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Multilateral Trade and Agricultural Policy Reforms in Sugar Markets

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Abstract: We analyze the removal of current market interventions in world sugar markets using a partial-equilibrium international sugar model calibrated on 2002 market data and current policies. We analyze the impact of trade liberalization and the removal of production subsidies and consumption distortions. The removal of trade distortions alone induces a 27 percent price increase by the end of the decade relative to the baseline level for sugar. The removal of all trade and production distortions induces a 48 percent price increase by the end of the outlook period. Aggregate trade expands moderately, but location of production and trade patterns are substantially affected. Protectionist countries of the Organisation for Economic Cooperation and Development (OECD) (the European Union, Japan, and, to a lesser extent, Mexico and the United States) experience an import expansion or export reduction and significant contraction in production in unfettered markets. World beet production decreases by 21 percent by the end of the decade, whereas world cane production increases by 8 percent. Brazil, Australia, Cuba, Indonesia, and Turkey expand production when all distortions are removed. Aggregate world sugar production and use decrease by 2 percent. We discuss the significance of these results in the context of the mounting pressures to reform U.S. and E.U. sugar policies and increase market access in OECD countries.

Keywords: sugar, trade liberalization, agricultural policy, Doha, WTO, domestic subsidies.

JEL code: Q18, F10

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1. Introduction

The current world sugar market situation has complex North-South and South-South components. A myriad of policy interventions make sugar one of the most distorted commodity markets in the world. The European Union, Japan, and the United States are among the worst offenders in these markets. Producers in the United States receive between two and three times the world market price because of production quotas, import controls, and government guaranteed prices. OECD (Organisation for Economic Cooperation and Development) countries' support to their sugar producers amounted to about $5.3 billion in 2002 (OECD, 2003), roughly the value of developing-country sugar exports. In 2002, the European Union, the United States, and Japan provided US$2.45 billion, US$1.18 billion, and Jap$40 billion of annual support (OECD, 2003). Such high protection has converted the European Union, a natural importer of sugar, to a net exporter and has reduced sugar imports to the United States and Japan to a fraction of free-trade levels. Further, most countries, including the lowest-cost producers, offer some form of protection or subsidies to their producers, and/or distort signals seen by consumers, and often impede or directly distort trade in some fashion with restrictive import policies (Mitchell, 2003; OECD, 2003).

An obvious question to ask is what unfettered markets would look like. What consumption and production levels would prevail and what world price could be sustained in the absence of distortions? The latter question has been a bone of contention with producers in protected markets. The current world price is often referred to as the "world dump price" by sugar interests in OECD countries because a substantial share of world sugar trade occurs under preferential agreements (American Sugar Alliance, 2003). Beyond the politics of sugar protectionism, the determination of an undistorted world price is a legitimate concern. There is

no consensus on what this undistorted world price would look like. Partial-equilibrium estimates tend to be higher than those coming from computable general equilibrium (CGE) studies (van der Mensbrugghe, Beghin, and Mitchell, 2003). Given that policies and market conditions change over time, a useful contribution to this debate is to provide a new estimate of the undistorted world price of sugar.

Recent and interesting policy developments warrant a new analysis of the sugar market. Protectionist interests in the United States won a battle with the virtual exclusion of sugar in the U.S.-Australia Free Trade Agreement (FTA). Despite this setback, the United States and the European Union will soon be forced to reform their sugar programs because of internal market changes and international commitments already made under NAFTA, the Everything-But-Arms (EBA) agreement, and minimum-market access commitments made under the Uruguay Round of the World Trade Organization (WTO). Further commitments are being negotiated under and the Free Trade Agreement of the Americas (FTAA), and the latter will only exacerbate these pressures for reform. This is another case of border opening forcing domestic policy discipline, such as in the recent reform of the U.S. peanut program. Needed reforms coincide with scheduled reviews of the common agricultural policy (CAP) in 2006 and the expiring of the U.S. Farm Security and Rural Investment Act in 2007 and provide a target period to get reforms in place. Would these reforms be more palatable under free trade with a higher world price? What is the effect of domestic farm policies relative to border barriers on world prices and markets?

Multilateral trade liberalization erodes benefits and market access from preferential bilateral trade agreements and casts low-cost producers from Brazil and Thailand against less-efficient producers in the South. For example, 9 of the 42 countries that hold U.S. quotas do not even produce the sugar they deliver under the quotas. Hence, sugar market liberalization has an

important South-South dimension. How these reforms occur will have important consequences for developing countries. If world price effects are large, what is the net effect of removing one's protection when it is combined with a substantial world price increase?

Most partial-equilibrium analyses of the sugar market analyze trade liberalization holding prices and policies constant in other markets. We depart from this approach and incorporate the impact of agricultural trade liberalization on prices for crops competing with sugar in land use. These free-trade prices come from a similar policy analysis carried out with companion models and using the same baseline of the Food and Agricultural Policy Research Institute (FAPRI) (FAPRI, 2002).

In the following paragraphs we summarize major policy interventions in world sugar markets. Then we briefly describe the international sugar model used for the simulations. After having introduced the policy reform scenarios, we present the results of our simulations. An Appendix table provides further detailed information on the results country by country for consumption and production. We close with further reflection on what our results mean for global sugar policy reforms.

2. Distortions in Sugar Markets

Table 1 summarizes key current (as of 2002) distortions by countries covered in our analysis. Sugar markets are highly distorted in virtually all countries. OECD markets are by far the most distorted (OECD, 2003). But virtually all countries provide some sort of support to their sugar producers, including countries considered low-cost producers, such as Brazil (Mitchell, 2003).

Several countries use tariff rate quotas (TRQs) and TRQ-like schemes to block imports with prohibitive duties on out-of-quota imports (the European Union, Japan, and the United

States). Many countries (Turkey, the Philippines) have no TRQs but have high tariffs on imports. Several countries (e.g., India, Egypt, and Colombia) provide domestic farm subsidies to their producers, either directly or through sugar processors who rebate them to farmers. In several countries (e.g., Japan), domestic production policies are in fact supported by trade barriers. Closed borders reduce government outlays on farm programs, and sugar users and consumers effectively bear the cost of the production subsidies. To summarize the extent of distortions, 6o percent of trade in sugar and 80 percent of production takes place at prices above the world price (Mitchell, 2003).

3. Structure of the CARD International Sugar Model

The CARD[1] international sugar Model is a non-spatial, partial-equilibrium econometric world sugar model consisting of 29 countries/regions, including a Rest-of-the-World aggregate to close the model. The model is used to establish the sugar component of the FAPRI baseline (FAPRI, 2003) and for policy analysis (Beghin, et al., 2003). Major sugar producing, exporting, and importing countries are included in the CARD international sugar Model. The model specifies only raw sugar production, use, and trade between countries/regions and does not disaggregate refined trade from raw trade. Consequently, there is no category for importers as refiners or toll refiners because those countries that specialize in that role are well known and stable over time. Country coverage consists of the following countries/regions: Algeria, Argentina, Australia, Brazil, Canada, China, Colombia, Cuba, Eastern Europe (Poland, Hungary, Czech and Slovak Republics[2]), Egypt, European Union-15, Former Soviet Union (FSU) (mainly Russia and the

[1] CARD stands for Center for Agricultural and Rural Development at Iowa State University.
[2] Eastern Europe also includes Albania, Bosnia, Bulgaria, Croatia, Macedonia, Romania, and Slovenia.

Ukraine[3]), India, Indonesia, Iran, Japan, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, South Africa, South Korea, Thailand, Turkey, The United States, Venezuela, and a Rest-of-World aggregate.

The general structure of the country sub-model includes behavioral equations for area harvested, yield, production for sugar beet and sugarcane on the supply side, and per capita consumption and ending stocks on the demand side. Equilibrium prices, quantities, and net trade are determined by equating excess supply and excess demand across countries and regions. Using price transmission equations, the domestic price of each country or region is linked with a representative world price (Caribbean f.o.b. price) through exchange rates and other price policy wedges such as tariffs and transfer-service margins. Because of the overall scope of the model, it is not feasible to include the complete empirical model in the text. The general framework for each country sub-model consists of the following:

(1) Planted area: $AH_t = f\,(AH_{t-1}, RSPP_{t-1}, RGP_{t-1}, \text{Trend})$,

(2) Yield: $\text{Yield}_t = f\,(\text{Yield}_{t-1}, \text{Trend})$,

(3) Cane and beet crop production: $\text{Production}_t = AH_t * \text{Yield}_t$,

with AH denoting acreage, RSPP being the cane or beet price, and RGP denoting the price of alternative crops.

Total sugar production is obtained by converting beet production and raw cane production into raw sugar equivalent. Sugar consumption per capita is determined by the real price of sugar and income per capita:

(4) Per capita sugar consumption: $= f\,(RSP, PCRGDP)$,

[3] The Former Soviet Union includes Armenia, Azerbaijan, the Baltic States (Estonia, Latvia, and Lithuania), Belarus, Georgia, Republic of Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Republic of Uzbekistan.

with RSP being the real consumer price of raw sugar, and PCRGDP representing real income per capita; total demand is just the product (population* per capita consumption). Inventory demand is

(5) Ending Stocks = f (ES_{t-1}, SC, RSP),

with ES representing ending stock, and SC denoting sugar consumption.

In many countries, the beet or cane prices are set by policy and can be treated as being predetermined. Some countries lack information on agricultural price and the raw cane sugar price, RSP, is used instead of the agricultural prices in the specification of the acreage response. In some countries, yield improvements are captured by a time trend. The excess demand (supply) of each country goes to the world market for raw sugar, and the sum of all excess demands and supplies is equal to zero by market clearing to determine the world market price.

The CARD international sugar model uses price transmission elasticities to link the world and domestic markets for each country. The price transmission equation assumes that agents in each country are price-takers in the world market. Countries are either a natural importer or exporter if their autarkic price falls above or below the world price. Net importers enjoy natural protection plus whatever barrier is set at the border. Abstracting from any spatial consideration and assuming an "ad valorem tariff only" regime, the domestic price can be expressed as

(6) $P^d = \alpha + \beta \cdot P^w \cdot r \cdot (1+d)$,

where P^d is the domestic price, P^w is the world price of sugar including international transportation cost if the country is an importer (f.o.b. price for exporters), r is the exchange rate, and d summarizes policy interventions between the world and domestic markets and is expressed in ad valorem form. Parameter α captures the divergence of the domestic and border price that does not depend on the price level but rather reflects transaction costs arising between the

farmgate and the market place and/or marketing markups. Parameter β allows imperfect transmission between world and domestic prices. Depending on data availability, domestic prices in the sugar model can be farm, wholesale, or retail prices. Because of the homogeneous nature of sugar, quality adjustments are not incorporated in the price transmission equations. In general, only one domestic price is used in the model. Consumer and producer prices are differentially specified only in countries that have a deficiency type of producer support or an explicit tax on consumption.

This general structure is slightly modified to accommodate policy interventions other than price distortions, such as quantitative restrictions on area, supply, or trade flows. For example, imports constrained by binding TRQs are treated as exogenous, and domestic prices are solved endogenously. Policy interventions providing a price floor are treated as such and are effective whenever the domestic producer price falls to the price floor level (e.g., the U.S. loan rate). This mechanism is important when we remove trade barriers in the first scenario but maintain domestic farm policies.

The interaction with other model components used to establish the FAPRI baseline is limited to cross-price effects in supply (for wheat, rice, and soybeans). There are no links in consumption.

Data for area, yield, sugarcane, and sugar beet production were gathered from the Food and Agricultural Organization (FAO) of the United Nations, and data for sugar production, consumption, and ending stocks were obtained from PS&D View of the U.S. Department of Agriculture. Cane and beet production is tied to sugar production through the extraction rate. Macroeconomic data such as real gross domestic product (GDP), consumer price index, population, and exchange rate were gathered from various sources, including the International

Monetary Fund and WEFA-DRI.

Demand and supply price responses and income response of demand are econometric estimates or, when not available, consensus estimates. Their elasticity values are available from the FAPRI web site (http://www.fapri.iastate.edu/tools/elasticity.aspx). The period for the econometric estimation is 1980 to 2001. Simple linear specifications and ordinary least squares are used in the estimation of these equations to save degrees of freedom, given the short time series used. This estimation approach treats sugar prices as exogenous for estimation purpose.

Elasticities in the CARD international sugar model are comparable to most existing ones (e.g., Devadoss and Kropf, 1996; Hafi, Connell, and Sturgiss, 1993; and Wohlgenant, 1999) and do not depart from the conventional wisdom on price-inelastic sugar markets. The own-price elasticities of sugarcane supply are highly inelastic in the short run. This feature is consistent with the fact that several annual crops can be harvested from one planting of sugarcane. Therefore, there is limited acreage adjustment to price fluctuations in the short run. The own-price supply elasticities for sugar beet production are generally not as inelastic as they are for sugarcane since beet is an annual crop.

On the demand side, the own-price and income elasticities reflect the fact that in many developing countries sugar is considered a staple in the diet. Consumers look to sugar to fulfill basic caloric requirements.

The Caribbean raw sugar price is generally considered to be the representative world market price. Sugar is a homogeneous commodity. The nominal world price of sugar has been increasing over time, although in a volatile fashion, while the real price has decreased.

Our analysis has some caveats, which are inherent to the radical nature of the policy reforms considered. The policy changes considered in the first two scenarios are drastic and

imply large price changes and displacement of market equilibrium far from prevailing volume and prices. For example, our assumptions on supply curves underlying E.U. production quotas are based on consensus views on the relative competitiveness of the producers constrained by the quota. The exact shape of those supply curves is unknown.

4. Scenarios

We ran a sequence of three scenarios in deviation from the FAPRI baseline. We use the 2002 baseline because it was used to carry the trade liberalization analysis in all other agricultural markets (FAPRI, 2002).[4] The first scenario removes all trade distortions (tariffs, export taxes/subsidies, TRQs, and state trading). The second scenario considers the trade reforms of the first scenario plus the removal of domestic production subsidies and taxes. The last scenario considers the removal of all market interventions in trade and production, as well as consumption distortions. In each scenario, the policy reforms are fully implemented in 2002/03 and their impact is measured in deviations for the years 2002/03 to 2011-12. We report these annual impacts and the average of these annual changes as a summary indicator of the impacts.

To implement scenario 1, we assume that governments have the fiscal resources to sustain existing sugar production subsidies. Producers receive the prevailing domestic market price under open borders but receive a production subsidy, which leaves the domestic policy support to production unchanged. This is of course an artificial device, which allows us to separate the specific effects of trade and domestic production policies. In reality, the mounting fiscal pressures of domestic subsidies would render them unsustainable in the medium run and

[4] Since we initiated the investigation of the sugar model, a new (2003) FAPRI baseline has been established. The implications of updating baselines for sugar implied only marginal changes in the baseline trajectories and we therefore decided to keep the 2002 baseline as our reference run.

policy reforms would follow.

5. Results

Trade Liberalization Reform

Tables 2 and 3 present trade impacts, and changes in production and consumption in key countries for the first scenario, respectively. The trade table includes changes in the world price and New York spot price. Additional tables covering all countries are available in Appendix 1. The removal of all trade distortions increases the world sugar price by 32 percent on average during the simulation period. This average figure is inflated by a very strong initial price shock, which eventually tapers to 27 percent in 2011/12. The latter figure provides an estimate of the long-term response of world markets, as production adjustments take time. Aggregate trade increases at a moderate 3 percent by the end of the decade. The depth of the world market price formation mechanism increases dramatically, however, since preferential trade and export subsidies are eliminated. This mostly concerns E.U. imports and exports, and U.S. and Japanese imports. Aggregate effects on world production and consumption are small, but relocation of consumption and, to a lesser extent, production is substantial because of the magnitude of the price effects. In countries supporting their sugar producers with domestic policies, production changes little. Sugar consumption in the United States, the European Union, and Japan increases by 1.3, 4.5, and 2.9 percent respectively. Consumption in India increases on average by 4 percent, or 0.8 mmt. Production does not change because of domestic farm policies in place. The increase in consumption induces a trade pattern reversal, making India a net importer of sugar. In China, sugar use decreases by 3.6 percent and production increases by 4.3 percent, inducing a decrease of net imports of 0.7 mmt. Production increases in Australia (+4.9 percent) and Brazil

(+7.9%), and it falls notably in Eastern Europe (-8 percent), the FSU (-13.4 percent), Japan (-13.5 percent), and the Philippines (-14.4 percent).

Trade Liberalization and Domestic Production Subsidy Reforms

Tables 4 and 5 show the results for the combined removal of trade distortions and domestic policies affecting production. Major changes occur with the additional removal of domestic production subsidies. The removal of all trade and production distortions induces a 43 percent price increase by the end of the outlook period. Aggregate trade expands moderately, but location of production and trade patterns are substantially affected. Protectionist OECD countries (the European Union, Japan, and, to a lesser extent, Mexico and the United States) experience an import expansion or export reduction and significant contraction in production. World beet production decreases by 21 percent by the end of the decade, whereas world cane production increases by 8 percent. Hence, in aggregate terms, the conventional wisdom holds that cane sugar production tends to be more competitive than beet sugar production. Brazil, Australia, Cuba, Indonesia, Malaysia, and Turkey expand production when all distortions are removed. Aggregate world sugar production and use decrease by 2.9 percent. The world price increases further, to 48 percent above the baseline level in 2011/12. Production relocation away from the most protected OECD markets is massive (European Union, -61 percent; Japan, -61 percent. The effect is smaller for Mexico (-7 percent) and the United States (-6 percent). Production goes to competitive producers in developing economies (Brazil, 17 percent; Cuba, 16 percent; Australia, 10 percent), but also to producers in less-competitive countries (e.g., Turkey, 33 percent). This result is caused by the high world price resulting from removal of trade and domestic distortion that affects production. The net incentive effect is positive for producers (a world price increase net of tariff and subsidies removal).

The changes in consumption observed in the first scenario are accentuated in this second scenario. Countries with moderate border protection experience further worsening of consumer prices. For example, in China, consumption decreases by 13 percent. In countries with high tariffs, the benefits from policy reforms accruing to domestic consumers are mitigated by the stronger world price increases. However, since sugar demand tends to be inelastic, these changes are not dramatic. Sugar consumption in the European Union-15 increases by 3 percent and in Japan by 2 percent. U.S. consumption increases by less than 1 percent.

Full Market Liberalization (Trade, Consumption, and Production Reforms)

In this scenario, distortions are removed in Egypt, India, and Morocco.[5] Impacts on world markets price effects are marginal relative to scenario 2. By 2011/12, the world price increase is 47 percent or 1 percent lower than in scenario 2. Hence, the bulk of the effects of this reform occur in the countries removing their own consumer price distortions. In Egypt, consumption decreases by 21 percent, whereas it would decrease by 15 percent under scenario 2. In Cuba, because of the large subsidy removal, consumption decreases significantly, by an average of 42.5 percent between 2002/03 and 2011/12. Finally, in Morocco, the removal of the consumption subsidy results in the reduction of sugar consumption by 11 percent relative to the baseline. Under scenario 2, consumption would decrease by nearly 4 percent.

6. Conclusions

We analyzed a sequence of policy reforms in international sugar markets, considering in turn multilateral trade liberalization in the first scenario, and then the removal of domestic farm

[5] Although in the past sugar was sold at subsidized prices to consumers in Turkey, consumer sugar subsidies have been gradually reduced over the last several years and prices have increased according to production costs, resulting in consumption increases closer to the population growth rate. For this reason, consumer subsidies in Turkey were not considered.

policies in the second scenario. A third scenario analyzed the removal of pure consumption distortions —a minor reform relative to the two former reforms.

We obtained large price effects. We found that by the end of the outlook period, world prices increase by about 27 percent with the imposition of free trade and by a staggering 48 percent when all trade and production distortions are removed. These figures are slightly inflated by strong initial price shocks, which take time to taper because of the slow dynamic adjustment of sugar production. Supply adjustment in sugar production takes time, and the price changes in the later years provide a sense of how markets would adjust in the long run to such radical policy shocks. These estimates of the price effects are large but within the ballpark of previous estimates obtained with partial-equilibrium models (Sheales, Hafi, and Toyne, 1999; Wolhgenant, 1999). Sugar markets are price inelastic both on the supply and demand sides. This fundamental characteristic explains why reforms have large price effects but more moderate effects on production, consumption, and trade.

Despite the near collapse of the Doha Round of agricultural negotiations, the U.S. sugar industry is keen on promoting a multilateral approach to sugar policy reform and has vehemently opposed the bilateral negotiations of the current U.S. administration. The multilateral negotiation argument has been a convenient veil of legitimacy for U.S. protectionist interests. For example, the sugar industry fought the U.S.-Australia FTA on that basis. Nevertheless, our numbers provide some credence to the U.S. sugar industry claim of the "world dump price," and it appears that the competitive segment of the U.S. sugar industry would survive in unfettered markets. A major qualifier to our analysis is that our model may understate exit/entry and investment decisions. The drastic world price increases predicted by our analysis may induce massive investment in sugar production and reduce these price changes considerably.

Despite these limitations, it is clear that a massive production relocation would take place away from protected OECD markets (the European Union; Japan, and, to a lesser extent, Mexico and the United States) and toward competitive producers in developing economies, chiefly Brazil, Cuba, and Australia, but also to producers in less-competitive countries such as Turkey because of the large price effects. Hence, there is a large overlap of sugar interests in the FTAA, the U.S.-Australia FTA, and the CAIRNS group to open U.S. borders. The European Union and Japan have virtually everything to lose in unfettered markets. The large increase in price is little solace for their sugar producers, who would probably be wiped out. E.U. producers might want to focus on quickly negotiating a buy-out program within the ongoing CAP reforms, while the Doha Round evolves slowly and the EBA agreement is not yet fully implemented. Japanese sugar producers may well be the last bastion of protectionism in global sugar markets.

In contrast, sugar interests in Mexico and the United States would lose in unfettered markets, but they would survive the global policy reform without being annihilated. Although at odds within NAFTA, the two countries have a common goal in resisting global sugar policy reform. This is ironic since they are implicated in the undoing of their own protections because of their NAFTA and Uruguay Round commitments.

The analysis also makes clear that trade liberalization without domestic reforms would induce import surges in the United States. These surges would make domestic programs unsustainable because of the current policy commitments. A similar pattern emerges in the European Union, which is constrained in its ability to export expensive domestic sugar displaced by cheaper imports. Of course one should never underestimate the strength of the sugar lobby in OECD countries, and many sugar specialists have wrongly predicted the imminent unraveling of sugar protectionism as shown in the recent outcome of the Australian-US FTA.

References

American Sugar Alliance. "Submission of the American Sugar Alliance on the US-Central America Free Trade Agreement," Office of the U.S. Trade Representative, U.S. Department of Labor, April 25, 2003.

Beghin J., B. El Osta, J. Cherlow, and S. Mohanty. "The Cost of the U.S. Sugar Program Revisited," *Contemporary Economic Policy* 21 (1) (2003): 106-116.

Borrell, B., and R.C. Duncan. "Economic Effects of Policy Intervention of World Sugar Policies," *The World Bank Research Observer* 7(2) (1992): 173-194.

Devadoss, S., and J. Kropf. "Impact of Trade Liberalization under the Uruguay Round on the World Sugar Market," *Agricultural Economics* (1996): 83-96.

Food and Agricultural Policy Research Institute (FAPRI). "The Doha Round of the World Trade Organization: Appraising Further Liberalization of Agricultural Markets." CARD Working Paper 02-WP 317, Center for Agricultural and Rural Development, Iowa State University, Ames, November 2002.

———. *FAPRI 2003 U.S. and World Agricultural Outlook*, CARD Staff Report 1-03, Iowa State University, Ames, Iowa, January 2003.

———. Searchable databases online: Elasticities available at: http://www.fapri.iastate.edu/tools/elasticity.aspx.

Hafi, A., P. Connell, and R. Sturgiss. "Market Potential for Refined Sugar Exports from Australia." ABARE Research Report 93.17, Canberra, Australia, 1993.

Mitchell, D. "Sugar Policies: Opportunity for Change," Washington, DC, October 2003. Forthcoming as chapter 8 in *Global Agricultural Trade and the Developing Countries*, A. Aksoy, and J. Beghin, eds. Oxford University Press and The World Bank.

Organisation for Economic Cooperation and Development (OECD). *Agricultural Policies in OECD Countries. Monitoring and Evaluation 2002*. Paris: OECD Publications, 2003.

Sheales, T., S. Gordon. A. Hafi, and C. Toyne. "Sugar International Policies Affecting Market Expansion." ABARE Research Report 99.14. Canberra, Australia, 1999.

van der Mensbrugghe, D., J. Beghin, and D. Mitchell. **"**Modeling Tariff Rate Quotas in a Global Context: The Case of Sugar Markets in OECD Countries," CARD Working Paper 03-WP-343, Center for Agricultural and Rural Development, Iowa State University, Ames, September 2003.

Wohlgenant, M.K. *Effects of Trade Liberalization on the World Sugar Market*, prepared for the Food and Agriculture Organization of the United Nations, Rome, 1999.

Table 1. Sugar Policies by Country [1]

Country	Trade and Domestic Policies
Algeria	imposes a tariff rate of 15% on cane sugar and 5% on beet sugar.
Argentina	imposes a 20% tariff on sugar imports in addition to a variable duty of $60/ton on imports from Brazil. A 5% export tax is in place as well as a 4.05% export rebate.
Australia	ended administered price arrangements in 1989 and removed import tariffs in 1997.
Brazil	imposes a 17.5% tariff on imports from non-MERCOSUL countries (Brazil has zero imports). Although high-cost growers in the Northeast region are to receive a small subsidy (BRR 5.07/mt), this support has not been received for the past few years.
Canada	imposes a tariff on refined imports from MFNs equal to CAD $30.86/ton and on raw imports equal to CAD $22.07 to CAD $24.69/tonne (depending on the polarization of sugar). Developing countries pay zero duty on raw sugar, and Australia and Cuba, from where the bulk of the raw sugar is imported, are exempt from duty.
China	provides a 'guidance price' to sugar refiners to guide prices paid for sugarcane and sugar beet, but market forces largely determine prices. China has a TRQ of 1.64 million tons at a 20% in-quota rate and a 76% above-quota rate. The TRQ increases to 1.945 million tons by 2004 with an above-quota rate of 65%.
Colombia	Sugar imports from the Andean community are allowed duty free. The basic duty on raw and refined sugar imports from the non-Andean Community is 20%. In addition, a variable surcharge is calculated based upon adjusted floor, ceiling, and reference prices. In 2002, the total effective duty (basic plus surcharge) on raw sugar imports was $114/ton and on refined imports was $85/ton. Export subsidies of 2.5% of the f.o.b. value for centrifugal and panela sugar is received by Colombian exporters. This is not provided for exports to the United States. Colombia sets guaranteed sugar prices close to the world price.
Cuba	imposes a tariff rate of 10% on raw and refined sugar. The sugar industry is under the control of the Cuban government[2]. The domestic price of sugar is subsidized by the Cuban government under a rationing system. A monthly allowance of 6 pounds of sugar is provided at 0.13¢/lb.
Eastern Europe (Poland)[3]	imposes an in-quota tariff on sugar imports of 40% with a minimum of EUR 0.17/kg and an out-of-quota tariff rate of 96% with a minimum of EUR 0.43/kg. Although minimum sugar prices are set by the government, Poland has not been able to enforce them.
Egypt	imposes a 5% import tariff on raw sugar and a 10% tariff on refined sugar. The government also establishes sugarcane and sugar beet prices (set in 2002 at LE 95/ton and LE 77/ton respectively). Sugar consumption is subsidized. 500,000 tons of white sugar is sold at 60 piasters/kg to ration card-holders while another 500,000 tons is sold at 130 piasters/kg. Non-rationed sugar is sold at LE 1.30/kg through government outlets while the retail price in private shops is between LE 1.6/kg and LE 2/kg (1 LE = 100 piasters).
European Union	sets intervention prices for farmers and national aid for Italy, Portugal, and Spain. Export refunds are paid to exporters to cover the gap between the E.U. price and the world price when sugar is sold from intervention stocks. Production quotas are used to limit the sugar eligible for support. The surplus of A and B production above domestic consumption is exported with subsidy. C quota sugar must be exported at world prices. Sugar imported from ACP is re-exported with subsidy. Production levies are applied to quota sugar production to cover export refunds (2% on A and B quotas and between 30% and 37.5% on B quota plus additional levies to cover shortfalls in export refunds in the previous year). The import levy is a fixed duty plus a safeguard clause allowing variable additional duty. 1.3 million tons of white sugar equivalent preferential imports from ACP countries are at guaranteed prices and an additional 0.2-0.3 million tons at 85% of the guaranteed price. The with-in quota rate is EUR 98/ton and out-of-quota rate is EUR339/ton. Everything-But-Arms is limited by quotas until 2009 when duty-free access is allowed.

Table 1: continued

Former Soviet Union (Russia)[4]	had a total TRQ of 3.65 million tons in 2002 (3.35 million tons for the first six months and 0.3 million tons for the remaining months). Seasonal tariffs are added during periods of peak domestic production to protect producers and support prices. The in-quota tariff rate was 5% but no less than EUR 0.015/kg and the over-quota rate was set at 40% for raw and white sugar but no less than EUR 0.12/kg for raw sugar and EUR 0.14/kg for white sugar. The over-quota seasonal rate was 50% but not less than EUR 0.15 /kg for raw sugar and EUR 0.18/kg for white sugar.
India	imposes an import duty of 60% plus INR 850/ton countervailing duty on raw sugar. National minimum support price for sugarcane (INR 620/ton in 2001/02) are augmented by state governments by another 20% to 50%. Sugar millers and importers are required to sell portion of supplies to PDS at below market prices for resale to low-income consumers (15% of production and imports). There is a transport subsidy to encourage exports (INR 140/ton in 2001/02).
Indonesia	imposes a tariff rate of 20% on raw cane sugar and 25% on beet sugar. To support farmers' incomes, the government also sets a sugar floor price (IDR 2,600/kg in 2001/02).
Iran	imposes a tariff rate of 19% on sugar imports [5].
Japan	imposes a prohibitive duty on refined sugar of JPY 21.5/kg with an additional surcharge of JPY 53.88/kg. In 2001, the minimum producer price for sugar beet was JPY 17,040/ton and JPY 20,370/ton for sugarcane. A target price is set for sugar refiners to allow them to pay the guaranteed price to farmers and a subsidy is provided to the refiners to cover the difference between the domestic market price and the target price. The difference is made up by a subsidy provided by a surcharge on imported sugar, other surcharges, and funds from Japan's national budget. The current subsidy for refiners is JPY 90 billion, 85% from surcharge on raw sugar imports. In 2001, average import price was JPY 32,580/ton and the resale price was JPY 59,960/ton, implying a surcharge of JPY 27,380/ton. A secondary surcharge is imposed on import companies that exceed their raw sugar import volume target (JPY 23,309/ton). The volume of target imports was 1.47 million metric tons. Japan does not impose import tariffs on raw sugar.
Malaysia	controls sugar imports through quota restrictions by licenses. The country imposes a 5% ad valorem rate on sugar imports as well as a specific tax .Wholesale and retail sugar prices are controlled (MYR 1,345/ton for the wholesale price and MYR 1.4/kg for the retail price).
Mexico	imposes a duty of $0.3166/kg on U.S. sugar imports and $0.3958/kg on third-country imports. Every year the government announces the reference price for standard sugar, which is used to calculate the price paid to sugarcane growers. Growers are given 57% of the wholesale reference price of a ton of standard sugar (MX pesos 4,561.08/ton in 2001/02).
Morocco	imposes a 35% tariff rate on sugar imports plus a 0.25% parafiscal tax and 123% of the difference between a threshold price (MAD 3,500/ton) and the CIF price (if the latter is less than the former). The country sets support prices for beet and cane with additional bonus for various regions (MAD 325/ton for sugar beet and MAD 220/ton for sugarcane with additional bonus ranging between MAD 25/ton and MAD 55/ton). The government subsidies sugar consumption at the retail level. In 2001, the government paid refineries a subsidy of MAD 2,000/ton.
Pakistan	imposes a 30% import tariff on raw and refined sugar. The country also sets a producer support price, although market prices are usually above support prices (currently 50% above).
Philippines	has sugar imports duties set at 65%.
Peru	imposes a tariff rate of 25% and an additional duty based on the price band system used in Colombia. The domestic price is set by the market based on supply and demand.
South Africa	imposes duties based on the difference between the world price and a set reference price. The duty was ZAR 784/ton in 2001 and ZAR 1312/ton in July 2002. South Africa provides import access of sugar to Swaziland, Mozambique, Zambia, and Zimbabwe.

Table 1: continued

South Korea	imposes a 3% tariff on raw sugar and a temporary 50% tariff on refined sugar. The wholesale sugar price is controlled by the government.
Thailand	maintains high internal sugar prices using quotas and import tariffs. The country has a 65% in-quota tariff rate and a 99% out-of-quota tariff rate. The government sets initial and final producer prices for sugarcane (THB 530/ton in 2002). If the final price is greater than the initial price, a supplement is paid to the growers; if the final price is less than the initial price, the government compensates the mills for the difference.
Turkey	imposes a 138% tariff rate on sugar imports but 110.45% of c.i.f. value for imports from the E.U. Turkey sets production quotas for refined beet sugar and corn sweeteners and administered floor prices for sugar beet. Quota A is set for domestic consumption; B (2% of A quota) is set to meet emergency needs; C sugar (produced in excess of A and B) is sold in the world market at prevailing prices below domestic prices as it cannot be sold domestically. Turkey sets a support price for sugar beet (TRL 50,000/kg in marketing year 2002). Retail prices are determined by market forces.
United States	has an MFN import duty of 0.625/lb (raw value) but most quota suppliers are exempt. The above-TRQ rate is 15.36¢/lb for raw sugar and 16.21¢/lb for refined sugar (TRQ was 1.361 million tons in 2001 and 1.289 million tons in 2002). Under NAFTA, Mexico has duty-free access to the U.S. of up to 25,000 MTRV until 2008 when all imports from Mexico are duty free. Raw sugar over-quota tariff for Mexico is 9.07¢/lb, which drops about 1.5¢/lb each year to zero by 2008. Sugarcane processors see a loan rate of $0.18/lb for raw cane sugar and $0.229/lb for refined beet sugar. Processors can forfeit sugar to the CCC if the minimum selling price is less than the loan rate plus the interest rate. The minimum raw sugar market price to discourage forfeitures is 19.86¢/lb for raw cane sugar and 24.78¢/lb for refined beet sugar.
Venezuela	imposes a 15% tariff-rate (0% for the Andean Community) and an additional duty based on the price band system used in Colombia and Peru. Venezuela does not provide producer support prices.

(1) All policies are as of 2001/02.
(2) The Cuban sugar industry is currently undergoing significant restructuring.
(3) Poland is used to represent Eastern Europe as its production constitutes 60% of total sugar production in Eastern Europe.
(4) Russia is used to represent the Former Soviet Union as it is the region's largest importer. The Ukraine sets minimum purchase prices for sugar beets and refined sugar at the wholesale level. However, sugar prices are often below the mandated minimum.
(5) Regional average.

Table 2: Impact of Trade Liberalization Reform on Sugar Trade for Selected Countries

	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average
Major Net Exporters						(Thousand Metric Tons)						
Australia												
Baseline	3,646	4,007	4,398	4,811	4,920	5,025	5,130	5,238	5,346	5,456	5,568	4989.95
WTO	3,646	4,065	4,677	5,152	5,282	5,402	5,512	5,616	5,719	5,824	5,931	5318.02
% chg	0.00%	1.45%	6.34%	7.08%	7.37%	7.50%	7.46%	7.23%	6.98%	6.73%	6.51%	6.46%
Brazil												
Baseline	9,500	10,919	11,147	11,295	11,243	11,351	11,401	11,377	11,406	11,456	11,521	11311.48
WTO	9,500	11,449	12,878	13,413	13,519	13,712	13,812	13,812	13,854	13,914	13,983	13434.52
% chg	0.00%	4.86%	15.53%	18.75%	20.24%	20.80%	21.15%	21.40%	21.46%	21.46%	21.37%	18.70%
Cuba												
Baseline	2,700	2,625	2,741	2,863	3,002	3,145	3,293	3,449	3,611	3,778	3,953	3245.84
WTO	2,700	2,683	2,849	3,018	3,198	3,398	3,600	3,807	4,016	4,227	4,442	3523.86
% chg	0.00%	2.23%	3.94%	5.41%	6.51%	8.05%	9.34%	10.39%	11.23%	11.89%	12.38%	8.14%
European Union												
Baseline	1,850	3,065	3,170	3,248	3,385	3,555	3,753	3,960	4,177	4,403	4,634	3734.87
WTO	1,850	2,198	2,288	2,432	2,660	2,867	3,086	3,327	3,570	3,817	4,078	3032.31
% chg	0.00%	-28.29%	-27.81%	-25.12%	-21.42%	-19.36%	-17.76%	-15.98%	-14.53%	-13.31%	-11.99%	-19.56%
Thailand												
Baseline	3,550	3,662	3,816	3,925	4,042	4,144	4,241	4,347	4,452	4,562	4,607	4179.72
WTO	3,550	3,619	3,690	3,744	3,819	3,893	3,973	4,066	4,161	4,262	4,297	3952.38
% chg	0.00%	-1.16%	-3.31%	-4.61%	-5.50%	-6.06%	-6.33%	-6.47%	-6.54%	-6.58%	-6.72%	-5.33%
World Net Exports												
Baseline	24,816	28,006	29,007	29,878	30,434	31,165	31,931	32,666	33,479	34,332	35,097	31599.57
WTO	24,816	27,219	29,036	30,336	31,044	31,910	32,776	33,555	34,396	35,254	36,021	32154.78
% chg	0.00%	-2.81%	0.10%	1.53%	2.01%	2.39%	2.65%	2.72%	2.74%	2.69%	2.63%	1.66%
Major Net Importers						(Thousand Metric Tons)						
China												
Baseline	1,177	1,159	1,201	1,169	1,203	1,219	1,310	1,478	1,690	1,923	2,155	1450.67
WTO	1,177	212	169	268	423	523	672	896	1,155	1,435	1,711	746.37
% chg	0.00%	-81.71%	-85.93%	-77.10%	-64.87%	-57.13%	-48.68%	-39.36%	-31.64%	-25.40%	-20.58%	-53.24%
Former Soviet Union												
Baseline	6,286	7,565	7,469	7,520	7,471	7,516	7,600	7,651	7,716	7,791	7,840	7613.89
WTO	6,286	7,656	7,796	8,075	8,197	8,363	8,530	8,635	8,735	8,832	8,893	8371.37
% chg	0.00%	1.21%	4.38%	7.39%	9.72%	11.27%	12.23%	12.87%	13.21%	13.37%	13.43%	9.91%
Indonesia												
Baseline	1,600	1,406	1,789	2,003	2,133	2,230	2,320	2,401	2,486	2,579	2,680	2202.74
WTO	1,600	1,307	1,685	1,895	2,000	2,087	2,165	2,228	2,297	2,374	2,456	2049.34
% chg	0.00%	-7.01%	-5.80%	-5.42%	-6.23%	-6.45%	-6.69%	-7.19%	-7.60%	-7.94%	-8.38%	-6.87%
Japan												
Baseline	1,548	1,553	1,536	1,529	1,524	1,524	1,525	1,527	1,529	1,532	1,535	1531.41
WTO	1,548	1,642	1,647	1,672	1,692	1,716	1,737	1,752	1,767	1,779	1,789	1719.17
% chg	0.00%	5.72%	7.21%	9.38%	10.99%	12.60%	13.88%	14.79%	15.52%	16.10%	16.52%	12.27%
United States												
Baseline	1,344	1,616	1,799	1,966	2,164	2,397	2,555	2,707	2,866	3,028	3,132	2423.20
WTO	1,344	2,723	2,759	2,910	2,917	3,021	3,093	3,146	3,229	3,300	3,340	3043.80
% chg	0.00%	68.46%	53.38%	48.03%	34.82%	26.02%	21.03%	16.22%	12.63%	8.99%	6.62%	29.62%
Raw Sugar Prices						(U.S. Dollars per Metric Ton)						
FOB Caribbean												
Baseline	190	186	199	199	211	215	216	222	227	232	239	214.61
WTO	190	280	267	264	276	279	281	287	292	296	302	282.31
% chg	0.00%	50.56%	34.38%	32.92%	30.55%	30.04%	29.80%	28.90%	28.23%	27.43%	26.65%	31.95%
New York Spot												
Baseline	465	458	439	427	418	409	408	407	402	396	394	415.78
WTO	465	302	289	286	298	301	303	309	314	318	325	304.35
% chg	0.00%	-34.13%	-34.10%	-32.92%	-28.80%	-26.31%	-25.81%	-24.09%	-22.03%	-19.71%	-17.72%	-26.56%

Table 3: Impact of Trade Liberalization Reform on Sugar Production and Consumption for Selected Countries

	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average
Major Net Exporters					(Thousand Metric Tons)							
Australian												
Production												
Baseline	4,662	5,035	5,437	5,862	5,978	6,093	6,210	6,327	6,445	6,564	6,684	6063.38
WTO	4,662	5,035	5,682	6,175	6,315	6,447	6,570	6,684	6,797	6,911	7,026	6364.24
% chg	0.00%	0.00%	4.52%	5.34%	5.65%	5.80%	5.81%	5.65%	5.47%	5.28%	5.11%	4.86%
Consumption												
Baseline	1,020	1,031	1,041	1,053	1,059	1,069	1,081	1,090	1,099	1,108	1,117	1074.69
WTO	1,020	1,004	1,018	1,030	1,038	1,047	1,059	1,068	1,078	1,087	1,095	1052.37
% chg	0.00%	-2.58%	-2.16%	-2.12%	-2.04%	-2.03%	-2.02%	-2.00%	-1.98%	-1.95%	-1.93%	-2.08%
Brazilian												
Production												
Baseline	18,500	20,624	21,077	21,442	21,591	21,893	22,118	22,251	22,415	22,577	22,729	21871.81
WTO	18,500	20,597	22,453	23,215	23,531	23,910	24,175	24,327	24,496	24,663	24,812	23617.86
% chg	0.00%	-0.13%	6.53%	8.27%	8.98%	9.21%	9.30%	9.33%	9.29%	9.24%	9.16%	7.92%
Consumption												
Baseline	9,450	9,706	9,936	10,154	10,355	10,549	10,723	10,879	11,014	11,125	11,211	10565.25
WTO	9,450	9,277	9,592	9,808	10,016	10,203	10,367	10,518	10,646	10,751	10,831	10201.03
% chg	0.00%	-4.42%	-3.46%	-3.40%	-3.27%	-3.28%	-3.32%	-3.32%	-3.34%	-3.36%	-3.39%	-3.46%
Cuban												
Production												
Baseline	3,200	3,329	3,463	3,608	3,758	3,918	4,083	4,253	4,428	4,610	4,798	4024.91
WTO	3,200	3,329	3,536	3,731	3,923	4,141	4,361	4,581	4,805	5,031	5,259	4269.67
% chg	0.00%	0.00%	2.12%	3.40%	4.39%	5.69%	6.79%	7.73%	8.49%	9.12%	9.61%	5.73%
Consumption												
Baseline	700	718	728	744	754	769	784	798	812	826	839	777.13
WTO	700	665	694	712	724	738	754	768	782	797	811	744.48
% chg	0.00%	-7.32%	-4.65%	-4.30%	-4.05%	-3.95%	-3.87%	-3.74%	-3.64%	-3.50%	-3.40%	-4.24%
European Union												
Production												
Baseline	16,178	17,835	18,013	18,141	18,318	18,522	18,746	18,982	19,229	19,486	19,752	18702.35
WTO	16,178	17,835	18,013	18,141	18,318	18,522	18,746	18,982	19,229	19,486	19,752	18702.35
% chg	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Consumption												
Baseline	14,700	14,768	14,815	14,851	14,888	14,921	14,950	14,982	15,015	15,050	15,088	14932.70
WTO	14,700	15,425	15,563	15,601	15,593	15,607	15,620	15,625	15,635	15,649	15,659	15597.65
% chg	0.00%	4.45%	5.05%	5.04%	4.74%	4.59%	4.48%	4.29%	4.13%	3.98%	3.79%	4.46%
Thai												
Production												
Baseline	5,225	5,505	5,697	5,866	6,032	6,199	6,369	6,541	6,717	6,895	7,012	6283.39
WTO	5,225	5,505	5,668	5,783	5,914	6,053	6,206	6,370	6,539	6,713	6,826	6157.79
% chg	0.00%	0.00%	-0.52%	-1.42%	-1.94%	-2.35%	-2.56%	-2.62%	-2.64%	-2.64%	-2.66%	-1.94%
Consumption												
Baseline	1,750	1,807	1,862	1,922	1,982	2,047	2,114	2,183	2,254	2,327	2,401	2090.00
WTO	1,750	1,841	1,946	2,013	2,082	2,149	2,220	2,294	2,369	2,446	2,525	2188.66
% chg	0.00%	1.92%	4.51%	4.70%	5.02%	5.02%	5.00%	5.07%	5.10%	5.14%	5.17%	4.67%

Table 3: Impact of Trade Liberalization Reform on Sugar Production and Consumption for Selected Countries (continued)

	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average
Major Net Importers					(Thousand Metric Tons)							
Chinese												
Production												
Baseline	7,623	7,735	7,824	8,026	8,180	8,359	8,494	8,593	8,713	8,846	8,980	8375.08
WTO	7,623	7,735	8,432	8,557	8,650	8,767	8,863	8,934	9,025	9,135	9,244	8733.96
% chg	0.00%	0.00%	7.77%	6.61%	5.74%	4.88%	4.35%	3.97%	3.57%	3.26%	2.94%	4.31%
Consumption												
Baseline	8,800	8,903	9,046	9,203	9,396	9,582	9,802	10,075	10,412	10,782	11,149	9834.95
WTO	8,800	8,071	8,612	8,820	9,072	9,284	9,526	9,827	10,184	10,576	10,965	9493.71
% chg	0.00%	-9.35%	-4.80%	-4.16%	-3.45%	-3.11%	-2.81%	-2.46%	-2.19%	-1.90%	-1.66%	-3.59%
Former Soviet Union												
Production												
Baseline	4,111	4,250	4,327	4,412	4,462	4,529	4,580	4,614	4,650	4,686	4,719	4523.13
WTO	4,111	4,250	4,212	4,037	3,893	3,823	3,781	3,754	3,751	3,764	3,782	3904.78
% chg	0.00%	0.00%	-2.68%	-8.49%	-12.75%	-15.60%	-17.45%	-18.64%	-19.33%	-19.68%	-19.86%	-13.45%
Consumption												
Baseline	11,649	11,819	11,846	11,985	12,013	12,124	12,256	12,348	12,453	12,565	12,654	12206.35
WTO	11,649	11,870	11,976	12,118	12,146	12,254	12,383	12,473	12,575	12,686	12,773	12325.21
% chg	0.00%	0.44%	1.09%	1.11%	1.10%	1.07%	1.03%	1.01%	0.98%	0.96%	0.94%	0.97%
Indonesian												
Production												
Baseline	1,700	1,619	1,593	1,593	1,617	1,652	1,694	1,739	1,788	1,838	1,889	1702.10
WTO	1,700	1,619	1,620	1,620	1,642	1,676	1,717	1,761	1,809	1,858	1,908	1723.01
% chg	0.00%	0.00%	1.67%	1.67%	1.59%	1.43%	1.33%	1.27%	1.20%	1.12%	1.04%	1.23%
Consumption												
Baseline	3,400	3,481	3,569	3,676	3,788	3,905	4,031	4,155	4,288	4,431	4,585	3990.96
WTO	3,400	3,406	3,498	3,597	3,687	3,789	3,900	4,007	4,122	4,249	4,382	3863.72
% chg	0.00%	-2.14%	-1.99%	-2.16%	-2.68%	-2.98%	-3.23%	-3.56%	-3.86%	-4.12%	-4.43%	-3.12%
Japanese												
Production												
Baseline	795	803	814	827	840	852	863	873	882	891	898	854.26
WTO	795	803	792	770	751	735	721	711	703	695	689	736.93
% chg	0.00%	0.00%	-2.73%	-6.99%	-10.53%	-13.77%	-16.42%	-18.53%	-20.36%	-21.92%	-23.29%	-13.46%
Consumption												
Baseline	2,350	2,341	2,344	2,354	2,364	2,376	2,388	2,400	2,411	2,423	2,433	2383.36
WTO	2,350	2,423	2,430	2,439	2,443	2,451	2,458	2,464	2,470	2,475	2,478	2453.02
% chg	0.00%	3.48%	3.63%	3.58%	3.35%	3.16%	2.96%	2.70%	2.43%	2.16%	1.87%	2.93%
United States												
Production												
Baseline	7,189	7,924	8,065	8,034	7,983	7,942	7,906	7,917	7,940	7,958	7,983	7965.40
WTO	7,189	7,924	7,478	7,441	7,498	7,580	7,670	7,729	7,787	7,856	7,922	7688.57
% chg	0.00%	0.00%	-7.29%	-7.38%	-6.07%	-4.56%	-2.99%	-2.38%	-1.93%	-1.28%	-0.77%	-3.46%
Consumption												
Baseline	9,335	9,469	9,669	9,853	10,026	10,203	10,362	10,517	10,676	10,834	10,976	10258.58
WTO	9,335	9,673	9,862	10,031	10,176	10,335	10,488	10,632	10,777	10,921	11,050	10394.51
% chg	0.00%	2.16%	1.99%	1.81%	1.50%	1.29%	1.22%	1.09%	0.95%	0.80%	0.68%	1.35%

Table 4: Impact of Trade Liberalization and Domestic Production Subsidy Reforms on Sugar Trade for Selected Countries

	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average
Major Net Exporters						(Thousand Metric Tons)						
Australia												
Baseline	3,646	4,007	4,398	4,811	4,920	5,025	5,130	5,238	5,346	5,456	5,568	4989.95
WTO	3,646	4,145	5,056	5,559	5,736	5,859	5,952	6,033	6,112	6,190	6,273	5691.56
% chg	0.00%	3.46%	14.95%	15.55%	16.60%	16.60%	16.03%	15.18%	14.32%	13.44%	12.66%	13.88%
Brazil												
Baseline	9,500	10,919	11,147	11,295	11,243	11,351	11,401	11,377	11,406	11,456	11,521	11311.48
WTO	9,500	12,232	15,359	16,136	16,567	16,786	16,811	16,728	16,674	16,609	16,552	16045.25
% chg	0.00%	12.03%	37.79%	42.86%	47.35%	47.88%	47.45%	47.03%	46.19%	44.99%	43.66%	41.72%
Cuba												
Baseline	2,700	2,625	2,741	2,863	3,002	3,145	3,293	3,449	3,611	3,778	3,953	3245.84
WTO	2,700	2,752	3,064	3,338	3,625	3,912	4,188	4,461	4,725	4,982	5,234	4028.13
% chg	0.00%	4.85%	11.77%	16.59%	20.75%	24.40%	27.20%	29.34%	30.88%	31.86%	32.42%	23.01%
European Union												
Baseline	1,850	3,065	3,170	3,248	3,385	3,555	3,753	3,960	4,177	4,403	4,634	3734.87
WTO	1,850	-5,821	-7,758	-8,894	-9,165	-9,124	-8,934	-8,649	-8,306	-7,944	-7,555	-8214.96
% chg	0.00%	-289.90%	-344.76%	-373.78%	-370.77%	-356.63%	-338.09%	-318.42%	-298.87%	-280.45%	-263.04%	-323.47%
Thailand												
Baseline	3,550	3,662	3,816	3,925	4,042	4,144	4,241	4,347	4,452	4,562	4,607	4179.72
WTO	3,550	3,825	3,951	4,052	4,132	4,198	4,268	4,347	4,425	4,508	4,527	4223.20
% chg	0.00%	4.47%	3.55%	3.23%	2.23%	1.30%	0.63%	0.00%	-0.62%	-1.18%	-1.73%	1.19%
World Net Exports												
Baseline	24,816	28,006	29,007	29,878	30,434	31,165	31,931	32,666	33,479	34,332	35,097	31599.57
WTO	24,816	21,891	23,651	23,620	24,191	24,964	25,788	26,588	27,492	28,391	29,202	25577.84
% chg	0.00%	-21.84%	-18.46%	-20.95%	-20.51%	-19.90%	-19.24%	-18.61%	-17.88%	-17.30%	-16.80%	-19.15%
Major Net Importers						(Thousand Metric Tons)						
China												
Baseline	1,177	1,159	1,201	1,169	1,203	1,219	1,310	1,478	1,690	1,923	2,155	1450.67
WTO	1,177	-1,853	-1,914	-1,950	-1,689	-1,343	-984	-598	-182	233	624	-965.58
% chg	0.00%	-259.92%	-259.35%	-266.78%	-240.37%	-210.19%	-175.13%	-140.45%	-110.77%	-87.91%	-71.02%	-182.19%
Former Soviet Union												
Baseline	6,286	7,565	7,469	7,520	7,471	7,516	7,600	7,651	7,716	7,791	7,840	7613.89
WTO	6,286	7,086	6,898	6,952	6,938	7,058	7,220	7,345	7,489	7,644	7,767	7239.65
% chg	0.00%	-6.33%	-7.64%	-7.55%	-7.14%	-6.10%	-5.00%	-4.00%	-2.94%	-1.89%	-0.93%	-4.95%
Indonesia												
Baseline	1,600	1,406	1,789	2,003	2,133	2,230	2,320	2,401	2,486	2,579	2,680	2202.74
WTO	1,600	1,163	1,052	1,124	1,095	1,069	1,057	1,035	1,009	992	977	1057.30
% chg	0.00%	-17.28%	-41.18%	-43.90%	-48.64%	-52.06%	-54.45%	-56.88%	-59.42%	-61.53%	-63.56%	-49.89%
Japan												
Baseline	1,548	1,553	1,536	1,529	1,524	1,524	1,525	1,527	1,529	1,532	1,535	1531.41
WTO	1,548	1,597	1,745	1,870	1,979	2,072	2,150	2,212	2,260	2,296	2,320	2050.05
% chg	0.00%	2.82%	13.59%	22.34%	29.79%	35.99%	40.99%	44.88%	47.81%	49.86%	51.11%	33.92%
United States												
Baseline	1,344	1,616	1,799	1,966	2,164	2,397	2,555	2,707	2,866	3,028	3,132	2423.20
WTO	1,344	1,803	2,462	2,677	2,913	3,049	3,141	3,226	3,321	3,390	3,430	2941.35
% chg	0.00%	11.56%	36.87%	36.15%	34.66%	27.20%	22.92%	19.17%	15.85%	11.95%	9.51%	22.58%
Raw Sugar Prices						(U.S. Dollars per Metric Ton)						
FOB Caribbean												
Baseline	190	186	199	199	211	215	216	222	227	232	239	214.61
WTO	190	410	334	351	351	347	346	349	349	350	353	353.93
% chg	0.00%	120.72%	68.06%	76.40%	66.08%	61.66%	59.99%	56.90%	53.39%	50.67%	47.94%	66.18%
New York Spot												
Baseline	465	458	439	427	418	409	408	407	402	396	394	415.78
WTO	465	432	356	373	373	369	368	371	371	372	375	375.97
% chg	0.00%	-5.67%	-18.84%	-12.67%	-10.86%	-9.69%	-9.82%	-8.78%	-7.80%	-6.09%	-4.83%	-9.50%

Table 5: Impact of Trade Liberalization and Domestic Production Subsidy Reforms on Sugar Production and Consumption for Selected Countries

	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average
Major Net Exporters					(Thousand Metric Tons)							
Australian												
Production												
Baseline	4,662	5,035	5,437	5,862	5,978	6,093	6,210	6,327	6,445	6,564	6,684	6063.38
WTO	4,662	5,035	6,023	6,539	6,733	6,872	6,980	7,071	7,161	7,248	7,340	6700.27
% chg	0.00%	0.00%	10.78%	11.55%	12.64%	12.78%	12.40%	11.76%	11.12%	10.42%	9.81%	10.33%
Consumption												
Baseline	1,020	1,031	1,041	1,053	1,059	1,069	1,081	1,090	1,099	1,108	1,117	1074.69
WTO	1,020	967	986	995	1,004	1,014	1,026	1,036	1,045	1,055	1,063	1019.19
% chg	0.00%	-6.16%	-5.26%	-5.44%	-5.20%	-5.10%	-5.06%	-4.99%	-4.91%	-4.84%	-4.77%	-5.17%
Brazilian												
Production												
Baseline	18,500	20,624	21,077	21,442	21,591	21,893	22,118	22,251	22,415	22,577	22,729	21871.81
WTO	18,500	20,607	24,451	25,348	26,035	26,446	26,619	26,680	26,752	26,783	26,796	25651.73
% chg	0.00%	-0.08%	16.01%	18.22%	20.58%	20.79%	20.35%	19.90%	19.35%	18.63%	17.89%	17.16%
Consumption												
Baseline	9,450	9,706	9,936	10,154	10,355	10,549	10,723	10,879	11,014	11,125	11,211	10565.25
WTO	9,450	8,682	9,085	9,235	9,462	9,650	9,803	9,947	10,071	10,167	10,238	9633.87
% chg	0.00%	-10.55%	-8.56%	-9.05%	-8.62%	-8.52%	-8.58%	-8.57%	-8.56%	-8.62%	-8.68%	-8.83%
Cuban												
Production												
Baseline	3,200	3,329	3,463	3,608	3,758	3,918	4,083	4,253	4,428	4,610	4,798	4024.91
WTO	3,200	3,296	3,704	3,989	4,298	4,608	4,903	5,191	5,474	5,747	6,015	4722.58
% chg	0.00%	-0.99%	6.96%	10.55%	14.37%	17.61%	20.08%	22.07%	23.60%	24.66%	25.37%	16.43%
Consumption												
Baseline	700	718	728	744	754	769	784	798	812	826	839	777.13
WTO	700	574	647	651	671	690	708	724	741	758	774	693.96
% chg	0.00%	-19.97%	-11.09%	-12.44%	-11.05%	-10.18%	-9.76%	-9.29%	-8.66%	-8.17%	-7.75%	-10.84%
European Union												
Production												
Baseline	16,178	17,835	18,013	18,141	18,318	18,522	18,746	18,982	19,229	19,486	19,752	18702.35
WTO	16,178	9,248	7,762	6,533	6,271	6,340	6,544	6,836	7,201	7,584	7,988	7230.69
% chg	0.00%	-48.14%	-56.91%	-63.98%	-65.76%	-65.77%	-65.09%	-63.99%	-62.55%	-61.08%	-59.56%	-61.28%
Consumption												
Baseline	14,700	14,768	14,815	14,851	14,888	14,921	14,950	14,982	15,015	15,050	15,088	14932.70
WTO	14,700	14,995	15,356	15,336	15,367	15,405	15,429	15,446	15,474	15,499	15,520	15382.79
% chg	0.00%	1.54%	3.65%	3.26%	3.22%	3.24%	3.21%	3.10%	3.05%	2.99%	2.87%	3.01%
Thai												
Production												
Baseline	5,225	5,505	5,697	5,866	6,032	6,199	6,369	6,541	6,717	6,895	7,012	6283.39
WTO	5,225	5,505	5,812	5,941	6,100	6,241	6,386	6,541	6,700	6,861	6,961	6304.78
% chg	0.00%	0.00%	2.01%	1.27%	1.13%	0.69%	0.28%	0.00%	-0.26%	-0.50%	-0.72%	0.39%
Consumption												
Baseline	1,750	1,807	1,862	1,922	1,982	2,047	2,114	2,183	2,254	2,327	2,401	2090.00
WTO	1,750	1,673	1,827	1,865	1,952	2,028	2,101	2,179	2,261	2,343	2,428	2065.81
% chg	0.00%	-7.43%	-1.89%	-2.97%	-1.52%	-0.89%	-0.65%	-0.20%	0.31%	0.72%	1.13%	-1.34%

Table 5: Impact of Trade Liberalization and Domestic Production Subsidy Reforms on Sugar Production and Consumption for Selected Countries (continued)

	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	Average
Major Net Importers					(Thousand Metric Tons)							
Chinese												
Production												
Baseline	7,623	7,735	7,824	8,026	8,180	8,359	8,494	8,593	8,713	8,846	8,980	8375.08
WTO	7,623	7,640	9,532	9,481	9,709	9,740	9,712	9,685	9,698	9,726	9,769	9469.22
% chg	0.00%	-1.23%	21.82%	18.13%	18.69%	16.52%	14.34%	12.71%	11.30%	9.94%	8.78%	13.10%
Consumption												
Baseline	8,800	8,903	9,046	9,203	9,396	9,582	9,802	10,075	10,412	10,782	11,149	9834.95
WTO	8,800	6,171	7,607	7,553	8,002	8,363	8,696	9,066	9,502	9,950	10,390	8529.91
% chg	0.00%	-30.69%	-15.91%	-17.93%	-14.84%	-12.71%	-11.28%	-10.02%	-8.75%	-7.71%	-6.81%	-13.66%
Former Soviet Union												
Production												
Baseline	4,111	4,250	4,327	4,412	4,462	4,529	4,580	4,614	4,650	4,686	4,719	4523.13
WTO	4,111	4,250	4,936	4,918	4,983	4,993	4,964	4,926	4,896	4,858	4,821	4854.56
% chg	0.00%	0.00%	14.05%	11.47%	11.67%	10.23%	8.38%	6.78%	5.28%	3.68%	2.16%	7.37%
Consumption												
Baseline	11,649	11,819	11,846	11,985	12,013	12,124	12,256	12,348	12,453	12,565	12,654	12206.35
WTO	11,649	11,548	11,814	11,914	11,973	12,101	12,239	12,339	12,454	12,574	12,669	12162.57
% chg	0.00%	-2.29%	-0.27%	-0.59%	-0.34%	-0.19%	-0.14%	-0.08%	0.01%	0.07%	0.12%	-0.37%
Indonesian												
Production												
Baseline	1,700	1,619	1,593	1,593	1,617	1,652	1,694	1,739	1,788	1,838	1,889	1702.10
WTO	1,700	1,564	2,148	2,253	2,424	2,574	2,702	2,831	2,976	3,119	3,266	2585.88
% chg	0.00%	-3.35%	34.84%	41.43%	49.95%	55.79%	59.50%	62.80%	66.49%	69.71%	72.93%	51.01%
Consumption												
Baseline	3,400	3,481	3,569	3,676	3,788	3,905	4,031	4,155	4,288	4,431	4,585	3990.96
WTO	3,400	3,256	3,386	3,463	3,560	3,664	3,774	3,880	3,998	4,124	4,258	3736.33
% chg	0.00%	-6.44%	-5.13%	-5.82%	-6.02%	-6.17%	-6.37%	-6.61%	-6.77%	-6.93%	-7.14%	-6.34%
Japanese												
Production												
Baseline	795	803	814	827	840	852	863	873	882	891	898	854.26
WTO	795	803	674	546	443	360	291	236	195	166	146	385.92
% chg	0.00%	0.00%	-17.25%	-34.07%	-47.19%	-57.77%	-66.30%	-72.95%	-77.88%	-81.41%	-83.71%	-53.85%
Consumption												
Baseline	2,350	2,341	2,344	2,354	2,364	2,376	2,388	2,400	2,411	2,423	2,433	2383.36
WTO	2,350	2,381	2,409	2,413	2,421	2,432	2,441	2,448	2,456	2,462	2,467	2433.09
% chg	0.00%	1.71%	2.76%	2.49%	2.44%	2.37%	2.23%	2.04%	1.85%	1.63%	1.39%	2.09%
United States												
Production												
Baseline	7,189	7,924	8,065	8,034	7,983	7,942	7,906	7,917	7,940	7,958	7,983	7965.40
WTO	7,189	7,924	7,824	7,204	7,230	7,296	7,348	7,386	7,463	7,538	7,614	7482.78
% chg	0.00%	0.00%	-2.99%	-10.33%	-9.44%	-8.14%	-7.07%	-6.71%	-6.01%	-5.27%	-4.62%	-6.06%
Consumption												
Baseline	9,335	9,469	9,669	9,853	10,026	10,203	10,362	10,517	10,676	10,834	10,976	10258.58
WTO	9,335	9,504	9,776	9,921	10,082	10,251	10,409	10,557	10,711	10,859	10,993	10306.18
% chg	0.00%	0.36%	1.10%	0.69%	0.56%	0.47%	0.45%	0.38%	0.32%	0.23%	0.15%	0.47%