EFFECTS OF TRADE LIBERALIZATION ON THE WORLD SUGAR MARKET WITH IMPLICATIONS FOR DEVELOPING COUNTRIES, ACP COUNTRIES, AND SMALL ISLAND STATES

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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 from the Uruguay Round (UR), (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, Indonesia, and 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: USA, Canada, European Union, 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 ACP countries and SIS aggregate was also conducted, including an analysis of the effects on these aggregates from revision of the ACP/EC Protocol. Also, a separate analysis was conducted on the impact of selected trade scenarios on individual ACP countries and developing export and import countries.

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 capita 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 elasticites by country were obtained from 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%. Production is expected to decline in the USA, EU, Japan, Australia, China, Indonesia, the Philippines, Mexico, Brazil, and South Africa as a result of the UR agreement. Consumption would rise mainly in the USA and Japan because of reduced domestic prices. Imports would increase in the USA, China, Indonesia, and the former USSR because of the UR agreement. Exports would be lower in the EU, Australia, Mexico, and Brazil as a result of the UR agreement; however, exports are projected to be higher in India and Cuba 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% 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 USA, Japan, and India would experience the largest increase in imports.

4. Under partial global trade liberalization (20% reduction in tariffs across the board), the world price would increase by 6.4% 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., USA,. Canada, EU, other Western Europe, Australia, New Zealand, Japan, South Africa, and Israel), the world price rises by 9.8% and 0% ,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 USA and Japan would experience significant increases in imports while the EU, 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% and 1.1%, respectively, compared to the baseline price of $0.120. Aside from Korea, production would fall, consumption would rise, and net trade would fall in all of these developing countries. The USA, former USSR, Mexico, and other Latin America countries would gain the most in terms of increased production and net trade.

7. Many developing export countries would benefit from trade liberalization because of relatively small trade barriers. Imports would decline for most developing import countries with a uniform reduction in tariffs across all countries. Imports would decline (rise) in China, India, and Indonesia if trade were liberalized in only industrialized (major developing) countries.

8. 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 EU and USA for large proportions of sugar exported to those countries; however, the impact of the UR agreement will be to increase total revenue from exports slightly (by about 1%) . Similar effects are expected in the case of the SIS aggregate, with a 3.3% increase in expected in export earnings as a result of the UR agreement.

9. 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 EU and USA with partial trade liberalization. Assuming a 20% decrease in transfers to ACP countries with partial global trade liberalization, export earnings to ACP countries would decline by about 7%. Exports would rise except for trade liberalization only in the developed countries, and partial and complete elimination of preferences under the ACP Protocol and USA TRQ.

10. Similar trade patterns would be exhibited across individual ACP countries as for the aggregate of all ACP countries. However, the impact on individual countries would be expected to be greater compared to the aggregate of all ACP countries. What is apparent from the various trade simulations is that ACP producers will likely continue to experience price erosion unless their preferences remain intact or trade with the major developing countries (India, China, Indonesia) is liberalized.

11. 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% reduction in transfers from the EU and the USA, export earnings for the SIS would decline by only about 2.1%. The SIS aggregate could lose about 4% of export earnings over the current status quo

(continuation of the UR to 2005) with complete trade liberalization and with complete elimination of transfers.

12. A comparison of export earnings by ACP countries and SIS aggregate under complete trade liberalization indicates that the combined value of transfers from the EU and USA to these countries is worth between 27-31% of the value of their export earnings.

13. Removal of trade barriers within common trading areas poses a threat to many developing countries, especially ACP countries. Full implementation of NAFTA by 2008 could provide increased access to the USA market by Mexico. If the USA maintains its import restrictions, this would limit access to the USA market by ACP countries. However, under trade liberalization the USA's imports would be projected to increase sufficiently to meet increased exports from Mexico as well as increased exports from ACP countries.

Effects of Trade Liberalization on the World Sugar Market

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 UR provisions. This section also contains a discussion of the likely impact of the UR 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 selected trade liberalization scenarios for trade in developing export and import countries. The eighth 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. Also, an analysis of the impact of selected trade liberalization scenarios on individual ACP countries is presented. The ninth 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 totaled 112.5 million metric tons (MT) with world trade some 28% 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., USA) produce significant amounts of both crops while others specialize in production of either cane (e.g., Brazil) or beets (e.g., European Union (EU)). 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 USA 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., USA, Japan), reducing aggregate measures of support (e.g., Australia, EU, Brazil), or through reducing export subsidies (e.g., EU, Brazil).

Aside from tariff reduction commitments, the USA and EU are subject to the market access provision of minimum imports of 3% of consumption, which becomes 5% at the end of 2000. The

USA provides access to its market through quota allocations to specific countries at reduced import duties. The EU 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% of the EU reference price (Santana-Boado, 1995). These regulations complicate the analysis somewhat and are considered in more detail in the last 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 behavior 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 behavior. Net trade (exports less imports) is determined from the identity:

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

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 behavioral equations estimated had the general form:

$$S = S(LP, t)$$
$$D = D(P, Y, POP, t)$$
$$I = I(LI, D, P)$$

where P is the real sugar price, LP is the lagged sugar price, Y is per capita 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 behavioral relationships as deviations from the base period. Therefore, equations (1)-(4) can be expressed more concretely as follows:

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

(6) $$\Delta S/S_0 = \varepsilon(\Delta P/P_0) + \varepsilon_t t$$

(7) $$\Delta D/D_0 = \eta(\Delta P/P_0) + \eta_y(\Delta Y/Y_0) + \Delta POP/POP_0$$

(8) $$\Delta dI/dI_0 = \delta_d(\Delta D/D_0) + \delta_p(\Delta P/P_0)$$

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, P^w, 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) $$\Delta P/P_0 = \Delta P^w/P_0^w + [T_0/(1 + T_0)](\Delta T/T_0)$$

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

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 IMF exchange rates. For country aggregates, indices of weighted averages of prices for individual countries were derived.[1]

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.

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[1] 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.

Per capita 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 all 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.[2] 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.[3]

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

A final special consideration in modeling 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 EU and USA where they receive substantially reduced duties. In particular, both Mauritius and Fiji export about 98% of their production. Of this 98%, Mauritius sells 80.2% to the EU as "Preference Sugar,"

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

[3] 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 was ignored. If other commodity prices change little (in real terms), then ignoring these effects will have negligible effects on supply forecasts.

14.9% as "Special Preference Sugar," 4% to the USA under the TRQ, and 1% on the world market. Fiji sells about 41.3% to the EU as "Preference Sugar," 8% as "Special Preference Sugar," 3.7% to the USA under the TRQ, and 47% 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 countries elasticity of supply.[4]

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 changes, or population changes.[5] Moreover, all the elasticities were assumed to remain constant over the projection periods.[6]

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. [7] 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% 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 USA, 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% due to the UR agreement. This is smaller than Devadoss and Kropf's estimates of 8.8%, but it is larger than UNCTAD's estimate of 5% (Santana-Broado, 1995). Table 11 shows the impact on

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[4] 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)."

[5] 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 USA 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.

[6] 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.

[7] 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.

different quantities by country from the UR agreement. Production would be lower in many countries, including the USA, EU, 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 EU, 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 USA, 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 EU, Australia, amd 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 UR , 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% below the 2000 price of $0.123, assuming full compliance with the UR agreement. With the exception of the EU, 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 USA is expected to show an increase in imports, and it will remain above the 3% 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% 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 initially relatively high protection rates.

In countries with small trade barriers, price increases lead to decreases in consumption and increases in production. [8] This occurs predominately in Latin American and Caribbean countries, other Oceania, Asian, and Near Eastern countries. The USA, Japan, and India experience the largest increases in imports because of relatively high consumer response to price changes. Notice also that, as in the other projections, the policy change would have little impact on stock changes.

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[8] Trade liberalization is only assumed for those countries that belong to the WTO. Therefore, production increases and consumption decreases can be expected for those countries not belonging to the WTO.

Partial Global Trade Liberalization

The effects of partial global trade liberalization are examined assuming a uniform 20% 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% to $0.128 per pound compared to the 2005 baseline price of $0.120. Most quantity changes have the same sign as in the case of total liberalization.

Complete and Partial Trade Liberalization in (Industrialized) Developed Countries

This section considers the impact of complete and partial (20% reduction in all tariffs) in the developed countries: USA, Canada, EU, other Western Europe, Australia, New Zealand, Japan, South Africa, and Israel.[9] 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% 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, EU, other Western European countries, and Australia), and net trade would decline in all developed countries (except for Canada, EU, and New Zealand); in contrast, production would rise, consumption would decline, and net trade would increase in many other countries. As in the other cases, the largest changes in imports occur in the USA, Japan, India, and China. Large decreases in exports would occur in the EU and Australia. India, Mexico, and Brazil would experience large increases in exports.

For partial liberalization in the developed countries, price would essentially remain unchanged if tariffs were reduced by 20% 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.

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.

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%. 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 among the developing countries. The USA, EU, former USSR, Mexico, and other Latin America would gain the most in terms of increased production and net trade.

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% 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.

Implications for Developing Export and Import Countries

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[9] 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.

Tables 25 and 26 summarize the main effects of trade liberalization on net trade of the developing export and import countries. Most countries would expand exports under the various trade scenarios from the year 2000. An important exception is Malawi, which would become a net importer except under the complete free trade liberalization with the reduced duties to the EU and TRQ in the USA remaining intact. Because of relatively small trade barriers in many of the developing export countries, higher world prices as a result of trade liberalization would lead to larger exports.

Another important exception to increased exports is Mexico. With uniform reduction in tariffs across all countries (i.e., Complete Trade Liberalization and Partial Trade Liberalization), exports would go down and Mexico could possibly become a net importer under Complete Trade Liberalization. However, if only the industrialized (developed) countries liberated trade or only the major developing countries liberated trade, Mexico's exports would expand dramatically. The reason Mexico's exports would gain under these scenarios is because it would still be protected by its relatively high tariffs if trade were liberated in industrialized countries and in other major developing countries. In addition, Mexico has the production capacity to expand sugar production relative to many other countries, as indicated by its relatively large supply elasticity (Table 7).

Table 26 reveals that with the exception of Kenya, Tanzania, and Zimbabwe, imports would fall under a uniform reduction in tariffs across all countries (relative to 2005). This is because elimination of tariffs leads to an expansion of production which exceeds increases in consumption in these countries. Imports in China, India, Indonesia, and the Philippines would drop dramatically if tariffs were only lowered in the industrialized countries (in fact, India, Indonesia, and the Philippines would become net exporters). In contrast, imports would rise in many countries (most notably China, India, and Indonesia) if tariffs were only decreased in the major developing countries.

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 EU, 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 USA has a tariff rate quota (TRQ) on raw sugar. In essence, this policy gives quotas to certain countries selling sugar to the USA at reduced tariffs. While the EU market is the most important outlet for exports of ACP countries, a significant volume is also exported to the USA. In 1996, about 62% of the sugar exported from these countries went to the EU, 22% went to the USA, and the remaining 16% 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,

$$P_{acp} = (Q_{ps}/Q)P_{eu} + (Q_{sps}/Q)(P_{eu} - T_{sps}) + (Q_{us}/Q)(P_{us} - T_{us}) + (Q_w/Q)P_w$$

where P_{acp} is the weighted-average price received by ACP countries on exports, P_{eu} is the EU guaranteed price, P_{us} is the USA price, Q_{ps} is the quantity of sugar sold under PS quota, Q_{sps} is the quantity of sugar sold under SPS quota, Q_{us} is the quantity of sugar sold under the TRQ, Q_w is the quantity sold on the world market, T_{sps} is the import duty on SPS sugar, and T_{us} is the import duty on sugar imported into the USA under the TRQ.

ACP Countries

Aggregate production, consumption, and net trade in 1993-95 for the ACP countries[10] were 3263100 MT, 1382395 MT, and 1921383 MT, respectively.[11] In US dollars per metric ton, the EU price at about that time was $610, the US price was $421, and the world price was $262. The EU duty on SPS was $92/MT and the US duty for sugar under the TRQ was about $14/MT.[12] Based on data in "F.O. Licht's International Sugar and Sweetner Report (FOL)"(April 14, 1997), it is estimated that about 23% of the total sugar sales to the EU are SPS, implying approximately 48% of total exports of ACP countries goes for PS, 14% for SPS, 22% for TRQ sales, and 16% 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 taking quantity weighted shares of these individual country elasticites.[13] Exogenous changes to aggregate production and consumption of 0.39% and 2.4% , 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.[14]

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 27. 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% of their export earnings due to the UR.

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[10] 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.

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

[12] 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 USA and world data. An exchange rate of $1.17/ECU was assumed in converting to US dollars.

[13] 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.

[14] 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.

The third through seventh rows of table 27 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 EU and USA) and they would lose with reduction in transfers from the EU and USA. With a 20% decrease in transfers to ACP countries with partial global trade liberalization of 20%, export earnings to ACP countries would decline by about 7%. Exports would go up except for trade liberalization only in the developed countries, for partial trade liberalization in all countries, and for partial and complete elimination of transfers under the ACP Protocol and USA TRQ. Under complete trade liberalization and complete elimination of transfers (last row), export earnings would fall by about 18%. A comparison of row 4 with row 11 in table 27 indicates that transfers under free trade would be approximately 27% of their export earnings, compared to the case of complete free trade. What this table makes clear is that ACP producers face a substantial risk of price erosion if transfers from the EC or USA are either partially or totally eliminated. Table 27 also makes clear that the ACP producers could benefit greatly from trade liberalization in the major developing countries.

Tables 28 and 29 provide estimates of the possible impact of selected trade liberalization scenarios on production and exports of individual ACP countries. Except for Fiji and Mauritius (the effects for which were calculated directly), these effects were calculated by applying each country's share of production and consumption to the change in aggregate ACP production and consumption. Net exports (imports) were then projected based on the projected production and consumption amounts. A similar pattern of change emerges country by country as for the aggregate ACP except in the case of exports, where some countries change from being net exporters (importers) to net importers (exporters) depending upon the trade scenario. Despite the similar trade patterns exhibited across countries, it is clear that the impact of trade liberalization will be even greater on individual countries as opposed to ACP countries in total.

An idea of the approximate effect of the various trade liberalization scenarios on export earnings of individual ACP countries can be estimated by multiplying the appropriate blend price from table 27 by the corresponding export quantity in table 29. These values are shown in table 30 for those countries which are net exporters of sugar. Again, the pattern of change is similar across countries to the aggregate of ACP countries shown in table 27. However, the changes are even more striking across countries and underscore the price eroding effects of trade liberalization except when the ACP Protocol is maintained (under complete and partial trade liberalization) and when only the major developing countries liberalize trade.

SIS Aggregate

Aggregate production, consumption, and net trade for the SIS[15] in 1993-95 were 2100075 MT, 947440 MT, and 1205745 MT, respectively.[16] Although there are 25 countries included in this aggregate, Fiji and Mauritius account for about 81% of total exports. Because these two countries receive preferential trade concessions from the EU and USA, a blend export price was constructed as in the case of the ACP countries. Based on F.O. Licht's data, about 41.3% of Fiji's exports go for PS, another 8% for SPS, 3.7% for TRQ sales, and 47% are sold on the world market. It is estimated that 80.2% of Mauritius's exports are sold as PS, 14.9% are sold as SPS, 4% as TRQ to the USA, and only 1% are sold on the world market. Combining these two countries yields aggregate shares of

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[15] 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.

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

50% for PS, 9% for SPS, 3% for TRQ, and 38% for world sales.[17] 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.[18] Per annum growth rates for exogenous shifts in supply and demand were estimated to be –2.0% and 2.1%, 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 31 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%. 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 preferential treatment by the EU and USA). 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% reduction in transfers from the EU and the USA. In this case, the blend price is projected to decrease about 4.5%, exports are projected to increase about 2.12%, and total revenue from export sales to decline by about 2.4%. With a complete elimination of transfers, total export earnings would decrease by 4% with the increase in exports of 10% offset by the decline in blend price of 13%. The value of transfers from the EU and USA would be approximately 31% of their export earnings under complete free trade.

Impact of Regional Liberalization in Sugar Trade

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 USA, Canada, and Mexico. Mexico is a net exporter of sugar and currently is a quota holder under the USA's TRQ. If Mexico is able to expand its production and exports to the USA and if the present TRQ system remains in effect, then it is possible for ACP countries to lose some access to the USA. Ryberg (1998) estimates that if USDA's projected increase of USA imports of 2.48 million MT for 2005 occurs, then Mexico's surplus production would have to increase to more than a

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[17]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.

[18]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.

million MT over the next ten years in order for the portion of the TRQ 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, assuming full compliance by the USA to the UR agreement (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 USA 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 USA 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.

A related concern is the effect trade normalization between the USA and Cuba could have on other countries' future access to the USA market. If Cuba should again gain access to the USA market, this could adversely affect the ACP countries if access by Cuba meant reduced access by other countries. The question also arises as to how the USA could grant Mexico increased access while simultaneously giving Cuba access unless it was to increase its level of total import quota. Given the substantial increases in exports projected by Cuba under most of the trade scenarios, it is clear that how the USA reacts has significant implications for other countries exporting to the USA, especially the ACP countries.

MERCURSOR created a common market for Argentina, Brazil, Paraguay, and Uruguay. Economic analysis of its impact on trade by Brandao et al (1995) indicate that the main effect will be on member importers (especially Argentina) who rely on less imports from non-member countries. However, economy-wide and commodity specific effects from MERCORSUR are relatively small because it is a small regional block from both the world's point of view and Argentina's and Brazil's points of view.

APEC is intended to liberalize trade among North America, Japan, Australia/New Zealand, China, Indonesia, the Philippines, Thailand, and Malaysia/Singapore. However, Tuan et al (1998) indicate that its effects overall will be quite small on the overall sugar economy, increasing both exports and imports by 0.07%. For individual countries, if trade was only liberalized among the APEC countries, the largest export increases would come from Indonesia (1.41%), Australia/New Zealand (0.56%), and Thailand (0.11%).

For the ASEAN countries (Indonesia, Philippines, Thailand, and Malaysia/Singapore), the overall net effect would also be small, with exports increasing only 0.02% and imports only increasing 0.02%. However, Indonesia, Thailand, and Singapore could all increase exports dramatically (3.5%, 20.3%, and 13.4%). Moreover, the Philippines could become a net exporter, Brazil could reduce its exports by 0.05%, and Australia/New Zealand could reduce its exports by 0.13% as exports from the member exporting countries displace exports from non-member countries.

Concluding Remarks

While many other simulations could be performed, it should be clear from the results presented in this report that there are substantial 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. On the other hand, the consequences of trade liberalization would be quite unevenly distributed. With respect to the ACP and the SIS, mixed results were also obtained. Both the ACP and SIS would lose from partial revision of the Protocol, and they each would lose 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% 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.

Removal of trade barriers within common trading areas poses a threat to many developing countries, especially ACP countries. In particular, full implementation of NAFTA could provide increased access to USA market by Mexico. If the USA maintains its present import restrictions under the TRQ, this could limit access to the USA market by other countries, especially ACP countries. However, under a uniform reduction of tariffs across countries, the USA's import demand could increase sufficiently to offset projected increases in exports by Mexico so that the ACP countries would not necessarily lose access to the USA market.

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.