds are not likely to be as large as the potential export gains to LDCs because of industrial country trade liberalization in individual tropical products.

How are the trade gains or losses likely to be shared within the individual developing countries? In Tables 18 to 24 we list the supply and demand changes by country and by commodity arising from industrial country trade liberalization. Because in all cases we

Table 17. Summary of Supply/Demand and Consumer/Producer Welfare Consequences of Agricultural Trade Liberalization in Developed Countries

Commodity/Region	Number of AID-Assisted Economies	
	I. Increases in Supply Larger than Decreases in Demand *	II. Value of Producer Welfare Gains Larger than Value of Consumer Welfare Losses **
Wheat:		
Latin America	0(10)	0(10)
Asia	1(15)	4(16)
Africa	0(23)	0(26)
Sugar:		
Latin America	10(11)	7(11)
Asia	5(15)	5(15)
Africa	13(24)	9(24)
Coffee:		
Latin America	10(10)	10(10)
Asia	5(5)	6(6)
Africa	14(14)	14(14)
Maize:		
Latin America	3(10)	4(10)
Asia	4(11)	9(14)
Africa	3(14)	10(20)
Rice:		
Latin America	2(12)	6(12)
Asia	2(13)	10(14)
Africa	0(20)	1(20)
Soybean Oil:		
Latin America	0(10)	0(10)
Asia	0(9)	0(11)
Africa	1(6)	2(6)
Palm Oil:		
Latin America	4(4)	4(4)
Asia	2(13)	2(13)
Africa	6(13)	6(13)

* Figures in () refer to the number of countries that experience either a gain or a loss in net welfare when measured in quantity terms.

** Figures in () refer to the number of countries that experience either a gain or a loss in net welfare when measured in value terms.

Table 18. Rice:
Supply/Demand and Producer/Consumer Welfare Consequences of Agricultural
Trade Liberalization in Industrial Countries.

	(1) Change in Demand (Volume)	(2) Loss in Consumer Welfare (US\$ Thous)	(3) Change in Supply (Volume)	(4) Gain in Producer Welfare (US\$ Thous)	(5)=(1)+(3) Net Welfare Gain or Loss (Volume)	(6)=(2)+(4) Net Welfare Gain or Loss (US\$ Thous)*
ASIAN MARKET	-5303.3	-3298341	4059.0	3181257	-1244.3	-117084
Afghanistan	-12.9	-7136	10.1	7057	-2.8	-79
Bangladesh	-613.4	-340579	345.8	344649	-267.6	4070
Burma	-346.4	-192335	304.3	212445	-42.1	20110
Egypt	-64.5	-35808	13.2	37466	-51.3	1658
Fiji						
India	-2405.3	-1335487	2007.4	1401275	-397.9	65788
Indonesia	-1039.4	-577087	576.4	600306	-463.0	23219
Jordan	-2.0	-1118	0.0	0	-2.0	-1118
Morocco	-0.8	-452	0.2	123	-0.6	-329
Nepal	-70.8	-39317	57.9	40397	-12.9	1080
Pakistan	-88.0	-48837	38.9	73941	-49.1	25104
Philippines	-234.8	-130358	313.7	132819	78.9	2461
Sri Lanka	-75.1	-41678	36.3	39563	-38.8	-2115
Thailand	-348.0	-193216	354.8	291216	6.8	98000
Tunisia	0.0	0	0.0	0	0.0	0
Yemen	-1.9	-1073	0.0	0	-1.9	-1073
LATIN AMERICAN MARKET	-71.5	-64606	67.4	67018	-4.1	2412
Bolivia	-1.0	-866	0.1	150	-0.9	-716
Costa Rica	-4.6	-4163	3.9	4468	-0.7	305
Dominican Repub.	-13.3	-12009	9.2	10384	-4.1	-1625
Ecuador	-10.8	-9783	8.7	9885	-2.1	102
El Salvador	-1.6	-1433	1.3	1498	-0.3	65
Guatemala	-1.1	-1011	0.9	998	-0.2	-13
Haiti	-4.8	-4332	3.2	3619	-1.6	-713
Honduras	-1.4	-1288	1.2	1410	-0.2	122
Jamaica	-2.4	-2178	0.2	200	-2.2	-1978
Panama	-6.9	-4440	3.9	4456	-1.0	16
Peru	-23.9	-21539	25.2	19042	1.3	-2497
Uruguay	-1.7	-1564	9.6	10908	7.9	9344
AFRICAN MARKET	-115.2	-103880	47.773	54204	-67.427	-49676
Burundi						
Cameroon	-5.0	-4500	2.288	2596	-2.712	-1904
Chad	-1.0	-939	0.198	225	-0.802	-714
Gabon	-0.4	-361	0.000	0	-0.400	-316
Gambia	-2.8	-2515	0.671	761	-2.129	-1754
Guinea	-16.9	-15233	10.186	11557	-6.714	-3676
Kenya	-2.0	-1805	0.748	849	-1.252	-956
Liberia	-10.1	-9097	5.863	6652	-4.237	-2445
Malawi	-0.9	-830	0.759	861	-0.141	31
Mali	-9.8	-8880	3.839	4356	-5.961	-4524
Mauritania	-3.9	-3490	0.385	437	-3.515	-3053
Mauritius	-3.9	-3550	0.000	0	-3.900	-3550
Mozambique	-6.4	-5740	1.155	1310	-5.245	-4430
Niger	-2.7	-2431	1.232	1398	-1.468	-1033
Rwanda						
Senegal	-17.0	-15366	3.003	3407	-13.997	-11959
Sierra Leone	-16.7	-15041	10.373	11770	-6.327	-3271
Somali Repub.	-3.8	-3453	0.242	275	-3.558	-3178
Sudan	-0.9	-794	0.231	262	-0.669	-532
Togo	-1.5	-1312	0.374	424	-1.126	-888
Uganda	0.0	0	0.000	0	0.000	0
Zaire	-8.9	-8026	5.995	6802	-2.905	-1224
Zambia	-0.6	-517	0.231	262	-0.369	-255
Zimbabwe	0.0	0	0.000	0	0.000	0

* Asian Market (Pre-Liberalization US\$/Metric Ton = 226.62)
Latin American Market (Pre-Liberalization US\$/Metric Ton = 368.35)
African Market (Pre-Liberalization US\$/Metric Ton = 368.35)

Table 19. Wheat:
Supply/Demand and Producer/Consumer Welfare Consequences of Agricultural
Trade Liberalization in Industrial Countries.

	(1) Change in Demand (Volume)	(2) Loss in Consumer Welfare (US\$ Thous)	(3) Change in Supply (Volume)	(4) Gain in Producer Welfare (US\$ Thous)	(5)=(1)+(3) Net Welfare Gain or Loss (Volume)	(6)=(2)+(4) Net Welfare Gain or Loss (US\$ Thous)*
ASIAN MARKET	-4337.4	-1364279	3540.2	1187132	-797.2	-177147
Afghanistan	-160.2	-52488	142.4	49094	-17.8	-3394
Bangladesh	-136.6	-44764	102.3	21402	-34.3	-23362
Burma	-11.4	-3729	10.9	3748	-0.5	19
Egypt	-415.4	-136102	95.1	32790	-320.3	-103312
Fiji	-2.5	-832	0.0	0	-2.5	-832
India	-2241.4	-734412	2368.0	796916	126.6	62504
Indonesia	-222.7	-23056	0.0	0	-222.7	-23056
Jordan	-21.5	-7052	2.2	771	-19.3	-6281
Morocco	-221.0	-72406	124.7	42976	-96.3	-29430
Nepal	-29.9	-9787	29.9	10292	0	505
Pakistan	-648.0	-212314	618.2	213113	-29.8	799
Philippines	-43.8	-14337	0.0	0	-43.8	-14337
Sri Lanka	-52.2	-10183	0.0	0	-52.2	-10183
Thailand	-9.7	-3163	0.0	0	-9.7	-3163
Tunisia	-87.1	-28524	43.4	14973	-43.7	-13551
Yemen	-34.0	-11130	3.1	1057	-30.9	-10073
LATIN AMERICAN MARKET	-146.9	-48127	24.400	8412	-122.5	-39715
Bolivia						
Costa Rica	-6.2	-2036	0.000	0	-6.200	-2036
Dominican Republic	-11.6	-3806	0.000	0	-11.600	-3806
Ecuador	-19.2	-6286	0.982	339	-18.218	-5947
El Salvador						
Guatemala	-9.8	-3218	2.489	858	-7.311	-2360
Haiti	-9.1	-2991	0.000	0	-9.100	-2991
Honduras	-5.1	-1665	0.000	0	-5.100	-1665
Jamaica	-10.2	-3329	0.000	0	-10.200	-3329
Panama	-3.5	-1143	0.000	0	-3.500	-1143
Peru	-53.7	-17605	4.978	1716	-48.722	-15889
Uruguay	-18.5	-6048	15.951	5499	-2.549	-549
AFRICAN MARKET	-137.6	-48381	27.854	9603	-109.746	-38778
Burundi	-0.5	-166	0.000	0	-0.500	-166
Cameroon	-8.0	-2635	0.000	0	-8.000	-2635
Chad	-3.1	-1021	0.203	70	-2.897	-951
Gabon	-2.0	-666	0.000	0	-2.000	-666
Gambia						
Guinea	-2.2	-721	0.000	0	-2.200	-721
Kenya	-23.0	-7524	9.821	3386	-13.179	-4138
Liberia	-0.8	-277	0.000	0	-0.800	-277
Malawi	-0.5	-166	0.000	0	-0.500	-166
Mali	-2.2	-721	0.000	0	-2.200	-721
Mauritania	-6.6	-2164	0.000	0	-6.600	-2164
Mauritius	-4.3	-1415	0.000	0	-4.300	-1415
Mozambique	-7.2	-2353	0.152	53	-7.048	-2300
Niger	-1.7	-560	0.000	0	-1.700	-560
Rwanda	-0.6	-189	0.000	0	-0.600	-189
Senegal	-6.6	-2175	0.000	0	-6.600	-2175
Sierra Leone	-2.0	-666	0.000	0	-2.000	-666
Somali Republic	-7.5	-2441	0.000	0	-7.500	-2441
Sudan	-36.9	-12090	7.264	2504	-29.636	-9586
Togo	-3.0	-999	0.000	0	-3.000	-999
Uganda	-3.0	-999	0.000	0	-3.000	-999
Zaire	-11.3	-3717	0.559	193	-10.741	-3524
Zambia	-4.4	-1443	0.897	309	-3.503	-1134
Zimbabwe	-11.8	-3873	8.958	3088	-2.842	-785

* All Markets (Pre-Liberalization US\$/Metric Ton = 134.48)

Table 20. Maize:
Supply/Demand and Producer/Consumer Welfare Consequences of Agricultural
Trade Liberalization in Industrial Countries.

	(1) Change in Demand (Volume)	(2) Loss in Consumer Welfare (US\$ Thous)	(3) Change in Supply (Volume)	(4) Gain in Producer Welfare (US\$ Thous)	(5)=(1)+(3) Net Welfare Gain or Loss (Volume)	(6)=(2)+(4) Net Welfare Gain or Loss (US\$ Thous)*
ASIAN MARKET	-1192.2	-349609	1333.5	371316	141.3	21707
Afghanistan	-36.6	-9994	36.6	10473	0.0	479
Bangladesh						
Burma	-15.1	-4135	16.0	4578	0.9	443
Egypt	-277.9	-75847	176.2	50410	-101.7	-25437
Fiji						
India	-313.5	-98086	615.1	102267	301.6	4181
Indonesia	-202.7	-63432	128.5	66147	-74.2	2715
Jordan	-7.9	-2159	0.1	18	-7.8	-2141
Morocco	-0.2	-47	0.2	49	0.0	2
Nepal	-39.5	-10790	39.5	11307	0.0	517
Pakistan	-42.1	-13184	22.9	13610	-19.2	426
Philippines	-161.3	-50465	178.0	50919	16.7	454
Sri Lanka	-0.8	-213	0.0	0	-0.8	-213
Thailand	-81.7	-17735	118.4	60945	36.7	43210
Tunisia	-10.1	-2747	0.0	13	-10.1	-2734
Yemen	-2.8	-775	2.0	580	-0.8	-195
LATIN AMERICAN MARKET	-181.3	-49479	150.0	42944	-31.3	-6535
Bolivia						
Costa Rica	-6.1	-1673	4.8	1370	-1.3	-303
Dominican Republic	-13.8	-3756	4.8	1383	-9.0	-2373
Ecuador	-11.5	-3134	13.2	3784	1.7	650
El Salvador						
Guatemala	-52.5	-14333	50.5	14449	-2.0	116
Haiti	-7.8	-2116	7.0	2008	-0.8	-108
Honduras	-22.7	-6183	23.1	6595	0.4	412
Jamaica	-7.4	-2031	0.2	71	-7.2	-1960
Panama	-4.8	-1307	3.7	1062	-1.1	-245
Peru	-47.8	-13051	35.6	10192	-12.2	-2859
Uruguay	-6.9	-1895	7.1	2030	0.2	135
AFRICAN MARKET	-451.2	-123155	469.6	134323	18.4	11168
Burundi	-6.5	-1767	6.5	1852	0.0	85
Cameroon	-23.0	-6285	22.1	6319	-0.9	36
Chad	-2.3	-630	1.4	397	-0.9	-233
Gabon						
Gambia	-0.8	-217	0.8	228	0.0	11
Guinea	-2.6	-703	2.6	736	0.0	33
Kenya	-106.2	-28977	111.2	31816	5.0	2839
Liberia						
Malawi	-58.0	-15840	65.8	18831	7.3	2991
Mali	-8.8	-2397	5.1	1473	-3.7	-924
Mauritania	-0.2	-47	0.2	49	0.0	2
Mauritius						
Mozambique	-19.3	-5280	11.5	3302	-7.8	-1978
Niger	-1.7	-460	0.0	0	-1.7	-460
Rwanda	-4.8	-1312	4.5	1285	-0.3	-27
Senegal	-5.8	-1593	5.3	1522	-0.5	-71
Sierra Leone	-0.7	-183	0.7	187	0.0	4
Somali Republic	-16.7	-4556	14.9	4248	-1.8	-308
Sudan						
Togo	-8.8	-2393	8.5	2441	-0.3	48
Uganda	-22.5	-6136	20.8	5939	-1.7	-197
Zaire	-37.4	-10220	33.5	9571	-3.9	-649
Zambia	-52.9	-14444	48.2	13797	-4.7	-647
Zimbabwe	-72.2	-19715	106.0	30330	33.8	10615

* All Markets (Pre-Liberalization US\$/Metric Ton = 111.80)

Table 21. Sugar:
Supply/Demand and Producer/Consumer Welfare Consequences of Agricultural
Trade Liberalization in Industrial Countries.

	(1) Change in Demand (Volume)	(2) Loss in Consumer Welfare (US\$ Thous)	(3) Change in Supply (Volume)	(4) Gain in Producer Welfare (US\$ Thous)	(5)=(1)+(3) Net Welfare Gain or Loss (Volume)	(6)=(2)+(4) Net Welfare Gain or Loss (US\$ Thous)*
ASIAN MARKET	-3285.8	-359567	1660.6	386537	-1625.2	26970
Afghanistan	-5.7	-1846	1.0	233	-4.7	-1613
Bangladesh	-19.2	-6169	11.5	2667	-7.7	-3502
Burma	-4.3	-1395	6.5	1516	2.2	121
Egypt	-111.4	-35803	90.7	21124	-20.7	-14679
Fiji	-2.5	-816	28.1	6531	25.6	5715
India	-2664.7	-172927	738.0	171787	-1926.7	-1140
Indonesia	-122.2	-39267	173.6	40420	51.4	1153
Jordan	-7.7	-2490	0.0	0	-7.7	-2490
Morocco	-49.4	-15887	47.1	10962	-2.3	-4925
Nepal						
Pakistan	-92.3	-29663	126.0	29326	33.7	-337
Philippines	-117.2	-24678	185.3	43133	68.1	18455
Sri Lanka	-16.4	-5260	3.0	700	-13.4	-4560
Thailand	-48.7	-15637	248.8	57905	200.1	42268
Tunisia	-15.7	-5045	1.0	233	-14.7	-4812
Yemen	-8.4	-2684	0.0	0	-8.4	-2684
LATIN AMERICAN MARKET	-145.1	-45815	345.8	80522	200.7	34707
Bolivia	-0.5	-150	0.0	0	-0.5	-150
Coasta Rica	-9.7	-3106	24.1	5613	14.4	2507
Dominican Republic	-17.8	-5732	100.6	23417	82.8	17685
Ecuador	-20.7	-6641	26.9	6259	6.2	-382
El Salvador						
Guatemala	-18.5	-5961	58.1	13536	39.6	7575
Haiti	-4.4	-1403	4.8	1112	0.4	-291
Honduras	-7.7	-2476	22.4	5209	14.7	2733
Jamaica	-7.3	-2354	20.2	4711	12.9	2357
Panama	-7.4	-1561	17.2	4012	9.8	2451
Peru	-43.9	-14112	61.6	14344	17.7	232
Uruguay	-7.2	-2319	9.9	2309	2.7	-10
AFRICAN MARKET	-129.1	-41522	264.9	61671	135.8	20149
Burundi	-0.5	-172	0.0	0	-0.5	-172
Cameroon	-5.0	-1610	7.5	1749	2.5	139
Chad	-1.7	-537	2.5	583	0.8	46
Gabon	-1.3	-429	2.6	606	1.3	177
Gambia	-1.4	-451	0.0	0	-1.4	-451
Guinea	-1.9	-601	2.2	513	0.3	-88
Kenya	-25.2	-8094	34.8	8093	9.6	-1
Liberia	-0.5	-172	0.0	0	-0.5	-172
Malawi	-4.0	-1288	18.5	4315	14.5	3027
Mali	-2.7	-859	1.0	233	-1.7	-626
Mauritania	-1.7	-537	0.0	0	-1.7	-537
Mauritius	-2.7	-880	64.1	14927	61.4	14047
Mozambique	-6.7	-2147	11.0	2566	4.3	419
Niger	-0.5	-150	0.0	0	-0.5	-150
Rwanda	-0.3	-86	0.2	47	-0.1	-39
Senegal	-6.0	-1932	7.7	1796	1.7	-136
Sierra Leone	-1.2	-386	0.3	70	-0.9	-316
Somali Republic	-4.5	-1460	6.0	1399	1.5	-61
Sudan	-28.1	-9017	41.1	9563	13.0	546
Togo	-1.7	-558	0.0	0	-1.7	-558
Uganda	-2.9	-923	2.5	583	-0.4	-340
Zaire	-5.3	-1718	5.2	1201	-0.1	-517
Zambia	-7.3	-2362	10.5	2449	3.2	87
Zimbabwe	-16.0	-5153	47.2	10978	31.2	5825

* All Markets (Pre-Liberalization US\$/Metric Ton = 133.00)

Table 22. Coffee:
Supply/Demand and Producer/Consumer Welfare Consequences of Agricultural
Trade Liberalization in Industrial Countries.

	(1) Change in Demand (Volume)	(2) Loss in Consumer Welfare (US\$ Thous)	(3) Change in Supply (Volume)	(4) Gain in Producer Welfare (US\$ Thous)	(5)=(1)+(3) Net Welfare Gain or Loss (Volume)	(6)=(2)+(4) Net Welfare Gain or Loss (US\$ Thous)*
ASIAN MARKET	-1.5	-15079	7.1	43603	5.6	28524
Afghanistan						
Bangladesh						
Burma						
Egypt						
Fiji						
India	-0.5	-5025	1.7	10519	1.2	5494
Indonesia	-0.6	-6177	4.2	25602	3.6	19425
Jordan						
Morocco						
Nepal						
Pakistan						
Philippines	-0.3	-3310	0.8	4877	0.5	1567
Sri Lanka	-0.0	-25	0.1	318	0.1	293
Thailand	-0.1	-542	0.3	2055	0.2	1513
Tunisia						
Yemen	0.0	0	0.0	232	0.0	232
LATIN AMERICAN MARKET	-2.05	-20186	9.531	58066	7.481	37880
Bolivia						
Costa Rica	-0.49	-4794	1.515	9233	1.025	4439
Dominican Repub.	-0.30	-2916	0.638	3888	0.338	972
Ecuador	-0.28	-2790	1.204	7335	0.924	4545
El Salvador	-0.33	-3252	1.821	11093	1.491	7841
Guatemala	-0.18	-1798	1.896	11553	1.761	9755
Haiti	-0.01	-114	0.429	2614	0.491	2500
Honduras	-0.22	-2150	0.942	5740	0.722	3590
Jamaica	-0.00	-3	0.026	156	0.026	153
Panama	-0.01	-106	0.148	899	0.138	793
Peru	-0.23	-2263	0.912	5555	0.682	3292
Uruguay						
AFRICAN MARKET	-2.61	-25841	11.099	50122	8.489	24281
Burundi	-0.06	-545	0.623	2707	0.563	2162
Cameroon	-0.30	-2958	1.820	8918	1.520	5960
Chad						
Gabon	-0.00	-3	0.039	144	0.039	141
Gambia						
Guinea	-0.01	-73	0.064	263	0.054	190
Kenya	-0.51	-5076	2.154	9523	1.644	4447
Liberia	-0.01	-121	0.147	646	0.137	525
Malawi	-0.00	-39	0.047	179	0.047	140
Mali						
Mauritania						
Mauritius						
Mozambique						
Niger						
Rwanda	-0.04	-394	0.652	2537	0.612	2143
Senegal						
Sierra Leone	0.00	0	0.108	421	0.108	421
Somali Republic						
Sudan						
Togo	-0.01	-130	0.297	1165	0.287	1035
Uganda	-1.20	-11832	3.187	15177	1.987	3345
Zaire	-0.45	-4437	1.749	7642	1.299	3205
Zambia	-0.00	-25	0.012	31	0.012	6
Zimbabwe	-0.02	-208	0.200	769	0.180	561

* All Markets (Pre-Liberalization US\$/Metric Ton = 3270.11)

Table 23. Palm Oil:
Supply/Demand and Producer/Consumer Welfare Consequences of Agricultural
Trade Liberalization in Industrial Countries.

	(1) Change in Demand (Volume)	(2) Loss in Consumer Welfare (US\$ Thous)	(3) Change in Supply (Volume)	(4) Gain in Producer Welfare (US\$ Thous)	(5)=(1)+(3) Net Welfare Gain or Loss (Volume)	(6)=(2)+(4) Net Welfare Gain or Loss (US\$ Thous)*
ASIAN MARKET	-21.54	-32210	-15.08	18778	-6.46	-13432
Afghanistan	-0.10	-143	0.00	0	-0.10	-143
Bangladesh	-1.08	-1616	0.00	0	-1.08	-1616
Burma	-0.22	-334	0.00	0	-0.22	-334
Egypt	-0.45	-672	0.00	0	-0.45	-672
Fiji						
India	-6.43	-9607	0.00	0	-6.43	-9607
Indonesia	-6.87	-10270	14.06	17515	7.19	7245
Jordan	-0.57	-858	0.00	0	-0.57	-858
Morocco	-0.04	-57	0.00	0	-0.04	-57
Nepal						
Pakistan	-4.37	-6536	0.00	0	-4.37	-6536
Philippines	-0.25	-377	0.20	246	-0.05	-131
Sri Lanka	-0.08	-119	0.00	0	-0.08	-119
Thailand	-0.63	-944	0.82	1017	0.19	73
Tunisia						
Yemen	-0.45	-677	0.00	0	-0.45	-677
LATIN AMERICAN MARKET	-1.48	-2194	1.93	2359	0.45	165
Bolivia						
Costa Rica	-0.40	-596	0.48	602	0.08	6
Dominican Rep.	-0.01	-10	0.01	14	0.00	4
Ecuador	-0.83	-1235	1.05	1306	0.22	71
El Salvador						
Guatemala						
Haiti						
Honduras	-0.16	-234	0.27	318	0.11	84
Jamaica						
Panama						
Peru	-0.08	-119	0.12	119	0.04	0
Uruguay						
AFRICAN MARKET	-5.02	-3032	4.47	5598	-0.55	2566
Burundi						
Cameroon	-0.77	-1144	1.02	1277	0.25	133
Chad						
Gabon	-0.05	-72	0.02	29	-0.03	-43
Gambia	-0.02	-29	0.02	29	0.00	0
Guinea	-0.40	-596	0.48	602	0.08	6
Kenya	-0.94	-1411	0.00	0	-0.94	-1411
Liberia	-0.27	-410	0.39	491	0.12	81
Malawi						
Mali						
Mauritania						
Mauritius	-0.06	-91	0.00	0	-0.06	-91
Mozambique	-0.08	-114	0.00	0	-0.08	-114
Niger	-0.04	-62	0.00	0	-0.04	-62
Rwanda						
Senegal	-0.07	-100	0.00	0	-0.07	-100
Sierra Leone	-0.39	-577	0.47	583	0.08	6
Somali Republic						
Sudan	-0.26	-381	0.00	0	-0.26	-381
Togo	-0.18	-272	0.23	289	0.05	17
Uganda	0.00	0	0.00	0	0.00	0
Zaire	-1.49	2227	1.84	2298	0.35	4525
Zambia						
Zimbabwe						

* All Markets (Pre-Liberalization US\$/Ton = 495.58)

Table 24. Soybean Oil:
Supply/Demand and Producer/Consumer Welfare Consequences of Agricultural
Trade Liberalization in Industrial Countries.

	(1) Change in Demand (Volume)	(2) Loss in Consumer Welfare (US\$ Thous)	(3) Change in Supply (Volume)	(4) Gain in Producer Welfare (US\$ Thous)	(5)=(1)+(3) Net Welfare Gain or Loss (Volume)	(6)=(2)+(4) Net Welfare Gain or Loss (US\$ Thous)*
ASIAN MARKET	-12.2	-20213	2.30	3175	-9.90	-17038
Afghanistan						
Bangladesh	-0.4	-692	0.00	0	-0.40	-692
Burma						
Egypt	-0.7	-1167	0.42	584	-0.28	-583
Fiji						
India	-6.0	-9944	1.59	2194	-4.41	-7750
Indonesia	-0.1	-87	0.00	0	-0.10	-87
Jordan	-0.0	-82	0.00	0	0.00	-82
Morocco	-1.7	-2726	0.05	72	-1.65	-2654
Nepal						
Pakistan	-2.3	-3783	0.00	0	-2.30	-3783
Philippines	-0.1	-114	0.01	11	0.00	-103
Sri Lanka	-0.0	-5	0.00	0	0.00	-5
Thailand	-0.4	-714	0.23	314	-0.17	-400
Tunisia	-0.5	-899	0.00	0	-0.50	-899
Yemen						
LATIN AMERICAN MARKET	-2.6	-4230	0.43	580	-2.17	-3650
Bolivia						
Costa Rica	-0.0	-49	0.02	22	0.02	-27
Dominican Repub.	-0.5	-785	0.06	77	-0.44	-708
Ecuador	-0.6	-1030	0.10	138	-0.50	-892
El Salvador	-0.1	-175	0.01	17	0.00	-158
Guatemala	-0.1	-174	0.00	0	-0.10	-174
Haiti	-0.3	-420	0.08	110	-0.22	-310
Honduras	-0.0	-38	0.00	0	0.00	-38
Jamaica	-0.2	-256	0.12	160	-0.08	-96
Panama	-0.3	-425	0.00	0	-0.30	-425
Peru	-0.5	-818	0.02	28	-0.48	-790
Uruguay	-0.0	-60	0.02	28	0.02	-32
AFRICAN MARKET	-1.17	-1946	0.20	276	-0.97	-1670
Burundi						
Cameroon						
Chad						
Gabon						
Gambia						
Guinea						
Kenya	-0.01	-22	0.00	0	-0.01	-22
Liberia						
Malawi						
Mali						
Mauritania						
Mauritius	-0.13	-213	0.00	0	-0.13	-213
Mozambique						
Niger						
Rwanda						
Senegal	-0.59	-981	0.00	0	-0.59	-981
Sierra Leone						
Somali Republic	-0.13	-218	0.00	0	-0.13	-218
Sudan						
Togo						
Uganda						
Zaire						
Zambia	-0.16	-267	0.02	33	-0.14	-234
Zimbabwe	-0.15	-245	0.18	243	0.03	-2

* All Markets (Pre-Liberalization US\$/Metric Ton = 547.86)

assume that the domestic price of the commodity will rise in the same proportion as the world price increase, domestic demands decline while domestic supplies increase (or do not change if the country is not a producer of the commodity). Thus, for rice (Table 18) for example, India, a large producer, will increase its rice output by slightly over 2 million metric tons. However, the rice price increase will also cause domestic consumption to fall by about 2.4 million metric tons. The pertinent question then is whether the gains to rice producers outweigh the accompanying losses to consumers. In this particular case for India, while the incremental quantity of rice produced is lower than the decline in rice consumption (by about 0.4 million metric tons), the higher domestic prices may compensate producers by more than what consumers lose in value terms from having forgone consumption at the initially lower (pre-liberalization) prices.

Columns (2) and (4) of Tables 18 to 24 show the consequent losses to consumers and the resulting gains to producers (both as measured in dollar value terms) in each AID-assisted economy arising from changes in domestic supplies and demands by commodity. (The equations used to compute these welfare estimates are given in Appendix 1.) In the India example for rice (Table 18), consumers suffer a welfare loss of over \$1.3 billion while rice producers gain US\$1.4 billion. Thus, there are "net welfare gains" to the economy. These measures of domestic welfare effects however are but rough, albeit useful, approximations. Ideally, we would have required actual (pre-liberalization) prices of commodities in an LDC economy to obtain value estimates of its producer/consumer welfare gains and losses from liberalization (see Appendix 1 for the equations used to calculate these gains and losses). However, given that we have no reliable data on commodity prices in each LDC economy, we instead use world pre-liberalization commodity prices for all LDCs in our welfare calculations. This still allows us to make some useful comparisons across countries and across agricultural commodities as to the domestic welfare consequences of OECD trade liberalization. Perhaps more importantly, it allows us to have some useful notion of the orders of magnitude that is involved (or the extent of the internal distortions that would have to initially take place) as the AID-assisted LDCs adjust to developments in the international agricultural markets.

Table 17 summarizes some observations from Tables 18 to 24. In column I of this table we list for each commodity and for each region the number of countries that experience net welfare gains measured in quantity terms as shown in column 5 of Tables 18 to 24 (in other words, the number of countries where increases in supply are larger than the decreases in demand). In this same column we also note in brackets the number of countries where that experience some change in net welfare as measured in quantity terms. (note that all column I numbers do not include in its count those LDCs where increases in supply are equal to the decreases in demand). The results show that few countries experience higher supply growth than demand declines. This is particularly true of rice, wheat, and soybean oil as most AID-assisted economies are importers of superior grains and soybean oil. In tropical products (coffee and sugar) however, almost all AID-assisted LDCs gain more in supply terms than

what they lose in demand. For sugar, 10 of 11 countries in Latin America and 13 of 24 countries in Africa experience higher positive supply than negative demand responses to higher sugar prices. For coffee, all the countries in Latin America, Asia and Africa are likely to experience the same phenomena. AID-assisted LDCs are therefore more likely to favor industrial country liberalization in tropical products rather than in foodgrains.

Column II of Table 17 is obtained from column 6 of Tables 18 to 24. It lists the number of countries where the value of producer welfare gains are larger than the value of consumer welfare losses. The numbers in brackets in this column again show the number of countries in each region where the welfare gains to producers are not equal to the corresponding welfare losses to consumers. Results show that in more cases than in column I AID-assisted LDCs are "better off" from industrial country liberalization in specific commodities. In short, there are more developing countries where despite their larger losses in quantities consumed relative to their production quantity gains, corresponding value gains to producers are likely to be larger than the value losses to consumers. This is particularly true of rice and maize in all countries in the three different regions. Thus, OECD trade liberalization in these commodities may be more acceptable to AID-assisted LDCs than what the column I results seem to indicate.

Tables 18 to 24 show in general that if and when LDCs respond to commodity-specific industrial country liberalization, the magnitudes of their internal adjustments that have to take place can be substantial. For the Asian LDCs, for instance, this is true in the case of rice (Table 18), wheat (Table 19), and maize (Table 20) for almost all the Asian countries but particularly in Bangladesh, Burma, Egypt, India, Indonesia, Nepal, Pakistan, the Philippines and Thailand; for sugar (Table 21) in Egypt, India, Indonesia, Morocco, Pakistan, the Philippines and Thailand; and for palm oil (Table 23) and soybean oil (Table 24) in Indonesia, India, Morocco and Pakistan. For the Latin American countries, similar domestic adjustments are substantial in all the countries and commodities with the possible exception of palm oil and soybean oil. For Africa, the same is generally true. Internal adjustments are considerable in all the African countries and for all commodities with the exception of soybean oil and palm oil.

What the results of Tables 18 to 24 do not trace are the likely underlying income distribution effects of industrial country trade liberalization. These income distribution effects would depend on (a) the agricultural commodity subject to more liberalized trade rules in industrial economies, (b) the rural-urban distribution of the population, and (c) the distribution of the rural population across socio-economic classes. While domestic consumers, particularly urban consumers, always lose from the higher commodity prices, rural producers do not all gain. For one, only LDC producers of the commodity experiencing the higher domestic price share in the producer gains. Moreover, among the rural population, landed farmers are likely to gain the most. Landless laborers, while possibly benefiting from wider rural employment opportunities, are not expected to gain as much. Thus, the income distribution consequences of industrial

country trade liberalization would differ across AID-assisted economies.

A Summary of Results and Some Implications for AID

What the above analysis shows can be summarized as follows:

a) Industrial country liberalized trade in tropical commodities, in contrast to cereals, would better benefit AID-assisted economies. Unfortunately, and as already noted in Section I, there are relatively few trade and supply/demand studies on these tropical products with the possible exception of sugar.

b) To more fully understand the potential gains and losses to LDCs of industrial country liberalization, better price data and estimates of individual country supply/demand elasticities particularly for tropical commodities are clearly important. These basic parameters are necessary for even ad hoc estimates of the consequences for AID-assisted economies. It is often impossible for donor agencies to conduct meaningful dialogue with recipient countries without a study of policy effects which in turn often necessitates better data.

c) If industrial country trade in tropical products were liberalized along with trade in foodgrains, the developing countries, with the exception of a number of African countries, are likely to remain net gainers in export revenue terms. For these AID-assisted economies, there should really be less pessimism about participating in international trade. For them, self-sufficiency in cereals becomes more of a political rather than an economic argument for restricting trade.

d) As LDCs adjust to a new international trade environment, their short-run internal adjustment problems can be substantial. It is important for developing countries to understand who gains and loses domestically in the interim in order that the adjustment costs to the vulnerable groups can be made less severe. To gain this understanding, AID's assistance may be necessary as most LDCs lack the technical expertise to undertake such studies. Moreover, AID's food aid program can be used to help LDCs during this adjustment phase.

The Consequences for Policy in Developing Countries

Although it is difficult to generalize the likely policy responses of developing economies to agricultural trade liberalization in industrial economies, agricultural policy formulation and the socio-economic and endowment conditions prevailing in a country can be associated in predictable ways. As Binswanger and Scandizzo (1983) show, agricultural policies are heavily influenced by resource endowments and by constraints imposed by the country's structure and pattern of development. Not coincidentally, these same constraints circumscribe how particular LDCs will react to the adoption of more liberal agricultural trade rules in the developed economies.

While the exact reasons for the adoption of particular mixes of policies are often muddled in history, the general pattern of agricultural policy formulation that emerges from cross-country comparisons is one that moves from agricultural taxation to agricultural protection depending on the country's level of economic development. Most of primary export commodities in Africa, for example, are managed by marketing boards and are directly taxed, a legacy from the colonial years. Moreover, exchange rates are often overvalued, further taxing agriculture indirectly while benefitting industry. With the possible exception of post liberalization Nigeria, most of Africa discriminates against foodgrain agriculture through import subsidies and a low domestic food price policy. While very similar policies were pursued in Latin America before the 1970s, these are now less common. Significant agricultural policy (including trade) reforms in this region have resulted in more moderate agricultural protection than in most of Africa. In much of Asia, the spectrum of taxation cum protection is even more apparent. While a low agricultural price policy remains predominant, the more advanced economies of South Korea and Taiwan have shifted to agricultural protection under a high price regime. India and Bangladesh continue to discriminate against agriculture by encouraging low prices. However, often citing self-sufficiency as a goal, they have balanced these with production incentives that include irrigation, fertilizer and other input subsidies, expenditures in agricultural research and extension, and so on.

Many developing countries tax agricultural products or exports, thus holding domestic producer prices below world market levels. For these policies to be consistent with prices for consumers that are also below world market prices -- which is what these countries often wish to achieve -- they must subsidize consumer prices. A country that imports food will normally have to pay more in subsidies than it can reap in taxes on producers. Moreover, even countries that do not tax producers often subsidize consumer prices, as the data of Table 25 show (from Byerlee and Sain, 1986). Because of their governmental budget costs, their discouragement of domestic production, and/or their requiring additional scarce foreign exchange for food imports, these policies have often been criticized. For reviews of the issues see Bale and Lutz (1981), Josling (1980), Anderson and Hayami (1986), or World Bank (1986).

Agricultural trade liberalization which raises world prices generally increases the costs of these LDC subsidies. In the case of exporting LDCs, export tax revenues could be maintained while allowing domestic producer prices to rise. In either case -- food importers or exporters -- there are incentives for developing countries to liberalize along with the rest of the world. The World Bank (1986) emphasizes the gains that could be achieved. In their simulations, when the industrial countries liberalize the developing countries as a group are worse off by \$12 billion annually, as mentioned earlier. However, if the developing countries liberalize their own agricultural policies jointly with the industrial countries (moving their entries in Tables 2 and 9 to 1.00), then the developing countries gain \$18 billion annually (World Bank, 1986, p. 131).

Table 25. Adjusted Producer and Consumer NPCs for Wheat (Bread) in Selected Developing Countries

	Producers' Adjusted ¹ NPC	Consumers' Adjusted ¹ NPC
Nigeria	1.43	.80
Sudan	.90	.22
Burma	3.49	2.40
Colombia	1.40	1.68
Jordan	.98	.22
Algeria	1.52	na
Brazil	1.67	.62
Morocco	1.55	.37
Ethiopia	1.05	na
Ecuador	.99	.69
Bolivia	.88	.45
Cameroon	1.05	1.21
Paraguay	.85	.61
Chile	.85	.82
China	1.25	na
Lesotho	.81	.61
Syria	.91	na
Bangladesh	.96	.74
Argentina	.60	na
Kenya	.86	1.02
Tunisia	1.06	.38
Uruguay	.59	.63
Nepal	.98	1.20
Mexico	.66	.34
Tanzania	.50	.66
Pakistan	.62	.53
Afghanistan	na	na
India	.92	.76
Turkey	.79	.48
Peru	.58	.78
Egypt	.19	.05

na = not available

¹ The adjustment attempts to correct for over-valued exchange rates in many countries.

Source: Byerlee and Sain (1986), p.969.

The prospects for policy reforms in developing countries vary greatly from country to country. Countries with very high protection of consumers or taxation of producers are the most likely candidates. In the Byerlee and Sain list these would include Egypt, Tanzania, Mexico, Uruguay, Peru, Turkey, Lesotho, Paraguay, Pakistan, and Sudan. Indeed it would take a case-by-case study of more commodities in each country to assess these prospects adequately. However, what conditions (i.e., the resource endowments, production structures, macroeconomic policies, social welfare preferences) in developing countries particularly hinder or facilitate the realization of benefits from industrial country agricultural trade liberalization ?

A particular developing country's response to trade liberalization in industrial economies would depend on its net trade position(s) in the agricultural commodity(ies) affected by the more liberal trade rules. While trade liberalization in OECD economies would most likely affect temperate zone commodities (such as foodgrains, coarse cereals, beef and dairy products) the most, certain tropical commodities (such as sugar and the tropical beverages, coffee and tea) will be affected as well (Valdes and Zietz (1980)). Moreover, other commodities that are close substitutes or complements to these products in consumption and/or in production will also be affected. The effects on protein feeds (soybeans) and manioc exports, which are substitutes to cereals (as grain feed) in dairy production, is a particular case in point. Liberalized OECD trade in coarse cereals would lower coarse grain prices in the EC resulting in some substitution of imported soybeans and manioc for cereals in EC dairy production (OECD, 1986). The effect on oilseeds is another matter, as oilseeds are a close substitute to corn oil in consumption. With OECD liberalization, a rise in world corn (and hence, corn oil) prices would result in some substitution of corn for oilseeds in edible oil consumption.^{1/} Developing country producers (e.g., Thailand and Indonesia for manioc and India for oilseeds) could be indirectly, albeit significantly, affected by these spillover effects. Unfortunately, the paucity of economic studies on these important commodity relationships (both in production and in consumption) makes the direction, more so the magnitude, of these indirect commodity effects difficult to pick up in preliminary analysis.

For LDC commodity exporters, their factor endowments and the production technology (including agroclimatic requirements) of the agricultural commodity(ies) will also determine their initial response. As cultivable land constrains agricultural production in many LDCs and since agricultural technologies (both biological and mechanical) are not easily transferable across agroclimatic zones,

1/ There are of course many other supply/demand commodity linkages that are important here. These include, among others, the substitutability between and among soya and tapioca for barley and maize in dairy feed; corn, sugarcane, wheat, and sorghum in ethanol production; butter and margarine (soybean oil) in consumption; and sugar and corn sweeteners in consumption.

increased production for export in the near term can often be accommodated only by diverting scarce land from other crops. Moreover, even when the economic tradeoffs here favor the exported crop, a developing country may strongly desire self-sufficiency in cereals (e.g., India, Bangladesh, Egypt). It may be hesitant to take advantage of higher agricultural prices in exportable non-staples if it perceives the accompanying risks on domestic foodgrain availability (and hence on the welfare of large vulnerable groups in the population) to outweigh the potential gains from increased non-staple exports. In parts of Africa, however, where sizable pockets of arable land remain relatively abundant but market access (transport) is difficult (e.g., Mali, Ghana, Uganda, Sudan), improved opportunities from higher expected producer returns because of improved international market access and higher commodity prices could make investments in infrastructure more profitable. This would encourage better land-use patterns and change existing farming systems more rapidly (Binswanger and Pingali (1986)). With expanded world trade, agricultural exports could be their engine of growth.

For LDC commodity importers, their resource (particularly foreign exchange) constraints will largely determine their initial reactions to the lifting of agricultural tariff and non-tariff barriers in developed economies. As commodity prices rise, their imports can be severely constrained by foreign exchange availability. Because most LDC agricultural imports consist of cereals, they may consider more inward looking policies (e.g., self-sufficiency), relying less on foreign foodgrain supplies for their needs. Yet, on the other hand, they may liberalize their own agricultural trade as they are also net exporters in other commodities. As Valdes and Zietz (1980) have shown, LDC gains from reduced trade barriers in products such as coffee, cocoa, and oilseeds can compensate them for their losses from price increases in cereals. Furthermore some LDCs can be encouraged to develop new export products as industrial country markets become more accessible with the removal of preferential trade arrangements (as in EC administered ACP preferences for sugar and beef or the sugar quotas administered by the U.S.). While the preferred countries will be hurt by the removal of these non-tariff barriers, their land-use bias favoring their guaranteed exports (e.g., sugar in the Philippines, cassava in Indonesia) will disappear. In both quota and non-quota LDCs therefore and in the long run, a more rational allocation of internal resources will make each of them more competitive in the products where their real comparative advantages lie.

The policy response of developing countries will also be dictated by the extent of initial internal disharmonies caused by the new trade environment. If developing countries allowed full transmission of world prices to their economies, urban consumers and the rural landless will be the most severely hurt by the consequent food price increases (Quizon and Binswanger (1986)). Producers of exportables (largely landed farmers as in India or plantation owners as in Africa) whose export preferences are cut will also be adversely affected. In individual developing countries therefore, the magnitude of the welfare losses would depend on the population distribution according to these socio-economic groups. Depending however on the political

influence of these disadvantaged groups, it may be possible to compensate losers by redistributive measures. For instance, taxing the gainers and redistributing these revenues to losers such that all groups are made better off in the interim is possible (Quizon and Binswanger (1986)). In extremely poor LDCs however the implementation of such redistributive schemes remains far from simple. For one, redistributive measures (including land reform), even if politically feasible, may be at the cost of faster agricultural growth as producer investments out of farm profits can be compromised.

Finally, there are domestic economy-wide measures that indirectly affect agricultural performance in LDCs (e.g., overvalued exchange rates, low subsidized interest rates, two-price systems, and other macroeconomic policies). These policies in place will dictate much of how the higher world prices arising from the removal of trade barriers in industrial economies are transmitted to the domestic LDC economy (Chhibber and Wilton (1986)). While the new world trade environment may facilitate the phasing in of macroeconomic measures that are more attuned to the new trading opportunities, the timing and sequencing of these trade policy reforms in LDCs are crucial. There are many possibilities but for example, exchange rate reform (or a more rational exchange rate) is a necessary prerequisite for effective trade reforms such as the removal of import tariffs and/or export subsidies. Unfortunately, very little can be said regarding the potential for success or failure of this transition or adjustment to trade liberalization. This one area where research work has only recently began. Preliminary multi-country comparisons show that the speed, scope and intensity of these reforms are important for their maintenance and success (Papageorgiou, Michaely, and Choksi (1986)). The potential adjustment costs however are presumably large.

IV. Long-Term Consequences of Trade Liberalization

The short-term effect of liberalization which raises world prices is necessarily to increase the foreign exchange losses and net food costs of countries which are net importers of the commodities affected. But it has been argued that even these countries might gain from liberalization in the long run. The World Bank (1986) gives as reasons that "under free trade, some developing countries might, in the long run, become exporters of these products" and that developing countries could gain "if they liberalized their own agricultural policies along with the industrial countries" (p. 130). Greater world commodity price stability; lower costs of domestic buffer stocking operations; wider market access; improved domestic incentives for investments in agricultural infrastructure, research and extension; and decreased reliance on international food aid are but some of the likely long-run benefits to LDCs if they liberalize their own policies along with industrial nations. These are also points that AID should emphasize in its policy dialogue with LDCs for the latter to better gauge their potential overall benefits from agricultural trade liberalization.

Price Stability

An important long-run consequence of any multilateral

agricultural trade liberalization is its effect on world commodity price stability.^{2/} Available empirical evidences on the effects of commodity trade liberalization on world price stability are mainly based on liberalization in industrial economies, particularly the EC. They agree that agricultural prices may not necessarily be made more stable in all domestic economies, particularly in developed countries whose existing agricultural protection measures are meant to insulate their domestic economies from international price fluctuations (OECD, 1987). Nonetheless, a general decline in worldwide price instability will result from any multilateral commodity trade liberalization.

Any reversal of the present trend toward bilateralism in the conduct of trade will turn around the increasingly residual, and hence more volatile, nature of most international agricultural markets. With multilateral liberalization, adjustment policies are transferred to the world commodity markets where domestic market signals are summarily determined. While market instability caused by natural forces will not disappear, international prices will become more stable as world markets will no longer be subject to man-made instability arising from protective domestic policies. Private storage operations would even be encouraged by less intervention (i.e., public grain stockpiling) and add further to international price stability. In a competitive (many-trader) storage market, private traders would carry socially optimal, price responsive and more cost effective stock levels (Newbery and Stiglitz (1981), Reutlinger (1982) and Sarris (1982)).

Bale and Lutz (1979) theoretically show that policies followed by the EC to protect domestic agriculture, particularly variable levies, significantly increase agricultural price variability in world markets. Zwart and Meilke (1979) show that domestic pricing policies, particularly for wheat, are a principal cause of international commodity price instability. Change in these policies can be as effective as international buffer stocking in producing some degree of price and foreign exchange earnings stability. Schiff (1985), for

^{2/} Compared to the relative wealth of economic studies on the likely direction and magnitude of world price changes accompanying multilateral or global commodity trade liberalization, few simulation experiments on the consequences of multilateral commodity trade liberalization on world price stability are reported in the existing literature. However, the topic of domestic agricultural price stability is dealt with at length in the rich literature on buffer stocking and commodity price stabilization. This literature is relevant here since LDC buffer stocking and commodity price stabilization policies may be made redundant by the greater availability of agricultural output and more stable world commodity prices that are likely to result from the removal of trade barriers in industrial economies. For an excellent discussion of the present state of general equilibrium trade modelling, see Srinivasan and Whalley (1986).

example, estimates that the coefficient of variation for world wheat price would drop from 0.46 to 0.32 if the EC removed its trade barriers on wheat. Koester (1982) arrives at a similar conclusion. EC policies towards grain marketing and stockpiling export domestic agricultural adjustment pressures to the international markets, adding considerably to world price instability.

Tyers and Anderson (1987) incorporate both supply uncertainty and domestic market stabilization policies in their dynamic, stochastic, 7-commodity group simulation model. Their simulation experiments show that the Common Agricultural Policy of the EC is a major contributor to international price instability of wheat, coarse grain, dairy products and sugar. Though the CAP mitigates EC domestic price variability, it exacerbates world price fluctuations. Agricultural trade liberalization by the EC would substantially reduce world commodity price instability of the 7 commodity groups they considered. The same prices would be even more stable if other industrial countries (Japan, U.S., Canada, New Zealand) liberalized their agricultural trade as well. Further declines in this instability would result if developing countries were encouraged to follow more liberalized agricultural trade policies of their own. In general, the larger the number of participants in a more open agricultural trade regime, the larger would be the reduction in international commodity price instability. (A similar finding is reported in an earlier study of the world wheat market by Shei and Thompson (1977)). Net welfare gains will result from increased price stability, that is, with compensation all countries can be made better off under the more price stable regime (Schmitz (1984)).

How and to what extent world price variability is transferred to developing economies depends on policies that are followed by the developing countries themselves. While agricultural commodity prices have hitherto been more unstable in developing countries than in industrial economies, many LDCs have been able to stabilize their domestic prices relative to world prices by pursuing domestic policies including buffer stocking, price control of important commodities produced and/or consumed by target groups, direct subsidy payments to exporters, and so on. Unfortunately, these domestic policies, while often diametrically opposed in purpose to those of developed economies (Bale and Lutz (1981), World Bank (1986)), are in many ways also similar to the protectionist policies of the developed countries. They hamper the free flow of trade, inadvertently adding to world price instability rather than mitigating it. Nonetheless, because developing nations still play a relatively minor role in agricultural commodity trade, trade liberalization in industrial nations will have a larger impact on world price stability than if commodity trade liberalization measures were pursued in the developing countries alone.

The question of food aid and its effects on world prices has also been an important issue in the literature. Bilateral aid transfers food, largely cereals, often arbitrarily from surplus regions to regions with shortages. Food aid is also more closely related to the donor countries' needs to dispose excess stocks than to the requirements of recipient developing countries (World Bank, 1986).

While this aid is meant to avoid the conflict between commercial and concessional exports, it adds to the fragmentation of world markets and impedes with the proper functioning of international prices in its allocative role, an outcome similar to that arising from nontariff trade restrictions. Moreover, the vicissitudes of most state-to-state relations can make long-term bilateral agreements uncertain and can potentially upset price stability in the recipient developing country (OECD, 1987). This however is not to say that food aid does not benefit developing nations for even if food prices were made stable in the commercial markets, there is hardly any assurance that poor food importing nations with serious foreign exchange shortages will benefit from multilateral trade liberalization.

The degree to which international price fluctuations are transmitted to developing countries remains extremely important to these economies.^{3/} Food price fluctuations can create political instability and social discontent. Moreover, price variability generates uncertainty and because farmers in developing countries are largely risk averse (Binswanger, 1980), even temporary, albeit sharp, changes in important agricultural prices can seriously undermine long-term production goals. For consumers, price oscillations can be costly because they can promote further inflationary pressures and because larger fluctuations mean higher domestic inventory costs and/or extra costs in obtaining forward cover in futures markets. More importantly however, food price instability poses a serious threat to food security in many of the poor developing economies, as widespread hunger and malnutrition remain real possibilities with sharp food price increases (World Bank, 1986).

The developing countries that depend considerably on world agricultural markets either for their domestic food requirements or for their foreign exchange earnings are also those most vulnerable to the negative effects of world agricultural price instability. Whether these economies will pursue domestic price stabilization through trade given a more liberal trade regime in the industrial economies remains uncertain as there are alternative ways of obtaining domestic price stability other than through trade. While this set of alternative options can be analyzed based on economic criteria, what developing countries ultimately pursue rests on the government's multiple objectives and its own ability to implement alternative policies

^{3/} There is a large body of theoretical literature that debates the benefits and costs of price stability on consumer and producer welfare. See Turnovsky (1978), Roumasset, et al (1979), and Chisholm (1982) and for good reviews of this literature. While price stabilization always improves net welfare, domestic price stabilization measures can upset other desirable economic objectives. For instance, the singular pursuit of this policy may only destabilize farm incomes if agricultural yields are unstable. Moreover, Burmeister (1978) claims that price oscillations may be optimal because of the dynamic nature of tastes and technological relationships.

towards meeting these social goals (see section 3 of this report).

For instance, the pursuit of stability in prices, yields and hence incomes can be achieved through a host of internally oriented policies including investments in water management and pest and disease control, and other incentive policies. This however is not an easy option for LDCs as oftentimes LDC governments are constrained by competing demands for scarce fiscal resources and foreign exchange. There are also the special interests of influential groups in society who may dictate government options. Whereas urban consumers, for example, would like to maintain low food prices behind a protectionist wall, LDC producers would prefer more open trade. Government bureaucrats themselves may likewise give high priority to their own interests of protecting government revenues from agricultural export or import taxes and thereby inhibit agricultural trade liberalization in developing countries. To better understand the relationship between world markets and individual domestic policies in developing countries, the understanding of social dynamics in government decision making is clearly important. Nonetheless, to the extent that price stability is a highly desired goal in a developing economy, the country can be strongly encouraged to liberalize its agricultural trade for its own advantage. After all, open trade is a cheaper alternative to inward looking policies aimed at domestic price stabilization (e.g. buffer stocking). The prospect of greater price stability can be a convincing argument in trade liberalization negotiations with developing countries.

Investment and Technical Change

It has long been recognized that underpricing of agricultural output slows down agricultural growth in developing economies (Krishna (1967)). Not only is there poor utilization of existing resources but also a bias against new investments in LDC agriculture because of low returns.

With generally higher commodity prices and greater world price stability expected from multilateral trade liberalization among the developed economies, long-term agricultural investments become more profitable particularly in commodity exporting LDCs whose domestic producers are exposed to the world price. Higher and more stable commodity prices would increase their investments in, among others, land development, irrigation infrastructure, roads and markets, and agricultural research and extension, resulting in rightward shifts in their long-run agricultural supply curves. Higher primary commodity exports, their principal source of foreign exchange, would then improve their ability to purchase imports required for development.^{4/}

^{4/} There is a debate in the literature as to the relation between export instability and economic growth. Knudsen and Parnes (1975), for instance, find that export instability, insofar as it results in higher investments out of permanent incomes, is positively related to

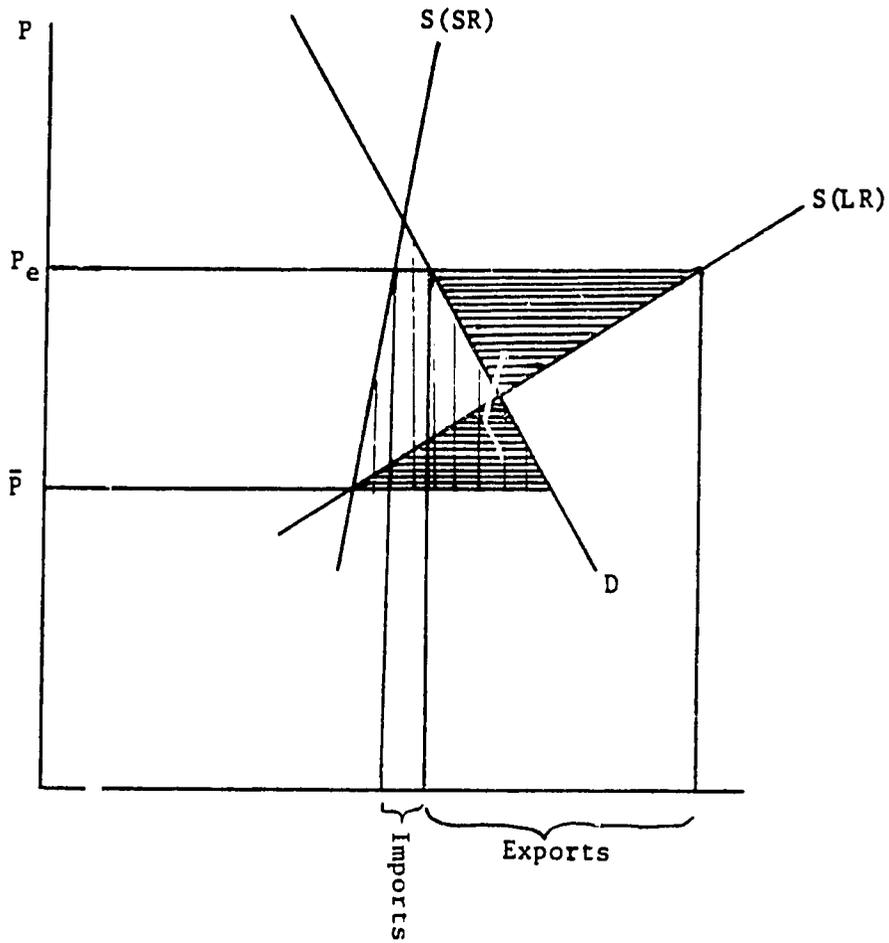
For commodity importers, some of their initial losses from agricultural trade liberalization in the developed economies may in turn be reversed in the long run. Higher world prices could, for one, encourage sufficient rightward shifts in an importing country's own supply curve such that it eventually becomes a commodity exporter. More likely however, the boosts in world supply together with the generally low income elasticity of demand for food, will draw down initial increases in world prices from liberalization. Thus, commodity importers' short-run losses as consumers will not be as large as in the long run. (The historic long-run decline in most commodity prices is already indicative of this likelihood.) Furthermore, the greater availability of foodgrains in the world markets could encourage food importers to store foreign exchange instead of maintaining costly stockpiles of cereals. This would only further improve the net fiscal balances of commodity importing nations.

The situation in which long-run supply response would change the consequences of liberalization is shown in Figure 6, with effects as shown for a small developing country importer. Liberalization in the industrial countries raises the world price from P to P_e . In the short run, excess demand (i.e., imports) is reduced by the price rise to the quantity M_e . Consumers cut back and producers increase output, but both demand and supply are inelastic so the country remains an importer under liberalization. However, in the long run the developing country has a more elastic supply response. Because of the higher prices, governmental infrastructure and capital investment in farming and in research and extension are encouraged. So the price rise calls forth a lot more output in the long run than in the short run. In the short run, the net losses (consumer losses minus producer gains) are the horizontal difference between D and $S(SR)$ from P to P_e , represented as a vertically hatched trapezoidal area. In the long run, however, output expands along $S(LR)$ sufficiently that the country becomes an exporter. The net gain is the upper horizontally hatched triangle minus the lower horizontally hatched triangle. The diagram has the overall sum being a small net gain in the long run, but of course this depends on the details of the supply and demand responses.

There is not enough evidence for the AID assisted countries we have been considering to be confident that the favorable outcome would occur for any of them. But the possibility is a real one in several cases. However, it is important to note that if all or most countries in the world have a large long-run supply response, then the rise in world price from P to P_e will be less in the long run. It is not enough to know that developing countries can take advantage of higher

4/ continuation ... economic growth. Others (e.g., Michalopoulos and Perez (1978)) however argue that export instability is detrimental to investments and hurts growth because of consequent fluctuations in imports.

Figure 6, Short-run Imports and Long-run Exports Under Liberalization



prices.

The World Bank (1986) notes that a large body of evidence indicates that the long-term supply response for developing countries to higher commodity prices is high. This is true even in Africa (see Table 26) where supply elasticities for most crops can be as high as elsewhere. Even in the short-term, these supply responses are significantly larger than one. This is encouraging given the common belief that farmers are slow to adopt to changing circumstances.

There are no large scale general equilibrium models however that treat the dynamic feedback effects of higher world prices from liberalization on agricultural investments and technical change, output supply and commodity prices. There are a number of studies however that consider the effects of a domestic pricing policy, arising perhaps from a trade policy regime, for certain commodities in specific LDCs. Quizon and Barbieri (1986), for example, investigate at length how open trade in rice would affect growth and income distribution in India. While this study still ignores the consequences for agricultural investments, it notes that in the short term, a more liberal rice trade in India would increase domestic prices. Rice output will increase. However, because of a drop in domestic demand for rice with higher prices, this output increase would not be as sharp as what partial equilibrium analysis would normally show. Moreover, increased rice production will come at the expense of other crops, particularly coarse cereals, because cultivable land is limited. Because total agricultural output increases by only a small percentage, there are only small positive effects on agricultural labor demand and agricultural wages. This hardly improves the rural income distribution since most of the rural poor are landless laborers whose welfare declines substantially from the increase in cereals prices.

In separate simulation exercises, Quizon and Binswanger (1986) study the consequences of irrigation investments and of crop specific technical changes on growth and income distribution in India. They note that the effects of increased agricultural output from investments or from technical changes (as was the case in the Green Revolution in India) depends largely on the extent to which the extra output made possible by these investments or technical changes are absorbed in the domestic economy. While aggregate output always increases; the income distribution consequences depend on trade. If the increased output were domestically absorbed, then domestic prices drop and the rural poorest benefit not only from the lower prices but also from increased labor demand made possible by the new irrigation or technical change. If the increased output were exported, then rural landowners benefit more because of higher outputs and agricultural prices.

While there are a number of other multimarket agricultural sector studies that investigate the growth, government revenue, and/or income distribution consequences of agricultural pricing policies in specific countries, few actually endogenize the investment and technical change aspects of long term adjustments arising from these policies.^{5/} Other

Table 26. Summary of Output Responses to Price Changes*

Crop	Africa	Other Developing Countries
Wheat	3.1-6.5	1.0-10.0
Maize	2.3-24.3	1.0-3.0
Sorghum	1.0-7.0	1.0-3.6
Groundnuts	2.4-16.2	1.0-40.5
Cotton	2.3-6.7	1.0-16.2
Tobacco	4.8-8.2	0.5-10.0
Cocoa	1.5-18.0	1.2-9.5
Coffee	1.4-15.5	0.8-10.0
Rubber	1.4-9.4	0.8-10.0
Palm Oil	2.0-8.1	0.4-4.0

* The range shows short-term to long-term supply responses.

Source: World Bank (1986).

more macroeconomic and aggregative studies, assessing the structural adjustment of countries to external shocks, have dwelled on these issues but have in turn neglected the particular importance of agricultural policies in LDCs. Some of these largely World Bank studies are reviewed in Sanderson and Williamson (1985) who point to the importance of country specific endowments and domestic policies in assessing the long term outcomes of domestic adjustment.

Finally, what are important in the long term are not only the positive shifts in supplies likely to result from agricultural trade liberalization but the demand changes as well. With higher incomes from trade for most LDCs but with relatively low income demand elasticities for most agricultural commodities, the extent of the long-term positive demand shifts in both the world and domestic LDC markets are difficult to predict. What is certain is that increased demand for higher valued and/or more processed agricultural products will arise. These changing consumer tastes may very well benefit more advanced economies who presently have both the investment and the comparative advantage in processing agricultural commodities. However, with higher expected output in the LDCs there is also incentive for them to develop new export products and expand their own agricultural processing operations.

Trade Liberalization and Food Aid

Food aid adds to the immediate net income position of recipient countries. Yet many economists have argued that the long-term consequences have often been deleterious to the receiving country. (See Cathie (1982); Hall (1980); or Purcell and Morrison (1987) for discussion of the issues.) Food aid involves some issues that trade liberalization does not, notably that food aid is often aimed at short-term emergencies rather than at long-term institutional change. Moreover, a problem that arises with food aid that does persist over several years is that the recipient may become overly dependent on a particular supplier of aid, at the expense of the long-term development of its own agriculture. This analogy does not provide an analysis of long-term effects of liberalization, but it suggests that if we are concerned about the long-term effects of food aid we should be heartened by the developing countries' prospects under agricultural policy liberalization by industrial countries.

The issue also arises of how existing food aid programs would fit

5/ See, for example, Singh, Squire and Strauss (1986) who review a number of household agricultural sector models. Cavallo and Mundlak's (1982) study of Argentina points to the importance of investment issues in determining the long-run outcomes of domestic pricing policies. For instance, they show that because of its consequent effects on investments, the long-run effects of low food prices (implemented by reducing the tax on domestic food consumption and increasing the tax on non-agricultural output) on agricultural production, per capita income, per capita consumption and investment are unfavorable.

in with a liberalized agricultural trade regime. To the extent that bilateral programs like PL 480 were treated as programs for subsidized exports or surplus disposal, a general scaling back of these programs would be part of the liberalization scenario. While increased commodity assistance in the short term (but targeted to the most disadvantaged consumers in the developing country) may be necessary to assist some LDCs in their transition to liberalization (and as an encouragement to liberalize), only multilateral and emergency food aid directed at specific problems of famine or malnutrition should presumably be maintained in the long run under a liberal trade regime. Indeed, a benefit of negotiated liberalization could well be a rationalization of food aid programs so that they were more carefully targeted at the times and places needed rather than being a vehicle for dumping surpluses. With less agricultural surpluses in developed countries in the long term, food aid will very likely be less cost effective than say, direct monetary aid when providing assistance to developing nations.

Implications for International Commodity Agreements

International Commodity Agreements (ICAs) for tropical products have been a mechanism by which developing country exporters of agricultural commodities have attempted to exercise market power through joint action. The idea is to increase the prices the exporting countries receive for their products, especially during periodic commodity price slumps. ICAs for coffee, rubber, and cocoa have been the focus of price-support efforts in the 1980s and as shown in Table 27, a number of AID-assisted economies are or have been members of these agreements.

Since these agreements often involve export restraints, as in the export quotas of the International Coffee Agreement, they are a likely target of a global agricultural trade liberalization effort. How much would the developing countries be giving up if the trade-restraining measures in ICAs had to be given up?

Although there are several contentious issues in the economic analysis of ICAs, the answer appears to be, very little. The reason is that ICAs in fact appear to have been able to do very little to raise commodity prices. This has been true even in the cases where the importing industrial countries have joined the agreements and have agreed to buy through market-sharing arrangements. Gordon-Ashworth (1984) reviews 39 ICAs that have been implemented since 1939. Only one, for coffee, appears effective today, and it is doubtful that it has achieved any significant long-term price support. The coffee agreement, like the one for rubber, may have contributed to price stability by fostering the holding of commodity stocks. In the case of rubber, these are stocks held by the association, while in the case of coffee stocks are held by individual countries, primarily Brazil. These measures may be beneficial, although even here there are questions whether the benefits outweigh the costs. In any case, it should not be part of any trade liberalization scheme to stop joint stockpiling behavior by ICAs. Stabilization effects can be conducted just as well by means of buffer stocks as by means of export controls. Indeed buffer stocks are preferable to export controls in that while

Table 27. AID-Assisted Countries That Are or Have Been Members of International Commodity Agreements in Coffee, Rubber and Cocoa *

International Commodity Agreements		
Coffee	Rubber	Cocoa
Bolivia	Cameroon	Cameroon
Burundi	Indonesia	Dominican Republic
Cameroon	Liberia	Ecuador
Congo	Sri Lanka	Ghana
Central African Republic		Indonesia
Costa Rica		Ivory Coast
Dominican Republic		Philippines
Ecuador		
El Salvador		
Ethiopia		
Gabon		
Ghana		
Guinea		
Guatemala		
Haiti		
Honduras		
India		
Indonesia		
Jamaica		
Kenya		
Liberia		
Malawi		
Panama		
Peru		
Philippines		
Rwanda		
Sierra Leone		
Sri Lanka		
Thailand		
Togo		
Uganda		
Zaire		
Zimbabwe		

* Membership varies over time because countries move in and out of international commodity agreements.

both can support prices during a market slump, only buffer stocks provide the means to stabilize prices downward during a boom. Therefore, if trade liberalization did involve restraints on the ability of ICAs to impose export controls, this would not harm their stabilizing capabilities. The removal of export controls rather than ICA joint stockpiling capabilities should be of more importance to AID when fostering trade liberalization policies among LDCs.

V. Managing the Transition to Liberalization: What Developing Countries Can Do

At this time, the GATT appears to be the only avenue for developing countries to influence the shaping of the world agricultural trade environment. But this is hardly a guarantee given the diverse trade interests among the developing nations themselves. Although agricultural trade has taken its rightful place in the new round of multilateral trade negotiations (MTN), there remains strong pessimism that, in the absence of formal approach to this issue among LDCs, the MTN will not effectively reduce agricultural trade barriers in developing countries.

Since its inception, the GATT has only loosely supervised agricultural trade among its members. Trade distorting measures in the agricultural sector have not been subject to the same strict discipline imposed on non-agricultural trade. The General Agreements in fact provide certain exceptions to the free conduct of agricultural trade. For instance, quantitative import restrictions of agricultural products are permitted for at least nine different reasons 6/, including the need to regulate the marketing and production of domestic agricultural products (Article IX). Moreover, all existing national laws that were in force in 1947 are exempt from the GATT, even if they are inconsistent with it. Because most of the pre-1947 U.S. agricultural legislations remain valid to this date (e.g., the 1985 Farm Act is a longstanding farm legislation extending back to 1933), U.S. agricultural export subsidies, for example, can be justified. It is not surprising then that agricultural trade has been dominated by government-to-government contracts and market sharing agreements.

What is important for developing countries to work for in the upcoming MTN on agricultural trade is the removal of all non-tariff barriers to commodity trade in the developed economies. These include all domestic provisions that extend beyond the border but have negative agricultural trade effects (subsidies and farm supports, variable levies, sanitary and phytosanitary regulations, and so on). For the LDCs, limiting the role of GATT exceptions, if not making recourse to them more costly, is also in their common interest. Perhaps what is even more important and fundamental is the need to

6/ See Anjaria, et al (1985) for a listing of the principal GATT provisions under which the maintenance of quantitative import restrictions may be justified.

strengthen the GATT by giving it stronger powers to enact rules and enforce them. Only with greater recognition for and stronger enforceability of the rights of countries within the GATT can individual developing nations hope to gain some bargaining power. This is sorely lacking and is necessary even for the developing country's own bilateral trade dealings with a developed country under GATT auspices (Sathirathai and Siamwalla (1986), Valdes (1986)).

In turn, the developing countries should offer some reciprocal trade concessions, including the lifting of some domestic trade barriers (particularly on non-agriculture goods) of their own. As noted by an earlier UNCTAD study (1983), tariffs of developing economies are significant barriers to trade among the LDCs themselves.

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APPENDIX

On Calculating the Producer and Consumer Welfare Gains and Losses and the Net Trade Effects of Industrial Country Trade Liberalization on AID-Assisted Economies

A. Producer and Consumer Welfare Gains and Losses

We use the following equations to calculate the welfare gains and losses of LDC producers and consumers from trade liberalization in industrial economies.

a. Change in Demand and Supply

$$\Delta D = D_1 * e_D * \Delta P$$

$$\Delta S = S_1 * e_S * \Delta P$$

b. Gain in Producer Surplus

$$GPS = 0.5 * \Delta P * \Delta S$$

c. Loss in Consumer Surplus

$$LCS = 0.5 * \Delta P * \Delta D$$

d. Change in Producer and Consumer Welfare

$$\Delta WD = -D_2 * \Delta P + LCS$$

$$\Delta WS = S_2 * \Delta P - GPS$$

e. Change in the \$ Value of Welfare Loss or Gain

$$\Delta W\$D = P_1 * \Delta WD$$

$$\Delta W\$S = P_1 * \Delta WS$$

B. Net Trade Effects

a. Net Exports

$$NX_1 = X_1 - M_1$$

APPENDIX (cont'd)

b. Change in Net Exports

$$\Delta NX = \Delta S - \Delta D$$

c. Net Exports After Liberalization

$$NX_2 = NX_1 + \Delta NX$$

d. Change in Net Export Revenues

$$\Delta NXR = (1 + \Delta P) * NX_2 - NX_1$$

$$P_1 = 1$$

e. Change in the \$ Value of Net Export Revenues

$$\Delta NXR\$ = P_1 * \Delta NXR$$

ΔP = change in prices

ΔD = change in demand

ΔS = change in supply

D_1 = quantity demanded before liberalization

S_1 = quantity supplied before liberalization

e_D = price elasticity of demand

e_S = price elasticity of supply

GPS = gain in producer surplus

LCS = loss in consumer surplus

D_2 = quantity demanded after liberalization
= $D_1 + \Delta D$

S_2 = quantity supplied after liberalization
= $S_1 + \Delta S$

NX_1 = net exports (quantity) before liberalization

X_1 = exports (quantity) before liberalization

M_1 = imports (quantity) before liberalization

ΔNX = change in net exports

NX_2 = net exports (quantity) after liberalization

ΔNXR = change in net export revenues

$\Delta NXR\$ = P_1 * \Delta NXR$

APPENDIX TABLE 1: Assumptions Used in the Analysis in Section III.

A. Country specific demand and supply elasticities used in the study

	Elasticities	
	Supply	Demand
	-----	-----
Sugar		
India		-1.75
Pakistan		-1.75
Peru		-0.60
Philippines		-0.60
Wheat		
Bangladesh	0.67	
India	0.41	
Indonesia		-1.20
Sri Lanka		-0.66
Maize		
India	0.70	-0.35
Indonesia	0.22	-0.35
Pakistan	0.19	-0.35
Thailand	0.22	-0.50
Rice		
Bangladesh	0.23	
Egypt	0.08	
India	0.22	
Indonesia	0.26	
Pakistan	0.12	
Peru	0.50	
Philippines	0.55	
Sri Lanka	0.21	
Thailand	0.28	

B. Default values for missing elasticities

	Elasticities		Change in World Price (%)
	Supply	Demand	
	-----	-----	-----
Sugar	0.6	-0.4	16.7
Wheat	0.4	-0.4	12.7
Maize	0.4	-0.4	11.7
Coffee			2.3
Africa	0.845	-0.33	
Other	0.54	-0.33	
Rice	0.33	-0.4	10.0
Soybean oil	0.4	-0.33	3.0
Palm oil	0.4	-0.33	2.9

For each commodity, the country specific and default values were taken from the same source (given below).

APPENDIX TABLE 1 (cont'd)

Sources:

- a) for wheat, sugar, and maize
 - supply and demand elasticities: Zeitz and Valdes (1985)
 - world price change: Zeitz and Valdes (1985)
- b) for rice
 - supply and demand elasticities: Scandizzo and Bruce (1980)
 - world price change: Tyers and Anderson (1987)
- c) for coffee
 - supply elasticity: World Bank (1986) p.68, mid-range
 - demand elasticity: Scandizzo and Bruce (1980)
 - world price change: Valdes and Zeitz (1980)
- d) for palm oil and soybean oil
 - supply elasticity: World Bank (1986), p.68, mid-range for palm oil
 - demand elasticity: Scandizzo and Bruce (1980), edible oils demand elasticity is used
 - world price change: Valdes and Zeitz (1980)

**Appendix Table 2: Sources of Data Used in
the Analysis in Section III**

a. Exports and imports by commodity and by country are 1984-86 averages from the semi-annual tape on world agricultural supply and disposition as released by the Foreign Agricultural Service (FAS) of the United States Department of Agriculture (USDA).

b. World commodity prices are 1984-86 averages from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). We have no country-specific commodity price data as the country level price data made available to us from alternative sources remains suspect. Therefore, to compute dollar values for export revenues, losses in consumer welfare, and gains in producer welfare, we used the IFS 1984-86 price averages from the IFS (which we refer to in the text Tables as pre-liberalization prices). This allows us to do some approximate cross country comparisons.

c. All other estimates are from sources cited in Appendix Table 1.