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**The U.S. Cane and Beet Sugar Industry
Under Alternative Trade Liberalization
Policy Options**

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Highlights

Issues related to the U.S. sugar industry for the 2000 Round of the World Trade Organization (WTO) agricultural trade negotiations include further reductions in internal supports and export subsidies, restricting activities of state trading enterprises, and harmonization of existing regulations on agricultural biotechnology among countries. These issues are not unique to the U.S. sugar industry but are fairly common for most agricultural commodities produced in the United States. Issues more directly related to the U.S. sugar industry are expected changes in U.S. sugar programs and policies, mainly loan rates and TRQs under the Uruguay Round Agreement (URA) and the upcoming WTO negotiations.

The objective of this study is to analyze major issues the U.S. sugar industry is facing or will face in the near future and the impacts of alternative trade liberalization policies in the United States and the European Union (EU) on the U.S. sugar industry. Special attention is given to regional competitiveness in sugar production in the United States.

A global sugar policy simulation model was used for this study. This study is based on the base and alternative scenarios. The base scenario is grounded on a series of assumptions about general economy, agricultural policies, and technological changes in exporting and importing countries. It is generally assumed that current agricultural policy will be continued in all countries. Average weather conditions and historical rates of technological change are assumed to prevail during the projection period. Three alternative scenarios developed in this study are (1) the United States eliminates its import restrictions on sugar for the 2001 to 2004 period and maintains its trade embargo on Cuba, while other countries maintain their subsidies and import restricting programs, (2) the United States eliminates its import restrictions on sugar for the 2001 to 2004 period and allows trade with Cuba, while other countries maintain their subsidies and import restricting programs, and (3) both the United States and the EU eliminate import restrictions and subsidies, respectively, for the 2001 to 2004 period, and other countries maintain their subsidies and import restricting programs. The results from these alternative scenarios are compared with those from the base scenario to evaluate impacts of the stated policy changes on the U.S. sugar industry.

In the base scenario, sugar production in the United States is expected to increase about 4.2 percent for beet sugar and 3.2 percent for cane sugar during the 2001 to 2004 period. However, sugar consumption in the United States is expected to increase about 4.4 percent, which is slightly larger than production. As a result, U.S. imports of sugar are projected to increase 5.4 percent in this time period. The Caribbean price of sugar is expected to increase 21 percent for the 2001 to 2004 period in the base scenario. However, the U.S. domestic wholesale price of sugar is expected to increase only 6.1 percent for the same time period. This is mainly because the U.S. government increases its imports to stabilize the domestic price of sugar.

Under the U.S. trade liberalization scenario in which the United States eliminates its import restrictions while other countries maintain their sugar programs, the Caribbean price of sugar is expected to increase about 36 percent for the 2001 to 2004 period because increased U.S. imports of sugar raise demand for sugar in the world market. At the same time, the U.S. wholesale price decreases 28 percent for the 2001 to 2004 period because increased imports raise the supply of sugar in the United States. U.S. sugar production decreases substantially due to decreased domestic sugar prices, resulting in increases in sugar imports. When the United States includes Cuba as a trading partner, the Caribbean price of sugar increases only 32 percent and the U.S. whole sale price decreases 30.6 percent. This is mainly because Cuba can supply large amounts of sugar to the United States at shipping costs lower than any other off-shore origins.

When both the United States and the EU liberalize their sugar trade, the Caribbean price of sugar is expected to increase 68 percent from 9.45 cents per pound in 1999 to 15.86 cents per pound in 2004. This is mainly because under this scenario, (1) sugar production in the EU decreases substantially and the EU starts to import sugar and (2) the United States also increases its sugar imports, resulting in the increased demand for sugar in the world market. The U.S. wholesale price of sugar decreases only 10 percent for the 2001 to 2004 period under this scenario.

The U.S. sugarbeet industry is more cost efficient than the sugarcane industry. Florida is the most competitive sugarcane producing region. The Red River Valley is the most competitive in producing beet sugar. Most sugarbeet producing regions and Florida will remain competitive as a result of the elimination of the sugar programs in the United States and the EU. However, if only the United States eliminates its sugar programs, all U.S. sugar producing regions would be threatened.

Abstract

The objective of this study is to analyze major issues the U.S. sugar industry is facing or will face in the near future and the impacts of alternative trade liberalization policies in the United States and the European Union (EU) on the U.S. sugar industry. Special attention is given to regional competitiveness in sugar production in the United States. A global sugar policy simulation model was used for this study.

This study indicates that most sugar producing regions may be able to survive at current costs and asset values if both the United States and the EU liberalize their sugar trade, while sugar subsidies remain in other countries. However, if only the United States eliminates its sugar programs, all U.S. sugar producing regions would be threatened.

Key words: sugarbeet, sugarcane, loan rates, import liberalization, sugar price, Caribbean sugar price, high fructose corn syrup

The U.S. Cane and Beet Sugar Industry Under Alternative Trade Liberalization Policy Options

Won W. Koo*

Less than 30 percent of world sugar production is traded internationally. A substantial share of this trade takes place under bilateral long-term agreements or preferential terms, such as the U.S. sugar quota or the European Union's Lome Convention (Borremans 1999). Only a small proportion of world sugar is traded freely. Most sugar producing countries use various trade barriers to protect their own sugar industries and/or use export subsidy programs to increase or maintain their world market shares.

Under the Uruguay Round Agreement (URA) for agricultural goods, most countries made commitments to reduce their subsidies for sugar (WTO 1998). However, the basic structure of protection for sugar remains unchanged in most countries. A new round of World Trade Organization (WTO) negotiations and negotiations for the Free Trade Area of Americas (FTAA) both will start in November 1999. Liberalization of the world sugar industry through the successful conclusions of these two negotiations would affect the U.S. sugar industry.

The objective of this study is to analyze major issues the U.S. sugar industry is facing or will face in the near future and the impacts of alternative trade liberalization policies in the United States and the European Union (EU) on the U.S. sugar industry. Special attention is given to regional competitiveness in sugar production in the United States.

Overview of the World Sugar Industry

Sugar is produced in over 100 countries worldwide. For the 1994–1998 period, global sugar production was approximately 119 million tons annually with 30 percent of production exported from its country of origin (USDA-ERS 1999). The largest sugar producing region is the EU, followed by India and Brazil (Table 1).

Per capita sugar consumption is highest in Cuba (58.97 kg), followed by Brazil and Australia. Per capita sugar consumption in the United States is 32.66 kg, which is above the world average per capita consumption (19.96 kg). Per capita sugar consumption is lowest in China at 6.80 kg per capita, but that may increase substantially as per capita income increases. Global sugar consumption for the 1994–1998 period was 117 million metric tons annually.

The major sugar exporting countries are the EU, Brazil, Australia, Thailand, Cuba, and Ukraine. These countries account for 73 percent of global exports from 1990 to 1995 (Table 1). Relatively few countries dominate world sugar exports, but imports are less concentrated. Major importing countries are the EU, Russia, China, the United States, Japan, Korea, and Canada. Their imports accounted for about 46 percent of all sugar imports from 1994 to 1998. Under the Lome Convention the EU is required to import sugar under preferential terms from certain African, Caribbean, and Pacific countries. Figure 1 shows export-to-production ratios. The ratios fluctuate widely with a gradual downward trend, indicating that a smaller portion of production was traded in the global market.

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Table 1. World Sugar Supply and Utilization, 1995 to 1998 Average

Country	Crop ^a	Production	Consumption			Per Capita Consumption
			Net Exports	Ending Stocks		
			----- 1,000 metric tons, raw value -----			pounds
Algeria	B	10	917	-902	96	69
Australia	C	5,252	884	4,293	221	106
Brazil	C	13,256	8,180	5,080	679	114
Canada	B	134	1,243	-1,114	160	91
China	B/C	7,177	8,209	-1,327	2,560	15
Cuba	C	3,970	646	3,300	304	130
Egypt	B/C	1,120	1,735	-665	320	63
European Union (I 2)	B	17,562	14,006	3,721	2,395	85
Former Soviet Union	B	5,708	9,755	-3,795	1,714	73
India	C	15,037	14,808	-242	6,012	34
Indonesia	C	2,226	2,955	-815	537	33
Japan	B/C	815	2,489	-1,662	135	44
Mexico	C	4,576	4,238	421	630	97
South Africa	C	1,958	1,399	552	366	73
South Korea	-	0	1,104	-1,113	134	53
Thailand	C	5,176	1,517	3,673	575	56
United States	B/C	6,897	8,690	-1,744	1,268	72
Rest of the World	B/C	28,950	34,452	-7,662	6,242	40
World Total		119,825	117,228	34,888	24,346	44

a. B = Sugarbeet; C = Sugarcane.

Source: USDA, *PS&D View*, 1999.

Figure 2 shows world sugar production and consumption for the 1970 to 1998 period. In most years total sugar production has been larger than sugar consumption. This has led to downward pressure on the world price of sugar.

The Caribbean raw sugar price is usually considered to be the world market price for sugar. Except for years with high world market prices, there is a substantial wedge between the U.S. wholesale price of raw sugar and the world market price (USDA-ERS, various issues). Over the last decade, U.S. wholesale prices fluctuated between \$0.25 per pound and \$0.29 per pound. World market prices ranged between \$0.09 per pound and \$0.13 per pound (Figure 3). Both real Caribbean raw sugar prices and U.S. raw sugar import prices have long-term downward trends.

The volatility of world sugar prices could be due to the nature of supply response to price changes stemming from high fixed costs of sugar production. An increase in sugar production in response to rising sugar prices requires significant investments in processing facilities, and it takes some time until new production capacity becomes available. Once the facilities are in place, they tend to be used at full capacity to spread the fixed costs. Thus, when prices fall, production remains at full capacity. Sugar production is relatively unresponsive to price in the short run.

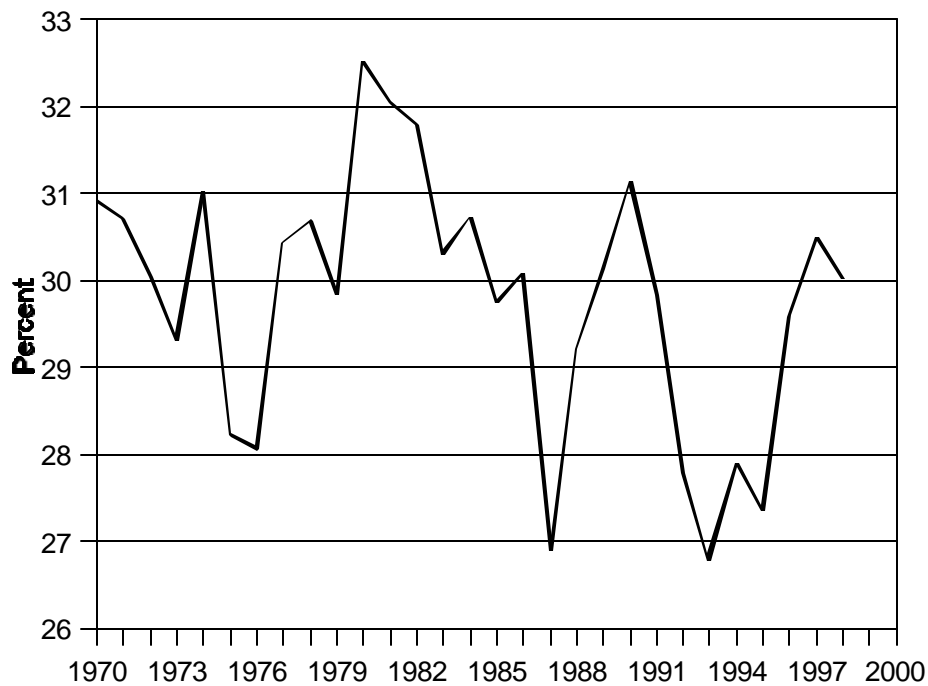


Figure 1. World Sugar Exports to Production Ratios

Source: USDA-ERS, *Sugar and Sweetener Situation and Outlook*, various issues.

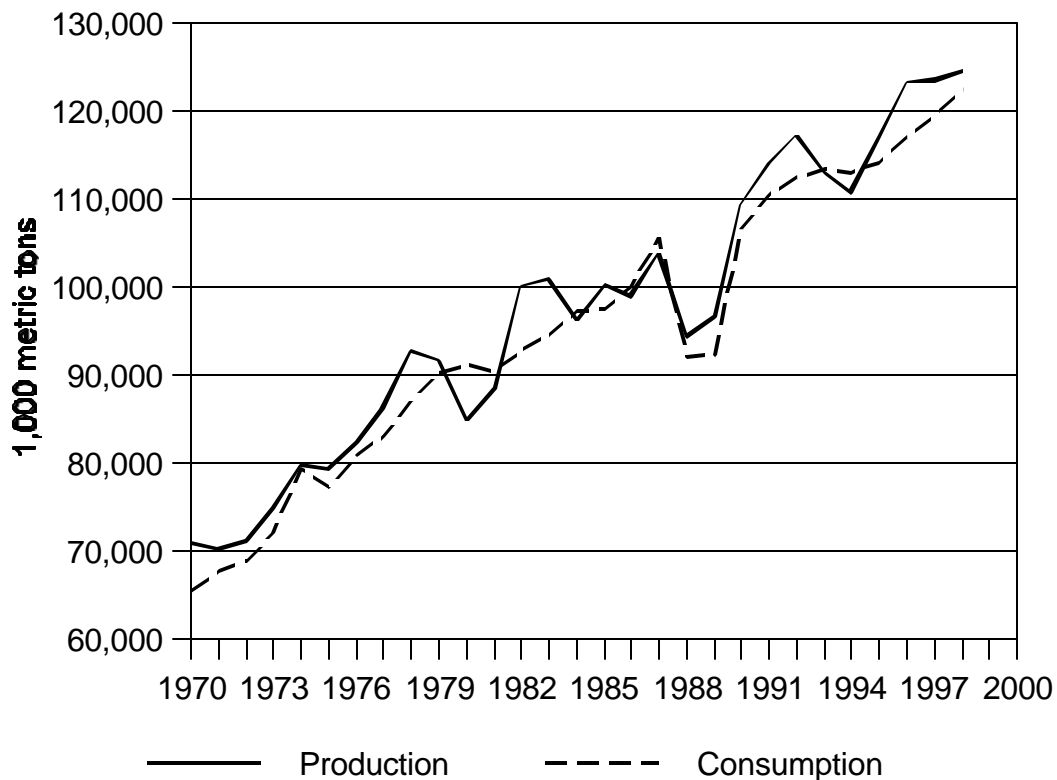


Figure 2. World Sugar Production and Consumption, Raw Sugar Equivalent

Source: USDA-ERS, *Sugar and Sweetener Situation and Outlook*, various issues.

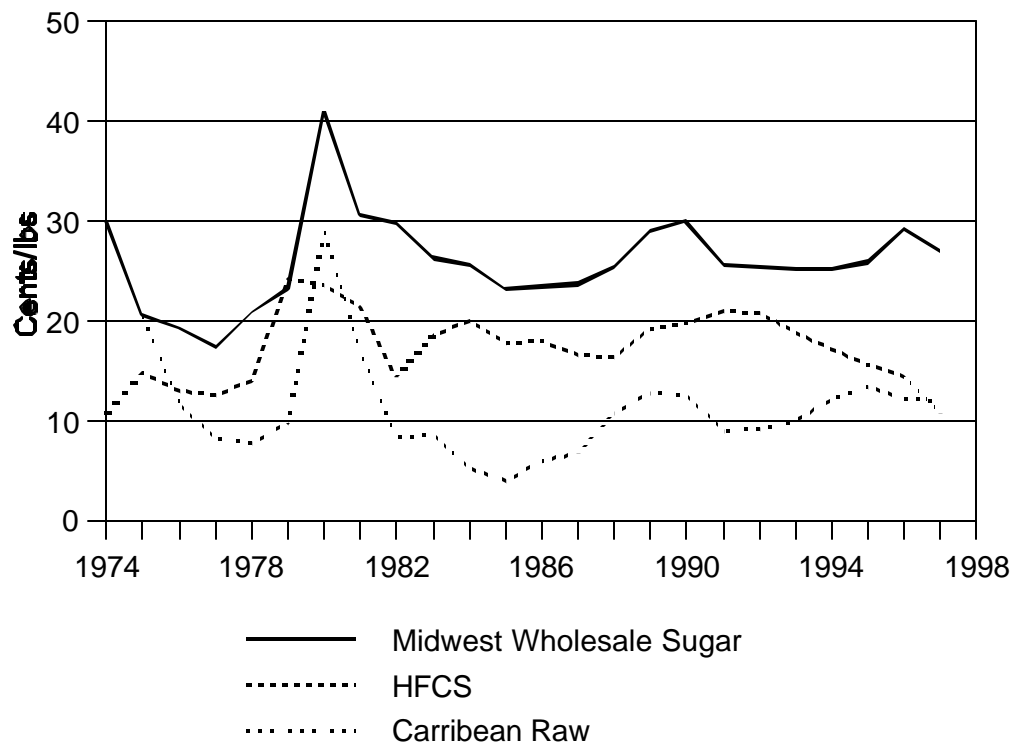


Figure 3. U.S. Sugar and HFCS Price

Source: USDA-ERS, *Sugar and Sweetener Situation and Outlook*, various issues.

The United States produces both beet and cane sugar. Cane sugar is produced mainly in Florida, Louisiana, Texas, and Hawaii. Beet sugar is produced largely in the Great Lakes region, Upper Midwest, Great Plains, and far western states. U.S. total sugar production (Figure 4) increased about 34 percent from 6.1 million tons in 1985/86 to 8.2 million tons in 1998/99 (USDA-ERS, various issues). Beet sugar production increased 41.3 percent for the 1985 to 1998 period, while cane sugar production increased 22.7 percent.

U.S. consumption of sugar also increased 22 percent from 8.1 million tons in 1985/86 to 9.8 million tons in 1997/98. The balance was imported from more than forty countries (Figure 5). U.S. sugar imports were reduced 71 percent from 4.5 million tons to 1.3 million tons for the 1974 to 1987 period and then increased to 2.1 million tons for the 1988 to 1998 period.

Figure 6 shows market shares of different sweeteners in the United States. Sugar produced in the United States accounted for about 40 percent of total domestic sweetener consumption during the 1985 to 1998 period. Market share of high fructose corn syrup (HFCS) was less than 10 percent of the domestic sweetener consumption in 1974, and increased to about 40 percent for the last 25 years. On the other hand, market share of imported sugar decreased substantially for the period. This clearly implies that production of HFCS did not affect production of sugar in the United States, but did affect sugar imports. Production of HFCS has stabilized since 1995.

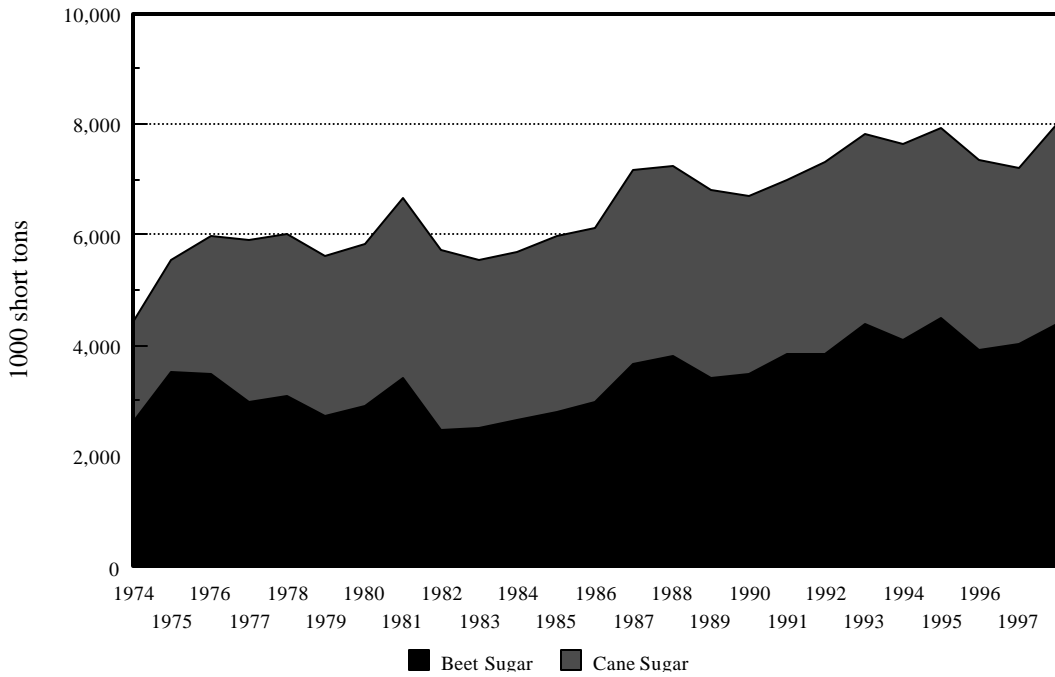


Figure 4. U.S. Production of Beet and Cane Sugar, 1974 to 1998

Source: USDA-ERS, *Sugar and Sweetener Situation and Outlook*, various issues.

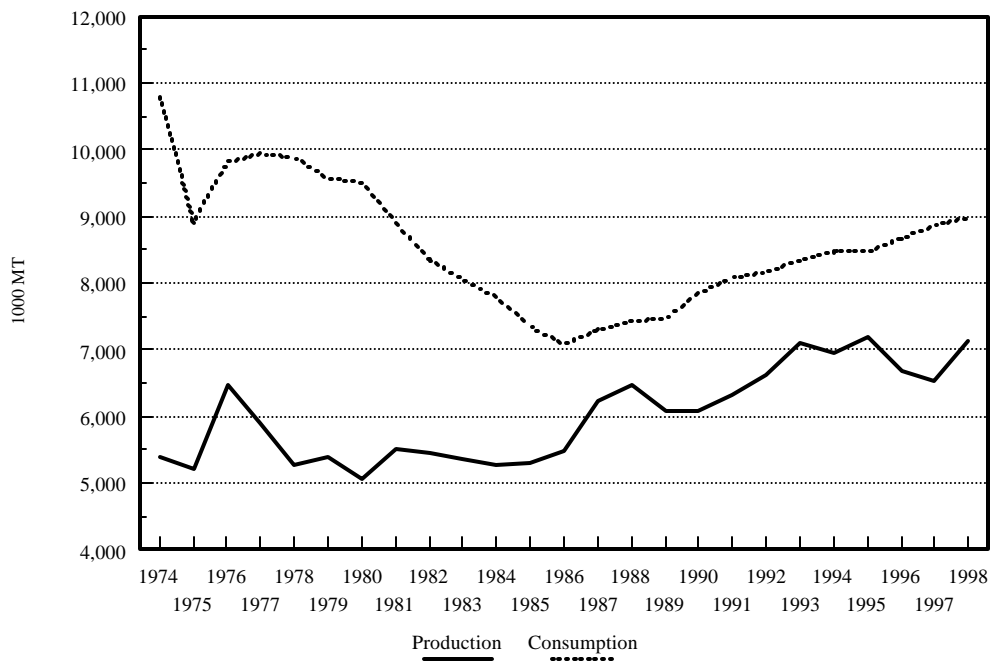


Figure 5. U.S. Sugar Production and Consumption

Source: USDA-ERS, *Sugar and Sweetener Situation and Outlook*, various issues.

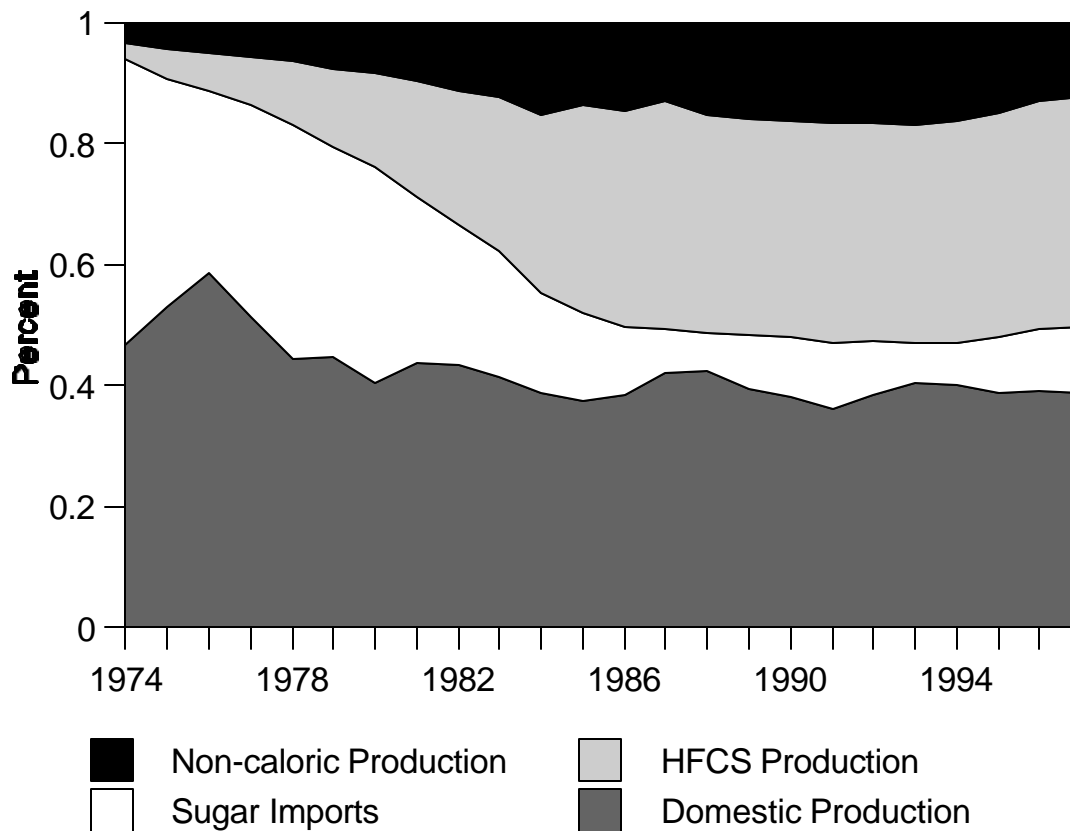


Figure 6. Market Share for Sweeteners in the United States

Source: USDA-ERS, *Sugar and Sweetener Situation and Outlook*, various issues.

Sugar Program and Policies in the United States and Other Countries

Sugar programs and policies differ among countries. Table 2 shows major policies used by major sugar producing regions and countries.

The U.S. Sugar Program and Policies

The U.S. sugar program was established by the Food and Agricultural Act of 1981. Several modifications have been made by the Food Security Act of 1985, the Food, Agriculture, Conservation, and Trade Act of 1990, and the Federal Agriculture Improvement and Reform (FAIR) Act of 1996.

The core policy tools in the program are the loan program and import restrictions (Lord 1996). The main purpose of the loan program is to maintain a minimum market price to U.S. producers. Processors use sugar as collateral for loans from the U.S. Department of Agriculture (USDA). The program permits processors to store the sugar rather than sell it for lower than desired prices. Loans can be taken up to nine months. Processors pay growers for delivered beets and cane, typically about 60 percent of the loan. The final payments are made, and the loan is repaid after the sugar has been sold.

Table 2. Policies and Practices Affecting Sugar Trade

Countries	Practice/Policy
United States	Loan program, TRQ
EU, South Africa, Mexico	Internal support, export subsidies
Australia, Brazil, China, India	State trading enterprises (STEs)
Developing Countries	High tariffs, lower labor costs and standards, weak environmental standards
Non-WTO Members	Independence from WTO rules on market access, internal support, and export subsidies

Source: U.S. GAO, *Sugar Program: Changing the Method for Setting Import Quotas Could Reduce Cost to Users*, GAO/RCED-99-209, 1999.

Under the FAIR Act, the sugar loan rate is set at 18 cents per pound for raw cane sugar and 22.9 cents per pound for refined beet sugar. Loans under the FAIR Act become recourse loans if the tariff rate quota (TRQ) is at 1.5 million tons or below, regardless of the price. When the TRQ is set above 1.5 million tons, the loans are nonrecourse. Under the nonrecourse loan, a processor forfeits collateral (sugar) to the Commodity Credit Corporation (CCC) if market prices fall below the loan rates. The processor must pay a penalty of about one cent per pound of sugar, effectively reducing the price support by the same.

Under the FAIR Act, the secretary of agriculture can reduce the U.S. sugar loan rates if major sugar producing and exporting countries reduce their export and domestic subsidies for sugar more than already agreed upon in the URA. The new U.S. rates must be at least as high as the level of support in other countries.

Processors who obtain a nonrecourse loan must pay farmers an amount for their sugarbeets and sugarcane that is proportional to the loan value of sugar. The USDA is authorized to establish minimum sugarbeet and sugarcane prices that processors must pay to growers. This is the same as under previous legislation.

The marketing assessment fee was raised by 25 percent in the FAIR Act. Beginning with fiscal year 1997, sellers of domestic sugar must pay an assessment of about one-quarter cent per pound.

The FAIR Act did not change the Harmonized Tariff Schedule of the United States established under the URA on agriculture. This implies that sugar imports are subject to two-tier tariff schedules under the TRQ.

The 1985 Food Security Act included a provision mandating the president to use all available authorities to operate the sugar program established under Section 206 of the Agriculture Act of 1949 at no cost to the federal government. However, Section 206 of the 1949 act was repealed by Section

701 of the 1996 FAIR Act, implying that the no-cost provision is no longer effective in the current sugar program.

The URA on agriculture made minor adjustments for sugar trade. U.S. import quotas on sugar were converted into TRQs, implying that a specified amount of sugar can be imported at the lower of two alternative duty rates. The amount of raw cane sugar subject to the lower duty rate must be no less than 1,117,195 metric tons in a fiscal year (Lord 1996). The minimum low-duty imports of refined sugar is 22,000 metric tons. The minimum low-duty imports for raw and refined sugar add up to 1.256 million short tons raw value of sugar per year. The high duty (about 17.62 cents per pound) is imposed on the amount of sugar imported over the import quota. The first-tier duty ranges from zero to 0.625 cents per pound.

The second-tier duty for raw cane sugar will be reduced from 17.62 cents per pound in 1995 to 15.82 cents per pound in 2000 under the URA. The duty for refined sugar will be reduced from 18.6 cents per pound in 1995 to 16.21 cents per pound in 2000. The quota will remain at the same level for the 1995 to 2000 period.

The sugar quota has been allocated among more than 40 quota-holding countries, allowing imports of specific quantities of sugar at first-tier duty rates. The quota allocation is based on historical exports to the United States for the 1975 to 1985 period.

The North American Free Trade Agreement (NAFTA) allows a rapid reduction in the second-tier duty for Mexican sugar over the next several years. The second-tier duty for Mexican sugar will be reduced from 16.11 cents per pound in 1995 to zero in 2008. Duties for most countries will remain at 15.36 cents for raw cane sugar and 16.21 cents for refined sugar (Henneberry and Haley 1998). This implies that Mexico is in a unique position to increase its exports of sugar to the United States above the allocated quota. Mexico produced 5.1 million metric tons of sugar in 1998 and consumed 4.24 million metric tons in the same year. Its exports were 0.87 million metric tons in 1998. If Mexico starts to use HFCS for beverages, more of its sugar could be exported to the United States.

Domestic and Export Subsidies in the EU, South Africa, and Mexico

The basic tools of the EU's sugar policies are (1) import restrictions with limited free access for certain suppliers; (2) internal support prices that ensure returns to producers for fixed quantities of production and permit the maintenance of refining capacity; and (3) export subsidies for a quantity of domestically produced sugar (Borremans 1999).

EU member states allocate an "A" quota and a "B" quota to each sugar producing operation, each isoglucose producing operation, and each inulin syrup producing operation established in their territory. Current quota levels have been placed since the accession of Austria, Sweden, and Finland to the EU and are currently legislated at these levels until 2000/01. The total EU sugar production quotas for A and B sugar are 11.98 million and 2.61 million, respectively. Any sugar that is produced by any member of the EU that is in excess of its yearly quota is considered "C-sugar." A and B sugar production is used for domestic consumption and for subsidized exports. C-sugar must be exported

into the world market without subsidy or carried over into the next marketing year. In general, the EU's target price for white sugar is about 30 cents (Euro) per pound, and its intervention price is 28.72 cents (Euro). The export subsidy was 20.0 cents (Euro) per pound for the 1995 to 1998 period. The EU's internal support is about 30 percent higher than that in the United States.

Since marketing year 1995, EU subsidized exports of sugar to third world countries have been limited, in volume and value, under the Uruguay Round commitments of the EU. However, the EU did not make an export subsidy commitment on its subsidized exports of a quantity of sugar equal to its preferential imports under the Lome Convention (Borremans 1999; Steel 1999).

South Africa has both internal price supports and export subsidies. South Africa is reducing its quantity of subsidized exports by 200,000 tons to 702,208 tons by the year 2000 under the URA (Steel 1999). Mexico also has subsidized exports and is subsidizing raw sugar storage (Steel 1999).

State Trading Enterprises in Australia, China, and India

Australia's sugar exports are handled by the Queensland Sugar Corporation (QSC), a statutory authority established under the Sugar Industry Act 1991 (Boston Consulting Group 1996). The QSC is responsible for the domestic marketing and export of 100 percent of the raw sugar produced in the state of Queensland, which produces 95 percent of the sugar produced in Australia. The QSC supports domestic producers through buyer-seller arrangements, marketing quotas, dual pricing arrangements, and other quasi-government mechanisms that isolate domestic producers from foreign competition. State trading enterprises (STEs) were not included in the URA. Other countries, including China and India, handle their sugar trade through STEs similar to the QSC.

Major Issues in the 2000 Round of the WTO Negotiations

Issues related to the U.S. sugar industry for the 2000 Round of the WTO agricultural trade negotiations include further reduction in internal supports and export subsidies, state trading enterprises, and agricultural biotechnology. These issues are not unique to the U.S. sugar industry but are fairly common for most agricultural commodities produced in the United States. Issues more directly related to the U.S. sugar industry are expected changes in U.S. sugar programs and policies, mainly loan rates and TRQs.

Internal Support and Export Subsidies

Although WTO members have made commitments to reduce internal supports and export subsidies, levels of these subsidies differ among countries. For instance, the EU's internal supports (producer support prices) for sugarbeet growers are about 30 percent higher than those in the United States (Table 3). Although the EU will reduce its subsidies on the basis of the committed schedule, the EU's export subsidies will remain at about 18 cents per pound in 2000/01, and subsidized exports will remain at 1.3 million tons (Table 4). These subsidies have stimulated sugar production in the region and lowered sugar prices in the world market.

Table 3. U.S.-EU Sugar Policy Comparison

Item	United States	European Union
Trade Status	Net importer	World's largest exporter
Producer Support Price (refined sugar)	22.90¢/lb	30-31¢/lb ^a
Future Support Price	Effective 6% reduction, 1996–2002	Frozen through 2001
Retail Price ^b (refined sugar)	41¢/lb	61¢/lb
Producer Tax on All Sugar Marketed	\$41 million/yr ^c	No
Export Subsidies	No	Yes
Production or Marketing Controls on Sugar	No	Yes
Production or Import Controls on Corn Sweeteners	No	Yes
Storage Payments to Producers	No	Yes
National Aids to Producers ^d	No	Yes
Refiner Subsidies	No	Yes
Subsidy for Nonfood Uses of Sugar	No	Yes

^a Weighted average of “A,” “B,” and “C” quotas; dollar value rises with exchange rates.

^b LMC International, *World Retail Sugar Price Survey*, June 1997.

^c Projected revenues of \$288 million during 1996/97–2002/03 for federal deficit reduction.

^d Italy and Spain pay their producers additional subsidies.

Source: Landell Mills Commodities, *U.S. and EU Sugar Policy Comparison*, 1997.

Table 4. EU Export Subsidy Limits, 1995/96–2000/01

Year	Volume (1,000 tons)	Budget (million Euro \$)
1995/96	1,566.6	733.1
1996/97	1,499.2	686.3
1997/98	1,442.7	639.5
1998/99	1,386.3	592.7
1999/00	1,329.9	545.9
2000/01	1,273.5	499.1

Source: European Communities, *Schedule CXL: Part IV Agricultural Products*, 1995.

State Trading

Many countries, including Australia and China, use STEs for sugar trade. As an example, the QSC in Australia handles 100 percent of sugar exports by that country (Boston Consulting Group 1996). It practices price discrimination and receives various subsidies from the government.

State trading will likely be an important issue in the 2000 Round of the WTO negotiations, primarily because STEs have the capacity to distort trade flows (Ingco and Ng 1998). Although the agenda of the 2000 Round of the WTO negotiations is uncertain with respect to STEs, it is clear that restrictions on STE operations will be needed to promote fair trade.

Biotechnology

Agricultural biotechnology has significant potential for consumers and producers. Genetically modified organisms (GMOs) are a leading edge of this technology; examples of GMOs include sugarbeets, corn, and soybeans that are insect resistant and herbicide tolerant. The GMOs also may increase sugar content in beets. However, GMO beets have not yet been produced in the United States mainly because of expected import restrictions on beet pulp produced from GMO sugarbeets in major foreign markets, including the EU and Japan. In 1998, the U.S. sugarbeet industry exported 555 thousand tons of beet pulp at \$124 per ton, mainly to the EU and Japan (USDA-ERS 1998). Differences in GMO regulations across countries pose potential barriers to exports. Clearly there is a need for harmonization of existing regulations among countries or negotiation of an international standard (Normile and Simone 1999).

Expected Changes in U.S. Sugar Programs and Policies

The 2000 Round of the WTO agricultural trade negotiations may require TRQs to be converted to a tariff system. If the United States converts TRQs to tariffs and reduces the tariffs gradually, U.S. imports of sugar will also gradually increase. As a result, the U.S. domestic sugar price may fall and also may become more volatile. Even if the United States is able to maintain its TRQ on sugar, the United States might have to raise its quota over the given time period and lower its second-tier duty, implying that more sugar would be imported into the United States. In addition, the United States would import more sugar from Mexico under NAFTA. The increased sugar imports may result in lower sugar prices in the United States.

World Sugar Simulation Model for Free Trade Scenarios

A major concern is what is going to happen in the world sugar industry if the U.S. government and/or the EU eliminate the sugar programs, mainly loan rates and TRQs in the United States and domestic and export subsidies in the EU, while other countries maintain their subsidies. There is strong opposition to the U.S. sugar program from food processors and consumers, and the elimination of the sugar program has been debated publicly for the last decade. A global sugar simulation model developed by Benirschka, Koo, and Lou (1996) was used to address this question.

Econometric Simulation Model

The global sugar policy simulation model was developed by dividing sugar into beet and cane sugar. This model includes 17 sugar producing and consuming countries. Some of these countries are beet sugar producing countries (Algeria, Canada, the EU, and FSU) and some are cane sugar producing countries (Australia, Brazil, Cuba, India, Indonesia, Mexico, South Africa, and Thailand). The remaining countries (China, Egypt, Japan, and the United States) produce both beet and cane sugar. These two sugars are perfectly substitutable in consumption, but are differentiated in the production process. Sugarcane is produced in tropical and subtropical climate zones. Once the cane is harvested, the sucrose starts breaking down. Thus, to minimize transport costs and sucrose losses, sugarcane mills are located close to cane fields. Mills convert sugarcane into raw sugar that is shipped to refineries for further processing into refined sugar. On the other hand, sugarbeets are produced in temperate climate zones. Since sugarbeets are bulky and costly to transport, beet processing facilities are located near the fields.

Sugar production, consumption, and carry-over stock equations in major producing and consuming countries are estimated with time series data by using econometric techniques. The estimated equations are linked under a partial equilibrium condition in the world sugar industry (Figure 7). The market clearing condition requires that the sum of all countries' excess demand for sugar, which depends on the world price of sugar, is zero. This aggregate excess demand equation is solved for the equilibrium price.

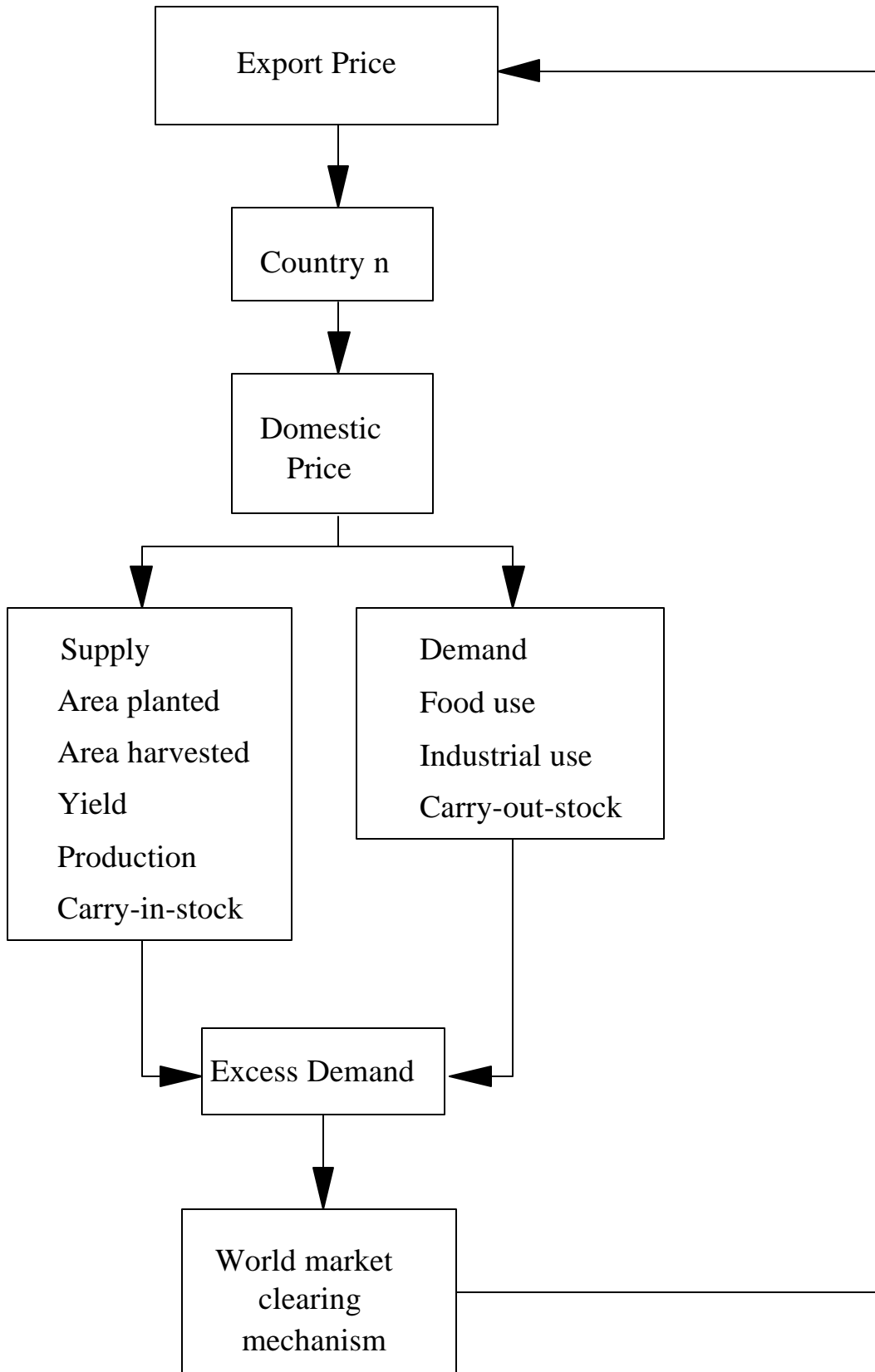


Figure 7. Conceptual Sugar Model

Sugar Supply

Area and yield equations determine the supply of sugar. Since sugar is divided into two classes (cane sugar and beet sugar), two separate supply equations are estimated in the United States, Egypt, Japan, and China, where both sugar classes are produced. Thus, these countries have behavioral equations for one sugar class which they largely produce under an assumption that the two sugar classes are not substitutable in production and consumption in the countries.

Sugar area depends upon expected prices of sugar and alternative crops. As a proxy for price expectations, lagged prices are used in the area equation. In addition to commodity prices, the lagged area variable is included to capture dynamics associated with producers' planting decisions. Area harvested is a function of lagged area, prices of sugar and alternative crops, and government policies as follows:

$$a_{i,t}^s = f(a_{i,t-1}^s, p_{i,t-1}^s, p_{t-1}^c, g_t) \quad (1)$$

where

- a^s = the sugar area harvested
- p^s = the world market price or domestic price of sugar
- p^c = the price of alternative crops
- g = policy parameters
- i = index for sugar type ($i=1$ for cane sugar and $i=2$ for beet sugar)

Since sugarcane and sugarbeets are not competing directly for land, area of each type is a function of price of the corresponding crop. Competing crops are cotton in sugarcane producing regions and wheat, barley, and oilseed crops in sugarbeet producing regions.

Sugar yields depend on lagged yield and a time trend representing changes in technology as

$$y_{i,t}^s = f(y_{i,t-1}^s, t) \quad (2)$$

where

- y^s = sugar yield per hectare
- t = a time trend representing technology.

The total quantity of sugar produced is the product of the area harvested and yield per hectare:

$$qp_{i,t}^s = a_{i,t}^s \cdot y_{i,t}^s \quad (3)$$

where

- $qp_{i,t}^s$ = the quantity of sugar produced

Sugar Demand

Demand for sugar comprises food and industrial uses for domestic demand, carry-out stocks, and net exports. Domestic demand and carry-out stock equations are estimated with time series data, while net exports are the difference between domestic demand and supply.

Per capita sugar consumption is a function of the price of sugar, income, and a time trend representing changes in consumers' tastes and preferences:

$$fd_{i,t}^s = f(p_{i,t}^s, cy_t, t) \quad (4)$$

Total consumption of sugar is calculated by multiplying the per capita consumption by population in the country as

$$qd_{i,t}^s = fd_{i,t}^s * pop_t \quad (5)$$

where

fd = demand for food

qd = the total demand for sugar

cy = per capita income

pop= population

Carry-out Stocks

Carry-out stocks are a precaution against unexpected shortfalls in production. These stocks, therefore, are likely related to the level of domestic production. However, since the opportunity cost of holding sugar stocks depends on the price of sugar, the stocks should respond to price changes.

$$qs_{i,t}^s = f(qs_{i,t-1}^s, qp_{i,t}^s, p_{i,t}^s) \quad (6)$$

where qs^s = carry-out stocks.

Net Export

Net exports are the difference between domestic supply and demand:

$$qx_{i,t}^s = qs_{i,t-1}^s + qp_{i,t-1}^s - qd_{i,t}^s - qs_{i,t}^s \quad (7)$$

where qx^s = the net export of sugar.

If net exports are negative, the country is a net importer.

Price Linkage

World prices of sugar are converted into domestic prices using the official exchange rates as follows:

$$pm_{it}^{s,n} = pm_{it}^{s,w} * er_t^n \quad (8)$$

where

$pm^{s,n}$ = import price of sugar in country n

$pm^{s,w}$ = world price of sugar

er^n = exchange rate of country n

To simulate changes in trade policies, specific and ad valorem tariffs can be added to the linkage equation as:

$$pd_{i,t}^{s,n} = pm_{i,t}^{s,n} \cdot (1 + b^{s,n}) + t^{s,n} \quad (9)$$

where

$pd^{s,n}$ = domestic price of sugar paid by consumers in country n

b = an ad valorem tariff

t = specific tariff

The wholesale price of sugar is linked to the world price of sugar in domestic currency:

$$pw_{i,t}^{s,n} = f(pd_{i,t}^{s,n}) \quad (10)$$

where $pw^{s,n}$ = wholesale price of sugar in country n.

The price of sugar received by farmers is linked to the world price of sugar in domestic currency:

$$pf_{i,t}^{s,n} = f(pd_{i,t}^{s,n}) \quad (11)$$

where $pf^{s,n}$ = price of sugar received by farmers in country n.

Market Equilibrium

The market equilibrium implies that the total supply equals total demand, indicating that the sum of each country's excess demand (exports) is equal to zero:

$$\sum_{n=1}^n qx_{i,t}^{s,n} = 0 \quad i = 1,2 \quad (11)$$

The equilibrium condition is solved to determine market clearing prices of sugar. For the countries which have import commitments under the UR agreement, their actual import commitments are used in the above equations when their imports are less than the commitments.

Assumptions and Data Collection

Base projections of this global sugar simulation model is grounded on a series of assumptions about general economy, agricultural policies, and technological changes in exporting and importing countries. Macro assumptions are based on forecasts prepared by WEFA group and Project Link. Some of the macro variables are GDP growth rates, interest rates, exchange rates, and inflation rates in the countries. It is generally assumed that current agricultural policy will be continued in all countries. Average weather conditions and historical rates of technological change are assumed to prevail during the projection period. The prices of sugar in individual countries and the world market are endogenous, while the prices of other crops are exogenous. Thus, the baseline projection of the model is based on the forecasted world prices of other crops which have substitute and complementary relationships with sugarbeets and sugarcane. The forecasted prices were obtained from the Food and Agricultural Policy Institute (FAPRI) baseline solution.

Alternative Scenarios

Alternative scenarios are developed on the basis of possible policy changes in the United States and the EU. The scenarios are:

1. The United States eliminates its import restrictions on sugar for the 2001 to 2004 period and maintains its trade embargo on Cuba, while other countries maintain their subsidies and import restricting programs.
2. The United States eliminates its import restrictions on sugar for the 2001 to 2004 period and allows trade with Cuba, while other countries maintain their subsidies and import restricting programs.
3. Both the United States and the EU eliminate import restrictions and subsidies, respectively, for the 2001 to 2004 period, and other countries maintain their subsidies and import restricting programs.

The results from these alternative scenarios are compared with those from the base scenarios to evaluate impacts of the stated policy changes on the U.S. sugar industry.

U.S. Sugar Industry under the Base and Alternative Trade Policies

In the base scenario, sugar production in the United States is expected to increase about 4.2 percent for beet sugar and 3.2 percent for cane sugar during the 2001 to 2004 period (Table 5). However, sugar consumption in the United States is expected to increase about 4.4 percent, which is slightly larger than production. As a result, U.S. imports of sugar are projected to increase 5.4 percent in this time period. Figure 8 shows beet and sugar production and consumption for the 1990-2004 period in the base scenario. As indicated above, sugar consumption will increase faster than both beet and cane sugar production, resulting in increases in imports.

Caribbean price of sugar is expected to increase 21 percent for the 2001 to 2004 period in the base scenario (Table 5). However, the U.S. domestic wholesale price of sugar is expected to increase only 6.1 percent for the same time period (Figure 9). This is mainly because the U.S. government increases its imports to stabilize the domestic price of sugar.

Table 5. Sugar Price, Production, Consumption, and Imports under the Base and Trade Liberalization Scenarios in the United States

		1999	2004			
		Actual	Base	Liberalization in the U.S.		Liberalization
				No Trade With Cuba	Open Trade With Cuba	U.S. and EU
<u>Production</u>						
Beet Sugar	1,000 ton	4,577.3	4,768.2 (4.2%)	3,733 (-18.3%)	3,668 (-19.7%)	4,135 (-9.4%)
Cane Sugar	1,000 ton	3,428.1	3,536.8 (3.2%)	2,956 (-13.8%)	2,914 (-15.5%)	3,216 (-6.2%)
<u>Consumption</u>						
	1,000 ton	10,083.1	10,518.8 (4.3%)	11,426 (12.7%)	11,494 (14.0%)	10,947 (7.9%)
<u>Imports</u>						
	1,000 ton	2,190.9	2,308.8 (5.4%)	4,772 (117.8%)	4,948 (125.8%)	3,616 (65.1%)
<u>Price</u>						
Sugarbeets	\$/ton	38.45	39.74 (3.4%)	29.02 (-23.7%)	28.23 (-25.4%)	34.69 (-8.3%)
Sugarcane	\$/ton	27.11	28.23 (4.1%)	18.86 (-29.0%)	18.16 (-31.6%)	23.82 (-10.3%)
Caribbean	cents/lbs	9.43	11.45 (21.4%)	12.53 (36.7%)	12.06 (32.2%)	15.86 (68.2%)
Import	cents/lbs	21.25	22.60 (6.4%)	15.03 (-29.3%)	14.47 (-31.9%)	19.03 (-10.4%)
Wholesale	cents/lbs	23.28	24.70 (6.1%)	16.75 (-28.0%)	16.17 (-30.6%)	20.95 (-10.0%)
Retail	cents/lbs	35.74	37.66 (5.4%)	26.89 (-24.8%)	26.09 (-27.0%)	32.58 (-8.8%)

Parenthesis show change from actual.

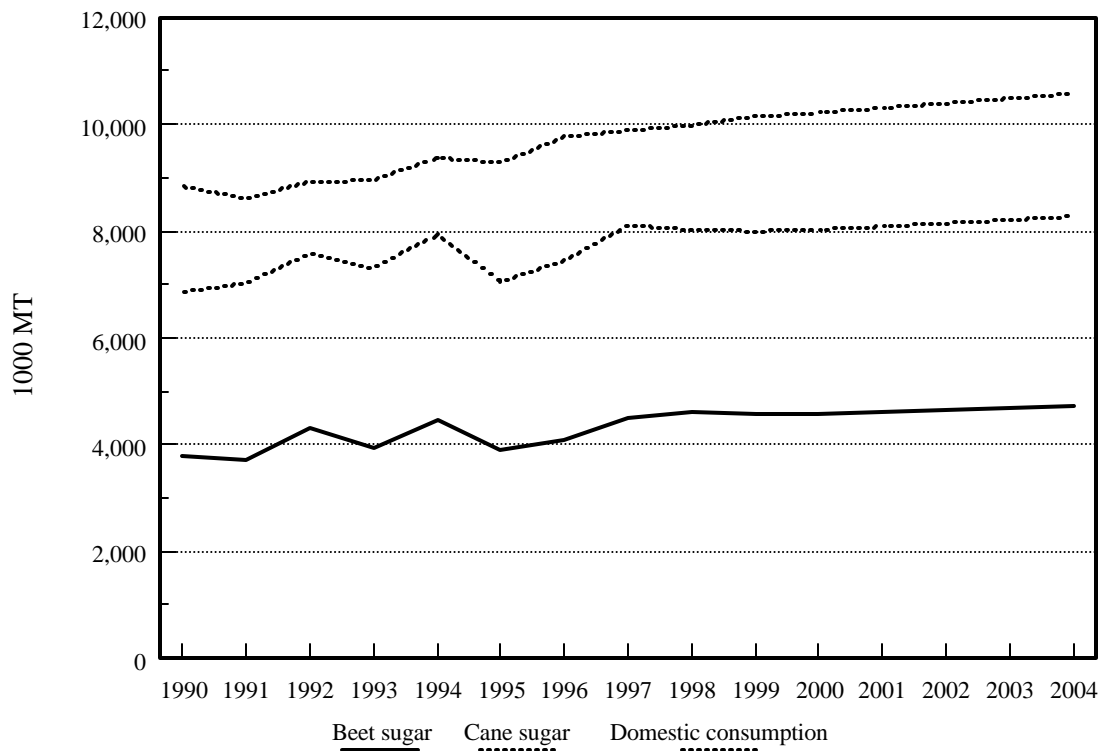


Figure 8. Beet and Cane Sugar Production and Consumption under the Base Scenario, 1990-2004.

Elimination of Import Restrictions and the Loan Program in the United States

Under the U.S. trade liberalization scenario in which the United States eliminates its import restrictions while other countries maintain their sugar programs (Scenario 1), the Caribbean price of sugar is expected to increase about 36 percent for the 2001 to 2004 period because increased U.S. imports of sugar raise demand for sugar in the world market. At the same time, the U.S. wholesale price decreases 28 percent for the 2001 to 2004 period because increased imports raise the supply of sugar in the United States. When the United States includes Cuba as a trading partner in the same scenario (Scenario 2), the Caribbean price of sugar increases only 32 percent and U.S. wholesale price decreases 30.6 percent. This is mainly because Cuba can supply large amounts of sugar to the United States at shipping costs lower than any other off-shore origins. Figure 9 shows annual movements of both Caribbean and U.S. domestic wholesale sugar prices for the 1990-2004 period under the U.S. trade liberalization scenario with and without trade with Cuba.

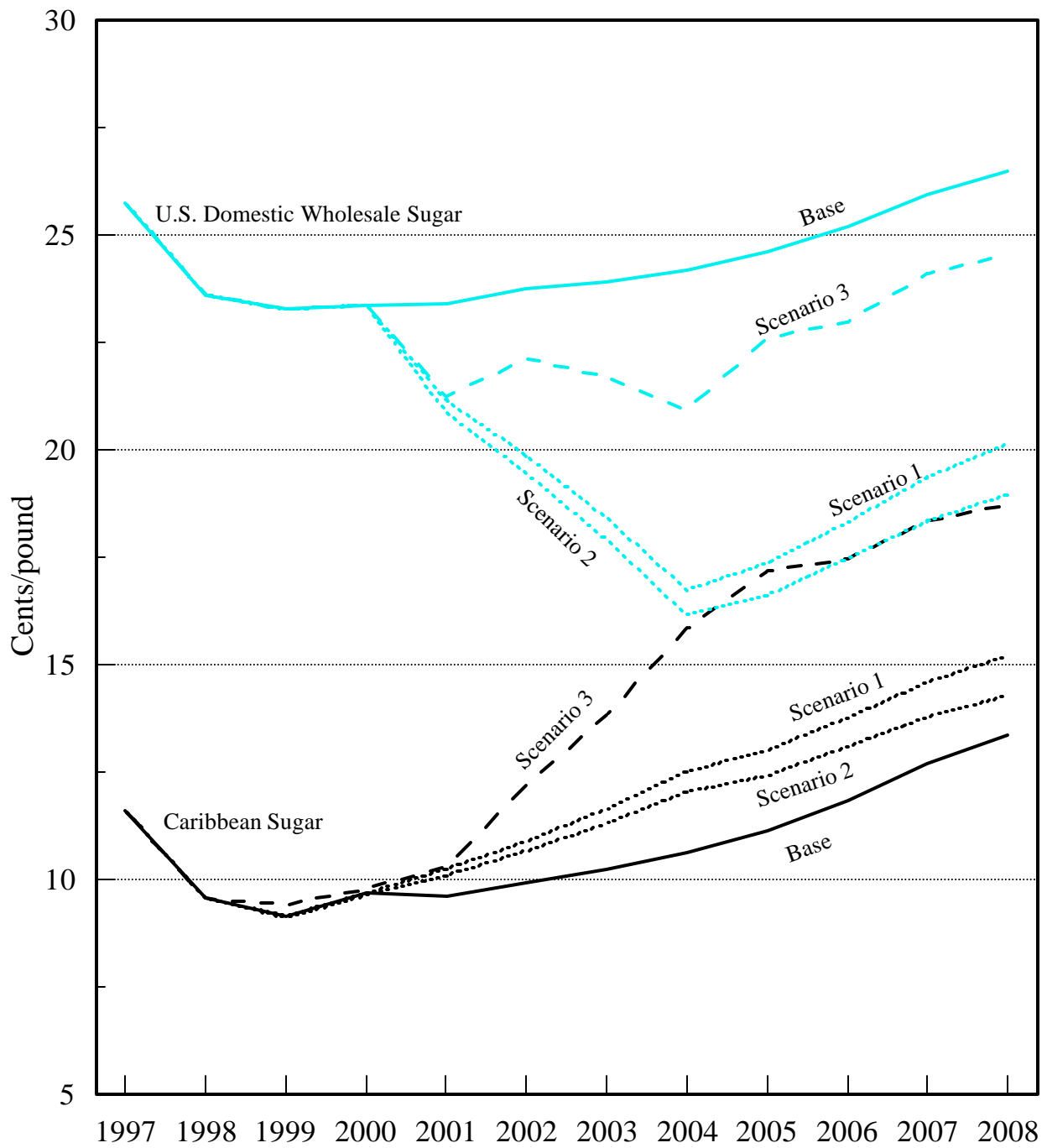


Figure 9. Caribbean and U.S. Domestic Wholesale Price of Sugar under the Base and Alternative Trade Liberalization Scenarios

Under the trade liberalization scenario with no imports from Cuba, U.S. sugar production is expected to decrease for the 2001 to 2004 period (18.3 percent reduction for beet sugar and 13.8 percent reduction for cane sugar) and consumption is expected to increase about 12.7 percent (Figure 10). When the United States starts to import sugar from Cuba under the trade liberalization scenario, production of sugar decreases further due to reduction in the domestic price of sugar, and consumption of sugar increases more than under the scenario with no import from Cuba. Since Cuba is a major sugar producing country in the world, trade liberalization with Cuba tends to increase imports from Cuba, resulting in further reductions in sugar production and increases in sugar consumption. U.S. sugar imports would increase 118 percent under the U.S. trade liberalization scenario with no imports from Cuba and 126 percent under the same scenario with imports from Cuba.

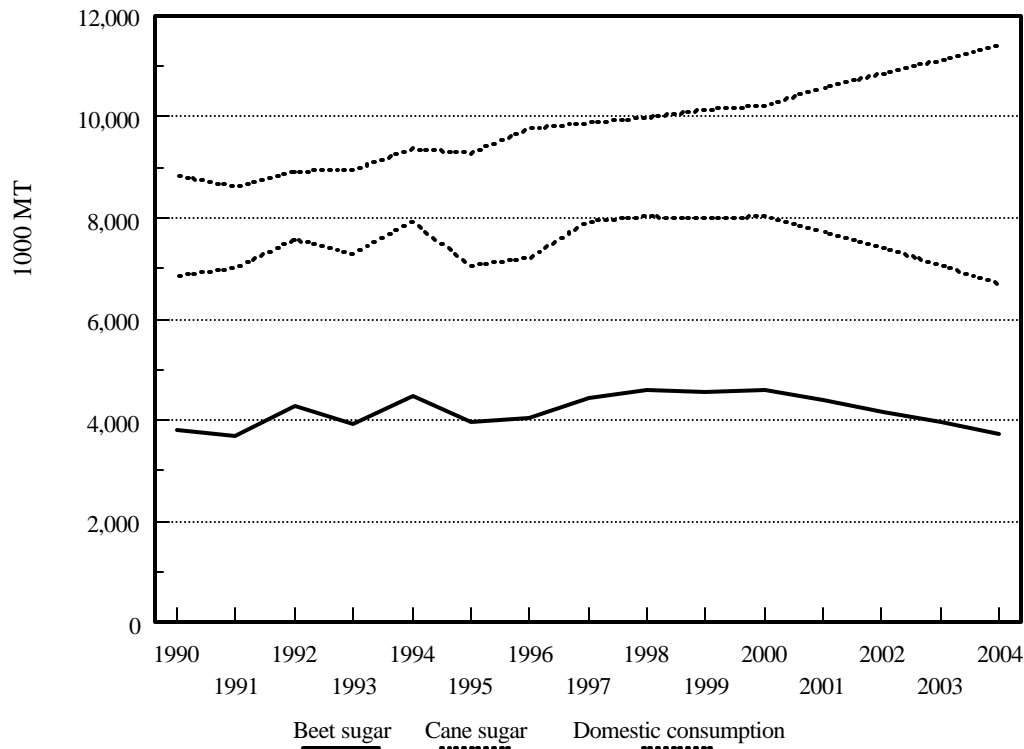


Figure 10. Beet and Cane Sugar Production and Consumption under the U.S. Trade Liberalization Scenario

Elimination of Domestic Programs and Trade Liberalization in the United States and the EU

When both the United States and the EU liberalize their sugar trade (Scenario 3), the Caribbean price of sugar is expected to increase 68 percent from 9.45 cents in 1999 to 15.86 cents per pound in 2004 (Figure 9). This is mainly because under this scenario, (1) sugar production in the EU decreases substantially and the EU starts to import sugar and (2) the United States also increases its sugar imports, resulting in the increased demand for sugar in the world market. The U.S. wholesale price of sugar decreases only 10 percent for the 2001 to 2004 period under this scenario.

Sugar production is reduced 9.4 percent for beet sugar and 6.2 percent for cane sugar, which is much smaller than under the other scenarios (Figure 11). Sugar consumption would increase 7.9 percent. As a result, sugar imports would increase 65 percent which is much smaller than under the other scenarios. This implies that impacts on the U.S. sugar industry are minimal if both the United States and the EU liberalize their sugar policies.

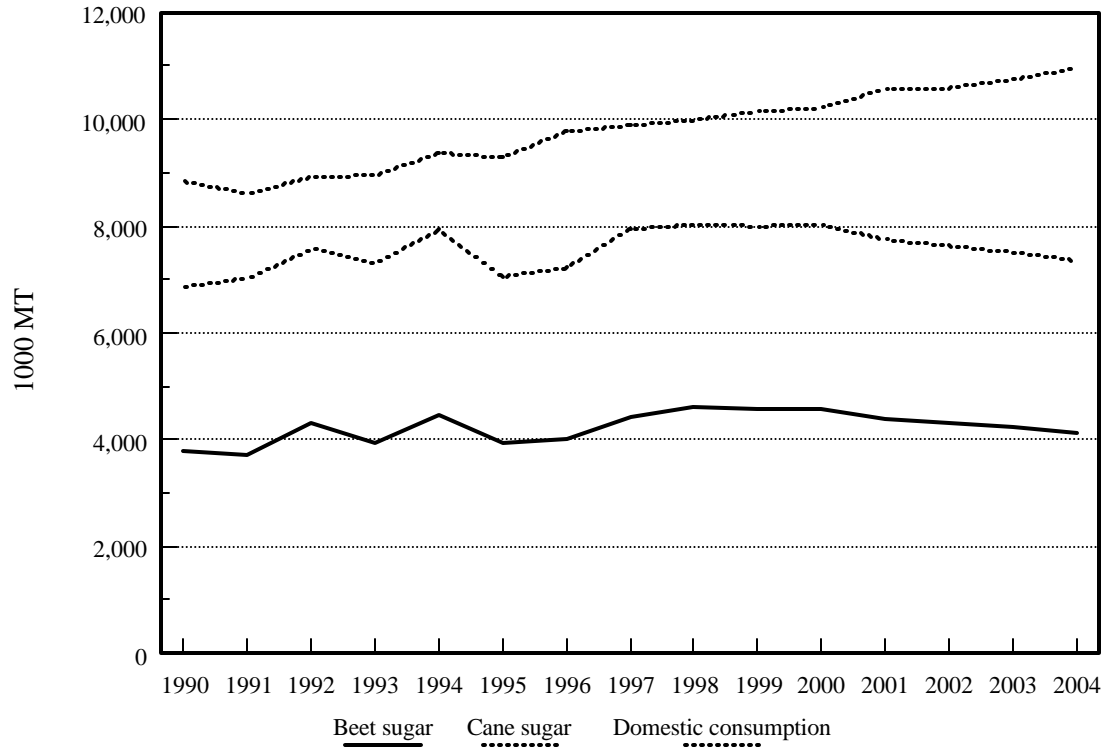


Figure 11. Beet and Cane Sugar Production and Consumption under the U.S. and EU Trade Liberalization Scenario

Regional Competitiveness

Figure 12 shows production and processing costs of refined sugar in major U.S. sugar producing regions. Production and processing costs are the highest in Hawaii, followed by Texas (McElroy and Ali 1995). Cane sugar producing regions have higher production and processing costs than most beet sugar producing regions, except in Florida. Production and processing costs in Florida are similar to those in beet sugar producing regions. The Red River Valley has the lowest production and processing costs in the United States, followed by the Northwest. These two regions appear to have a competitive advantage in producing sugar in the United States.

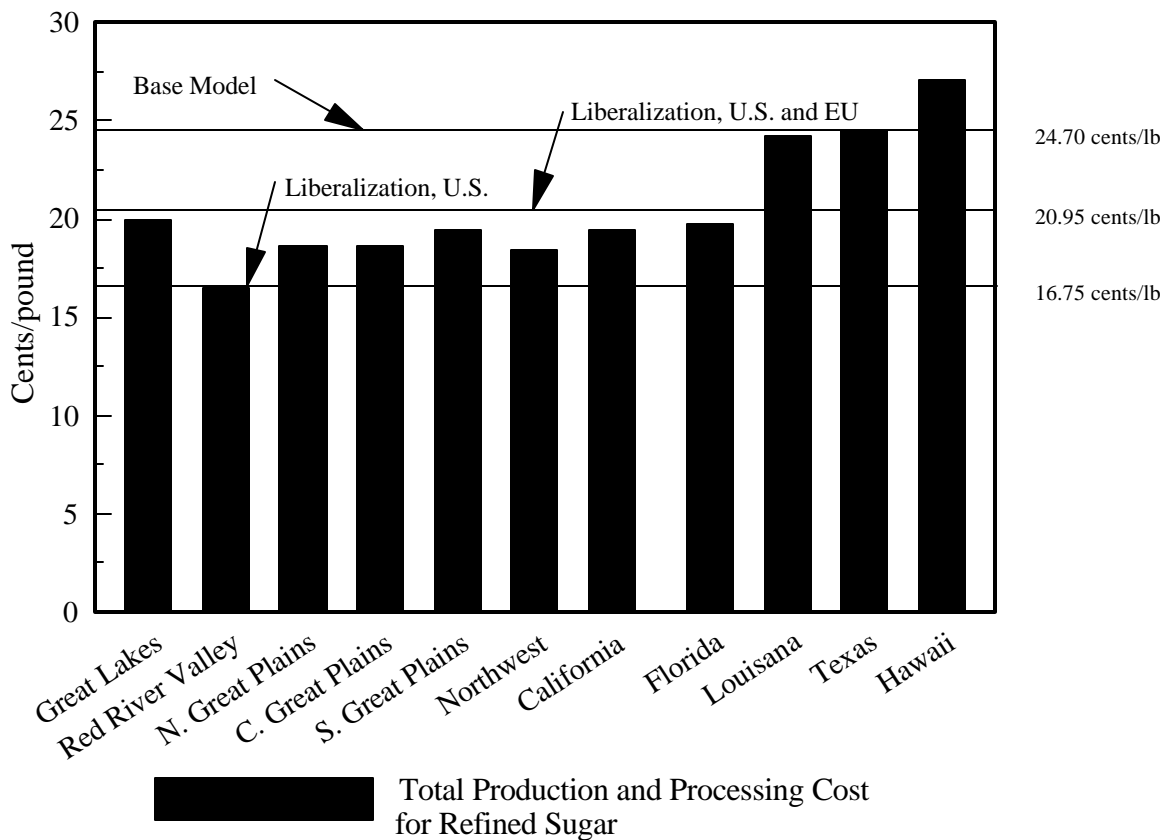


Figure 12. Break-even Point for North American Sugar Producing Regions
 Source: USDA-ERS, *Sugar and Sweetener Situation and Outlook*, various issues.

At a market price of 24.7 cents per pound, all areas except Hawaii are covering production and processing costs. When the price is lowered to 20.95 cents per pound under the trade liberalization scenario in both the United States and the EU, Louisiana, Texas, and Hawaii are not covering their costs, indicating that these three regions may not be able to sustain their sugar production. When the price is lowered to 16.75 cents per pound under the free trade scenario in the United States, no sugar producing regions in the United States are covering their production and processing costs at current asset values.

This implies that most sugar producing regions may be able to survive at current costs and asset values if both the United States and the EU liberalize their sugar trade, while sugar subsidies remain in other countries. However, if only the United States eliminates its sugar programs, all U.S. sugar producing regions would be threatened.

Concluding Remarks

The U.S. sugar industry has been protected by the U.S. sugar program in the 1996 FAIR Act and the TRQ under the URA. As a result, the domestic sugar price is about 23 cents, whereas the world sugar price is 9 cents per pound. Of concern is what the U.S. sugar industry will face with the expected changes in the U.S. sugar programs in the 2000 Round of the WTO negotiations on agriculture.

Aside from addressing further reductions in subsidies, the 2000 Round of the WTO negotiations will likely deal with issues involving the restriction of activities of STEs and the standardization of regulations on biotechnology. Progress on these issues will lead to further liberalization of world sugar trade and will have significant impacts on the U.S. sugar industry in the near future.

The United States may not be able to maintain the TRQs on sugar. The new WTO negotiations may require member countries to convert TRQs to a tariff system and to reduce the tariff rates over the given period. Even if the United States is able to maintain its TRQ on sugar, the United States will likely be expected to raise its quota on sugar and lower its second-tier duties over the given period. In addition, Mexico has the potential to export sugar to the United States under NAFTA. The United States will likely import much more sugar and, consequently, the U.S. domestic sugar price will likely fall.

The U.S. sugarbeet industry is more cost efficient than the sugarcane industry. Florida is the most competitive sugarcane producing region. The Red River Valley is most competitive in producing beet sugar. Most sugarbeet producing regions and Florida will remain competitive, at current costs and asset values, if the domestic price decreases to 20.95 cents per pound as a result of the elimination of the sugar programs in the United States and the EU. However, if only the United States eliminates its sugar programs, all U.S. sugar producing regions would be threatened.

References

- Benirschka, M., W.W. Koo, and J. Lou. "World Sugar Policy Simulation Model: Description and Computer Program Documentation." Agricultural Economics Report No. 356. Department of Agricultural Economics, North Dakota State University, Fargo, 1996.
- Borremans, Danielle. "Sugar Market Country Report: EU." U.S. Mission to the EU, Office of Agricultural Affairs. (http://www.sugarinfo.co.uk/sugar_report_eu.htm), 1999.
- Boston Consulting Group. "Report to the Sugar Industry Review Working Party: Analysis & Identification of Possible Option," 1996.
- European Communities. *Schedule CXL: Part IV Agricultural Products*, 1995.
- Henneberry, P.D., and S.L. Haley. "Implications of NAFTA Duty Reductions for the U.S. Sugar Market." *Sugar and Sweetener: Situation and Outlook Report*, U.S. Department of Agriculture, Economic Research Service, SSS-224, Washington, DC, 1998.
- Ingco, M., and F. Ng. "Distortionary Effects of State Trading in Agriculture: Issues for the Next Round of Multilateral Trade Negotiations." The World Bank, Washington, DC, 1998.
- Landell Mills Commodities. *U.S. and EU Sugar Policy Comparison*. Landell Mills, NY, 1997.
- Lord, R. "Sugar." *Provisions of the Federal Agriculture Improvement and Reform Act of 1996, AIB-729*. U.S. Department of Agriculture, Economic Research Service, Washington, DC, December 1996.
- McElroy, R.C., and M. Ali. "U.S. Sugarbeet and Sugar Cane Per-acre Costs of Production: Revisions of 1992 and new 1993 and 1994 Crop Estimates." *Sugar and Sweetener Situation and Outlook*, U.S. Department of Agriculture, Economic Research Service, Washington, DC, 1995.
- Normile, M., and M. Simone. "Agriculture in the Uruguay Round." U.S. Department of Agriculture, Economic Research Service, WTO Briefing Room, (<http://www.econ.ag.gov/briefing/wto/issues/uraa.htm>), 1999.
- Steel, P.M. Comments from the U.S. Department of Agriculture on GAO Report "Sugar Program, Changing the Method for Setting Import Quotas Could Reduce Cost to Users," GAO/RCED-99-209, Washington, DC, 1999.
- U.S. Department of Agriculture, Economic Research Service (USDA-ERS). <http://usda.mannlib.cornell.edu/reports/erssor/trade/fau-bb/data/1998> .

———. *PS&D View*. (Computer Files). Washington, DC, 1999.

———. *Sugar and Sweetener: Situation and Outlook Report*. Washington, DC, various issues.

U.S. General Accounting Office (U.S. GAO). *Sugar Program: Changing the Method for Setting Import Quotas Could Reduce Cost to Users*. GAO/RCED-99-209, Washington, DC, 1999.

World Trade Organization (WTO), *Trading into the Future*, 2nd. Geneva, Switzerland, 1998.