Trade Liberalization in Cereals:
Blessing or Curse to Developing Countries?*

Joachim Zietz**

I. Introduction

For some time now, the large exporters of cereals, such as the United States, Canada, and Australia, have had a keen interest in the removal of trade barriers for cereals, in particular in the countries of the European Community. The motivation behind this interest does not need any elaboration. What is less clear is how trade liberalization in cereals would affect developing countries. A recent study seems to indicate that developing countries could actually be worse off with trade liberalization (Koester), the reason being that most developing countries are net importers of cereals and trade liberalization is likely to increase the world price at which developing countries are buying.

The purpose of the current study is to analyse the gains and/or losses of developing countries that could arise from trade liberalization in cereals by developed countries. The study differs from previous work in this area (Koester; Valdés and Zietz) in that a more recent data set is used and the interdependencies in production and consumption among different cereals are modelled explicitly. Also, the model relies largely on domestic demand and supply elasticities rather than trade elasticities thus reducing the likely underestimation of the benefits of trade liberalization.

* The author would like to thank alberto Valdés of IFPRI and Ron Duncan of the World Bank for extensive comments on an earlier version of the paper. The suggestions of an anonymous referee are also appreciated. The usual disclaimer applies.
** Research Fellow at the Institute of World Economics, Kiel, West Germany.

Underestimation could be a problem in the latter approach when export changes are calculated on the basis of initial export levels for developing countries that are artificially low because of developed country protection.

The study is based on a world marke equilibrium model for the two dominant cereals in world trade, wheat and maize. The hypothetical case of a complete absence of tariffs and other non-tariff trade barriers in developed countries is compared with the current situation characterised by the existence of such impediments to trade. Interdepencies in production and consumption among the two commodities are incorporated through the use of cross-price elasticities.

The paper is organized as follows. The theoretical model is presented in the next section. It is followed by a short description of the data base. The results of the model simulations are discussed next. The paper ends with an overview of the main results.

II. The Model

Although only two commodities are actually investigated in the present study, the model as explained in this section can accommodate many products and countries. It operates on the principal that the changes in consumption, production, exports, and imports of all countries for a particular commodity $i (i = 1, \ldots, q)$ are a function of the change in world price of the product itself and of the world price of all other products that are included in the study. Within this framework the removal of trade barriers by developed countries provides the initial stimulus to the world market by increasing world import demand. For the world market, this results in excess demand at the initial set of world prices. It can be eliminated by an appropriate change in these prices. To make the model operational, the changes in domestic production and consumption of each country and hence the resulting changes in exports or imports are expressed as a function of the world price changes of all q commodities included in the study. The solution of the model requires finding a set of q world price changes such that exports equal imports for all commodities in the final equilibrium.

The model distinguishes among four categories of countries,

developed countries outside the European Community (DCs), the developed countries of the European Community (EC), developing countries (LDCs), and a group of countries classified as rest-of-the-world (ROW). The countries within each of these four categories are assumed to react to world price changes according to the same behavioural postulates, although based on different parameter constellations. Of the four groups of countries only the DCs and the EC-members are supposed to eliminate their trade barriers. The level of protection in all other countries is held constant. How the world price change is related to the price and quantity changes in each category of countries is explained next starting with the DCs and the individual EC-members.

In the preliberalization situation, which is denoted by superscript o, the domestic price (p) of commodity i ($i = 1,\ldots, q$) prevailing in developed country j ($j = 1,\ldots,r$) can be related to the world market price (pw) by the equation

$$p_{ij}^{o} = pw_{i}^{o}\, r_{j}\, (1 + \tau_{ij}^{o})\, (1 + m_{ij})$$

where r is the market exchange rate, τ^o the ad-valorem equivalent of a country's tariff and nontariff barriers, and where m is a margin which incorporates insurance, freight, and marketing costs. Under these conditions a complete elimination of tariffs entails a percentage change in domestic price (ph_{ij}) of

$$ph_{ij} = (1 + pwh_{i})/(1 + \tau_{ij}^{o}) - 1.$$

where pwh is defined as the percentage change in world price resulting from trade liberalization.[1]

For a given percentage change in domestic price (ph) consumption (C) and production (Q) of a particular commodity i in developed country j are assumed to change according to the behavioural equations

[1] The exchange rate and the marketing margin are assumed to be unaffected by the changes induced by trade liberalization.

$$(1)\quad \Delta C_{ij} = C^{o}_{ij}\ \left[\prod_{h}(1 + ph_{hj})^{\eta^{h}_{ij}} - 1\right]$$

$$(2)\quad \Delta Q_{ij} = Q^{o}_{ij}\ \left[\prod_{h}(1 + ph_{hj})^{\varepsilon^{h}_{ij}} - 1\right]$$

where Δ stands for change and where n^{h}_{ij} is the elasticiity of domestic demand for commodity i of country j with respect to the price of commodity h ($h = 1, \ldots, q$). stands for the price elasticity of supply.[2]

Given the changes in consumption and production as defined in equations (1) and (2), postliberalization levels of exports (X*) and imports (M*) are calculated for each commodity and developed country by equation sets (3) and (4), respectively:

$$(3)\quad \begin{aligned} X^{*} &= (X^{o} + \Delta Q - \Delta C) && \text{if } (\cdot) > 0 \text{ and } X^{o} > 0 \\ X^{*} &= -(M^{o} + \Delta C - \Delta Q) && \text{if } (\cdot) < 0 \text{ and } M^{o} > 0 \\ X^{*} &= 0 && \text{if } (\cdot) > 0 \text{ and } M^{o} > 0 \end{aligned}$$

$$(4)\quad \begin{aligned} M^{*} &= (M^{o} + \Delta C - \Delta Q) && \text{if } (\cdot) > 0 \text{ and } M^{o} > 0 \\ M^{*} &= -(X^{o} + \Delta Q - \Delta C) && \text{if } (\cdot) < 0 \text{ and } X^{o} > 0 \\ M^{*} &= 0 && \text{if } (\cdot) > 0 \text{ and } X^{o} > 0 \end{aligned}$$

where * denotes postliberalization levels and where subscripts i and j have been left out to avoid unnecessary clutter.[3]

In the model, each member country of the EC responds to the q world price changes in the manner explained above for DCs. However, whereas exports and imports of each DC directly affect

2 Here as in all other cases, domestic demand and supply elasticities are assumed to be constant. Equations (1) and (2) then give the exact changes in C and Q, for small as well as large price variations.

3 Both sets of equations, (3) and (4), allow for a trade reversal of developed countries in both directions, that is from an importing to an exporting status or vice versa. They further imply that the absolute level of stocks does not change.

world excess demand, the countries of the European Community are assumed to influence the world market only as a net trading entity, similar to a large country with several regions or states.[4] To incorporate such an effect, the sum of the imports of all EC members is subtracted from the sum of their exports to arrive at EC net exports (X^*_{iec}) or net imports (M^*_{iec}), depending on the particular commodity being analysed. Only these net quantities enter world excess demand.

Whereas the domestic price change for DCs and the member states of the EC is a function of the world price change and the initial level of protection, the domestic price change of developing countries simply equals the change in the world price of that commodity. This follows directly from the assumption of constant protection levels for all countries other than those which are removing their trade barriers. As a consequence, the response of consumption and production of developing country g ($g = 1,\ldots,s$) for commodity i to the simultaneous change in the world price of q commodities can be calculated by equations (1) and (2), respectively, if one replaces subscript j with g and ph_{hj} with pwh_h.

Postliberalization exports of commodity i for developing country g are then given by the equations.

$$X^* = X^o + \Delta Q - \Delta C \qquad \text{if } X^o > 0$$

$$X^* = -(M^o + \Delta C - \Delta Q) \qquad \text{if } (\cdot) < 0 \text{ and } M^o > 0$$

$$X^* = 0 \qquad \text{otherwise}$$

where subscripts i and g have been left out for ease of reading. Similarly, postliberalization import levels are derived as

$$M^* = (M^o + \Delta C - \Delta Q) \qquad \text{if } (\cdot) > 0$$

$$M^* = 0 \qquad \text{otherwise}$$

[4] This assumption is justified by the existence of the common agricultural policy and the large share of intra-EC trade.

As in the case of developed countries, the above equations allow for the possibility that developing countries turn from a net importing to a net exporting position. In contrast to the case of developed countries, however, a trade reversal in the other direction is excluded as long as the world price rises.

The category of countries classified as rest-of-the-world consists of the centrally planned economies (CPEs) and small developing countries (SDCs) that are not explicitly incorporated in the LDC category because of their small size. This group of countries enters the model as an aggregate. The ROW country group is also treated differently from individual DCs, EC-members of LDCs in that their postliberalization export and import levels are derived on the basis of the respective trade elasticities rather than on the basis of domestic demand and supply elasticities. In particular, the postliberalization level of exports of commodity i for the ROW group is derived as a weighted average of the export level for the group of CPEs and the group of SDCs as

$$X^*_{i\,ROW} = w_i\, X^o_{i\,CPE}\ (1 + \varepsilon_i^{x\,CPE}\ \ pwh_i)$$

$$+ (1 - w_i)\, X^o_{i\,SDC}\ (1 + \varepsilon_i^{x\,SDC}\ \ pwh_i)$$

where w_i is the preliberalization share of the centrally planned economies in the exports of commodity i of the ROW category of countries. ε_i^{xCPE} is the aggregate export supply elasticity of the CPE countries. An analogous equation is used for the postliberalization imports of the ROW group of countries. $(M^*_{i\,ROW})$.

The model is solved iteratively by searching for a vector of q world price changes, pwh_i $(i = ,\ldots,q)$, that achieves simultaneous postliberalization equilibrium in as many interdependent markets. Such an equilibrium is realized if world excess demand for all q commodities is zero. The latter is defined in terms of the postliberalization import and export levels of the four categories of countries, DCs, EC, LDCs, and ROW, as

$$\sum_i \left(\sum_k M^*_{ik} + M^*_{i\,\mathrm{EC}} + \sum_g M^*_{ig} + M^*_{i\,\mathrm{ROW}} \right) -$$

$$\sum_i \left(\sum_k X^*_{ik} + X^*_{i\,\mathrm{EC}} + \sum_g X^*_{ig} + X^*_{i\,\mathrm{ROW}} \right)$$

where subscript k stands for developed countries outside the European Community and subscript g for developing countries.

For a given vector of world price changes and the corresponding quantities of postliberalization exports and imports, the change in export revenue or import costs of developing country g and commodity i can be calculated as

$$(5) \quad \Delta VX_{ig} = (X^*_{ig}\ \mathrm{pw}^*_i - X^o_{ig}\ \mathrm{pw}^o_i)\ \phi_{ig}$$

$$(6) \quad \Delta VM_{ig} = (M^*_{ig}\ \mathrm{pw}^*_i - M^o_{ig}\ \mathrm{pw}^o_i)\ \theta_{ig}$$

respectively, where pw^*_i represents the world price for commodity i after trade liberalization. ϕ_{ig} equals the ratio of the export unit value of country g (px^o_{ig}) to the world price prior to trade liberalization. θ_{ig} is the corresponding ratio for the imort unit value (pm^o_{ig}). Since a preliberalization export unit value does not exist for countries incurring a trade reversal, the regional average ϕ_i substitutes for ϕ_{ig} in these cases. (5) is the relevant equation in the case where country g is an exporter prior to trade liberalization or experiences a trade reversal from a net importing position to a net exporting trade position because of trade liberalization. Equation (6) is used when country 8 is initially a net importer and remains so after trade liberalization.

If LDC g is exporting in the preliberalization period, its welfare gain deriving from trade liberalization can be approximated by

$$\Delta WX_{ig} = 0.5\ (\mathrm{pw}^*_i - \mathrm{pw}^o_i)\ (X^o_{ig} + X^*_{ig})\ \phi_{ig}$$

If LDC g is a net importer initially, its welfare loss is calculated as

$$\Delta WM_{ig} = 0.5\,(pw_i^* - pw_i^o)(M_{ig}^o + M_{ig}^*)\,\theta_{ig}$$

In those cases where developing country g experiences a trade reversal from a net importing to a net exporting trade position the change in welfare is derived by the equations

$$\Delta WX_{ig} = 0.5\,[(\phi_i\, pw^* - px_{ig}^T)\,X_{ig} - (P_{ig}^T - pm_{ig}^o)\,M_{ig}^o]$$

where p_{ig}^T is the price at which a trade reversal would occur in terms of import unit values; px_{ig}^T is the corresponding price in terms of export unit values. The latter is related to the former by the equation

$$px_{ig}^T = p_{ig}^T\,(pw_i^o\,\bar{\phi}_i/pm_{ig}^o).$$

For each country g with trade reversal the determining equation of p_{ig}^T is found by setting domestic production equal to domestic consumption and solving the resulting equation for $pm_{ig}^o\,(=p_{ig}^T)$.

III. Data

The study explicitly includes all market economy developing countries with a 1980 population level of more than five million. This sums to a total of fifty-eight countries. Seventeen market economy developed countries are considered. The remaining countries of the world, that is small market economy developing countries and centrally planned economies, are lumped together in the category rest-of-the-world (ROW).

Two commodities are analysed: wheat and wheat flour measured in wheat equivalents, and maize. Data on domestic production (Q^o), consumption (C^o), exports (X^o), and imports (M^o)

are taken from the Food Balance Sheets of the Food and Agriculture Oranization of the United Nations (FAO). The figures are averages for the years 1979 to 1981. X^o and M^o are net exports and net imports, respectively. Domestic consumption is calculated as a residual from figures on production, exports, imports, and stock changes value and quantity of world exports are from the FAO Trade Yearbook.

The preliberalization world market price (pw^o) equals the average deflated world export unit value for the years 1979 to 1981. The base year values of pw^o are US$186.6 for wheat and flour and US$145.6 for maize. They are expressed in 1980 US dollars per metric ton. For each commodity and developing country, preliberalization unit values of trade (pm_{ig}^o and px_{ig}^o) are calculated as simple averages of the deflated unit values of the years 1979 to 1981. The raw data come from the 1981 FAO Trade Yearbook.[5]

Values for domestic demand and supply elasticities are taken from the following sources: Askari and Cummings, Caspari et al., Stern et al., Tyers, and Tyers and Anderson.[6] The model is calculated for two sets of domestic supply elasticities. The benchmark run of the model uses the elasticity values for individual countries reported in the sources mentioned above. For countries for which elasticity values could not be obtained on an individual basis, the domestic demand and supply elasticities are set equal to 0.4 for both wheat and maize.[7] These values correspond roughly to those reported in Stern et al. (pp. 354-57) for both developed and developing countries. To check on the sensitivity of model results with respect to the choice of the domestic supply elasticities, a second set of elasticities is utilized for both wheat and maize. For this second model run, the domestic supply elasticities of all developing countries is raised to 0.8[8]

Cross-price elasticities for most developed countries and a number of Asian developing countries are taken from Tyers and Tyers and Anderson. For all other countries, the cross-price

[5] All base year quantities and values for all countries can be found in the appendix of Zietz and Valdes.

[6] The values reported in Tyers are partially reprinted in Anderson and Hayami.

[7] The own demand and supply elasticities for both commodities and all countries are reported in the appendix of Zietz and Valdes.

[8] Large aggregate supply elasticities for developing countries are favoured among others by Peterson.

elasticity of both production and consumption between maize and wheat is set to the minmum of 0.1 or one half the own price elasticity. Also, a cross-price elasticity of supply is used only if the other commodity is actually produced in the country. For the model run with domestic supply elasticities set at 0.8, all cross-price elasticities are raised to 0.2.

The calculation of postliberalization export and import levels of the ROW category of countries requires a value for the share of the centrally planned economies in the net exports and net imports of the ROW countries. These market shares are derived from the export and import data reported in the FAO Food Balance Sheets. All Eastern European countries as well as the Soviet Union are included in the CPE category. The import demand elasticities reported for the Soviet Union in Tyers, -1.0 for wheat and -0.27 for maize, are assumed to represent the corresponding elasticities for the CPEs as a whole. This assumption seems justified given the overwhelming share of the Soviet Union in the imports of CPEs. The export supply elasticity of the CPE block of countries for wheat is set to 1.0. Since the CPE export share for maize is zero, no assumption regarding the corresponding export supply elasticity is needed. The trade elasticities of the group of small developing countries are calculated as a weighted average of the trade elasticities of those developing countries included in the study with less than eight million inhabitants.

Ad-valorem tariff equivalents of tariff and nontariff trade barriers are derived from a comparison of domestic wholesale prices and the corresponding import unit values or border prices for each trade liberalizing country and commodty.[9] The calculations are based on the nominal protection coefficient, which is defined as the ratio of the domestic to the c.i.f. or border price, with both prices expressed in the same currency units. Wherever necessary, a distinction is made between the protection afforded to producers and the level of protection relevant to consumers.[10]

[9] The world price, pw^0, is not used for the calculation of protection levels because it does not allow for differences in transport costs or the composition of imports from country to country. The latter is very relevant since the commodity definitions used in this study are quite broad.

[10] See Zietz and Valdés for details on the calculation of protection levels as well as a listing of all values used in the calculations.

IV. Results

Table 1 provides an overview of the effects on developing countries[11] of a complete removal of trade barriers for wheat and maize as they prevailed in developed countries during 1979 to 1981. It also gives the model's predictions of the changes in the world market price and in world exports, which are defined as the sum of the net exports of all exporting countries. For each commodity, superscript 1 indicates the use of the benchmark elasticities. Superscript 2 identifies the alternative elasticity assumptions described in the data section.

The world price increases are predicted to be between 6 and 12 percent. As one could expect, the use of the larger domestic supply elasticities for developing countries leads to slightly lower world price increases. The differences between the alternative elasticity assumptions, however, are rather minor. This largely reflects the fact that the majority of developing countries are importers of grain rather than exporters. In fact, their share in world exports is a mere 6 percent for wheat and 12 percent for maize for the years 1979-81.

The third column of Table 1 presents the changes in foreign exchange earnings of developing countries. For the benchmark elasticity runs of the model, an increase of close to US$ 1 billion is predicted to occur per year for both commodities taken together. This value is expressed in 1980 dollars. Hence, the equivalent figure in 1986 dollars would be in excess of one and a half billion U.S. dollars.

A comparison of these figures with those for developed countries may be instructive. For wheat, the increase in foreign exchange of developing countries is about of the same order of magnitude as the combined effect for Australia and Canada, the two developed countries to gain the most in the case of wheat. By contrast, the foreign exchange earnings of the United States decrease by about US$200 million. This is the result of her large cross-price elasticity of wheat supply with respect to maize (-1.0). The United States is the country with the largest absolute gains in

[11] Unless otherwise noted, "developing countries" refers to the 58 countries included in the study.

maize, about US$4.2 billion, a figure close to eight times the size of those of all developing countries combined. France is the biggest loser among the developed countries in the case of maize. She would turn from a large exporter to a net importer.

The change in welfare of developing country exporters is only a fraction of the foreign exchange increase, thereby reflecting the domestic resource cost of increased production. The ratio of the welfare change to the change in foreign exchange earnings varies between 0.1 and 0.28. This variation reflects different implicit export supply elasticities between wheat and maize. For both commodities, the predicted increase in world price results in an absolute decrease in the value of developing country imports. This reaction implies an elastic import demand elasticity for the group of developing countries. This reduction in the import bill, however, although equivalent to a saving of foreign exchange, causes a welfare loss. This is evident from the negative values of the net welfare change in the last column of Table 1[12]

When we try to compare the results in Table 1 with the findings of other studies, several problems arise. First, commodity definitions often differ. Kirmani et al., for example, use broad aggregates such as cereals rather than specific commodities such as maize or wheat. Similarly, Anderson and Tyers study coarse grains rather than maize. Second, few studies use the same base period. The study by Valdes and Zietz is based on 1975-77 averages, as is the work by Koester. Anderson and Tyers take 1980 as their reference year. The current study utilises an average of the years 1979-81. Third, the calculation of protection levels generally differs among studies. Rather large differences of protection levels are reported by Kirmani et al. (Table 1), for example, for a number of surveyed studies. In light of the above problems, the following comparisons have to be considered with some caution.

Overall, the long-run steady-state results reported by Anderson and Tyers are very similar in spirit to the comparative static results of this study. The authors report world price increases for

[12] The change in net welfare is calculated as the difference between the welfare increases enjoyed by developing country exporters and the welfare losses incurred by developing country importers.

Table 1

EFFECT OF TRADE LIBERALIZATION ON WORLD PRICE AND EXPORT QUANTITY, TRADE VALUES AND WELFARE OF DEVELOPING COUNTRIES

	Percent Change in		Absolute Change in Developing Country			
	World Price	World Exports	Foreign Exchange Earnings	Welfare (Exporters only)	Import Bill	Net Welfare
	—% —		—US$ mill. 1980—			
Wheat[1]	7.1	-3.2	406	57	-122	-405
Wheat[2]	6.0	-3.0	455	47	-213	-342
Maize[1]	11.8	30.7	511	141	-497	-74
Maize[2]	10.6	30.6	772	129	-649	-55

Note: Superscripts identify different assumptions regarding the domestic supply elasticities. Details are given in the text. World exports are defined as the sum of net exports of all net exporting countries.

wheat and coarse grains of 20 and 16 percent, respectively. These are larger than the price increases given in Table 1 for wheat and maize, the commodities that match the more aggreate commodity groups chosen by Anderson and Tyers. The difference is particularly pronounced for wheat. One likely cause is that in this study, the changes of consumption and production (equations (1) and (2)) for Japan and Austria are calculated on the basis of different values of the preliberalization protection level. Owing to a subsidy system the protection relevant to producers in these two countries is considerably in excess of the protection that consumers actually have to live with. As a result, a removal of trade barriers will substantially decrease production but increase consumption only slightly. Anderson and Tyers report world export increases of 7.5 and 24.4 million tons for wheat and coarse grains, respectively. The corresponding figures of the current study are a decrease of world wheat exports of 2.6 million tons and an increase of 21.9 million tons of maize if one considers the benchmark results.

If one corrects for the differences in base year and the extent

of trade liberalization[13] between the study by Valdes and Zietz and the present work, the current figures for the benchmark elasticity runs are about four times as large for maize. For wheat the results are similar in size.

Koester also utilizes the methodology and basic data base of Valdés and Zietz, but concentrates on the analysis of cereals. Assuming a complete removal of trade barriers in the European Community, Koester predicts an increase in the world price of wheat and maize of 9.6 and 2.2 percent, respectively. Similar to the results of Anderson and Tyers the price increase for wheat exceeds that for maize. This contrasts with the findings of this study reported in Table 1. On the other hand, Koester's conclusion that trade liberalization in cereals as a whole results in a net weflare loss to developing countries is confirmed in the current study. This also applies to his prediction that foreign exchange earnings of developing countries are likely to increase by more than one billion dollars in the case of trade liberalization.

Tables 2 and 3 provide a regional account of the impact of trade liberalization on developing countries. Only the results for the benchmark elasticity runs of the model are reported. A change to higher domestic supply elasticities does not appreciably affect the regional impact. According to the model simulations, trade liberalization in wheat leads to welfare losses in all four regions. Most of the foreign exchange earnings accrue to Asia and here in particular to India. This country accounts for essentially all of the reported increase in Asia's export revenue. The situation is very similar for Turkey in the North Africa Middle East region and for Argentina in the case of Latin America Middle East region losses of trade liberalization in wheat are spread over most developing countries. The largest absolute losses are predicted for Egypt, Brazil, and Algeria. They are in the order of 65, 61, and 38 million dollars, respectively.

In the case of trade liberalization in maize, only Latin America could expect to register net welfare gains. But as in the case of wheat, all regions can increase their foreign exchange revenue by economically significant percentages. This applies in particular to Sub-Sahara Africa. Seven countries in this region

[13] Valdes and Zietz consider a fifty percent reduction in trade barriers.

Table 2

REGIONAL IMPACT OF TRADE LIBERALIZATION ON DEVELOPING COUNTRIES – WHEAT

Region	Change in		Percent Distribution of Change in Foreign Exchange Earnings	Percent Change in Foreign Exchange Earnings	Change in Import Bill
	Foreign Exchange Earnings	Net Welfare			
	–US$ mill.	1980–	–%–	–%–	–US$ mill.–
Sub-Sahara Africa	1.	-41	0.0	642	25
North Africa Middle East	141	-194	34.7	185	-20
Asia	175	-90	43.1	na	-186
Latin America	88	-81	21.7	12	58
Total	406	-405	100.0	51	-122

Note: na indictes that preliberalization exports are zero or negligible. The results refer to the benchmark elasticity assumptions.

could anticipate to experience a trade reversal and become net exporters of maize. Among those countries are Cameroon, Kenya, Malowi and Uganda. The incidence of trade reversals is also very large for Asia. Among others, India, Indonesia, the Philippines, and Pakistan fall into this category. As in the case of wheat, India could expect to reap most of the increase in foreign exchange earnings of the region, close to 50 percent. In the case of North Africa Middle East, most of the increase in foreign exchange would again accrue to Turkey. As for Latin America, Argentina would likely capture about 80 percent of the regions predicted gain in foreign exchange. But similar to Sub-Sahara Africa and Asia, a considerable number of countries experience a trade reversal from a net importing to a net exporting status. This applies, for example, to Brazil, Bolivia, and El Salvador. The countries losing most in absolute terms from trade liberalization in maize are the Republic of Korea, Mexico, and Venezuela, with

Table 3

REGIONAL IMPACT OF TRADE LIBERALIZATION ON DEVELOPING COUNTRIES – MAIZE

Region	Change in		Percent Distribution of Change in Foreign Exchange Earnings	Percent Change in Foreign Exchange Earnings	Change in Import Bill
	Foreign Exchange Earnings	Net Welfare			
	–US$ mill.	1980–	–%–	–%–	–US$ mill.–
Sub-Sahara Africa	73	-19	14.3	334	-119
North Africa Middle East	15	-64	2.9	na	-3
Asia	215	-7	42.1	62	7
Latin America	207	16	40.5	26	-382
Total	511	-74	100.0	44	-497

Note: na indicates that preliberalization exports are zero or negligible. The results refer to the benchmark elasticity assumptions.

net welfare losses of 47, 40, and 20 million dollars per year.

Another way to break down the results of this study is presented in Table 4, which analyses the potential impact of trade liberalization on the group of low-income countries. For the purposes of this study, low-income countries are those developing countries with a 1981 per capita gross national product of US$400 or less according to the World Development Report 1983. Of the developing countries included in this study, twenty-two are categorized as low-income. According to column (2), low-income countries as a group suffer a welfare loss from trade liberalization in cereals. This conclusion is similar to the one derived for all developing countries in Table 1. Column (3) of Table 4 expresses the foreign exchange gains of low-income countries as a percentage of the gains of all developing countries. A comprison of columns (3) and (4) shows that India is the low-income country

with by far the largest potential gains. The share of foreign exchange gains going to the group of low income countries apart from India seems rather low. But again, one has to consider that, for a small developing country, even a negligible share of total benefits may translate into a substantial amount of foreign exchange, in both absolute and relative terms.

Table 4

EFFECT OF TRADE LIBERALIZATION ON LOW INCOME COUNTRIES

	Change in		Col. (1) as Percent of LDC Total	Col. (3) without India	Change in Import Bill	Change in Welfare of Importers
	Foreign Exchange Earnings	Net Welfare				
	(1)	(2)	(3)	(4)	(5)	(6)
	—US$ mill. 1980—		—%—	—%—	—US$ mill. —	
Wheat[1]	184	-56	45.5	5.1	-226	-51
Wheat[2]	215	-49	47.2	6.4	-245	-43
Maize[1]	142	-5	27.7	9.5	-43	-12
Maize[2]	163	-4	21.1	9.4	-59	-10

Note: The results refer to the benchmark elasticity runs of the model. Superscripts identify different assumptions regarding the domestic supply elasticities of developing countries. Details are in the text.

V. Conclusion

This study has tried to predict how a simultaneous removal of all trade barriers by developed countries for wheat and maize would impact upon developing countries. The results seem to support the conclusion that trade liberalization in cereals would likely lead to a net welfare loss to developing countries as a whole. Nevertheless, a number of developing countries could expect considerable percentage and absolute increases in foreign exchange earnings. For wheat and maize together, they amount to about US$1 billion in 1980 dollars per year. For wheat, the increase in foreign exchange earnings are concentrated almost exclusively

among three countries, India, Turkey, and Argentina, whereas the welfare losses affect most countries. The situation is somewhat different for maize. For one, the combined welfare losses of developing countries are only a fraction of the size of their increases in foreign exchange. Also, the foreign exchange increases are more evenly spread than for wheat. It is finally noteworthy that, for maize, a considerable number of developing countries is predicted to turn net exporter as a result of trade liberalization.

In interpreting the study for the purpose of policy formulation, several of its limitations have to be taken into consideration. First, the welfare calculations did not take into account that for many developing countries the exchange rate is overvalued and hence that foreign exchange is at a premium. As a result, the welfare losses presented may overestimate the disadvantages of trade liberalization. Second, a recent study by Schiff (1985) for wheat came to the conclusion that trade liberalization by OECD countries would contribute significantly to world price stability. If, however, price stability is a highly valued good for LDCs, as the discussion of commodity price stabilization and buffer stocks seems to indicate, then the gains derived from increased price stability would have to be counted among the benefits of trade liberalization. Third, the permanent elimination of trade barriers in developed countries could very well induce developing countries to concentrate more resources on agriculture as opposed to industry. Conversely, trade liberalization would imply a substantial shift of resources out of agriculture into the service sector and industry for developed countries. On the level of the world market, this shift in resources should decrease service and industry prices relative to those to agriculture. This should give LDCs a strong additional incentive to develop agriculture. It may well be that for such a case the chosen supply elasticities, even the larger ones, are be unrealistically low, at least for the long run.

In conclusion, it seems that the answer to the question posed by this paper is not all that clear cut. For maize, trade liberalization could well be considered to be a blessing for developing countries at least in the longer run, when the above mentioned dynamic effects materialize. For wheat, the answer is less obvious. Although beneficial to the major exporting countries, trade liberalization may hurt many of the importing LDCs, certainly in the short run, much less in the longer run. Wheather in some

point in time after liberalization the postive effects could win out, must remain an open question at this point.

References

Anderson, K. and Y. Hayami, *Political Economy of Agricultural Protection: The Experience of East Asia,* Allen and Unwin, 1985.

Anderson, K. and R. Tyers, "European Community Grain and Meat Policies: Effects on Internatioinal Prices, Trade and Welfare," *European Review of Agricultural Economics,* 11, 4, 1984, 367-394.

Askari, H. and J.T. Cummings, *Agricultural Supply Response: A Survey of the Econometric Evidance,* Praeger, N.Y., 1976.

Caspari, C., Mac Laren, D. and G. Hobhouse, *Supply and Demand Elasticities for Farm Products in the Member Countries of the European Community* (under the direction of Edmund Neville-Rolfe, Bureau Europeen de Recheres, Brussels, Belgium), International Economics Division; Economics, Statistics, and Cooperative Service, United States Department of Agricultural, Washington, D.C., 1980.

FAO, *Trade Yearbook,* Food and Agriculture Organization of the United Nations, Rome, various issues.

——, *Food Balance Sheets, 1979-81.* Food and Agriculture Organization of the United Nations, Rome, 1984.

Kirmani, N., Molajoni, P., and T. Mayer, *Effects of Increased Market Access on Selected Developing Countries Export Earnings: An Illustrative Exercise,* Exchange and Trade Relations Department, International Monetary Fund, Washington, D.C., 1984.

Koester, U., *Policy Options for the Grain Economy of the European Community: Implications for Developing Countries,* Research Report 35, International Food Policy Research Institute, Washington, D.C., 1982.

Peterson, W.L., "International Farm Prices and the Social Cost of Cheap Food Policies," *American Journal of Agricultural Economics,* 61, 1, 1979, 12-21.

Schiff, M.W., *An Econometric Analysis of the World Wheat Market and Simulation of alternative Policies, 1960-80,* International Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C., Oct. 1985.

Stern, R.M., Francis, J., and B. Schumacher, *Price Elasticities in Internatioinal Trade, An Annotated Bibliography,* Macmillan, 1976.

Tyers, R., "Agricultural Protection and Market Insulation: Analysis of International Impacts by Stocha-

stic Simulation," *Pacific Economic Papers*, 111, Australia-Japan Research Centre, Australian National University, Canberra, 1984.

Tyers, R. and K. Anderson, "Price, Trade and Welfare Effects of Agricultural Protection: The Case of East Asia," Research Paper 109, Australia-Japan Research Centre, Canberra, Mar. 1984.

Valdes, A. and J. Zietz, "Agricultural Protection in OECD Countries: Its Cost to Less-Developed Countries," Research Report 21, International Food Policy Research Institute, Washington, D.C., 1980.

World Bank, *World Development Report, 1983,* International Bank for Reconstruction and Development, Washington, D.C., 1983.

Zietz, J. and A. Valdes, "The Costs of Protectionism to Developing Countries: An Analysis for Selected Agricultural Products," World Bank Staff Working Paper, 769, IBRD, Washington, D.C., Jan. 1986.