TEXT UPDATE - EXPANDED COUNTRY COVERAGE OF THE EFFECTS OF TRADE LIBERALIZATION ON THE WORLD SUGAR MARKET* - November 1999

*Note: Tables remain unchanged.

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Executive Summary

The purpose of this report is to present and discuss findings of a study of trade liberalization on the World sugar market. The study considers the following scenarios: (a) the effects of trade liberalization under the Uruguay Round Agreement (URA), (b) the effects of complete global trade liberalization, (c) the effects of partial trade liberalization, (d) the effects of complete trade liberalization in the industrialized countries, (e) the effects of partial trade liberalization in the industrialized countries, (f) the effects of complete trade liberalization in the major developing countries (Brazil, China, India, Indonesia, and the Republic of Korea), and (g) the effects of partial trade liberalization in the major developing countries. The analysis focused on changes in the world sugar price and on changes in production, consumption, stock changes, and net trade in the 42 countries and/or regions: United States, Canada, European Community (EC), Other Western Europe, Poland, Other Eastern Europe, Former USSR, Japan, Australia, New Zealand, Fiji, Rest of Oceania, China, India, Indonesia, Philippines, Thailand, Malaysia, Pakistan, Vietnam, Korea, Bangladesh, Other Asia, Cuba, Guatemala, Mexico, Argentina, Brazil, Chile, Other Latin America, South Africa, Kenya, Zimbabwe, Algeria, Malawi, Tanzania, Egypt, Mauritius, Rest of Africa, Turkey, Saudi Arabia, and Other Near Eastern countries. In addition to these countries, analysis of trade liberalization on the African, Caribbean and Pacific (ACP) countries and Small Island States (SIS) aggregate was also conducted, including an analysis of the effects on these aggregates from revision of the ACP/EC Protocol.

A multi-region, non-spatial equilibrium model of the world sugar market was developed in order to project future prices, production, consumption, stock changes, and net trade under various scenarios. Supply, demand, and stock change elasticities were obtained for each country/region either through direct estimation or from prior studies. Projection information on real per caput GDP, population, and tariff changes were derived from published data. Parameters for supply changes were derived from estimated trend coefficients of econometric models of production and from expert opinions of observers of the sugar industry. Income elasticities by country were obtained from Food and Agriculture Organization of the United Nations (FAO) and from estimates obtained from econometric analysis of consumption. The projection information was then used to simulate prices, production, consumption, stock changes, and net trade by country/region to 2000 and 2005 under the various scenarios.

The main results of this study may be summarized as follows:

1. The world sugar price (assuming full implementation of the UR) is projected to increase to $0.123 per pound from the baseline of $0.119 in 1993-95. Compared to the case of no change in tariffs to 2000, the effect of the UR Agreement is to raise the real world sugar price 7.0 percent. Production is expected to decline in the United States, EC, Japan, Australia, China, Indonesia, the Philippines, Mexico, Brazil, and South Africa as a result of the UR Agreement. Consumption would rise mainly in the United States and Japan because of reduced domestic prices. Imports would increase in the United States, China, Indonesia, and the former USSR because of the UR Agreement. Exports would be lower in the EC, Australia, Mexico, and Brazil as a result of the UR Agreement; however, exports are projected to be higher in Cuba and Pakistan as a result of the UR Agreement because of unchanged tariffs to 2000.
2. The baseline price is projected to decrease to $0.120 assuming continuation of the UR Agreement to 2005. Production and consumption are projected to be higher for most countries. The largest increase in imports is projected to occur in the former USSR because of decreased production. Australia, Cuba, and Brazil are projected to have large increases in exports.
3. With global trade liberalization, the world price is projected to increase 43.2 percent to $0.172 from a baseline projected price of $0.120.The gains from freeing up trade would be large. The gains would be especially great in many of the Latin American and Caribbean countries where production and exports would rise as a result of an increase in world price, assuming that transfers to ACP and SIS are not eliminated. The United States, Japan, India, and Pakistan would experience the largest increase in imports.
4. Under partial global trade liberalization (20 percent reduction in tariffs across the board), the world price would increase by 6.4 percent compared to the case of no further trade liberalization to 2005. A very similar pattern of changes in production, consumption, and net trade occurs compared to the complete liberalization scenario. In neither case are changes in stock changes from the baseline large
5. Under complete and partial trade liberalization of the developed countries (i.e. United States,. Canada, EC, other Western Europe, Australia, New Zealand, Japan, South Africa, and Israel), the world price rises by 9.8 percent and 0 percent, respectively, compared to the baseline price of $0.120. With minor exceptions, production would fall, consumption would rise, and net trade would decline in the developed countries; in contrast, production would rise, consumption would fall, and net trade would increase in many of the other countries. As in the other cases, the United States and Japan would experience significant increases in imports while the EC, Mexico, and Brazil show large increases in exports.
6. Complete and partial trade liberalization in selected developing countries (i.e. Brazil, China, India, Indonesia, and the Republic of Korea) would cause the world sugar price to rise 16.7 percent and 1.1 percent, respectively, compared to

the baseline price of $0.120. Aside from the Republic of Korea, production would fall, consumption would rise, and net trade would fall in all of these developing countries. The United States, EC, Philippines, India, Indonesia, China, Argentina, and Mexico would experience relatively large changes in net trade.

7. For the ACP countries, the impact of the UR Agreement will be to increase production, lower consumption, and increase exports. Producers receive preferential prices in the EC and United States for large proportions of sugar exported to those countries; however, the impact of the URA agreement will be to increase total revenue from exports slightly (by about 1 percent). Similar effects are expected in the case of the SIS aggregate, with a 3.3 percent increase in expected export earnings as a result of the URA agreement
8. With no change in transfers, ACP producers would gain under complete and partial trade liberalization and under complete and partial trade liberalization in the selected large developing countries. They would lose under continued market reform in developed countries and they would lose with reduction in transfers from the EC and United States with partial trade liberalization. Assuming a 20 percent decrease in transfers to ACP countries with partial global trade liberalization, export earnings to ACP countries would decline by about 7 percent. Exports would rise in all cases except for trade liberalization only in the developed countries.
9. As in the case of the ACP countries, the SIS producers gain under both total and partial global trade liberalization as well as total and partial liberalization in the large developing countries (assuming no change in export subsidies). However, the SIS lose with trade liberalization of developed countries. Under partial global trade liberalization with a 20 percent reduction in transfers from the EC and the United States, export earnings for the SIS would decline by only about 2.1 percent. The SIS aggregate could lose about 4 percent of export earnings over the current status quo (continuation of the URA to 2005) with complete trade liberalization and with complete elimination of transfers.
10. A comparison of export earnings by ACP countries and SIS aggregate under complete trade liberalization indicates that the combined value of transfers from the EC and United States to these countries is worth between 27-31 percent of the value of their export earnings.

INTRODUCTION

The purpose of this report is to summarize and discuss the findings of a study of trade liberalization of the world sugar market. Few studies have undertaken an analysis of the impact of the Uruguay Round (UR) agreement at the individual country level. Moreover, there is a dearth of studies on the possible effects of further trade liberalization and agricultural policy reforms on the world sugar market and on both developed and developing countries. A quantitative analysis of further liberalization will be useful to policymakers in the next round of multilateral trade negotiations.

In the next section, the salient features of the sugar economy are summarized. The third section describes the economic model used to quantify trade liberalization of the world sugar market. The fourth section presents parameter values for the baseline projections. The fifth section presents projection results for 2000 assuming full compliance with the present URA provisions. This section also contains a discussion of the likely impact of the URA policy provisions on world price and production, consumption, stock changes, and net trade at the country level. In the sixth section, results are presented for different trade liberalization scenarios, including complete and partial global trade liberalization. The seventh section discusses implications of trade liberalization for the ACP countries and the Small Island States (SIS) aggregates, including implications for revision of the ACP/EC Protocol. The eighth section discusses possible implications of the regional trade liberalization on developing and ACP countries. The final section offers some concluding observations.

The World Sugar Market

Sugar is important to the world economy. For 1993-95, world sugar production totalled 112.5 million metric tons (MT) with world trade some 28 percent of world production for those years. Despite the significance of trade, the world sugar economy is characterized by heavy government intervention both domestically and internationally.

Sugar is produced from both sugar cane and sugar beets. Sugar cane is grown primarily in tropical and sub-tropical climates while sugar beets are grown where the climate is more temperate. Some countries (e.g. United States) produce significant amounts of both crops while others specialize in production of either cane (e.g. Brazil) or beets (e.g. European Community (EC)). Lower-income countries, which rely more heavily on sugar as a source of income, tend to have fewer tariff barriers than high-income countries which more heavily subsidize domestic production – often at the expense of domestic consumers (Devadoss and Kropf,1996). In addition, protective domestic support policies for sugar have encouraged growth in HFCS consumption, especially in the United States and Japan.

The policy provisions of the UR for agriculture include market access, domestic support, and export competition provisions. The UR Agreement is a first step at addressing trade barriers between countries by attempting to convert market distortions to tariff equivalents. In most instances, tariff equivalents were derived based on the difference between internal prices and external or border prices (Santana-Boado, 1995). Countries participating in the agreement committed themselves to replacing non-tariff barriers with tariffs and then reducing these tariff equivalents over a period of time. Reduction commitments are expected to be achieved through reducing domestic price supports (e.g. United States, Japan), reducing aggregate measures of support (e.g. Australia, EC, Brazil), or through reducing export subsidies (e.g. EC, Brazil).

Aside from tariff reduction commitments, the United States and EC are subject to the market access provision of minimum imports of 3 percent of consumption, which becomes 5 percent at the end of 2000. The United States provides access to its market through quota allocations to specific countries at reduced import duties. The EC also provides access to its market through special preferences to exporting countries, especially the ACP countries. For a certain quota, ACP countries are able to sell without paying any import duty. For certain quantities above the fixed quota of about 1.3 million MT, ACP countries can

sell at a reduced duty of about 85 percent of the EC reference price (Santana-Boado, 1995). These regulations complicate the analysis somewhat and are considered in more detail in a later section of this report.

The Economic Model

The model is a multi-region, non-spatial equilibrium model, consisting of production, consumption, and stock demand equations for each country/region. Supply and demand relationships are intended to depict market behaviour for raw sugar. Quantity produced and consumed of sugar is the raw equivalent of all sugar products. Sugar cane and sugar beets are combined into one supply response relationship. Demand for sugar is derived from final uses of sugar, both direct and indirect. The stock equations reflect combined public and private stock-holding behaviour. Net trade (exports less imports) is determined from the identity:

$$(1)\quad S - D - dI = NT$$

where S is total production, D is consumption, dI is the difference between end-of-the year and beginning-of-the year inventories, and NT is net trade.

For the most part, supply, demand, and stock demand equations were estimated econometrically with time series data. The behavioural equations estimated had the general form:

$$(2)\quad S = S(LP, t)$$
$$(3)\quad D = D(P, Y, POP, t)$$
$$(4)\quad I = I(LI, D, P)$$

where P is the real sugar price, LP is the lagged sugar price, Y is per caput income (GDP per capita), POP is population, t is a linear time trend, I is end-of-the year inventories, and LI is lagged inventories (or beginning-of-the year inventories). Given estimates of production, consumption, and stock changes (computed from (4)), equation (1) is used to compute net trade for each country/region.

To implement the model empirically, the econometric estimates are first converted to price and income elasticities because the units are dimensionless. Also, because the model is used to project from a given base period (i.e. 1993-95), it is useful to express the behavioural relationships as deviations from the base period. Therefore, equations (1)-(4) can be expressed more concretely as follows:

$$(5)\quad S_0(\Delta S/S_0) - D_0(\Delta D/D_0) - dI_0(\Delta dI/dI_0) = NT_0(\Delta NT/NT_0)$$
$$(6)\quad \Delta S/S_0 = \varepsilon(\Delta P/P_0) + \varepsilon_t \Delta t$$
$$(7)\quad \Delta D/D_0 = \eta(\Delta P/P_0) + \eta_y(\Delta Y/Y_0) + \Delta POP/POP_0$$
$$(8)\quad \Delta dI/dI_0 = \delta_d(\Delta D/D_0) + \delta_p(\Delta P/P_0)$$

where "Δ" means change from the base period, the zero subscript refers to the base period, ε is the price elasticity of supply, ε_t is the elasticity of supply with respect time (a proxy for technical change), η is the price elasticity of demand, η_y is the income elasticity of demand, δ_d is the elasticity of stock change with respect to consumption, and δ_p is the elasticity of stock change with respect to sugar price.

With the wedge between the border or world price, Pw, and interior price, P, expressed in terms of an ad valorem tariff, each country's domestic (interior) price can be related to the world price as follows (Shui, Wohlgenant, and Beghin 1993):

$$P = (1 + T)P^w$$

or, expressing this relationship in proportionate changes, we have

$$(9)\quad \Delta P/P_0 = \Delta P^w/P_0{}^w + [T_0/(1 + T_0)](\Delta T/T_0)$$

where T is the ad valorem tariff and the zero subscript refers to the base period when the tariff is applied.

The final equation of the model is the market clearing condition that the sum of all net trade across countries equal zero, i.e.

$$(10)\quad \sum S_0(\Delta S/S_0) - \sum D_0(\Delta D/D_0) - \sum dI_0(\Delta dI/dI_0) = \sum(\Delta NT/NT_0)$$

where the summation sign refers to summation across all countries. Given equations (5) – (10); base quantities for production, consumption, change in stocks; elasticities of the supply and demand relations; and values for tariffs in the base year; projections can be made of change in world price and production, consumption, stock changes for each country over a given time horizon for a given change in tariffs.

PARAMETER VALUES AND PROJECTION ASSUMPTIONS

Data used to develop parameter estimates and baseline quantities for the model were provided by FAO. The basic data are supply and demand balances for sugar and primary production data for sugar cane and sugar beets obtained from FAOSTAT for calendar years 1970-95. For the most part, price data were obtained in local currencies and then converted to US dollars

using International Monetary Fund (IMF) exchange rates. For country aggregates, indices of weighted averages of prices for individual countries were derived.[6]

Table 1 shows the average production, consumption, stock changes, and net trade values for 1993-95 in each of the 42 countries/regions covered in the study. The individual countries included in the model cover the major sugar producing and consuming countries in the world. The average world price over this time period (in 1995 US dollars) was $0.119 per pound, or approximately $262 per MT.

Per caput GDP and population values for 1995 and projections for 2000 and 2005 are presented in table 2. GDP values come from the World Bank and population values were obtained from FAO.

Table 3 contains ad valorem equivalent tariffs under the UR for major countries and regions. Tables 4-6 contain ad valorem equivalent tariffs for the individual countries within each of the aggregate regions: other Western Europe, other Eastern Europe, other Asia, other Latin America, rest of Africa, and other Near East. As indicated previously, these tariffs are intended to represent market distortions between each country's internal price and the border (world) price. These data were obtained from schedules published by Santana-Boado (1995) and the International Sugar Organization (ISO). Tariffs for individual countries within each region aggregate are left disaggregated until simulations are performed. The proportionate change in tariff for a given region is computed by taking a simple average of the proportionate changes in tariffs of all countries within the region.[7] Note also that in some instances (e.g. other Oceania) there are no tariffs available. This is because, for the most part, these countries (or regions) are not members of WTO.

Table 7 lists the basic elasticities of supply and demand used in the simulation model. Econometric estimates were obtained for all the stock equations and for many of the supply and demand equations. Details of the econometric analysis are contained in the appendix tables A.1 – A.3. A comprehensive study of demand and supply for major Asian and Pacific countries (Australia, China, Fiji, India, Indonesia, Japan, Pakistan, Philippines, and Thailand) was conducted by FAO in late 1997, so elasticities from this study were used for those countries. In some instances, it was not possible to obtain reasonable econometric results, so elasticities from previous studies were used – see elasticity source in table 7.
Production growth rates (also shown in table 8) were derived for each country/region in order to project future sugar supply from technical change. Overall, the estimated growth rates represent the combined effects of technical change and other non-price factors influencing growth over time.[8]

In some countries, especially the EC, commitments to reductions in export subsidies are significant. The EC agreed to reduce the total value of export subsidies by 36 percent from 776.5million ECU to 497.0million ECU by 2000. The EC also agreed to reduce the quantity of exports subsidized by 21 percent from 1560.4 MT in 1995 to 1277.4 MT in 2000. Subsidized exports account for about 20 percent of all exports (with an export volume of about 7.5 million MT) and subsidized exports as a value of all production in the base year were estimated to be 35 percent. Therefore, in order to achieve the required reduction in export subsidies, supply would need to be decreased (vertically) by 9 percent. Therefore, the effect of a decrease in EC subsidies was taken into account by shifting the supply curve horizontally to the left by multiplying the supply elasticity by 9 percent.

A final special consideration in modelling the impact of trade liberalization on the world sugar market is to recognize that certain ACP countries export a large share of their sugar to the EC and United States where they receive substantially reduced duties. In particular, both Mauritius and Fiji export about 98 percent of their production. Of this 98 percent, Mauritius sells 80.2 percent to the EC as "Preference Sugar," 14.9 percent as "Special Preference Sugar," 4 percent to the United States under the Tariff Rate Quota (TRQ), and 1 percent on the world market. Fiji sells about 41.3 percent to the EC as "Preference Sugar," 8 percent as "Special Preference Sugar," 3.7 percent to the United States under the TRQ, and 47 percent on the world market. The export effects of these two countries were handled by calculating a blended price of exports sold on the various market outlets and by multiplying the changes in this blended price by each country's elasticity of supply.[9]

Finally, in developing the projections to 2000 and 2005, there were assumed to be no further changes in agricultural policy and no other changes in supply, demand, or stock changes not already accounted for by production growth, income

[6] In some instances, price data were deemed unreliable (either because the original price data may not be representative of actual market transactions or because the actual exchange rates are different than the official rates). In such cases, where price data were needed, either price data reported in local currency were used or the world sugar price (as reported by USDA, "World Agricultural Supply and Demand Estimates" WASDE-341, August 12, 1998), was used instead.

[7] The formula used to compute the proportionate change in tariff for an aggregate of countries within a region is:
$\{\Sigma[T/(1 + T)](\Delta T/T)\}/n$, where n is the number of countries within the aggregate.

[8] Other factors include, but are not necessarily limited to, changes in input costs, changes in other product prices, and changes in agricultural policies. While elasticities with respect to fertilizer prices are available, recent changes in prices suggest that, aside from abrupt changes in energy prices, future fertilizer price changes would have a small effect on future production. With respect to other commodity prices, because these commodity prices are also affected by future changes in GATT, any possible influence of other prices on supply response.were ignored. If other commodity prices change little (in real terms), then ignoring these effects will have negligible effects on supply forecasts.

[9] The formula used to calculate the blend price is given in the section entitled, "Impact of Trade Liberalization on ACP and Small Island States (SIS)."

changes, or population changes.[10] Moreover, all the elasticities were assumed to remain constant over the projection periods. [11]

PROJECTIONS TO 2000 UNDER THE UR AGREEMENT

Given the previous projection assumptions, the economic model of the world sugar market was used to simulate effects of the UR to 2000. [12]Table 9 gives projections under the UR Agreement assuming full compliance to the reduced commitments indicated in tables 4-6. The world price under this scenario is expected to increase approximately 3.2 percent from its base in 1993-95, or increase to $0.123 from $0.119 in 1993-95. Production and consumption are expected to rise in many countries over this time period. Production is expected to fall only in the United States, the former USSR, Argentina, Zimbabwe, and Mauritius; consumption is expected to fall only in the former USSR. For net importing countries, imports are projected to increase for all countries. Exports are expected to decline in many countries; the exceptions to this are Australia, Fiji, Thailand, Pakistan, Cuba, Guatemala, Mexico, Brazil, and South Africa.

To estimate the impact of UR alone on price and on quantities, it is necessary to compare the projections under the UR Agreement with those assuming no change in tariffs. Table 10 presents projection results by country under this scenario, and table 11 shows the effects on production, consumption, stock changes, and net trade due to reduced commitments under the UR. In the counter-factual situation of total non-compliance to the UR the world price decreases to$0.115 in 2000 from $0.119 in the base period. The projected increase to $0.123 under the UR Agreement is very close to FAPRI's projection of $0.124 and to Devadoss & Kropf's estimate of $0.120 to 2000. Compared to the case of non-compliance to the UR, the world sugar price is expected to increase 7.0 percent due to the UR Agreement. This is smaller than Devadoss and Kropf's estimates of 8.8 percent, but it is larger than UNCTAD's estimate of 5 percent (Santana-Broado, 1995). Table 11 shows the impact on different quantities by country from the UR Agreement. Production would be lower in many countries, including the United States, EC, Japan, Australia, China, Indonesia, the Philippines, Mexico, Brazil, and South Africa. This is because of reduced net domestic prices from decreased tariffs under the UR Agreement. For the EC, reduced export subsidies are a major contributing factor to reduced production. Consumption would be much higher in many countries because of lower (internal) prices to consumers.

The results with regard to net trade changes are broadly consistent with other studies by Devadoss & Kropf and Tuan, Fan, and Zhi. Imports in the major net importing countries of United States, China, and Indonesia would be expected to be higher as a result of the UR Agreement because of increased consumption due to lower interior prices. One major disagreement with Devaadoss and Kropf is that they indicate smaller imports in Japan with UR, while these results indicate imports would be higher as a result of the UR. In the major net exporting countries of EC, Australia, and Brazil, exports would be lower because of lower production and higher consumption. In contrast to Devadoss & Kropf, Cuba is projected to have higher exports as a result of the UR Agreement. Because this country does not have reduction commitments under the UR, production would rise and consumption would fall under the UR Agreement, so that with negligible changes in stock changes exports would be expected to be higher under the UR Agreement. Thus, the directions of changes predicted by the model appear reasonable.

TRADE LIBERALIZATION TO 2005

This section presents a number of trade liberalization scenarios, assuming for the baseline projections a continuation of the UR Agreement to 2005. These baseline quantity projections are presented in table 12. The baseline price for 2005 is projected to be $0.120, or about 2.8 percent below the 2000 price of $0.123, assuming full compliance with the UR Agreement. With the exception of the EC, other Western European countries, the former USSR, Argentina, Chile, Zimbabwe, and Mauritius, production is projected to be higher for 2005 compared to 2000. Changes in consumption are also expected to be positive for most countries because of population and income growth. The United States is expected to show an increase in imports, and it will remain above the 3 percent minimum access level. The largest increase in imports is projected for the former USSR due to decreased production. Australia, Cuba, and Brazil are projected to have large increases in exports to 2005.

Complete Global Trade Liberalization

Table 13 shows the effect on production, consumption, stock changes, and net trade assuming trade barriers between all countries are eliminated. The world price of sugar would rise to $0.172 per pound, which represents a 43.2 percent increase in price compared to the baseline price of $0.120 for 2005.

Table 14 shows the net effect of complete trade liberalization on production, consumption, stock changes, and net trade. In many countries, production would fall and consumption would rise as a result of complete trade liberalization. This is because of reduced tariffs and relatively high protection rates.

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[10] For many of the estimated demand functions for sugar, time trends were included in the econometric analysis to control for taste changes and other factors shifting demand over time. These trend effects are assumed to be zero for projection purposes. Also, for the United States the price of maize (a proxy for HFCS) was found to be a significant determinant of demand. An analysis of recent maize prices, however, suggested that the overall effect on demand would be small so this effect has also been ignored in the projections.

[11] In other words, elasticities are assumed to be constant rather than variable, as is often done by linearizing the supply and demand functions around the base period quantities and prices. Given the length of the time horizon for projections, it seemed more prudent to assume constant elasticities in developing future forecasts of the endogenous variables.

[12] In applying the simulation model at the base quantities, equation (10) was not completely satisfied because of exclusion of some (small) countries from the model and because of the cumulative effects of errors in production, consumption, stock changes, and net trade reporting in each country. This error, NT = -2253991, is only about 5% of total imports and was not accounted for in the simulations.

Of the major exporting countries (i.e. countries with production greater than 1 million MT), Australia, Brazil, Cuba, and the EC are projected to show increases in both production and exports. While only modest increases in production for these countries are expected (i.e. around 2 percent increase), exports in the EC are projected to increase 22 percent. Guatemala's production would also increase about 2 percent from its baseline projection to 2005, but its exports are projected to decline slightly by 3.4 percent under complete trade liberalization. In contrast to the other major exporting countries, Mexico, South Africa, and Thailand are projected to decrease production and exports under complete trade liberalization. Although the changes for South Africa and Thailand would be small (i.e. less than 1 percent), the changes for Mexico would be large. Production in Mexico would decline 13 percent and exports would decline 141 percent. Indeed, under this scenario, Mexico could possibly become a net importer. The reason for this is the relatively high protection rate in Mexico so that elimination of tariffs would decrease production. At the same time, a lower internal price of sugar would increase consumption, the net effect of which would be to drastically reduce net exports.

Of the major net importing countries (i.e. countries with consumption greater than 1 million MT), India, Indonesia, Japan, Pakistan, and the United States are projected to increase consumption because of lower internal prices. Japan would show the largest percentage increase of 23 percent, followed by India with 11 percent and the United States with 6 percent. Argentina, China, the Philippines, Poland, and the former USSR are projected to decrease consumption because internal prices are projected to rise in those countries. The largest percentage decrease in consumption would occur in Argentina (10 percent). Net imports would also increase in India, Indonesia, Japan, Pakistan, Poland, and the United States. The largest increases would be in India (315 percent), Pakistan (64 percent), Japan (37 percent), and the United States (35 percent). The largest decreases in imports would occur in the Philippines (134 percent) and Argentina (36 percent).

Partial Global Trade Liberalization

The effects of partial global trade liberalization are examined assuming a uniform 20 percent reduction in tariffs across all countries. The results of this simulation are shown in tables 15 and 16. The world sugar price is projected to rise 6.4 percent to $0.128 per pound compared to the 2005 baseline price of $0.120.

The same pattern of changes occurs under partial trade liberalization as under complete trade liberalization, except that the magnitude of the changes are much smaller as one might expect. The largest changes in production and exports that would occur among major exporting countries would be in Mexico, where production would decline by 3 percent and exports would decline by 28 percent. In the EC, production would increase by only 0.4 percent and exports would increase only 4.4 percent. For the major net importing countries, Japan's consumption would increase 4.5 percent. Net imports would increase by 63 percent in India, by 13 percent in Pakistan, and by 7 percent in the United States. Consumption would decrease at most by 2 percent in Argentina and net imports would decrease at most by 27 percent in the Philippines. Imports in Argentina would decline by only 7 percent and by only 4 percent in China.

Complete and Partial Trade Liberalization in (Industrialized) Developed Countries

This section considers the impact of complete and partial (20 percent reduction in all tariffs) in the developed countries: United States, Canada, EC, other Western Europe, Australia, New Zealand, Japan, South Africa, and Israel.[13] Tables 17-18 contain the effects on all countries for complete trade liberalization in all the developed countries; tables 19-20 contain the effects on all countries for partial trade liberalization in all the developed countries.

In the case of complete liberalization, the world price increases to $0.135 compared to the baseline of $0.120, implying price would rise 9.8 percent if trade was completely liberalized in the developed countries. Tables 17 and 18 show that production would fall and consumption would rise (except for Canada, EC, other Western European countries, and Australia), and net trade would decline in all developed countries (except for Canada, EC, and New Zealand); in contrast, production would rise, consumption would decline, and net trade would increase in many other countries. Among the major exporting countries, the largest increases in production and exports would occur in Mexico (11 percent and 120 percent, respectively). On the other hand, the EC would experience the largest reduction in production and exports (6 percent and 64 percent, respectively). For the major importing countries, consumption would fall in all countries except Japan and the United States (increases of 50 percent and 21 percent, respectively). Net imports would also decline in all major importing countries except Japan and the United States (80 percent and 117 percent, respectively). The largest decreases in imports would occur in India (285 percent), the Philippines (133 percent), Indonesia (104 percent), and China (78 percent). All these countries except Japan and the United States would experience price increases because trade would only be liberalized in developed countries.

For partial liberalization in the developed countries, price would essentially remain unchanged if tariffs were reduced by 20 percent in the developed countries. Tables 19 and 20 indicate the same directions of effects in all countries, but with substantially smaller changes compared to the case of complete trade liberalization. Mexico's production and exports would increase by 2 percent and 24 percent, respectively; production and net exports in the EC would decline by 1 percent and 13 percent, respectively. Of the major importing countries, consumption would increase at most 10 percent in Japan and imports would increase by at most 23 percent in the United States. India and the Philippines would experience the largest decreases in imports of 57 percent and 27 percent, respectively.

Complete and Partial Trade Liberalization in Selected Developing Countries

The final set of trade scenarios to consider in this section consists of complete and partial trade liberalization in the developing countries of Brazil, China, India. Indonesia, and the Republic of Korea.

[13] Israel is included in the category "other near eastern countries"; in calculating the impact of a change in tariff for these scenarios, the formula in note 3 was used with the proportionate change in tariffs of the other countries within that region set to zero.

In the case of complete trade liberalization in these developing countries, the world sugar price would increase to $0.14 per pound from the baseline price of $0.120, for an increase of 16.7 percent. The trade patterns in tables 21 and 22 show that, aside from China, India, Indonesia, and Brazil, production would rise, consumption would fall, and net trade would rise in all the developing countries being considered. China and India show the largest changes in absolute terms among the developing countries. The United States, EC, former USSR, Mexico, and other Latin America would gain the most in terms of increased production and net trade.

Among the major exporting countries, production would increase by as much as 17 percent in Mexico and net exports would increase by as much as 184 percent in Mexico and 50 percent in the EC. For the major net importing countries, India, Indonesia, and China would increase consumption by 31 percent, 18 percent, and 7 percent, respectively; Japan, Argentina, and the United States would decrease consumption by 16 percent, 10 percent, and 9 percent, respectively. Net imports would increase by 914 percent in India, 241 percent in Indonesia, and 147 percent in China. The Philippines, Pakistan, the United States, and Argentina would experience decreases in net imports of 205 percent, 89 percent, 48 percent, and 35 percent, respectively.

In the case of partial trade liberalization in these selected developing countries, the world sugar price would rise to $0.121 per pound, which implies an increase of 1.1 percent from the projected baseline price of $0.120. The effects on production, consumption, stock changes, and net trade (tables 23 and 24) have the same signs as those for the case of complete trade liberalization, but with smaller changes compared to the case of complete liberalization in these countries. Production would increase at most by 4 percent in Mexico and net exports would increase by 37 percent and 10 percent in Mexico and the EC. For net importing countries, consumption would increase by 6 percent in India, 4 percent in Indonesia, and 1 percent in China; consumption would fall at most by 6 percent in Pakistan. Net imports would increase by 183 percent in Indonesia, 48 percent in India, and 29 percent in China; in the other major net importing countries, imports would fall by 41 percent in the Philippines, 18 percent in Pakistan, 10 percent in the United States, and 7 percent in Argentina.

IMPACT OF TRADE LIBERALIZATION ON ACP AND SMALL ISLAND STATES (SIS)

Both the ACP and SIS aggregates are given preferential treatment in sugar trade. In the EC, the ACP countries can sell a certain quota without import duties (called “preferential sugar (PS)”); and for certain quantities above quota, the ACP countries can sell at reduced imported duties (called “Special Preference Sugar (SPS)”). The United States has a tariff rate quota (TRQ) on raw sugar. In essence , this policy gives quotas to certain countries selling sugar to the United States at reduced tariffs. While the EC market is the most important outlet for exports of ACP countries, a significant volume is also exported to the United States. In 1996, about 62 percent of the sugar exported from these countries went to the EC, 22 percent went to the United States, and the remaining 16 percent was sold on the world market (Ryberg).

In order to quantify the effects of trade liberalization on these countries, it is useful to view the price received by exporters from the countries receiving special treatment as a blended price. In other words, the price received by producers can be viewed as a weighted average of the price received for PS, net price received for SPS, the net price received under the TRQ, and the price received on the world market; that is,

$$Pacp = (Qps/Q)Peu + (Qsps/Q)(Peu - Tsps) + (Qus/Q)(Pus - Tus) + (Qw/Q)Pw$$

where Pacp is the weighted-average price received by ACP countries on exports, Peu is the EC guaranteed price, Pus is the United States price, Qps is the quantity of sugar sold under PS quota, Qsps is the quantity of sugar sold under SPS quota, Qus is the quantity of sugar sold under the TRQ, Qw is the quantity sold on the world market, Tsps is the import duty on SPS sugar, and Tus is the import duty on sugar imported into the United States under the TRQ.

ACP Countries

Aggregate production, consumption, and net trade in 1993-95 for the ACP countries[14] were 3263100 MT, 1382395 MT, and 1921383 MT, respectively.[15] In US dollars per metric ton, the EC price at about that time was $610, the US price was $421, and the world price was $262. The EC duty on SPS was$92/MT and the US duty for sugar under the TRQ was about $14/MT.[16] Based on data in “F.O. Licht’s International Sugar and Sweetener Report (FOL)”(April 14, 1997), it is estimated that about 23 percent of the total sugar sales to the EC are SPS, implying approximately 48 percent of total exports of ACP countries goes for PS, 14 percent for SPS, 22 percent for TRQ sales, and 16 percent for the world market. Given these proportions and the above price information, this implies (using the above formula) that the ACP blend price for exported sugar was about $497/MT in 1993-95. With an export volume of about 2.2 million MT in 1995, this implies total revenue from export sales of about $109 million compared with total revenue of about $58 million if it was all sold on the world market.

In order to project future changes in production and consumption, supply and demand elasticities for the ACP aggregate are required. Given that Fiji, Malawi, Mauritius, and Zimbabwe comprise a large proportion of production, consumption, and net trade in these countries, composite supply and demand elasticities of 0.17 and –0.13, respectively, were constructed by

[14] The ACP aggregate analyzed consists of Barbados, Belize, Fiji, Guyana, Cote D’Ivoire, Jamaica, Madagascar, Malawi, Mauritius, Zimbabwe, St. Kitts Nev, Swaziland, Tanzania, Trinidad & Tobago, and Zambia.

[15] Given the small share of stocks in production and consumption, changes in stocks are ignored in this analysis.

[16] Sources for these data include Agra Europe, “CAP Monitor,” August 19, 1997, and “F.O. Licht’s International Sugar and Sweetner Report,” April 14, 1997 for EU data; and USDA, “Sugar and Sweetner: Situation and Outlook,” May 1998 for the United States and world data. An exchange rate of $1.17/ECU was assumed in converting to US dollars.

taking quantity weighted shares of the individual country elasticities.[17] Exogenous changes to aggregate production and consumption of 0.39 percent and 2.4 percent , respectively, were estimated by regressing logarithms of production and consumption on prices (lagged price for production) and a linear time trend and using the coefficients on the trend variable to represent annual growth in supply and demand. Average tariff changes for the ACP countries for the various scenarios were constructed as an average of the changes across countries within the aggregate.[18]

Several scenarios were considered in the simulation of the impact of trade liberalization on the ACP countries and the results of these simulations are shown in table 25. The first two rows of the table show the probable impact of the UR Agreement on ACP countries. In the absence of the UR, production would be lower, consumption would be higher, and exports (net trade) would be lower. While the blend price would be higher in the absence of the UR, the world price would be lower. Because the percentage increase in exports is larger than the percentage change in blend price under the UR, producers can expect to gain about 1.2 percent of their export earnings due to the UR.

The third through seventh rows of table 25 show the effects of the various aggregate trade policies assuming no change in the status of the ACP protocol or the TRQ. Comparing rows 4-7 with row 3 suggests that ACP producers would gain under complete and partial global trade liberalization and under complete and partial trade liberalization in the selected large developing countries. They would lose under continued market reform in developed countries (because of lower internal prices in the EC and United States) and they would lose with reduction in transfers from the EC and United States. With a 20 percent decrease in transfers to ACP countries with partial global trade liberalization of 20 percent, export earnings to ACP countries would decline by about 7 percent. Exports would go up in all cases except for trade liberalization only in the developed countries and for partial trade liberalization in all countries. Under complete trade liberalization and complete elimination of transfers (last row), export earnings would fall by about 18 percent. A comparison of row 4 with row 11 in table 25 indicates that transfers under free trade would be approximately 27 percent of their export earnings, compared to the case of complete free trade.

SIS Aggregate

Aggregate production, consumption, and net trade for the SIS[19] in 1993-95 were 2100075 MT, 947440 MT, and 1205745 MT, respectively.[20] Although there are 25 countries included in this aggregate, Fiji and Mauritius account for about 81 percent of total exports. Because these two countries receive preferential trade concessions from the EC and United States, a blend export price was constructed as in the case of the ACP countries. Based on F.O. Licht's data, about 41.3 percent of Fiji's exports go for PS, another 8 percent for SPS, 3.7 percent for TRQ sales, and 47 percent are sold on the world market. It is estimated that 80.2 percent of Mauritius's exports are sold as PS, 14.9 percent are sold as SPS, 4 percent as TRQ to the United States, and only 1 percent are sold on the world market. Combining these two countries yields aggregate shares of 50 percent for PS, 9 percent for SPS, 3 percent for TRQ, and 38 percent for world sales.[21] Given this information and the price information reported in the previous section, the export blend price for SIS is estimated to be about $463, slightly lower than the ACP's average blend price of $497. With an export volume of about 1500000 MT in 1995, this implies export sales of about $69 million compared with total revenue of about $39 million if it was all sold on the world market.

Aggregate supply and demand elasticities for the SIS of 0.16 and –0.13, respectively, were constructed as quantity-share weighted sums of the elasticities for Fiji and Mauritius.[22] Per annum growth rates for exogenous shifts in supply and demand were estimated to be –2.0 percent and 2.1 percent, respectively. As in the case of the ACP countries, average tariff changes for the SIS were constructed for each scenario. The tariff schedules under the UR Agreement for the countries within this aggregate are in appendix table 5.

Table 26 presents the results for the same scenarios as the ACP countries. The effect of the UR on the SIS's export earnings is an increase of 3.4 percent. As in the case of the ACP, the SIS producers gain under both total and partial global trade liberalization as well as total and partial liberalization in the large developing countries (assuming no change in export subsidies). However, the SIS lose in both instances of trade liberalization of developed countries. As in the case of the ACP, export earnings would decline under trade liberalization with a 20 percent reduction in transfers from the EC and the United States. In this case, the blend price is projected to decrease about 4.5 percent, exports are projected to increase about 2.12 percent, and total revenue from export sales to decline by about 2.4 percent. With a complete elimination of transfers, total export earnings would decrease by 4 percent with the increase in exports of 10 percent offset by the decline in blend price of 13 percent. The value of transfers from the EC and United States would be approximately 31 percent of their export earnings under complete free trade.

IMPACT OF REGIONAL LIBERALIZATION IN SUGAR TRADE

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[17] Econometric estimates obtained directly with the aggregate data indicated an elasticity of supply of 0.08 and an elasticity of demand of –0.01. Since these estimates are too small, the constructed estimates based on aggregating over individual country elasticites were used.

[18] The formula used to compute the percentage changes in tariffs for the ACP aggregate is shown in note 3. Rates for the individual countries included in the calculation are shown in appendix table 4.

[19] The SIS aggregate consists of Antigua & Barbados, Bahamas, Barbados, Solomon Islands, Cape Verde, Cook Island, Comoros, Cyprus, Dominica, Dominican Republic, Fiji, Grenada, Haiti, Jamaica, Maldives, Malta, Mauritius, Vanuatu, Samoa, St. Kitts Nev, St. Lucia, St. Vincent, Sao Tome, Seychilles, and Trinidad & Tobago.

[20] As in the case of the ACP countries, changes in stock changes are ignored in the analysis.

[21] The estimates were obtained by multiplying each country's share by its share of exports in all SIS countries and adding the two results together. Fiji has 38% of total exports and SIS have43% of all exports.

[22] As in the case of the ACP countries, this approach produced more reasonable estimates of the elasticities. Econometric estimates with aggregate data indicated supply and demand elasticities of 0.04 and –0.005. respectively.

Regional trade liberalization in sugar trade for NAFTA, MERCURSOR, APEC, and ASEAN has potential implications for the ACP and SIS countries. In general, the effect of such regional trade associations is to create a free trade area within the trading area with a common external tariff on imports from non-member countries. The economic effect of establishment of such trade areas, if effective, is both to create and divert trade. Trade creation occurs as imports to a member nation increase as a result of elimination of trade barriers with other member countries; trade diversion occurs as imports from a member country displace imports from a non-member country. While the trade creation effect is generally positive for all countries, the trade diversion effect can have negative consequences for net exporting developing countries, and in particular individual ACP countries as we shall now discuss.

Of all the regional trade associations NAFTA is by far the largest and its full implementation by 2008 could have significant implications for the ACP countries. NAFTA creates a free trade area with the United States, Canada, and Mexico. Mexico is a net exporter of sugar and currently is a quota holder under the United States' TRQ. If Mexico is able to expand its production and exports to the United States and if the present TRQ system remains in effect, then it is possible for ACP countries to lose some access to the United States. Ryberg (1998) estimates that if USDA's projected increase of United States imports of 2.48 million MT for 2005 occurs, then Mexico's surplus production would have to increase to more than a million MT over the next ten years in order for the portion of the TRP available to the ACP countries to fall below their bounded percentages and amounts. USDA's projection of 2.48 million MT is very close to our projection of 2.52 million MT under continuation of the same tariff structure of the UR to 2005 (table 12). Mexico's exports are projected to be about 541, 000 MT in 2005 without any change in tariffs from the UR (table 12). Whether Mexico can increase its production capacity by some 400,000 MT so that the ACP countries' shares become in jeopardy is unclear. What appears to be more of a threat to ACP countries is the United States not increasing its imports by the amount projected but allowing Mexico to increase its imports. If that should occur, then ACP countries could lose some access to the United States under the TRQ. However, as Ryberg (1998, p.23) points out, granting Mexico increased access while reducing access by ACP countries constitutes a violation of the WTO's Article XIII's requirement of nondiscriminatory access under TRQ's and Article XXIV's requirement that free trade areas not raise barriers to trade with other WTO members.

CONCLUDING REMARKS

While many other simulations could be performed, it should be clear from the results presented in this report that there are significant gains to be reaped from trade liberalization, and that the UR Agreement has only moved us a small way toward total free trade. It was somewhat surprising to find that the effects of trade liberalization would be much more dramatic if the major developing countries would further liberate trade compared to the developed countries. However, because of the influence of government over trade in some of these countries, it is unclear whether the adjustments required to liberate trade to that extent would ever occur. Nevertheless, the simulations give some feel for the consequences of market incentives for trade flows among the different countries. Another striking feature of the various simulations is how unevenly distributed the consequences of trade liberalization would be if trade was only partially or completely liberated in particular countries. Overall, the simulation results clearly indicate that either complete or partial unilateral trade liberalization will have the least adverse distributional consequences for individual countries.

With respect to the ACP and the SIS aggregates, mixed results were also obtained. While both the ACP and SIS would lose from partial revision of the Protocol, the ACP would lose and the SIS would gain if the transfers were eliminated completely. What is significant to these countries, however, is the loss in transfers under complete free trade, which would be worth between 27-31 percent of the value of their export earnings under complete free trade.

Projections to 2000 and 2005 indicate that the raw sugar price is expected to only increase modestly from its level in 1993-95, assuming full compliance with the UR Agreement. These forecasts are quite close to others (e.g. FAPRI). While the model assumes a unitary elasticity of price transmission, the results appear quite robust to this assumption and the price changes presented can be viewed as lower bound estimates to the true effects. Therefore, the model can be quite useful for analysis of policy changes, particularly for the country and sub-aggregates analyzed here.

While the present model is intended to capture most of the policy distortions within the major countries though specification of ad valorem equivalent tariffs, the model does not capture the gains from reduction in total domestic support in the broader agricultural sector. In order to compute those gains, a CGE model would be required. What is clear, though, is that the gains from liberalizing trade would be expected to be even larger than those presented here.