Impacts of Trade Liberalizations Under the Uruguay Round on the World Sugar Market

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AER No. 95-7

August 1995

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Abstract

The impacts analysis based on the policy provisions of the Uruguay Round on the world sugar market reveals that these policies will stabilize the world sugar price at slightly higher levels than in the baseline. Global sugar consumption will increase as a result of the income growth caused by the Uruguay Round. Economic resources will be allocated more efficiently among the sugar industries of the various countries. However, the impacts on the sugar industries in countries with strong producer supports will be rather small because the negotiation process of the Uruguay Round has accommodated the changes in sugar policies already implemented by individual countries in the past few years. Low-cost sugar producing countries will benefit from the higher world sugar price and consumers in countries with protected markets will benefit from lower domestic prices.

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I. Introduction

Sugar is an important commodity in the world market with total production of 115.79 million metric tons (MMT), consumption of 111.15 MMT, and world trade equal to 27 percent of production in 1992. Sugar is produced in more than 100 countries and is one of the most heavily traded commodities. The international sugar market has several unique characteristics which distinguish it from other commodities. Among these are heavy government interventions, large price volatility, widespread production in many parts of the world, and a growing market for sugar substitutes. These features make the world sugar market a rich target for modeling analysis, though they pose considerable modeling difficulties.

Sugar is derived from sugarcane and sugarbeets. Since sugarcane is mostly grown in tropical climates and low-income countries, and sugarbeets are predominantly grown in temperate climates and high-income countries, sugar is produced in many parts of the world in sizeable quantities. The cost of sugar production is relatively lower in the low-income countries than in the high-income countries. Furthermore, most of these countries compete directly in the world market. Consequently, the developed countries in the northern hemisphere heavily protect domestic sugar producers often at the expense of domestic consumers. For example, Webb, Lopez, and Penn (1990) estimated that in 1987, 67 percent of sugar producers' income in Japan, 60 percent in the United States, 54 percent in Canada, and 41 percent in the European Union was derived from government subsidies and price supports. Ives and Hurley (1988) noted that the U.S. sugar programs maintained the domestic price at a much higher level than the free-market price at a cost to U.S. consumers of over $3 billion annually. Borrell and Duncan (1993) also concluded that the total cost to

U.S. consumers over the 1982-1988 period was about $2.5 billion annually. Roberts and Whish-Wilson (1991) estimated that the European Union's sugar policies during the period 1979-89 imposed an annual implicit cost on consumers of about $3.8 billion. Sturgiss, Tobler, and Connell (1988) estimated that Japanese sugar policies during 1985-87 cost the consumers about $2.3 billion annually.

The sugar policies of developed countries also inflicted significant economic loss to low-income sugar exporting countries as these countries experienced lower world prices and production, and displacement of employment opportunities. For example, Borrel and Duncan (1993) predicted that the combined effects of the sugar policies of the United States, European Union, and Japan alone could depress the world price by 33 percent and increase world price variability by 28 percent. Ives and Hurley (1988) predicted that, because of reduction in the volume of the U.S. import quota in 1987, countries exporting sugar to the United States incurred a loss in export earnings of over $700 million annually.[1] Evidence from these studies and others noted below have led to conclusions such as the one by Marks and Maskus (1993): developed countries' sugar policies have "made sugar markets among the most egregiously distorted of all agricultural commodity markets and have caused significant global welfare losses."

Because of the level of distortions in the world sugar market, trade liberalization resulting from the Uruguay Round (UR) of the General Agreement on Tariffs and Trade (GATT) should lead to a significant improvement in world resource allocation by shifting sugar production to more efficient areas and reducing the inefficient production of corn-based sweeteners. For example, Sturgiss, Wong, and Borell (1987) found that previous international sugar agreements to raise and stabilize the world price through stock

management were inefficient, but elimination of government subsidies and other forms of intervention would improve world welfare.

As UR policy provisions are implemented, it is important for the sugar exporting and importing countries to assess the effects of these trade reforms on their sugar markets. The results of these trade liberalization analyses will be useful to producers and policy makers. The objective of this study is to empirically quantify the effects of the trade liberalization agreements negotiated under UR on sugar production, consumption, trade, and prices of the major sugar exporting and importing countries. This objective is accomplished by estimating a nonspatial equilibrium model of the world sugar market consisting of 21 countries/regions. For each country, important components of supply and demand are estimated by incorporating the domestic and trade policies and modeling sugar substitutes.

The organization of this paper is as follows. Section II briefly reviews the current domestic and trade policies of the major exporting and importing countries. Section III discusses the policy provisions negotiated under UR trade reforms. Section IV explains the structure of the trade model, details of country coverage, data sources, and model estimation. Section V presents the effects of trade liberalization on the world sugar market. The final section provides the summary and policy implications.

II. World Sugar Policies

Almost all countries intervene in the sugar market because (a) sugar production requires a huge investment; (b) producers seek to maintain stable prices and incomes; (c) many countries rely on the sugar industry for employment opportunities; (d) low-income countries generate foreign exchange from exports; and (e) some countries pursue self-sufficiency goals because sugar is used widely in many products. Since UR trade reforms are aimed at liberalizing the existing domestic and trade policies, a brief review of the

current policies of major exporters and importers is provided next.[2] The policy reviews presented in this section are drawn from Borrell and Duncan (1993); Ives and Hurley (1988); and Lord and Barry (1990).

The United States: Government intervention in the U.S. market began as early as 1789 when the United States imposed a tariff of 1 cent per pound on brown sugar, 3 cents on loaf sugar, and 1.5 cents for all other sugar. Since only recent U.S. policies are relevant for modelling purposes, the policies from 1934 to present are briefly reviewed.

From 1934 to 1974, a series of sugar acts were enacted to protect the U.S. market. The key elements of these acts were designed to: (a) allocate total domestic consumption between domestic producers and foreign countries by assigning each an import quota, (b) provide government benefits to producers, (c) restrict acreage, and (d) impose an excise tax on sugar. Since new sugar legislation proposed in 1974 was not passed, the 1975 and 1976 crops were not supported by farm programs. From 1977 to 1979, U.S. sugar programs were characterized by loan rates, price supports, and government payments. The 1980 and 1981 crops did not require government support because of high world sugar prices. The 1981 Farm Legislation set a market stabilization price of 21.5 cents per pound, 3.5 cents above the loan rate of 18 cents per pound. To maintain the domestic price supports, a combination of a tariff and quota was imposed. The 1985 Act maintained all the provisions of the 1981 Act, but also required that the sugar program should not impose budgetary burdens on the government. In 1990, in response to the pressure from GATT, the United States established a new tariff-rate quota system. Under this system, the United States reduces the market stabilization price and loan rates and implements a country-by-country quota of duty free imports which increase by 250,000 metric tons annually. Imports above these quotas are

subject to a tariff. Since 1975, high price support policies in the United States have encouraged rapid expansion of high fructose corn syrup (HFCS), which contributed to sugar surpluses and low prices in the world market.

The European Union (EU): The EU maintains three types of sugar production quotas (A, B, and C). The A and B quotas receive domestic price supports in the form of intervention prices which effectively establish a floor price for producers. The B quota has a higher co-responsibility levy than quota A. Production under quota C is sold at the world price. In 1988/89, the intervention price was 0.45ECU/Kilogram, whereas the world price was 0.22ECU/Kilogram. To protect the domestic market from a glut of sugar imports in response to the high internal prices, the EU instituted a threshold price and a variable levy on imports. These trade policies effectively disconnect the link between the domestic and world prices. Because of the high level of price supports, the EU switched from being a net importer of sugar to a net exporter in the mid-1970s. In order to export its excess production under quotas A and B, the EU subsidizes sugar exports by paying restitution to the traders.

Japan: In the interests of self-sufficiency, price stability, and income support to growers, Japan fixes domestic prices at very high levels for producers and consumers. For example, in 1985/86 the producer and consumer prices were, respectively, eight and five times higher than the world price. To maintain the high levels of domestic prices and to raise revenues for supporting domestic producers, Japan imposes levies on raw sugar imports. Because of high domestic sugar prices, per capita consumption in Japan is the lowest among the developed countries. Japan's policies also encourage the consumption of HFCS.

Canada: Domestic sugar consumption in Canada has averaged about one MMT over the past 20 years, of which 90 percent is typically imported and 10 percent is produced domestically.

Canada does not fix the domestic consumer price and thus it tracks the world price. However, Canada protects its sugar producers by setting a target price. If the domestic price falls below the target price, producers receive a compensatory payment up to the target price which is paid from a Tripartite Stabilization Program fund.

Mexico: The Mexican government intervenes both in the production and consumption of sugar. On the supply side, it provides guaranteed minimum producer prices, marketing subsidies, input subsidies and crop insurance. On the demand side, it implements price controls and subsidies. In addition, Mexico imposes trade volume controls, import levies, and export duties. In the 1960s and 1970s, Mexico was a net exporter of sugar, but since 1980, Mexico has exported sugar in some years and imported in other years.

Cuba: Sugar is the leading export revenue generator for Cuba, averaging about 75-80 percent of the annual export earnings. Beginning in 1960, Cuba nationalized the sugar industry, including the sugar mills, refineries, and other commercial properties. Since then, Cuba has had export agreements with the Former Soviet Union (FSU), China, and Eastern Europe. The FSU bought Cuban sugar at a price substantially higher than the world price. For example, in the mid 1980s, FSU paid 30-40 cents per pound when the world price was only 10.2 cents per pound. With the collapse of communism in FSU and Eastern Europe, however, Cuba is attempting to find western markets for its sugar.

Brazil: Brazil, along with India, is a leading producer of sugarcane. Brazil uses about two-thirds of its cane production to produce ethanol. Because of its heavy dependence on ethanol, Brazil's potential to increase its exports is limited. Sugar and ethanol production are controlled by the allocation of annual quotas to farms, mills and refineries. Brazil also regulates the prices of sugar and ethanol. These production and price controls insulate domestic producers and consumers from the world market. Brazil has also pursued domestic

policies to ensure that consumption is sufficiently met by domestic production. These policies include government subsidies such as low interest rates to producers and price controls at the retail level.

Australia: The Australian sugar market is characterized by acreage allotments and production quotas. Returns from domestic and world markets are pooled and redistributed to the growers through a system of price controls. In 1988/89, the price support for raw sugar was 14.5 cents per pound compared to the world price of 11.6 cents per pound. Production on non-allotment lands are procured by the government at a lower price. To restrict lower priced imports, an import duty is imposed.

Though the other countries and regions included in the model pursue intervention policies, these policies are not discussed here because of space limitations. However, these policies are incorporated in the analysis.

III. Sugar Trade Liberalization Policies under UR

The effects of UR on commodity markets and the world trade will emanate from the reduction of domestic agricultural supports and trade distortions. The effects on the sugar market will be realized through changes in production, consumption, trade, and prices in individual countries. In this section, the major provisions of UR for specific policy reduction schedules by various countries for the sugar market are presented. UR provisions for agriculture can be broadly classified under four major categories: **market access, domestic support, export competition, and sanitary and phytosanitary measures.** Brief descriptions of these categories are given next. The source of the following discussion is the GATT secretariat (1993).

Market Access: Under the market access provision, all non-tariff barriers such as import quotas, variable import levies, and voluntary import restraints will be converted to equivalent

tariff rates (*ad valorem* or specific rates). This process is called tariffication. The base period for tariffication is 1986 to 1988. The tariff equivalent is computed using the difference between the border prices and domestic prices in the base period. The border price represents the actual average c.i.f. price for the importing country. Once the tariff equivalents are computed for the base period, they will be reduced by 36 percent on average for all commodities over the six year transition period beginning July 1, 1995. However, the reduction for an individual commodity will be no less than 15 percent. In addition, the market access provision requires member countries to maintain import levels equal to three percent of domestic consumption, which will be increased to five percent by the end of the six year transition period.

Domestic support: Under the provision of domestic support, an Aggregate Measurement of Support (AMS) will be calculated for each product. The AMS is computed as the difference between the government administered price and a fixed external reference price times the quantity of production. The fixed external price is the average f.o.b. price in years 1986 to 1988. Other government payments such as input and marketing subsidies are also included in the AMS computation. Then the Total Aggregate Measurement of Support (Total AMS) is computed as the sum of AMS of all agricultural products. Once the Total AMS is computed, a country must reduce its Total AMS by 20 percent during the phase-in period of July 1, 1995 to June 30, 2001. However, this reduction is not required on a commodity-by-commodity basis. In particular a commodity can be excluded from this reduction if the domestic support it receives is less than the 5 percent of total value of production. Also, domestic policies that are non-trade distorting need not be reduced.

Export competition: Under the export competition provisions, the negotiations were aimed at reducing the export subsidies offered by member countries for agricultural exports. The

provision requires members to cut both subsidized exports and expenditures for such subsidies. The subsidies that will be reduced include: direct export subsidies including payment-in-kind, sales of non-commercial stocks at a reduced price, marketing subsidies for agricultural exports, and transportation subsidies for agricultural exports. Export subsidies computed over the base period 1986-1990 will be reduced over the six year transition period by 21 percent of the volume of exports and 36 percent of the value of exports. Export subsidy reduction is on commodity-by-commodity basis.

Sanitary and Phytosanitary Measures: Member countries will follow sanitary or phytosanitary measures which conform to international standards and scientific guidelines set by international organizations. The chief intent of these measures is to protect human, animal and plant life and health. These measures will be enforced such that they will minimize the negative effects on trade.

A special committee on agriculture will be established by the GATT to review the implementation of the commitments by the member countries. The review will be conducted periodically to verify the member countries' obligations are being met. During such review, member countries can raise issues relevant to the implementation of commitments.

The detailed specific-policy reduction schedules by various countries for the sugar market are given in the Appendix. The country-specific policy reduction schedules are used in the simulation analysis to analyze the impacts of the UR negotiations on the world sugar market.

IV. World Sugar Trade Model

This section describes the structure of a nonspatial equilibrium world sugar trade model, and provides detailed information about data, country coverage, and model estimation. The basic elements of such a model in a partial equilibrium framework is

illustrated graphically in Figure 1. The U.S. excess demand curve (ED_{us}) is the difference between domestic demand (D_{us}) and supply (S_{us}) and represents the quantity of imports at various price levels demanded from the world market. Exporters' supply and demand schedules are given in the lower panel. The curve EST is the combined excess supply of all the exporters, which is the difference between the supply and demand of all the exporters. The excess demand curve (EDO) of all other importers is the difference between their total demand and total supply. Exporters' export supply (EST) and importers' import demand (EDO) are represented in the top panel under the title 'Foreign Trade'. The excess supply curve (ESN) facing the U.S. is the difference between the export supply (EST) of all exporters and the import demand (EDO) of all other importers. A trade equilibrium is achieved by equating excess demand of the United States to the net excess supply of all other countries, which also equates the excess demands and supplies generated from all the countries. It should be noted that this graphical analysis is illustrated using a free trade framework for ease of exposition. However, as indicated previously, the world sugar market is hardly a free trade market. The theoretical and empirical model presented below does incorporate the important features of domestic and trade policies of major exporters and importers.

Theoretical Model

The algebraic formulations of the necessary components of the world sugar trade model is described here.

Exporters ($i=1,\ldots,n$)

The domestic demand for sugar in the ith exporting country is specified as

$$SUD_i = D_i(SP_i, Y_i, ZP_i, \mathbf{X}_{1i}). \qquad (1)$$

Domestic demand for sugar (SUD_i) is determined by own price (SP_i), income (Y_i), substitute price (ZP_i) such as HFCS price, and a vector of country-specific demand shifters ($\mathbf{X}_{1i}$) that explain food use. Thus, the theoretical specification for demand is based on consumer theory.

The domestic stock demand for sugar in the ith exporting country is specified as

$$SUSD_i = SD_i(SP_i, SUPD_i, GP_i, \mathbf{X}_{2i}). \quad (2)$$

The behavioral relationship of stock demand ($SUSD_i$) reflects speculative and transactive motives of inventory demand. The stock demand is determined by own price (SP_i), current production ($SUPD_i$), government stock policies (GP_i), and a vector of shift variables ($\mathbf{X}_{2i}$).

Domestic supply is determined by estimating acreage functions. The acreage function in the ith exporting country is specified as

$$SUAC_i = AC_i(SP_i, LSP_i, GSP_i, CP_i, \mathbf{X}_{3i}). \quad (3)$$

The acreage ($SUAC_i$) is determined by current price (SP_i), lagged price (LSP_i), government price supports (GSP_i), competing crop prices (CP_i), and a vector of country-specific supply shifters ($\mathbf{X}_{3i}$).

Sugar supply in the ith exporting country ($SUSY_i$) is yield ($SUYD_i$) times acreage times extraction rate (ER_i) plus beginning stocks ($SUSD_{i,t-1}$). Thus,

$$SUSY_i = SUAC_i*SUYD_i*ER_i + SUSD_{i,t-1}. \quad (4)$$

The excess supply of sugar by the ith exporting country is the sum of domestic supply minus domestic demand. Thus, the export supply ($SUES_i$) is given by

$$SUES_i = SUSY_i - SUD_i - SUSD_i. \quad (5)$$

If an exporting country pursues border intervention policies such as export subsidies to increase its exports, then an export supply function is explicitly estimated. The total export

supply of all the exporters (SUEST) is the sum of each country's export supply

$$SUEST = \sum_{i=1}^{n} SUES_i. \quad (6)$$

This function is comparable to the EST curve in Figure 1.

Importers (j=1,...,m)

The m importing countries include the United States. The notations used for describing the supply and demand functions for the exporting countries can also be used for the importing countries with two modifications. First, the subscript i is changed to j to denote the importing country. Second, the m number of importing countries are divided into m-1 other importers and the United States as shown in Figure 1. The subscript j denotes the m-1 countries and u represents the United States. With these modifications the sugar excess demand by the jth importing country ($SUED_j$) and the United States ($SUED_u$) is given by

$$SUED_j = SUD_j + SUSD_j - SUSY_j \quad (7)$$

$$SUED_u = SUD_u + SUSD_u - SUSY_u. \quad (8)$$

For the United States, the corn sweetener market is also explicitly modelled because of the growing importance of HFCS in the caloric sweetener industry. The market for HFCS has steadily expanded in the last two decades because of its substitutability for the artificially high priced sugar from cane and beets. For example, in 1975 sugar and HFCS consumption in the U.S. were 9.6 and 0.5 million tons, respectively (USDA). Since then, sugar consumption has declined slightly, but HFCS consumption has increased by several folds. For example, in 1992, sugar and HFCS consumption were 8.3 and 6.7 million tons, respectively (USDA). The specifications for HFCS supply ($HFCSS_u$) and demand ($HFCSD_u$) in the U.S. are given as

$$HFCSS_u = HS(HP_u, COP_u, SDP_u, X_{u4}) \quad (9)$$

$$HFCSD_u = HD(SP_u, HP_u, Y_u, X_{u5}) \quad (10)$$

where HP_u is the HFCS price, COP_u corn price, SDP_u soft drinks price, Y_u income in the United States, and X_{u4}, and X_{u5} are vectors of supply and demand shifters.

As with the exporting countries, if an importing country pursues border intervention policies such as quotas and tariffs, then an import demand function is explicitly estimated.

The sum of excess demands of other m-1 importers is

$$SUEDO = \sum_{j=1}^{m-1} SUED_i. \tag{11}$$

This function is comparable to the EDO curve in Figure 1.

The net excess demand (SUESN) facing the United States is the difference between the excess supply of exporters minus excess demand of the other importers

$$SUESN = SUEST - SUEDO. \tag{12}$$

This function is comparable to the ESN curve in Figure 1.

The world market equilibrium for sugar is determined by equating the excess demand of the United States to the net excess supply of all other countries. Thus,

$$SUHED_u = SUESN. \tag{13}$$

This world market equilibrium corresponds to point A in Figure 1.

Price linkage equations are specified to account for the transportation costs, exchange rate differences between countries, and trade policies. The price linkage equations for the importing and exporting countries and the United States are

$$SP_i = SP_i(WSP^*e_i, Z_i) \quad i=1,...,n \tag{14}$$

$$SP_j = SP_j(WSP^*e_j, Z_j) \quad j=1,...,m-1 \tag{15}$$

$$SP_u = SP_u(WSP, Z_u) \tag{16}$$

where WSP is the world sugar price, e is the exchange rate between the particular country and the currency (dollar) used to represent the world price. The vector Z represents transportation costs and trade policies such as import tariffs, quotas, and export subsidies.

Empirical Model

The model consists of 21 countries/regions. The exporting countries/regions included in the model are Australia, Brazil, Cuba, the European Union, India, South Africa, Thailand, other Central America, and other South America. The importing countries/regions are the United States, Canada, Japan, Mexico, Indonesia, China, the Former Soviet Union, Eastern Europe, other Western Europe, other Asia, other Africa, and the ROW. The high level of disaggregation allows the market structure of most of the countries/regions participating in the world sugar market to be adequately captured.

This large-scale model allows us to incorporate the influence of domestic and trade policies on production, consumption, stocks, and trade. Furthermore, the incorporation of government intervention policies enables us to accurately capture the effects of trade liberalization. The model includes the dynamic behavior of the sugar market, which captures the adjustments in the endogenous variables over time in response to policy changes. The influence of macroeconomic variables (exchange rates, interest rates, inflation rates, and GNP), and time lags in production are also explicitly modelled.

Data for production, consumption, exports, imports, and ending stocks are obtained from the Economic Research Service and from the Foreign Agricultural Service of the U. S. Department of Agriculture.[3] Data for area harvested, yield, and extraction rates are obtained from the Food and Agricultural Organization of the United Nations (FAO). Macroeconomic data such as income, population, exchange and inflation rates are obtained from the International Monetary Fund (IMF). The estimation period includes the years 1970 to 1992.

For each country, functional relationships for supply and demand components, and price linkage equations are estimated. The estimation of the supply side consists of sugarcane or sugarbeet area planted and a total sugar production equation which is the

product of the area planted, the extraction rate, and the yield. For some countries, the supply side also includes the estimation of sugar imports. The estimation of the demand components consists of sugar consumption and ending stocks. For some countries, sugar exports are also estimated. The price linkage equation links the domestic price to the world price. As specified in the theoretical model, for each country net excess demand or excess supply is derived and the world market clearing is established by equating the net import demand of all the importers and net export supply of all the exporters.

Since the model incorporates considerable details such as inclusion of a large number of country level disaggregation, modeling HFCS, incorporation of domestic and trade policies, inclusion of macroeconomic factors, and accounting for unique production characteristics, a rigorous analysis can be conducted to accurately estimate the effects of trade liberalizations.

The model includes a total of 82 endogenous equations and 21 market clearing equations, which determines 103 endogenous variables and uses 205 exogenous variables. Both linear and nonlinear techniques are used in estimating the endogenous equations.[4] Because of the space limitations, the complete empirical model, which runs about 130 pages, could not be included in the text. However, readers interested in the modeling approach, structural coefficients, and estimated equations can obtain the model documentation with complete empirical model and elasticities from the authors.

V. Impacts of the Uruguay Round on the World Sugar Market

In this section, details about baseline projections and UR projections and impacts are presented. To examine the effects of UR a baseline scenario is run to project the endogenous variables over the period 1993 to 2001 by using the forecast values of the exogenous variables. The forecast values of the exogenous variables are derived from various sources:

GDP, GDP deflator, exchange rates, commodity production and prices are obtained from the International Food Policy Research Institute (Meyers, 1994b). Population forecasts are obtained from the USDA (1993). Crude oil prices and coffee prices come from a World Bank Report (1992). The baseline values of the endogenous variables serve as a benchmark to measure the effects of the trade liberalization.

As discussed in section III, beginning July 1995 the GATT member countries are expected to implement the policy provision schedule by reducing aggregate measurement of support, tariff equivalents, and export subsidies and increasing import access. The policy parameters provided in the Appendix along with the new income growths under UR (obtained from the USDA) are incorporated in the world sugar trade model and the UR scenario is run for the period 1995 to 2001. The provisions of UR will liberalize the world sugar market as sugar producing countries reduce their domestic producer support, sugar importing countries increase their market access, and sugar exporting countries reduce their export subsidies. Table 1 reports the baseline projections and the impacts of UR on sugar production, consumption, and exports or imports of the countries and regions included in the model. Table 2 presents the baseline projections and the impacts of UR on the net trade of major sugar exporters and importers and on the world sugar price.

The United States: The baseline projections show a small decline in sugarcane area of about 6,000 acres and a modest decline in sugarbeet area of about 100,000 acres from 1995 to 2001. These declines in areas are in response to U.S. farm policies which, in the recent years, have reduced the domestic price supports. As a result of UR, the cane and beet areas are lower than the baseline areas by an average of about 0.26 and 1.24 percent, respectively. These decreases are caused by the continued reduction in U.S. domestic price support and the ensuing decline in the producer price. The slightly larger response of sugarbeet area to

sugar price changes is because beet supply is more elastic than sugarcane supply. The reason for this result is that sugarbeet is a short term crop with significant potential for year-to-year variation in area planted, whereas sugarcane area is a long term crop with 3-4 year crop cycle due to ratooning practices. Consequently, cane area planted shows little year-to-year variation in the short run. As a result of the decreases in cane and beet area planted, total U.S. sugar production declines from 1995 to 2001 by about 170,000 MT. UR causes an additional decrease by an average of 1.06 percent (also refer to Figure 2).

The baseline projections of the U.S. sugar consumption show a small increase of about 40,000 MT from 1995 to 2001 caused by an increase in U.S. population and income. UR contributes to an additional income increase in the United States, lowers price for the U.S. consumer, and increases HFCS prices relative to sugar prices. These developments result in an average increase in U.S. sugar consumption of about 1.82 percent over the baseline consumptions.

The declining production and increasing consumption trends in the baseline causes the U.S. sugar imports to rise by about 350,000 MT from 1995 to 2001. The tariff reductions in the market access provision of UR and the developments in U.S. domestic supply and demand during the implementation period will cause the United States to increase its imports by an average of about 12 percent above the baseline. The increase in U.S. sugar imports is relatively small from 1995 to 1997 but picks up in the later years due to a larger increase in domestic consumption and modest decline in production.

Australia: Australia's sugar production is strongly affected by developments in the world sugar market and the world sugar price because the country is a sugar exporter and sells its exports at the world price. UR increases the world sugar price (explained below). Australian sugar producers respond to the higher world price by increasing their production

by an average of about 2.1 percent over baseline production. Australia's sugar consumption increases only slightly (by 0.4 percent) as a result of higher income growth in UR. This development enables the country to increase its sugar exports by an average of about 2.89 percent over the baseline.

European Union: The Common Agricultural Policy's 1992 reforms reduce domestic support for sugar producers which results in a decrease in total EU sugar production of about 800,000 MT from 1995 to 2001 in the baseline projections. Declines in domestic supports and export subsidies as required by UR lead to an additional decrease in total EU sugar production by an average of about 0.53 percent. The production quotas A and B, which receive the domestic price supports, decline by an average of about 1 percent as a result of UR. However, production of quota C sugar, which receives the rising world price, grows by an average of 2.21 percent during the implementation period of UR. Some of the area allocated for quotas A and B are used for quota C production because sugarbeet production in the EU even under the C quota is still more profitable than the production of alternative crops.

The EU sugar consumption increases slightly by an average of 0.55 percent as a result of higher income growth in UR. A projected stagnation in EU population growth, however, limits the increase in sugar consumption. The decrease in total EU sugar production, the small increase in sugar consumption, and the reduction in export subsidies as required by UR cause a decrease in EU sugar exports by an average of 1.23 percent. These results also corroborate the findings of Meyers (1994a) and USDA. This decline would have been larger if it were not for the increase in the unsubsidized exports resulting from higher production of quota C sugar.

Brazil: Developments in the world sugar market and the world sugar price influence Brazilian sugar production. The increase in the world price under UR causes Brazilian sugar producers to increase their production by an average of about 1.5 percent over baseline production. Brazil's sugar consumption increases by an average of 1.49 percent as a result of the higher income growth from UR in this developing country. This development enables Brazil to increase its sugar exports by an average of 2.3 percent over baseline exports.

Canada: Canada's small sugar production does not change significantly in response to the UR. Since Canadian consumers face the world price, the higher world sugar price in UR along with a projected stagnation in population growth and higher substitution of HFCS for sugar reduces Canadian sugar consumption by an average of 2.02 percent below baseline consumption. The reduction in consumption causes a decline in Canadian sugar imports by an average of 2.32 percent.

China: Sugar production in China increases by an average of about 0.86 percent over the baseline production. This production increase is due to the availability of improved technology, more inputs, and a higher producer income as a result of UR. Higher population and income growths cause sugar consumption to rise by an average of about 0.87 percent over baseline consumption. These developments allow China to reduce its necessary sugar imports during the first five years of the implementation period of UR but requires additional imports in the last two years when production increases do not offset consumption increases.

Cuba: Cuba is one of the largest exporters of sugar. However, much of its exports went to the FSU in the past. With the collapse of communism in the FSU, Cuba is actively looking for export markets in the Western countries. Consequently, Cuba is not able to reap the benefits of UR. Both production and exports under UR increase only slightly over the baseline values.

India: Sugar production in India increases by an average of about 1.37 percent over baseline productions. This increase is due to the increased availability of improved technology and inputs for production, higher producer income, and government control, and the higher world sugar price resulting from UR. Population and income increases cause sugar consumption to rise by an average of about 0.81 percent over the baseline productions. These developments enable India to increase its sugar exports by an average of 5.34 percent over baseline exports.

Indonesia: Sugar production in Indonesia increases by an average of about 1.11 percent in response to the higher world sugar price under UR. The country's sugar consumption increases by an average of about 4.18 percent because of higher population growth and strong income growth, which cause Indonesia to increase its sugar imports.

Japan: Increased substitution of HFCS for sugar coupled with a higher world sugar price cause Japanese consumption to decline by an average of 2.23 percent below baseline consumption. The reduction in consumption causes a decline in Japanese sugar imports. However, imports of HFCS are expected to increase.

Mexico: UR does not have a significant effect on Mexico's sugar production. Higher income growth causes an increase in sugar consumption by an average of about 0.36 percent.

Thailand: Thailand's sugar production is strongly affected by developments in the world sugar market and the world sugar price because Thailand is a sugar exporter and receives the world price for its exports. The higher world price under UR causes Thailand's sugar producers to increase their production by an average of 0.42 percent over baseline productions. As a result of UR, significant income growth is projected for Thailand which leads to an increase in sugar consumption by an average of about 3.87 percent. Since

consumption increases are stronger than production increases, Thailand reduces its sugar exports by an average of about 0.7 percent.

Former Soviet Union: As the economic reforms reduce the role of centrally planned policies, sugar producers will be able to make independent production decisions. Availability of inputs and improved technology help to increase the FSU production. Sugar production in the FSU increases by an average of about 0.55 percent over baseline production. Since the income growth in this country is projected to be relatively small, sugar consumption increases only slightly (by 0.26 percent). This development enables the FSU to reduce its imports slightly (by 0.15 percent) below the baseline imports. The decline in imports also reflects the higher world sugar price. Lack of hard currencies will also limit the ability of FSU to import sugar, which is in contrast to the communist regime when FSU exchanged oil for sugar with Cuba.

Regional sugar markets: The increase in world sugar price caused by UR leads to increases in sugar production in all regions. These increases are relatively small in Africa (0.04 percent) because of limited technology and in central America (0.24 percent) and western Europe (0.25 percent) because of the limited production area. Eastern Europe benefits from the availability of improved technology and increases its sugar production (by 0.46 percent). South America also gains from the availability of better technology and increases its production (by 0.52 percent) and exports (by 0.72 percent). Asia is able to increase its sugar production (1.45 percent) because of improved technology, additional input use, higher producer incomes, and market-oriented economic decisions.

The increase in global income caused by UR leads to increases in sugar consumption in all regions. Smaller consumption increases occur in western Europe (0.24 percent), South America (0.33 percent) and Eastern Europe (0.75 percent) while developing regions with

projected strong income growth experience larger sugar consumption increases: Africa (0.94 percent), Asia (2.51 percent), and central America (3.75 percent).

Importing regions such as Africa and Asia increase their imports because of strong increases in sugar consumption. South America is able to increase its exports by an average of about 0.72 percent, and central America reduces its exports by an average of about 4.24 percent below baseline exports as a result of the strong consumption increase.

World net trade and world sugar price: Most major sugar exporting countries increase their net exports because of higher world sugar prices resulting from UR. Two exceptions are the European Union and Thailand. The export competition provision of UR, which lowers export subsidies, reduces EU's net exports by an average of about 6 percent (also refer to Figure 3). Thailand's net exports decrease by a very small amount (an average of 0.7 percent) because strong consumption increases resulting from the higher income growth under UR outpaces the production increases. India gains significantly from UR because of its developing country status, availability of more inputs, and improved technology, which result in net exports about 9.5 percent higher than the baseline (also refer to Figure 4). Australia and Brazil also post modest increases in net exports.

The impacts of UR on major importing countries vary. Net imports by some countries decline slightly because of higher world prices (Canada), increased substitution from HFCS (Japan) and production increases (Soviet Union). Higher income growth, population growth, and reduction in tariff equivalents increase U.S. net sugar imports by an average of 16.03 percent. It should be noted that though this percentage increase seems large, the volume of the net import increase is very small compared to the level of consumption in the United States. In Indonesia, China, and Mexico, strong consumption increases outpaces production increases causing the net imports in these countries to rise.

The world income growth caused by UR increases sugar consumption globally, surpassing production increases, which causes world sugar prices to increase. The average increase in the world price is about 8.83 percent, which translates into an increase of only about one cent per pound (also refer to Figure 5). These results are very similar to the findings of the USDA (1994).

VI. Conclusion

The liberalization of domestic and trade sugar policies as required by UR will have impacts on the demand and supply components of the sugar market in various countries. The demand side is affected by the global income growth causing an increase in sugar consumption which is more significant in developing countries than in developed countries. Consumers in countries with strong domestic and trade policy interventions will also enjoy lower domestic consumer prices which will increase the competitiveness of sugar with HFCS.

The impacts of UR on the supply side are less pronounced. Low-cost sugar producing countries benefit from the slightly higher world price and increase their production and exports, as is the case in Australia, Brazil, and India. High-cost sugar producing countries reduce their production slightly because of lower producer supports and domestic prices. However, the policy reforms required by UR have been accommodated by most countries through policy changes, which have been already implemented in the past ten years or so. For these countries, UR largely serves to codify existing policies. Therefore, the impacts on sugar production in these countries are rather small. This is the case in the United States where sugar production decreases only by an average of about one percent. In the European Union, subsidized sugar production decreases while unsubsidized production increases resulting in a small decline of EU sugar exports.

As a result of UR, the consumption increases exceed the production increases causing the world price to rise but only slightly. In general, the liberalization of the sugar market caused by UR contributes to a less fluctuating and more stable world sugar price and a more efficient allocation of economic resources in the sugar production among countries.

ENDNOTES

1. Also see Borrel and Duncan (1993) for estimates of individual exporting country's losses inflicted by the United States, the European Union, and Japan.

2. The policy discussion presented in this section provides useful information which is particularly of interest to readers who are not familiar with the sugar policies of various countries. However, this section can be deleted, which will not interrupt the flow of reading of the rest of the paper. Reviewer's suggestion to delete or include this section will be appreciated.

3. We acknowledge Ron Lord of the Economic Research Service of the U.S. Department of Agriculture for supplying some of the data and providing sources for additional variables.

4. The estimation procedure used is ordinary least squares (OLS). The OLS estimation technique is preferred over simultaneous estimation techniques because with a large number of exogenous variables and limited number of observations, simultaneous estimation techniques pose degrees of freedom problem. The principal component technique is frequently used to circumvent the degrees of freedom problem. Since the number of exogenous variables is too large in the model, the principal component technique was not used to estimate the model.

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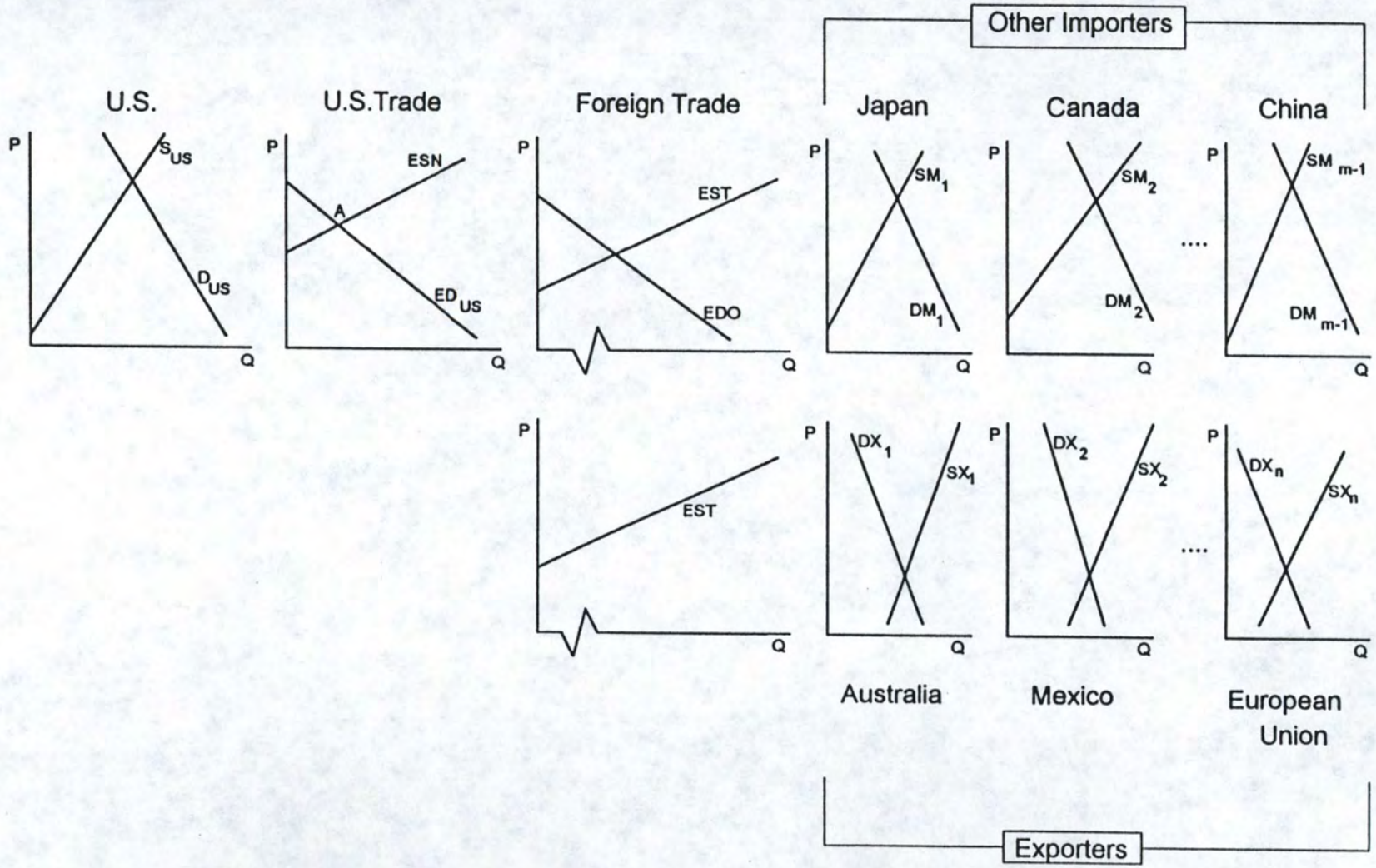


Figure 1: Illustration of a Nonspatial Equilibrium World Sugar Model

Table 1. World Sugar Market: Baseline Projections and the Uruguay Round (UR) Impacts

Country and Item	Units	1995	1996	1997	1998	1999	2000	2001	1995–2001 Avg.
United States									
Cane Area (Base)	1000 acres	836.76	833.77	832.58	833.22	830.80	829.45	830.34	
UR Impacts	percent	0.00	−0.12	−0.31	−0.53	−0.33	−0.35	−0.21	−0.26
Beet Area (Base)	1000 acres	1391.86	1364.99	1346.18	1353.28	1344.16	1332.30	1299.02	
UR Impacts	percent	0.03	−0.04	−0.59	−1.55	−1.67	−2.63	−2.21	−1.24
Production (Base)	1000 MT	6680.38	6621.56	6591.48	6636.21	6589.21	6559.18	6513.53	
UR Impacts	percent	−0.01	−0.07	−0.46	−1.09	−1.06	−1.89	−2.81	−1.06
Consumption (Base)	1000 MT	7995.45	7956.35	7989.74	7945.83	7989.71	7995.77	8035.07	
UR Impacts	percent	0.01	0.27	0.93	1.97	2.81	2.76	3.99	1.82
Total Imports (Base)	1000 MT	1700.67	1886.17	2002.44	1821.36	1847.37	1952.82	2063.84	
UR Impacts	percent	0.09	1.13	5.57	14.15	18.30	18.94	25.08	11.89
Australia									
Production (Base)	1000 MT	4306.66	3570.24	4323.41	4060.46	4444.44	4410.48	4423.72	
UR Impacts	percent	0.00	0.86	0.73	1.80	2.93	4.29	4.08	2.10
Consumption (Base)	1000 MT	839.27	832.47	843.47	845.87	847.56	849.50	850.83	
UR Impacts	percent	0.01	0.08	0.12	0.38	0.58	0.68	0.92	0.40
Total Exports (Base)	1000 MT	3153.35	3309.44	3162.67	3451.54	3526.25	3432.17	3605.44	
UR Impacts	percent	0.06	0.90	1.43	2.12	4.12	6.06	5.55	2.89
European Union									
Quota A (Base)	1000 MT	10771.29	10380.31	10480.69	10457.15	10430.20	10408.72	10403.50	
UR Impacts	percent	−0.62	−0.57	−0.71	−1.09	−1.25	−1.27	−1.49	−1.00
Quota B (Base)	1000 MT	2591.25	2497.20	2521.34	2515.68	2509.20	2504.03	2502.77	
UR Impacts	percent	−0.62	−0.57	−0.71	−1.09	−1.25	−1.27	−1.49	−1.00
Quota C (Base)	1000 MT	2694.83	2661.08	2573.31	2608.16	2528.87	2397.54	2366.14	
UR Impacts	percent	0.74	0.77	0.62	2.38	3.45	2.92	4.56	2.21
Total Production (Base)	1000 MT	16057.38	15538.59	15575.34	15630.98	15468.26	15310.28	15272.41	
UR Impacts	percent	−0.39	−0.34	−0.49	−0.82	−0.48	−0.61	−0.55	−0.53
Consumption (Base)	1000 MT	12824.34	12858.02	12844.15	12838.40	12851.35	12854.09	12892.12	
UR Impacts	percent	0.09	0.20	0.46	0.87	0.85	0.77	0.62	0.55
Total Exports (Base)	1000 MT	6246.30	5776.90	6133.99	5899.45	5746.69	5666.65	5552.00	
UR Impacts	percent	−0.98	−0.94	−1.63	−2.65	−0.69	−1.12	−0.58	−1.23
Brazil									
Production (Base)	1000 MT	10490.92	9965.90	10263.82	10605.41	10639.92	10718.20	10802.65	
UR Impacts	percent	0.05	0.69	1.22	1.58	1.71	1.52	3.76	1.50
Consumption (Base)	1000 MT	7602.90	7947.50	7978.22	8057.29	8101.35	8191.56	8289.70	
UR Impacts	percent	0.26	0.66	1.58	1.43	2.11	1.95	2.46	1.49
Total Exports (Base)	1000 MT	2796.16	1781.31	2290.93	2520.37	2513.93	2497.73	2478.74	
UR Impacts	percent	−0.01	1.25	0.12	3.77	1.59	0.81	8.57	2.30
Canada									
Consumption (Base)	1000 MT	980.20	994.34	1010.44	984.01	985.23	987.29	990.40	
UR Impacts	percent	−0.09	−0.56	−0.85	−1.49	−2.70	−3.79	−4.68	−2.02
Total Imports (Base)	1000 MT	857.19	876.44	881.77	854.78	858.22	866.09	869.82	
UR Impacts	percent	−0.12	−0.63	−1.02	−1.55	−2.99	−4.48	−5.47	−2.32
China									
Production (Base)	1000 MT	7251.10	7483.54	7456.08	7759.57	7925.05	8241.51	8540.20	
UR Impacts	percent	0.04	0.59	1.07	2.09	1.86	0.47	−0.11	0.86
Consumption (Base)	1000 MT	8292.03	8505.87	8716.76	8738.00	8786.62	8793.83	8840.26	
UR Impacts	percent	0.15	0.31	0.67	0.71	0.76	1.46	2.02	0.87
Total Imports (Base)	1000 MT	1522.30	1570.00	1556.15	1408.77	1309.66	995.01	758.12	
UR Impacts	percent	−0.29	−1.41	−1.06	−9.28	−7.18	11.22	25.22	2.46
Cuba									
Production (Base)	1000 MT	8756.38	8991.57	9084.66	9084.86	9197.07	9151.09	9240.81	
UR Impacts	percent	−0.00	0.01	0.13	0.19	0.48	0.65	1.00	0.35
Total Exports (Base)	1000 MT	7724.52	7926.38	8069.92	8100.83	8112.72	8202.95	8021.38	
UR Impacts	percent	−0.00	0.03	0.06	0.21	0.28	0.76	1.00	0.33
India									
Production (Base)	1000 MT	15259.44	16908.62	16035.44	16208.64	16143.14	16285.62	16557.36	
UR Impacts	percent	0.05	0.12	1.40	1.55	2.21	2.32	1.96	1.37
Consumption (Base)	1000 MT	14142.23	14666.43	15115.45	15146.67	15191.64	15221.32	15367.91	
UR Impacts	percent	0.02	0.11	0.36	0.67	1.17	1.89	1.42	0.81
Total Exports (Base)	1000 MT	1219.81	2434.22	2167.29	1843.95	1824.47	1880.27	1967.84	
UR Impacts	percent	1.60	0.05	5.36	9.45	9.12	4.71	7.10	5.34

Table 1. World Sugar Market: Baseline Projections and the Uruguay Round Impacts (Contd.)

Country and Item	Units	1995	1996	1997	1998	1999	2000	2001	1995–2001 Avg.
Indonesia									
Production (Base)	1000 MT	1765.26	1876.45	1751.18	1656.36	1731.28	1758.63	1830.53	
UR Impacts	percent	0.00	0.00	0.61	0.59	1.11	2.49	3.00	1.11
Consumption (Base)	1000 MT	2394.26	2420.34	2394.37	2399.39	2401.74	2402.62	2545.01	
UR Impacts	percent	0.37	0.99	2.18	3.66	5.91	9.07	7.06	4.18
Japan									
Consumption (Base)	1000 MT	2711.30	2756.80	2725.79	2775.26	2797.44	2820.66	2847.87	
UR Impacts	percent	−0.28	0.12	−0.26	−2.08	−3.17	−4.19	−5.73	−2.23
Total Imports (Base)	1000 MT	1657.96	1668.14	1606.34	1633.72	1633.28	1631.99	1636.25	
UR Impacts	percent	−0.49	0.20	−0.45	−3.67	−5.59	−7.29	−10.01	−3.90
Mexico									
Consumption (Base)	1000 MT	3898.53	3943.14	3972.52	4012.95	4058.94	4107.61	4109.68	
UR Impacts	percent	−0.01	0.07	0.17	0.24	0.41	0.68	0.96	0.36
Thailand									
Production (Base)	1000 MT	4548.91	4823.81	4928.35	5058.02	5304.68	5465.04	5614.31	
UR Impacts	percent	0.00	0.00	0.66	0.27	0.37	0.74	0.90	0.42
Consumption (Base)	1000 MT	1166.02	1206.79	1239.50	1275.97	1315.05	1354.34	1396.20	
UR Impacts	percent	0.29	0.73	1.64	2.85	4.58	6.89	10.10	3.87
Total Exports (Base)	1000 MT	3361.65	3587.27	3704.07	3774.37	3978.88	4104.15	4211.09	
UR Impacts	percent	−0.03	−0.20	0.29	−0.49	−0.98	−1.32	−2.13	−0.70
Former Soviet Union									
Production (Base)	1000 MT	9305.56	9287.53	9326.73	9331.71	9308.34	9359.46	9421.82	
UR Impacts	percent	0.05	0.05	0.12	0.40	1.10	1.10	1.01	0.55
Consumption (Base)	1000 MT	15416.72	15635.89	15634.07	15737.54	15780.44	15832.11	15970.84	
UR Impacts	percent	0.01	0.04	0.10	0.12	0.36	0.64	0.57	0.26
Total Imports (Base)	1000 MT	6598.87	6570.25	6406.48	6464.39	6492.35	6331.41	6373.58	
UR Impacts	percent	−0.22	−0.00	0.00	−0.44	−0.76	0.26	0.12	−0.15
Eastern Europe									
Production (Base)	1000 MT	4448.41	4395.75	4314.77	4375.93	4406.82	4523.09	4526.15	
UR Impacts	percent	0.00	0.22	0.30	0.35	0.71	0.86	0.78	0.46
Consumption (Base)	1000 MT	5190.97	5241.70	5297.12	5355.55	5365.14	5477.02	5478.00	
UR Impacts	percent	0.05	0.12	0.28	0.54	0.90	1.36	1.97	0.75
Western Europe									
Production (Base)	1000 MT	1030.37	1043.84	1053.06	1043.73	1095.72	1046.60	1046.82	
UR Impacts	percent	−0.00	0.31	0.12	0.22	0.41	0.32	0.36	0.25
Consumption (Base)	1000 MT	1462.68	1469.92	1476.70	1483.46	1490.29	1497.35	1504.65	
UR Impacts	percent	0.02	0.04	0.09	0.18	0.29	0.44	0.63	0.24
Africa									
Production (Base)	1000 MT	6260.47	6408.96	6547.56	6721.03	6882.52	7127.84	7216.45	
UR Impacts	percent	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.04
Consumption (Base)	1000 MT	8891.73	9387.44	9924.01	10094.82	10164.51	10226.37	10291.11	
UR Impacts	percent	0.06	0.16	0.36	0.68	1.14	1.73	2.48	0.94
Total Imports (Base)	1000 MT	4587.17	4857.63	5150.29	5243.48	5281.52	5415.27	5400.59	
UR Impacts	percent	0.06	0.17	0.38	0.72	1.19	1.78	2.57	0.98
Central America									
Production (Base)	1000 MT	3410.23	3455.54	3502.65	3551.70	3625.69	3680.57	3758.40	
UR Impacts	percent	0.05	0.05	0.15	0.23	0.31	0.41	0.49	0.24
Consumption (Base)	1000 MT	1717.30	1829.22	1915.46	2013.62	2065.21	2070.82	2131.90	
UR Impacts	percent	0.24	0.65	1.68	3.10	5.28	8.15	7.18	3.75
Total Exports (Base)	1000 MT	1665.32	1587.49	1595.87	1527.15	1542.94	1595.60	1607.57	
UR Impacts	percent	0.02	−0.48	−1.72	−3.26	−6.17	−9.69	−8.34	−4.24
South America									
Production (Base)	1000 MT	4347.15	4358.66	4805.12	4566.60	4535.27	4568.96	4651.83	
UR Impacts	percent	0.00	0.07	2.90	0.12	0.26	0.20	0.12	0.52
Consumption (Base)	1000 MT	4105.07	4216.53	4177.18	4213.95	4266.20	4316.31	4380.05	
UR Impacts	percent	0.03	−0.22	0.39	0.52	0.36	0.44	0.80	0.33
Total Exports (Base)	1000 MT	1062.54	1066.56	1222.18	1139.04	1128.11	1139.86	1168.75	
UR Impacts	percent	0.00	0.10	3.98	0.17	0.37	0.28	0.16	0.72
Asia									
Production (Base)	1000 MT	5664.96	5649.02	5628.94	5533.24	5466.34	5517.94	5590.38	
UR Impacts	percent	0.16	0.25	0.63	1.27	2.03	2.26	3.55	1.45
Consumption (Base)	1000 MT	9217.27	9607.59	10000.26	10003.45	9782.03	9963.82	10126.52	
UR Impacts	percent	0.28	0.67	1.50	1.54	4.81	4.41	4.36	2.51
Total Imports (Base)	1000 MT	4385.54	4580.76	4856.10	4921.74	4842.62	4907.15	4942.66	
UR Impacts	percent	0.31	0.70	1.39	1.09	4.28	3.59	2.51	1.98

Table 2. Baseline Projections and Uruguay Round (UR) Impacts on World Price and Net Trade of Major Exporters and Importers

Country	Units	1995	1996	1997	1998	1999	2000	2001	1995–2001Avg.
Net Exporters									
Australia									
Baseline	1000 MT	3153.35	3309.44	3162.67	3451.54	3526.25	3432.17	3605.44	
UR Impacts	percent	0.06	0.90	1.43	2.12	4.12	6.06	5.55	2.89
Brazil									
Baseline	1000 MT	2796.16	1781.31	2290.93	2520.37	2513.93	2497.73	2478.74	
UR Impacts	percent	−0.01	1.25	0.12	3.77	1.59	0.81	8.57	2.30
European Union									
Baseline	1000 MT	2985.52	2524.21	2980.14	2757.45	2544.39	2464.84	2306.24	
UR Impacts	percent	−2.72	−3.68	−5.79	−10.48	−6.66	−7.67	−5.91	−6.13
Cuba									
Baseline	1000 MT	7724.52	7926.38	8069.92	8100.83	8112.72	8202.95	8021.38	
UR Impacts	percent	−0.00	0.03	0.06	0.21	0.28	0.76	1.00	0.33
India									
Baseline	1000 MT	422.52	1601.97	1314.47	987.25	963.68	1016.52	1094.66	
UR Impacts	percent	4.79	0.08	8.70	17.33	16.54	7.40	11.90	9.54
South Africa									
Baseline	1000 MT	787.44	1608.96	1471.79	1669.06	1669.96	1576.58	1771.58	
UR Impacts	percent	−0.64	−0.34	−4.52	−3.53	−5.87	28.07	9.84	3.29
Thailand									
Baseline	1000 MT	3361.65	3587.27	3704.07	3774.37	3978.88	4104.15	4211.09	
UR Impacts	percent	−0.03	−0.20	0.29	−0.49	−0.98	−1.32	−2.13	−0.70
Net Importers									
United States									
Baseline	1000 MT	1200.67	1386.17	1502.44	1321.36	1347.37	1452.82	1563.84	
UR Impacts	percent	0.13	1.54	7.42	19.50	25.09	25.46	33.10	16.03
Canada									
Baseline	1000 MT	857.19	876.44	881.77	854.78	858.22	866.09	869.82	
UR Impacts	percent	−0.12	−0.63	−1.02	−1.55	−2.99	−4.48	−5.47	−2.32
China									
Baseline	1000 MT	1178.43	1212.98	1177.21	1004.83	883.58	556.99	321.71	
UR Impacts	percent	−0.37	−1.83	−1.40	−13.01	−10.64	20.05	59.43	7.46
Indonesia									
Baseline	1000 MT	638.88	555.48	631.50	744.94	671.28	644.21	703.45	
UR Impacts	percent	0.94	4.06	6.03	9.59	17.35	26.14	18.06	11.74
Japan									
Baseline	1000 MT	1657.96	1668.14	1606.34	1633.72	1633.28	1631.99	1636.25	
UR Impacts	percent	−0.49	0.20	−0.45	−3.67	−5.59	−7.29	−10.01	−3.90
Mexico									
Baseline	1000 MT	146.78	240.92	192.10	246.32	297.19	342.05	341.01	
UR Impacts	percent	−3.74	−1.11	3.33	0.79	3.50	8.57	11.53	3.27
USSR									
Baseline	1000 MT	6598.87	6570.25	6406.48	6464.39	6492.35	6331.41	6373.58	
UR Impacts	percent	−0.22	−0.00	0.00	−0.44	−0.76	0.26	0.12	−0.15
World Sugar Price									
Baseline	US cents/lb	12.78	10.19	12.79	12.36	12.16	12.11	11.92	
UR Impacts	percent	3.17	4.26	4.97	10.52	13.23	12.01	13.62	8.83

Figure 2. U.S. Sugar Production under Baseline and Uruguay Round

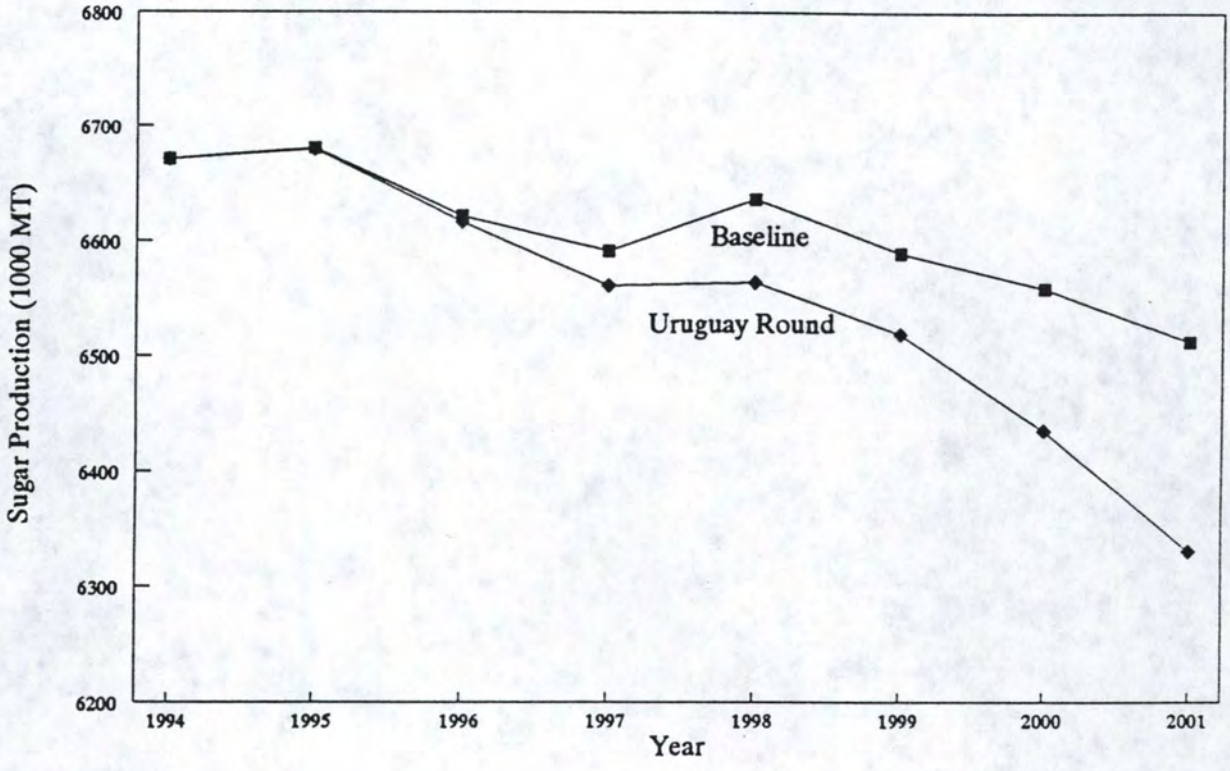


Figure 3. EU Net Sugar Exports under Baseline and Uruguay Round

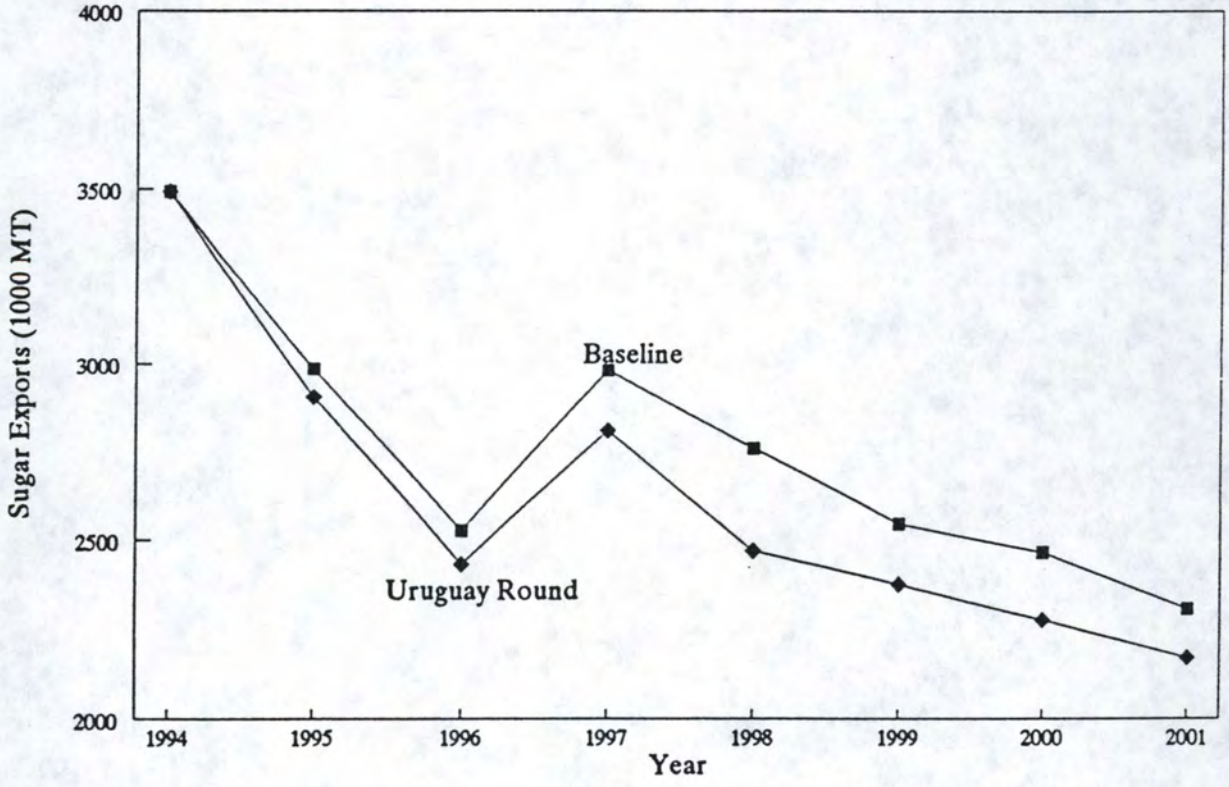


Figure 4. India's Net Sugar Exports under Baseline and Uruguay Round

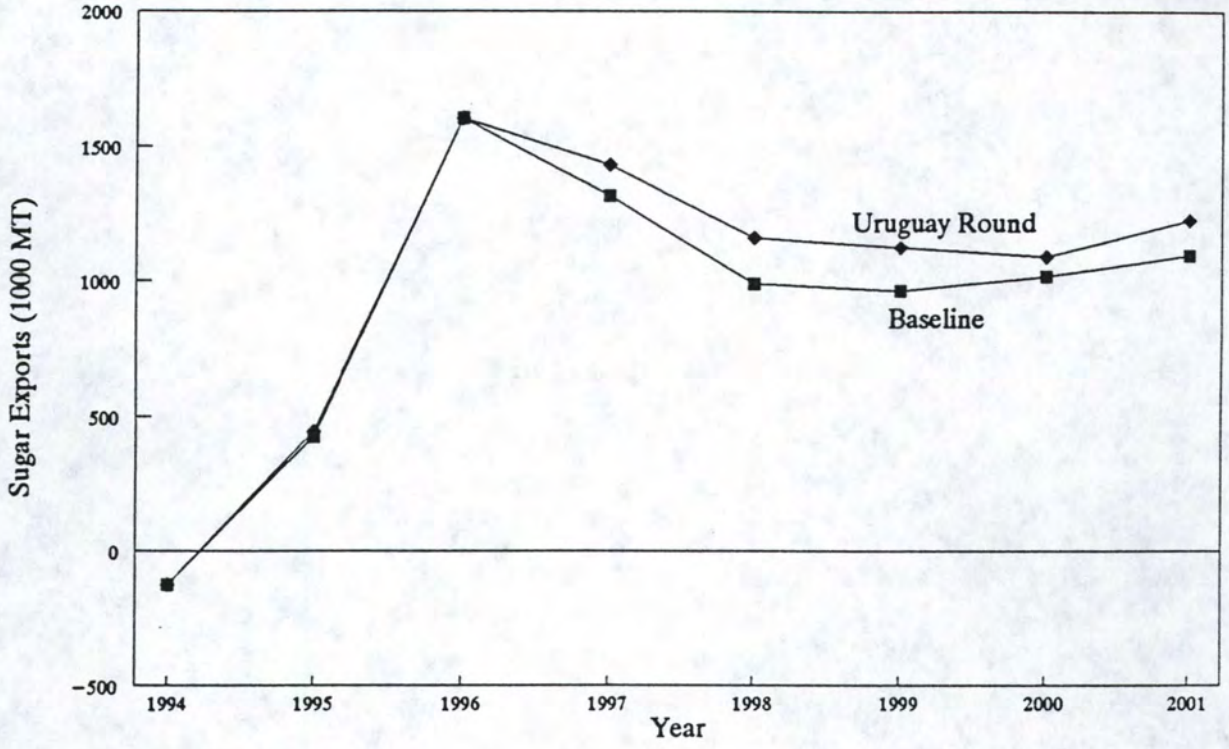
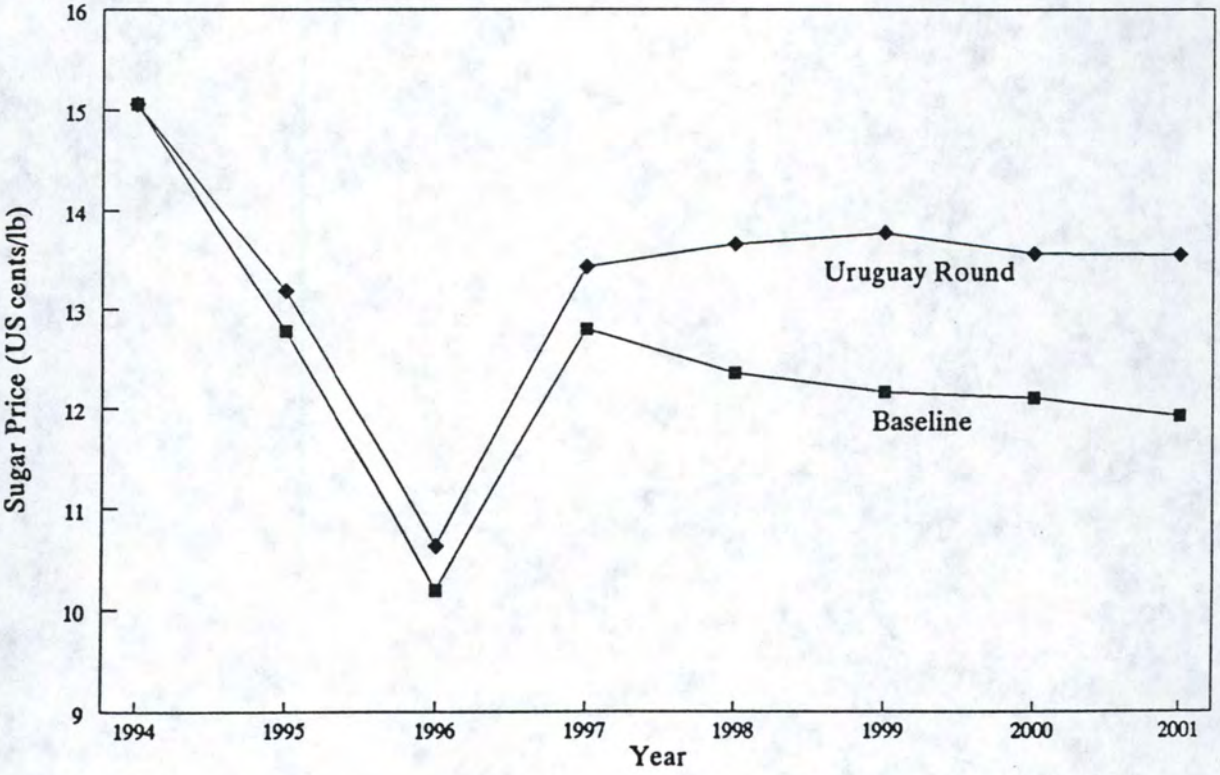


Figure 5. World Sugar Price under Baseline and Uruguay Round



Appendix: The Uruguay Round Policy Provisions for Sugar. [1,2]

Description	Australia	Brazil	Canada		Czech Republic	Egypt	European Union	Finland
Base Period, 1986-88			Beet	Cane				
Aggregate Measure of Support [3]								
Price Support								
Administrated price	398 Aus$/mt	250 US$/mt					614.1 ECU/mt	484 FIM/mt
External price	270 Aus$/mt						193.8 ECU/mt	218 FIM/mt
Eligible production	814,000 mt	7.967 Mil mt					13.3 Mil mt	771,000 mt
Total market price support	104.19 Mil Aus$	813.3 Mil US$					5,608 Mil ECU	215 Mil. FIM
Price related direct payment			10.1 Mil Can $					
Other nonexempt direct payments			3.3 Mil Can $					
Other direct payments		28.0 Mil US$						
Nonexempt payments								
Nonexempt direct payments								2.4 Mil. FIM
Credit								
Global Measure of Support								
Other net price supports							(341) Mil ECU	
Total direct payment			13.4 Mil Can $					
Product specific budgetary outlay								
Total AMS	64.73 Mil Aus$	856.6 Mil US$	13.4 Mil Can $				5,266 Mil ECU	217 Mil. FIM
Required/applied reduction	20 Percent	13.3 Percent	20 Percent				20 Percent	20 Percent
Bound rate [4]								
Final outlay [4]	51.78 Mil Aus$	742.6 Mil US$	10.7 Mil Can $				4,213 Mil ECU	174 Mil. FIM
Tariffication								
Current rate of duty	76 Percent				70.0 Percent			
Internal price	410 Aus$/mt						719 ECU/mt	6.74 FIM/mt
External price	268 Aus$/mt						195 ECU/mt	1.14 FIM/mt
Tariff Equivalent: base rate	143 Aus$/mt		32.54 Can $/mt	28.38 Can $/mt			524 ECU/mt	5.61 FIM/mt
	55 Percent	46 Percent				30 Percent		493 Percent
Required/applied reduction	50 Percent	25 Percent	15 Percent	15 Percent	15 Percent	33 Percent	20 Percent	15 Percent
Bound rate [4]	28 Percent	35 Percent	27.7 Can $/mt	24.1 Can $/mt	59.5 Percent	20 Percent	419 ECU/mt	0.37 FIM/mt
								287 Percent
Import Access								
Current access							1.876 Mil mt	
Minimum access								
Base level consumption							10.847 Mil mt	

Appendix: The Uruguay Round Policy Provisions for Sugar. (contd.) [1,2]

Description	Australia	Brazil	Canada		Czech Republic	Egypt	European Union	Finland
			Beet	Cane				
New Access								
Initial 1995								
Final 2000								
Initial in-quota tariff rate								
Final in-quota tariff rate								
In-quota tariff rate							0 Percent	4.53 Percent
Initial tariff quota							1.565 Mil mt	118,000 mt
Final tariff quota [4]							1.565 Mil mt	118,000 mt
Export Subsidies. Base period is 1986-90, with no front-loading option.								
Quantity								
Base rate								
Average of 1986-1990		791,300 mt					1.617 Mil mt	
Average of 1991-1992								
1995 level								
Required/applied reduction		24.0 Percent					21 Percent	
Bound rate [4]		601,400 mt					1.277 Mil mt	
Expenditure								
Base rate								
Average of 1986-1990		56,000 US$					777 Mil ECU	
Average of 1991-1992								
1995 level								
Required/applied reduction		24.0 Percent					36 Percent	
Bound rate [4]		43,000 US$					497 Mil ECU	

Appendix: The Uruguay Round Policy Provisions for Sugar. [1,2]

Description	Hungary	Iceland	India	Indonesia	Israel		Japan	Mexico
Base Period, 1986-88						Beet	Cane	
Aggregate Measure of Support [3]								
Price Support								
Administrated price	20,457 HUF/mt		188 Rup/mt				272,000 Yen/mt	
External price	8,842 HUF/mt		156 Rup/mt				82,800 Yen/mt	
Eligible production	492,000 mt		88.28 Mil. mt				306,800 mt	
Total market price support	5,707 Mil HUF			552 Bil Rupiah			83 Bil Yen	
Price related direct payment								
Other nonexempt direct payments								
Other direct payments								
Nonexempt payments								
Nonexempt direct payments	(64) Mil HUF							
Credit							5.6 Bil Yen	
Global Measure of Support								
Other net price supports								
Total direct payment								
Product specific budgetary outlay								
Total AMS	5,920 Mil HUF		2,485 Mil Rup	552 Bil Rupiah			88 Bil Yen	
Required/applied reduction	20 Percent			13.3 Percent			20 Percent	
Bound rate [4]								
Final outlay [4]	4,736 Mil HUF			478 Bil Rupiah			71 Bil Yen	
Tariffication								
Current rate of duty								
Internal price				706 Rupiah/mt				889 Pesos/mt
External price				349 Rupiah/mt				376 Pesos/mt
Tariff Equivalent: base rate		350 Percent	75 Percent	110 Percent	5.0 Percent	84.5 Yen/kg	41.5 Yen/kg	400 US$/mt
								50 Percent
Required/applied reduction		50 Percent	(100.0) Percent	13.6 Percent	100.0 Percent	15 Percent	15 Percent	10 Percent
Bound rate [4]		175 Percent	150 Percent	95 Percent	0.0 Percent	71.8 Yen/kg	35.3 Yen/kg	360 US$/mt
								45 Percent
Import Access								
Current access								
Minmum access								
Base level consumption								3.676 Mil mt

Appendix: The Uruguay Round Policy Provisions for Sugar. (contd.) [1,2]

Description	Hungary	Iceland	India	Indonesia	Israel	Japan		Mexico
						Beet	Cane	
New Access								
Initial 1995								110,280 mt
Final 2000								183,800 mt
Initial in-quota tariff rate								
Final in-quota tariff rate								
In-quota tariff rate	60 Percent	0 Percent		60 Percent				
Initial tariff quota	600,000 mt	11,820 mt		149,000 mt				
Final tariff quota [4]	600,000 mt	11,820 mt		149,000 mt				
Export Subsidies. Base period is 1986-90, with no front-loading option.								
Quantity								
Base rate								
Average of 1986-1990	166,000 mt							1.436 Mil mt
Average of 1991-1992								
1995 level								
Required/applied reduction	81 Percent							14 Percent
Bound rate [4]	32,000 mt							1.260 Mil mt
Expenditure								
Base rate								
Average of 1986-1990								523 Mil $
Average of 1991-1992								
1995 level								
Required/applied reduction								24 Percent
Bound rate [4]								421.8 Mil $

Appendix: The Uruguay Round Policy Provisions for Sugar. (contd.) [1,2]

Description	New Zealand	Norway	Pakistan		Philippines	Singapore	Slovak Republic	Thailand	United States
Base Period, 1986-88			Beet	Cane					
Aggregate Measure of Support [3]									
Price Support									
Administrated price									
External price									
Eligible production									
Total market price support			(15) Mil Rup						1,054 Mil US$
Price related direct payment									
Other nonexempt direct payments									
Other direct payments									
Nonexempt payments									
Nonexempt direct payments									
Credit									
Global Measure of Support									
Other net price supports									
Total direct payment									
Product specific budgetary outlay									
Total AMS									
Required/applied reduction			(15) Mil Rup						20.0 Percent
Bound rate [4]									843 Mil US$
Final outlay [4]									
Tariffication									
Current rate of duty									39.59 US ¢/kg
Internal price								11,597 Baht/mt	66.53 US ¢/kg
External price								5,673 Baht/mt	26.86 US ¢/kg
Tariff equivalent: base rate	0.9 US$/kg	2.02 NOK/kg 116 Percent	144 Percent	122 Percent	100 Percent	27 Percent	70.0 Percent	5,924 Baht/mt 104.0 Percent	39.59 US ¢/kg 149.40 Percent
Required/applied reduction	0 Percent	30 Percent			50 Percent	63 Percent	15.0 Percent	10 Percent	15.00 Percent
Bound rate [4]	0 US$/kg 0 Percent	1.41 NOK/kg 82 Percent	150 Percent	150 Percent	50 Percent	10 Percent	59.5 percent	5,332 Baht/mt 94.0 Percent	33.65 US ¢/kg 126.99 Percent
Import Access									
Current access									
Minimum access									
Base level consumption									

Appendix: The Uruguay Round Policy Provisions for Sugar. (contd.) [1,2]

Description	New Zealand	Norway	Pakistan		Philippines	Singapore	Slovak Republic	Thailand	United States
			Beet	Cane					
New Access									
Initial 1995									
Final 2000									
Initial in-quota tariff rate					50 Percent				
Final in-quota tariff rate					50 Percent				
In-quota tariff rate								65 Percent	1.46 US¢/kg
Initial tariff quota					103,400 mt			13,000 mt	1.139 Mil mt
Final tariff quota [4]					103,000 mt			14,000 mt	1.139 Mil mt
Export Subsidies. Base period is 1986-90, with no front-loading option.									
Quantity									
Base rate									
Average of 1986-1990									
Average of 1991-1992									
1995 level									
Required/applied reduction									
Bound rate [4]									
Expenditure									
Base rate									
Average of 1986-1990									
Average of 1991-1992									
1995 level									
Required/applied reduction									
Bound rate [4]									

Note: Australia, Czech Republic, Egypt, India, Israel, New Zealand, Pakistan, Singapore and Slovak Republic did not specify import access and export subsidies in the schedule. Czech Republic, Egypt, Iceland, Singapore, Slovak Republic and Thailand did not specify the AMS. Hungary did not specify tariffication export subsidy expenditures. Iceland, Norway, Philippines and Thailand did not specify export subsidies.

Footnotes: 1 This appendix is adapted from V. Premakumar et. al. (1994)
2 This appendix is based on the schedules submitted prior to April 15, 1994 and does not incorporate changes made by the countries after that date.
3 By agreement, reduction commitment is on aggregate level across commodities, and not by tariff line items.
4 For developed countries, bound rate, final outlay, tariff rate quota apply to year 2000, but for developing countries year 2004.