Partial Liberalization of the World Sugar Market:
A General Equilibrium Analysis of Tariff-Rate Quota Regimes

Aziz Elbehri*
USDA/ERS, Washington DC, USA

Thomas Hertel
Purdue University, W. Lafayette, Indiana, USA

Merlinda Ingco
The World Bank, Washington DC, USA

and

K. R. Pearson
Monash University, Melbourne, Australia

Abstract

In this paper we develop a TRQ model within GTAP that explicitly handles the tariff rate quota regimes and we apply it to an analysis of partial multilateral sugar liberalization. Results show that a combination of tariff reduction and quota expansion by the U.S. and the E.U. is welfare improving for both importers and exporters. However, either instrument alone results in losses for one or the other group.

Keywords: Tariff rate quota; Trade policy; General equilibrium; Sugar

---

Third Annual Conference on Global Economic Analysis,
Melbourne, Australia,
June 27-30, 2000

The views expressed in this paper are those of the authors and do not reflect the views of their respective institutions.

* Corresponding author, Tel.: 202-694-5291; e-mail: aelbehri@ers.usda.gov

1. Introduction

The tariff-rate quota (TRQ) system emerged from the Uruguay Round Agreement on Agriculture (URAA) as a new policy mechanism to ensure both tariffication and market access. Tariffication required conversion of non-tariff barriers into tariff-equivalents to be lowered over a period of time, while market access ensured that quantities imported before the agreement could continue to be imported[1]. There are nearly 1400 tariff lines notified under TRQs, about 200 are country specific rather than global (OECD, 1998). Moreover, most of the domestically sensitive agricultural products in OECD countries are covered by TRQ regimes.

There are basically two problems with the TRQ regime that needs to be addressed in the upcoming WTO negotiations: the overall level of access, and the administration of TRQs (Skully, 1998). Expanded market access will depend on increasing the volume of imports allowed under the current regime of TRQs, either via expanded minimum access commitments or via reductions in over-quota tariffs. The other important area of reform is a need for more transparent administration mechanisms and a need to address the significant concerns that have arisen regarding implementation. For example the "first-come first-served" principle favored by WTO Secretariat has come under criticism due to unintended detrimental effects on trade resulting from uncertainty about firm's access to quotas (Abbott and Morse, 1999). In some agricultural commodities (i.e., sugar), quota allocation is often based on diplomatic considerations and historical ties rather than least cost production criteria (Skully, 1999).

Given the importance of market access issues in the upcoming WTO round on agriculture, economists have recently begun focusing attention on the TRQ import regimes (Abbott and Paarlberg, 1998) and the implementation mechanisms (Skully, 1999; Tsigas and Ingco, 1998). What is needed however, are quantitative models of import regimes that take into account the TRQ mechanism. During the Uruguay Round most quantitative trade policy analyses viewed "policy" in agriculture in terms of tax or subsidy equivalents. In other words, observed price differences are taken as a good approximation of the incidence of price or quantity barriers. Hence the modeling of the Uruguay Round was usually based on tariff equivalents of various policy measures (Martin and Winters, 1995). However, given the prominence of quotas in the current agricultural policy regime (sanctioned via the TRQ mechanism), the modeling of border measures must explicitly come to grips with this unique blend of price and quantity constraints.

This paper examines the consequences of liberalizing the sugar TRQ import regime using an applied general equilibrium model that explicitly accounts for TRQ mechanisms. The model has several features that are suitable for examining the sugar TRQ regime. First is the ability to examine liberalization scenarios on a bilateral basis (e.g., sugar imported by the United States from the Philippines) as well as multi-lateral basis (e.g., sugar imported from the U.S. and the E.U. from all exporting regions). Another valuable feature of the model is the explicit calculation of quota rents and their distribution between importers and exporters. This feature is particularly useful for assessing the welfare effects on small developing countries that currently depend on rents generated from quota-based preferential access. A third advantage of this approach is that it provides a more comprehensive vehicle for analyzing interactions with other

[1] Developing countries were given the option of "ceiling bindings" with full discretion on the level of the tariff bindings. Many developing countries established "ceiling bindings" at levels significantly higher than applied tariffs (Ingco, 1996).

aspects of a multilateral trade agreement. While we don't take full advantage of this aspect in the present study, which focuses only on sugar liberalization, future analyses could examine interactions between liberalization in other sectors and the TRQ regime for sugar.

The objectives of this analysis are as follow. First, we examine the possible trade-off effects between tariff cuts and quota expansion within the TRQ regime in the case of sugar, and the welfare implications for sugar exporters and importers. We explore the linkages between quota rent changes, tariff revenue losses and trade expansion under a liberalized TRQ. We also seek to assess which of the TRQ instruments, over-quota tariffs or quota volume, is the more effective means of expanding sugar market access. A second objective is to provide a quantitative assessment of global market access liberalization in the sugar case, emphasizing the implications for partial sugar liberalization by the EU, the US and Japan on global sugar trade. Before embarking on the empirical analysis and results, the next two sections introduce the conceptual underpinning of the TRQ regime and its role in the sugar import policy regimes in OECD countries.

2. Economics of trade liberalization under the TRQ regime

A tariff rate quota is a trade policy regime that combines elements of tariffs and quotas. Under the TRQ, imports up to some fixed quantity are subject to a low tariff (in-quota tariff) while imports above that quantity are charged a higher tariff (over-quota tariff). Figure 1 illustrates three possible regimes under the TRQ[2]. The quota is represented by the quantity Q. Given a small country assumption, import supplies under the TRQ regime are represented by a step function with two horizontal lines. The lower line represents the in-quota imports and extends from 0 to Q. The other horizontal line represents the effective import supply of over-quota imports and extends from Q to infinity. At the import volume Q there is a discontinuity: a vertical line joins the in-quota and over-quota segments. M represents actual imports that are determined by the import demand function that yields imports according to the domestic price P_m of the importing country. In Figure 1, T_{in} represents the in-quota tariff and T_{out} the over-quota tariff. P_w is the world price. The world price plus an applicable tariff determines the price of imports in the domestic market: P_m. Under the TRQ regime, imports can be above the quota Q when T_{out} is effective (case 1), or imports can equal Q when the quota is effective (case 2). When imports are below Q, T_{in} is effective (case 3).

In case 1, import demand M exceeds the quota Q and the domestic price of imports, P_m , equals the world price plus the over-quota tariff T_{out} so that positive quota rents arise (shaded area). The total value of the rent is the maximum per-unit rent, $T_r^{\max}$ times the quota volume. Rent per unit of in-quota imports equals the difference between the domestic import price and the world price plus the in-quota tariff. This is equivalent to the power of the maximum per unit rent $T_r^{\max}$ being equal to the ratio of T_{out} over T_{in}[3]. In case 3, imports M are below the quota Q and the domestic price of imports equals the world price plus the in-quota tariff ($P_m = P_w * T_{in}$).

[2] We abstract from special cases such as endogenous quotas (Boughner and De Gorter, 1999) and cases when countries may apply in-quota tariff for over-quota imports.

[3] The power of the tariff is equal to one plus the *ad valorem* rate divided by 100. For example, if the over-quota tariff rate is 60%, the power of the over-quota tariff is 1.6.

The TRQ behaves just like a tariff and no quota rents arise ($T_r = 1$). In case 2, import demand intersects the import supply step function on its vertical portion at a quantity equal to the quota (Q). In this case, the domestic import price, P_m, equals $P_w * T_{in} * T_r$, where $1 < Tr < T_r^{max}$.

Figure 2 illustrates the trade and revenue implications of liberalizing the TRQ regime in the case when the over-quota tariff is binding (M > Q). To simplify the discussion, we assume that all quota rents accrue to the exporting region. In liberalization scenario 1, the over-quota tariff is reduced (but remains above the in-quota tariff, T_{in}) since the demand curve is downward sloping. Therefore, imports increase while quota rents are reduced. The determinants of the welfare implications for importers and exporters are quite different. For the importer, welfare will be affected by the net tariff revenue changes (difference of loss of area C and the gain of area D). For the exporting region, the net welfare effect will depend on the difference between the quota rent loss (equal to area A) and the extra revenue from added exports.

In liberalization scenario 2, the quota level is expanded from Q to Q'. In this case quota rents may increase or decrease depending on whether the quota rent loss equal to area A is compensated by the gain of areas B + D. If the quota expansion results in a net increase in-quota rents, the exporter will definitely increase welfare since exports also expand. For the importer the net welfare effect is ambiguous and depends on the net tariff revenue change corresponding to the difference between the tariff revenue loss (areas C+B) and the tariff revenue gain (area F).

In liberalization scenario 3, the tariff cut and quota expansion are combined with quota expanding from Q to Q' and imports from M to M' (>Q'). If we assume the same level of tariff cut and quota expansion as in cases 1 and 2, we would expect the new total quota rents to be in between case 1 (tariff quota only) and case 2 (quota increase only). Again quota rents changes equal to the difference between area A (loss) and B + D (gain). The tariff revenue changes to the importer are equal to the difference between C+B (loss) and F+G (gain).

3. Overview of sugar import regimes

Sugar is one of the most highly regulated agricultural commodities, particularly within the largest developed economies: the EU, the US, and Japan. The EU sugar program operates under an intervention price above the world price, maintained primarily through import restrictions implemented with a TRQ regime and the subsidization of exports to prevent excessive stock increases. High tariffs on over-quota imports prevent the intervention price from being undermined by import competition. Moreover, the 'special safeguard' provision imposed by the EU via an additional duty effectively prevents any sugar imports above the TRQ. The EU sugar import quota allocation is targeted mostly to the ACP countries plus India. The ACP sugar receives the same support price as internally-produced EU sugar and enters the EU duty free. As a result, economic rents accrue to the ACP exporters under this preferential regime.

For the US, imports under TRQs are administered to ensure that domestic prices stays at or above the loan rate (Haley, 1999). The U.S. sugar TRQs are allocated as bilateral quotas to exporting countries on the basis of their average market shares of U.S. sugar imports in the period 1975-1981, exclusive of the highest and lowest years (Swarez, 1997). While these quotas have not changed, the exporters ability to supply sugar have. Consequently, it is argued that the current US sugar quota allocation mechanism induces economic inefficiencies (Skully, 1999b).

Japan is another major sugar importer that intervenes heavily in the sugar market through a mix of producer price supports, levies and tariffs on imports. Since Japan's sugar production is only one third of consumption, much of the intervention takes place in the form of high import tariffs (ABARE, 2000).

Several developments are likely to nudge OECD governments towards greater market access. These include: EU enlargement, implementation of NAFTA, the expiry of the current EU sugar regime in 2001, and the APEC negotiations towards a free trade area by 2010. In the US case, an agreement for a moderate market access expansion for sugar could still leave the domestic program unaffected, but significant new market access commitments might require downward adjustments to the loan rate provided to sugar processors, which serves as a minimum domestic price. On the other hand, the absence of market access agreement will likely expose the price support program to outside pressure beginning in 2004 when the "peace clause" expires.

The same conflicts in policy goals between market access and domestic support can also be expected for the EU. As the EU is set to review its sugar program beginning in 2001, several factors are likely to push in the direction of reductions in production quotas with possible additional price support cuts. This includes binding UR commitments and the prospects of WTO challenges to export subsidies after the expiry of the "Peace Clause" in 2003.

Given all these considerations, any new WTO agreement on sugar market access would likely consist of a partial sugar trade liberalization affecting over-quota or MFN tariffs. Depending on the extent of sugar liberalization, such an agreement could have significant consequences on importing countries both for consumers, producers and processors. For exporters particularly developing countries, the income effects from a market access agreement would be determined by the offsetting roles of quota rent revenues and volume of trade changes. These effects are examined in the present analysis.

4. Empirical analysis

4.1. Simulation model

In this analysis we employ a TRQ model (Elbehri and Pearson, 2000) implemented within an applied general equilibrium model, GTAP (Hertel, 1997) using the GEMPACK software (Harrison and Pearson, 1996). The GTAP model is a multi-region multi-sector applied general equilibrium currently in use by scores of researchers in more than 40 countries on five continents. Since the GTAP model production and demand structures are fully described elsewhere (Hertel, 1997) they will not be repeated here. In this section we briefly describe the TRQ features of the model (for a detailed description of how to implement the TRQ regime in GTAP, see Elbehri and Pearson, 2000).

The discontinuity inherent in the two-tier tariff system, as described in section 2, was modeled as a mixed complementarity problem. The TRQ mechanism is implemented at the bilateral level - that is at the level of each trade flow represented by a triple of indices (*i*,*r*,*s*) where *i* is the commodity, *r* is the source region and *s* is the destination region. The TRQ behavior was handled in the model via the following non-differentiable equation abstracts from the triple dimension (*i*,*r*,*s*):

$$IF\ (T_r + M/Q <= 2,\ THEN\ T_r = 1), \qquad (1)$$
$$ELSE\ IF\ (T_r + M/Q >= 1 + T_r^{\max}\ ,\ THEN\ T_r = T_r^{\max},$$
$$ELSE\ IF\ (T_r + M/Q > 2\ and\ T_r + M/Q < 1 + T_r^{\max}\ ,\ M = Q\ and\ 1 < T_r < T_r^{\max}\ )$$

were, as before, M and Q are the imports and the quota levels, respectively; T_{out}, T_{in} and T_r are the power of the tariff for the over-quota, in-quota, and the unit per quota rent, respectively. $T_r^{\max}$ is the maximum level of the power of unit per quota rent and is equal to the ratio of T_{out} over T_{in}. Each of three lines of equation E1 corresponds to one of three cases of the TRQ regime represented in figure 1. The first line corresponds to case 3 of figure 1 (in-quota), the second line to case 1 (over-quota), and the third line to case 2 (at-quota). Starting from the initial benchmark database where the TRQ status of each triple (*i*,*r*,*s*) is known in terms of in-quota, at-quota or above quota position, equation E1 is used to solve for the effective TRQ instrument. In each of the three cases, the final equilibrium import levels are determined via the following price linkage equation in the level form[4]:

$P_m = P_w * T_{in}$ in-quota (case 3, figure 1), where $Tr = 1$ (2.1)

$P_m = P_w * T_{in} * T_r$ at-quota (case 2, figure 1), where $1 < Tr < T_r^{\max}$ (2.2)

$P_m = P_w * T_{out}$ over-quota (case 1, figure 1), where $Tr = T_r^{\max} = T_{out}/T_{in}$ (2.3)

The model also solves for the equilibrium total quota rents (Q_r) associated with each triple *(i,r,s)* via the following equation:

$$Q_r = (T_r - 1) * M \qquad (3)$$

The model also solves for the portions of the total quota rents that accrue to the source (*r*) and destination region (*s*) for each commodity *i*. The distribution of quota rents between exporters and importers is performed as part of the model solution based on exogenously specified quota rent shares provided on a bilateral basis. In the case when imports are within quota ($M < Q$), T_r is equal to 1 and quota rents reduce to zero.

[4] As in all GE models, prices in the GTAP model are relative to a *numeraire* taken to be a global primary factor price index as suggested by de Melo and Robinson (1989) and de Melo and Tarr (1992).

4.2 TRQ data set and model calibration

The underlying data structure for the model is the GTAP database version 4 benchmarked for 1995 and covering 50 treadable sectors and a world economy divided into 45 countries/regions. There are five primary factors in the model: agricultural land, physical capital, skilled labor, unskilled labor, and natural resources. Land and natural resources are fixed factors used by a subset of tradeable sectors, while labor and physical capital and labor are used by all sectors. We have chosen to make labor is perfectly mobile across sectors, while inter-sectoral mobility of capital, land and natural resources is restricted in the spirit of the Ricardo-Viner trade model.

The present analysis uses an aggregation of 20 regions and 13 treadable sectors. The regional aggregation covers the major importing and exporting sugar markets in the world including the OECD and developing countries with significant shares of world sugar trade. Eight out of 13 sectors in the model are agricultural sectors. Table 1 shows the sugar import and export shares for all regions in the model from the benchmark database. For example, we find that Japan's sugar imports were 35 percent from Australia, 25.6 percent from Thailand, and 9 percent from the Caribbean region. Likewise, the 'rest of Africa' region exported 87 percent of total sugar exports to the EU and only 6.7 percent to the US.

Supplemental data to implement the TRQ regime includes the quota volume, in-quota tariffs and over-quota tariffs[5]. These data are shown in table 2 in the sugar case. Quota volume data was provided from country submissions on market access to the WTO. In order to aggregate the reported data to the GTAP level commodity aggregation, quantity-to-value conversion was carried out using unit values derived from FAO Agrostat databases.

In addition to trade data, we also collected tariff data for TRQ commodities. For in-quota tariffs, we used country tariff schedules for the US and the EU. For Canada and Japan we used Uruguay Round tariff schedules. For developing countries we used UNCTAD TRAINS database. These tariffs are on an *ad valorem* equivalent basis and are aggregated to the GTAP commodity level using trade values as weights. For over-quota tariffs, we applied the OECD Secretariat estimates of the *ad valorem* equivalents of over-quota tariffs based on specific rates derived from import volumes and values per tariff line (OECD, 1998). These specific tariff rates were compared with world market prices for 1996 resulting in over-quota *ad valorem* tariffs. For sugar, the over-quota *ad valorem* tariff for the US and the EU used in the benchmark database was 129 percent and 147 percent, respectively (Appendix table A1). For Japan, the benchmark MFN *ad valorem* tariff for sugar was 143 percent.

The model solution also includes the post-equilibrium quota rents distributed between exporting and importing regions based on specified quota shares incorporated into the benchmark data[6]. Quota rent allocation between importers and exporters was relatively

[5] In order to make the required TRQ data consistent with the underlying data structure of the GTAP model, the additional TRQ data was incorporated into the model as ratios rather than flows. Hence quota volume was incorporated as ratio of quota over imports. This approach allowed us to model the TRQ regime switches while preserving the internal balance of the overall GTAP database.

[6] Since the standard GTAP model implicitly assumes that all quota rents accrue to the importing region, the initial income data in the benchmark data set was adjusted based on the quota rent shares assumptions. To this end a

straightforward in the sugar case. For the TRQ sugar imports into the EU, the entire amount of the economic rents is allocated to the ACP exporters and India consistent with the preferential access agreement with the EU. For sugar imports from third countries, the EU is assumed to capture the quota rents. In the case of the US, sugar exporters with bilateral quotas are assumed to capture all quota rents[7].

5. Simulations results

To examine the economic effects of liberalizing the world sugar market, we consider three sets of policy experiments: i) US sugar TRQ liberalization only; ii) EU sugar liberalization only; and iii) multilateral sugar trade liberalization with or without the TRQ regime. These policy experiments are listed in table 2. The US TRQ sugar liberalization is analyzed under three cases: over-quota tariff reduction by 1/3 only (US_T), TRQ quota expansion by 1/3 only (US_Q), and a combination of both (US_TQ). The same three cases are used to analyze the EU sugar TRQ liberalization (EU_T, U_Q, and EU_TQ). These experiments are designed to help isolate the effects on welfare from quota rents adjustments and changes in trade volume. In the multilateral sugar policy liberalization experiments with tariff cut only (MULTI_T) and a combination of tariff cuts and quota expansion (MULTI_TQ), the goal is to quantify the welfare and trade effects from a partial multilateral sugar liberalization. These multilateral experiments are also designed to differentiate the net welfare effects on importers between unilateral vs multilateral liberalization options.

5.1 Partial sugar TRQ liberalization by the US

Under the scenario US_T where the US cut the over-quota tariff cut by one third, the global sugar trade volume is increased by over $US 280 M or 1.13 percent (table 4). The U.S. expands sugar imports by 14.5 percent or $US 222.3 M (table 4) while domestic sugar output declines by 3.9 percent (table 5). This increased trade is captured largely by the Caribbean countries ($US 28.9 M), Brazil ($US 16.6 M) and rest of Latin American ($US 38.2 M) (table 5). In percentage terms, however, the largest exports were shown for the US (18.5%), the Philippines (13%), and Canada (10.7%). Taiwan shows a decline of sugar exports by -24.2% or $US –4.9 M under this scenario (table 5).

The welfare results under scenario US_T demonstrate the offsetting effects of quota rents, tariff revenue changes and trade effects. The US shows a net welfare gain of $US 352 M from cutting sugar over-quota tariffs by 1/3 (table 8). This gain reflects the trade effect from expanded imports as well as a net increase in tariff revenue from sugar imports ($US 56.6 M) (table 8). On the other hand, exporting countries with preferential access to the US market show a net welfare loss as the erosion of quota rents dominates the benefits from expanded exports.

---

simulation was performed for income adjustment to preserve the underlying income and expenditure balance in the model.

[7] For TRQ commodities other than sugar, quota rent shares between importers and exporters may be hard to gather. In this case, information on the mechanism of TRQ implementation may serve as a guide to derive reasonable assumptions. For example in the case the TRQ is handled on the basis of first come first served, one might expect the quota rents to be shared between importers and exporters. Likewise, information on who holds the right to import and import/export licenses may also provide some basis for quota rent sharing assumptions.

The magnitude of welfare loss for the sugar exporters was commensurate with sugar export shares. The largest welfare losses were shown by the sugar quota holding exporters to the US, namely Brazil ($US –39.4 M), Caribbean countries ($US-88.3), rest of Latin America ($US – 64.2), Australia (-$US 15.7 M) and the Philippines ($US – 24.4 M) (table 6).

When the US expands the sugar quota by 1/3 from its Uruguay Round commitments (scenario US_Q), the welfare effects are opposite in sign. In this scenario, sugar imports by the US increase only by $US 18.2 M (table 3) and output is only marginally affected (table 4). Under the quota expansion scenario, the US experiences a welfare loss of $US - 349 M due mainly to the tariff revenue loss ($US 340.5 M). On the other hand, the sugar exporting countries show a net welfare gain, due in part to increased exports, but mostly owing to the increased quota rents (table 6). The largest gains accrue in the Caribbean region ($US 134.8 M), Brazil ($US 52.1 M) and rest of Latin America ($US 83 M). Other quota-holding sugar exporters also show smaller welfare gains such as the Philippines ($US 34.1 M), Australia ($US 20.6 M), South Africa ($US 10.7 M) and rest of Africa ($US 19.2 M).

The combination of over-quota tariff reduction and quota expansion by the US (scenario US_TQ) result in welfare gains for both the US and the net exporting countries (table 8). For the US, the loss of tariff revenues ($US –205.5 M) are not enough to offset the gains from expanded imports, leading to a net welfare gain of $US 63 M (table 8). For the exporting countries the quota rent losses from lower over-quota tariffs are compensated for by gains from expanded quota volume, resulting in much smaller marginal quota rent losses, and therefore a net welfare gain. Note that the production and trade effects under US_TQ scenario are quite similar to the US_T scenario. This is because in the post-simulation equilibrium, the key instrument under either scenario is the over-quota tariff cut. In this case, the quota expansion largely affects the division of quota rents and tariff revenues, and hence the welfare results. A graphical illustration of this equilibrium is shown in Section 2, figure 2 case 3. In that case, the quota is expanded from Q to Q' while the new equilibrium level of imports M' is larger than Q'. Hence the (lowered) over-quota tariff is still the effective policy instrument that determines the equilibrium domestic price. Overall, the comparison of these three US sugar liberalization cases suggest that reductions in over-quota tariffs or quota expansion alone may not be beneficial to both exporting and importing countries. However, a combination of both tariff cut and quota expansion can be welfare improving for both exporting and importing countries. As we will see in the case of the EU, this important result can be generalized to other bilateral TRQ cases when quota-holding exporters extract either part or the whole of the economic rents that result from a binding TRQ regime.

5.2 Partial sugar TRQ liberalization by the EU

EU unilateral liberalization of the sugar TRQ regime shows larger welfare effects compared to the US (table 8) since the EU holds a much larger share of world sugar trade and is both a major importer and exporter of sugar. However, unlike the US liberalization scenarios, the EU sugar liberalization leads to an export decline by the EU in all the three cases (table 6). Also, since the EU also administers the import sugar quotas on a preferential basis and allowing the quota-holding countries to capture the quota rents, the same trade offs between quota rents and trade effects were at work in determining the net welfare effects. Under the over-quota tariff cut scenario (EU_T), the EU welfare gain reaches over $US 1 billion, while quota-holding exporters with preferential access from Africa, the Caribbean and Latin America show both quota rent erosion and welfare losses (table 8), despite an expansion of sugar exports (table 6). However, exporters without preferential access such as Brazil, Thailand and Australia show a positive net welfare gain as their export expands without having to incur any quota rent losses.

The opposite welfare outcome is observed when the TRQ quota is expanded with no cut in the over-quota tariffs (scenario EU_Q). In this case, the EU show a welfare loss of $US 264.4 M while the exporters from Africa and the Caribbean show a net welfare gain led by the 'rest of Africa' region ($US 213.3 M), the Caribbean group ($US 125.2 M), rest of Latin America outside Brazil ($US 68.1 M) and South Africa ($US 44 M). Other sugar importing countries such as Japan, China, and the US also show a small welfare loss (table 6) resulting from increased sugar import prices into these regions.

The combination of sugar quota expansion and tariff cut by the EU (EU_TQ scenario) results in a win-win outcome for both the EU and the sugar exporters. In this case the EU welfare gains amount to $US 416.8 M while the largest welfare gain to the exporters went to the Caribbean countries ($US 63 M) and to a smaller extent to the rest of Africa ($US 18.2 M). The latter region shows much larger quota rent losses compared to the Caribbean group and Latin America which explains the smaller welfare gains despite that the Africa region captures three quarters of the expanded sugar trade following this sugar liberalization scenario. This outcome underscores the importance of accounting for quota rent adjustments in analyzing the welfare implications of liberalizing the TRQ import regime.

5.4 Multilateral sugar import liberalization

The multilateral, partial sugar import liberalization tariff scenario (MULTI_T) consists of cutting over-quota tariffs (by the US and the EU) and MFN tariffs (by all other regions) by one third. Under this scenario, sugar output in the major OECD markets declines by 7.9 percent for Japan, 2.9 percent for the US and 2.47 percent for the EU. The sugar exporting countries expands output with the highest increases shown by the African region (3.12%), the Caribbean countries (2.98%), Australia (3.06%) and Thailand (3.02%). Smaller output increases were also shown for rest of Latin America, Brazil and South Africa (table 4). Under the MULTI_T scenario, the volume of world sugar trade expands by over $US 2 billion, with Africa capturing $US520.5 M (including South Africa) of that expansion (table 5). The rest of Latin America, the Caribbean and Brazil captures $US 162.2 M, $US 120.9 M, and $US 32.6 M, respectively. In addition, sugar exporters like Australia and Thailand, who benefit relatively little from the US and the EU partial tariff liberalization, show a bigger gain under the multilateral liberalization scenario (MULTI_T). This is because Australia and Thailand, supply most of Japan's sugar imports, and benefits from Japan's MFN sugar tariff reductions. Under the MULTI_T scenario, sugar imports by the EU expand by $US 445 M followed by the US with $US 220 M and Japan by $US 205 M. The Middle East and North Africa (MENA) region - a net sugar importer, also shows a substantial expansion of imports ($US 274.2 M) under this scenario resulting largely from its own sugar import tariffs.

The comparison between the multilateral liberalization scenario and unilateral liberalization by the US and the EU reveals several useful insights. The implications for the US and the EU are quite different between the two alternatives. While the EU sugar imports are significantly larger under a multilateral liberalization scenario (MULTI_T) compared to unilateral scenario (EU_T), the US sugar imports are roughly of the same magnitude between MULTI_T and US_T. As a result, for the major sugar importers like the US and Japan, the welfare and trade effects are mostly affected by their own sugar policy reforms. Whereas, for the EU that is both a major sugar importer and exporter, both domestic and multilateral sugar reforms will affect how the EU domestic sugar industries and overall welfare respond to those reforms.

The net global welfare gains under scenario MULTI_T was $US 1,300 M. The largest welfare gain is captured by the EU ($US 845 M) followed by the US ($US 306 M) and Japan ($US 300 M). For exporting countries the welfare effects of sugar tariff cuts were mixed. Countries that export mostly under TRQ quota to the US and the EU show a net welfare loss due mostly to the dominant effect of quota rent erosion. On the other hand, welfare effects were positive for Australia ($US 31.8 M) and Thailand ($US 70.6 M) with significant sugar exports to Japan whose sugar import regime is not subject to the TRQ regime.

In the case when the US and the EU also expand their quota volume by 1/3 in addition to a multi-lateral tariff cut by one third (scenario MULTI_TQ), the welfare effects were significantly different. The EU and the US welfare gains are much smaller compared to the MULTI_T case ($US 247 M for the EU and $US 8.9 M for the US), while Japan's welfare gains remain largely unchanged since it doesn't have a TRQ regime (table 6). Under MULTI_TQ, exporters experience positive welfare in most cases with the Caribbean region showing the largest gain ($US 112.8 M), followed by Thailand ($US 72.0), India ($US 51.8 M) and Australia ($US 49.4). Welfare gains for the African region and Latin America were positive but of a smaller magnitude (table 6). The net sugar importers like China, Canada and Korea experience a small negative welfare loss, consistent with the view that some sugar importing countries are currently benefiting from the downward pressure on world prices resulting from high sugar regulations.

6. Conclusions

This paper develops a modeling framework for analyzing bilateral tariff-rate quotas within the widely used GTAP multi-sector multi-regional general equilibrium model. In this analysis we apply the model to an analysis of the sugar import regime, emphasizing sugar TRQs in the the US and the EU. Among the features of the TRQ model are the bilateral treatment of the TRQs and the readjustments of the quota rents between importers and exporters. This latter feature is critical in the sugar case given that many quota-holding exporters also benefit from preferential access and capture the associated economic rents that result from the much higher domestic prices compared to world prices. To explore the implications of sugar TRQ reform, we examined separately the reduction of over-quota tariffs and quota expansion by the US and the EU. We also examine the consequences of a global liberalization of sugar trade including both the TRQ import and MFN tariff regimes.

Results show that reducing US over-quota tariffs by one-third results in a net welfare gain for the U.S. but a net income loss for exporting countries as the erosion of the quota rents dominates the gains from expanded exports. On the other hand, expanding quotas by one-third leads to net welfare gains by the quota-holding exporters while the liberalizing country (U.S.) shows a net income loss from reduced tariff revenues. However, the combination of tariff reductions and quota expansion results in welfare improvement for both the importer and the exporting countries. The same welfare effects were found in the case of the EU unilateral sugar liberalization exercise. These results highlight the complexity of the TRQ mechanism and suggest that the modalities of reforming the TRQs can be critical in determining the distribution of gains from trade liberalization between importers and exporters. These results also suggest that the partial liberalization of the world sugar market might lead many exporting developing countries to suffer severe difficulties may be misplaced. Our analysis shows that a combination of both over-quota tariff reductions and quota expansion could minimize the negative impacts on those exporters whose domestic industries critically depend on the existing preferential access.

Overall, this analysis provides new insights into the workings of the TRQ import regime and shows that in the sugar case, the welfare implications of partial trade liberalization are largely determined by the interplay of economic rents and volume of trade changes. The analysis also shows that the EU sugar import liberalization has a much larger impact on the world sugar trade and regional welfare than the impacts from US sugar liberalization alone. This is because the EU is the largest sugar market and is both a significant exporter and importer of sugar. The analysis also showed that under the multilateral sugar liberalization scenario the welfare effects for net sugar importers (US, Japan) are mostly affected by their own reforms while the welfare gains for sugar exporters are larger when export markets are diverse.

References

Abbott, P. and B.A. Morse (1999), TRQ Implementation in Developing Countries, paper presented at the conference on Agriculture and the New WTO Trade Agenda in the WTO 2000 Negotiations, World Bank/WTO, October 1-2, 1999, Geneva, Switzerland.

Abbott, P. and P. Paarlberg (1998), Tariff Rate Quotas: Structural and Stability Impacts in Growing Markets, Agricultural Economics 19, 1998, pp. 257-67.

Boughner, D.S. and H. de Gorter (1999), The Economics of 2-tier Tariff Rate Import Quotas and the Agreement on Agriculture in the WTO. Department of Agricultural, Resource and managerial Economics, Cornell University.

Elbehri, A. and K. R. Pearson (2000), Implementing Bilateral Tariff Rate Quotas in GTAP using GEMPACK, GTAP Technical Paper (forthcoming).

Harrison, W.J. and K.R. Pearson (1996), Computing Solutions for Large General Equilibrium Models Using GEMPACK, Computational Economics vol. 9, pp. 83-127.

Hertel, T.W. (ed.) (1997) Global Trade Analysis: Modeling and Applications, Cambridge University Press.

Ingco, M.D. (1996), "The Uruguay Round and the Least-Developed Low-Income Food Deficit Countries", Paper presented to the Inter-Agency Meeting of the World Food Situation and Net Food Importing Countries, the World Bank, Washington, D.C., 18-19 December.

Ingco, M.D. and M. Tsigas, (1998). “Implementing Market Access Commitments in Agriculture: Welfare Evaluation of Issues for the Next Round of WTO Negotiations.” Paper presented at the First Annual Global Analyses, June 8-10, Purdue University.

OECD (1998). Review of tariffs and non-tariff barriers: tariff regimes of the QUAD countries. OECD: Paris.

OECD (1999), Sugar Policy Reform: Price Regulation Options. OECD: Paris.

Skully, D.W. (1999a), The Economics of TRQ Administration. Working Paper #99-6, International Agricultural Trade Research Consortium.

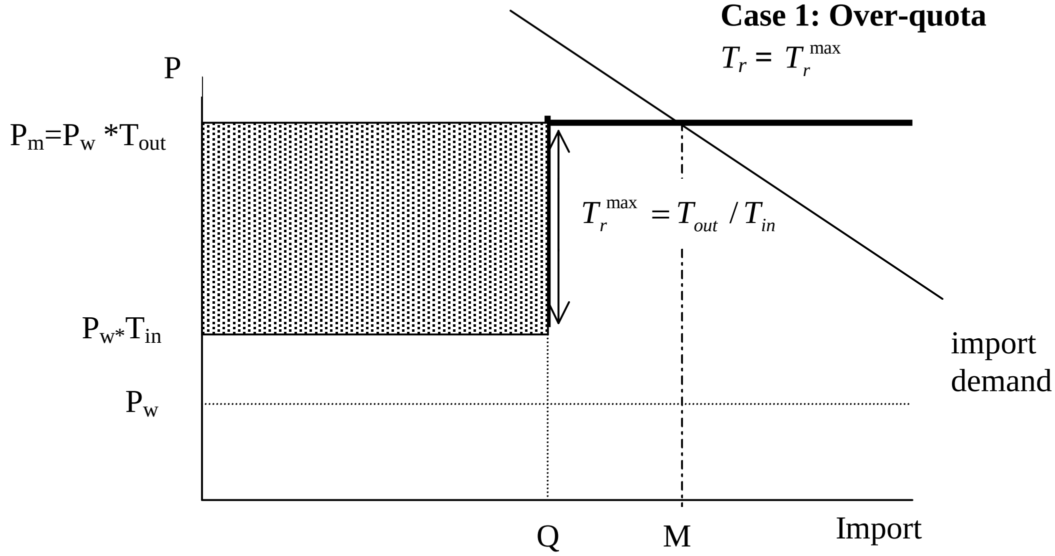
Skully, D.W. (1999b), “The Sugar TRQ System in the US”, In: Sugar and Sweetener; USDA/ERS, September 1999.

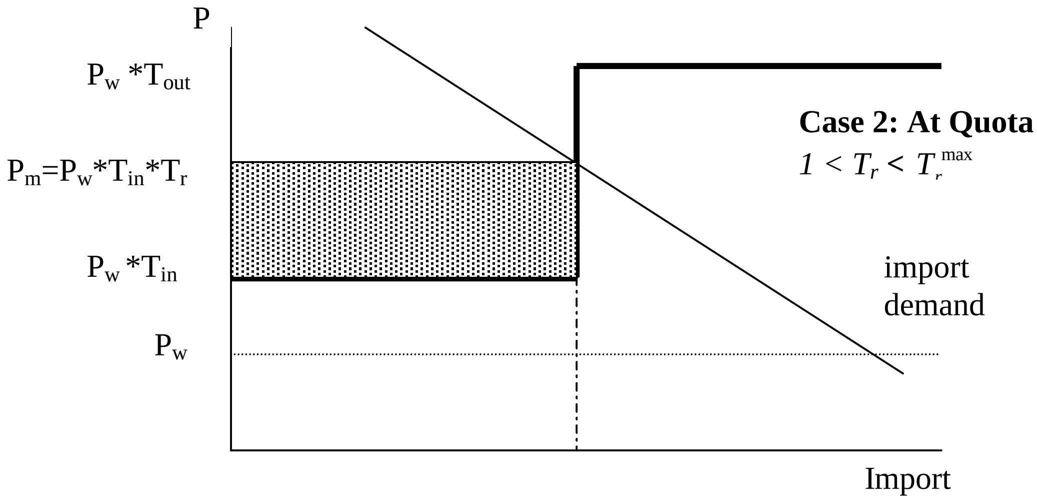
Martin, W. and A. Winters (1995) (eds.), The Uruguay Round and the developing economies. World Bank Discussion paper 307.

Haley, S. (1999), “Stocks-to-use ratios and sugar pricing relationship: Implications for U.S. sugar policy”, In: Sugar and Sweetener; USDA/ERS, September 1999.

Swinbank, A. (1999), “EU agriculture, Agenda 2000 and the WTO commitments”, World Economy Vol. X: 41-54.

Figure 1. Tariff Rate Quota Regime





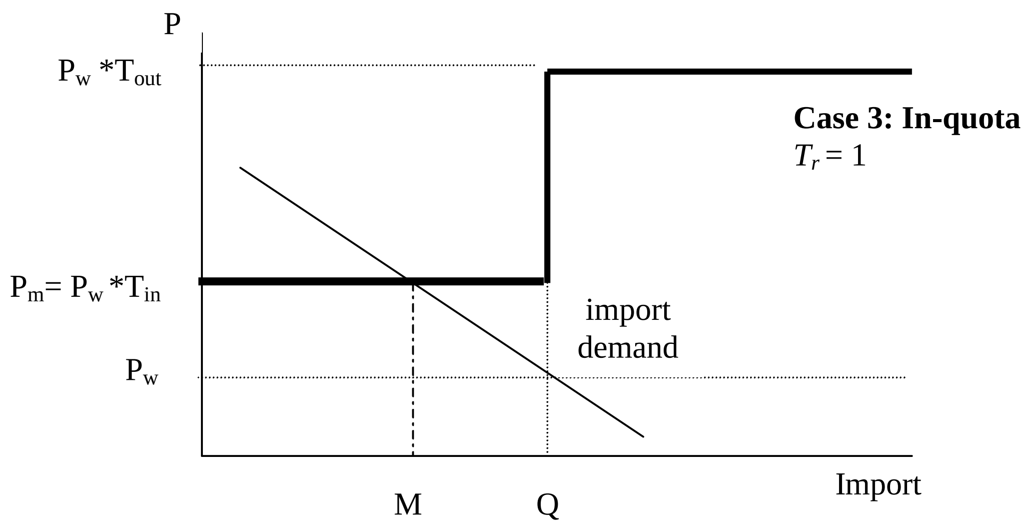


Figure 2. TRQ liberalization scenarios

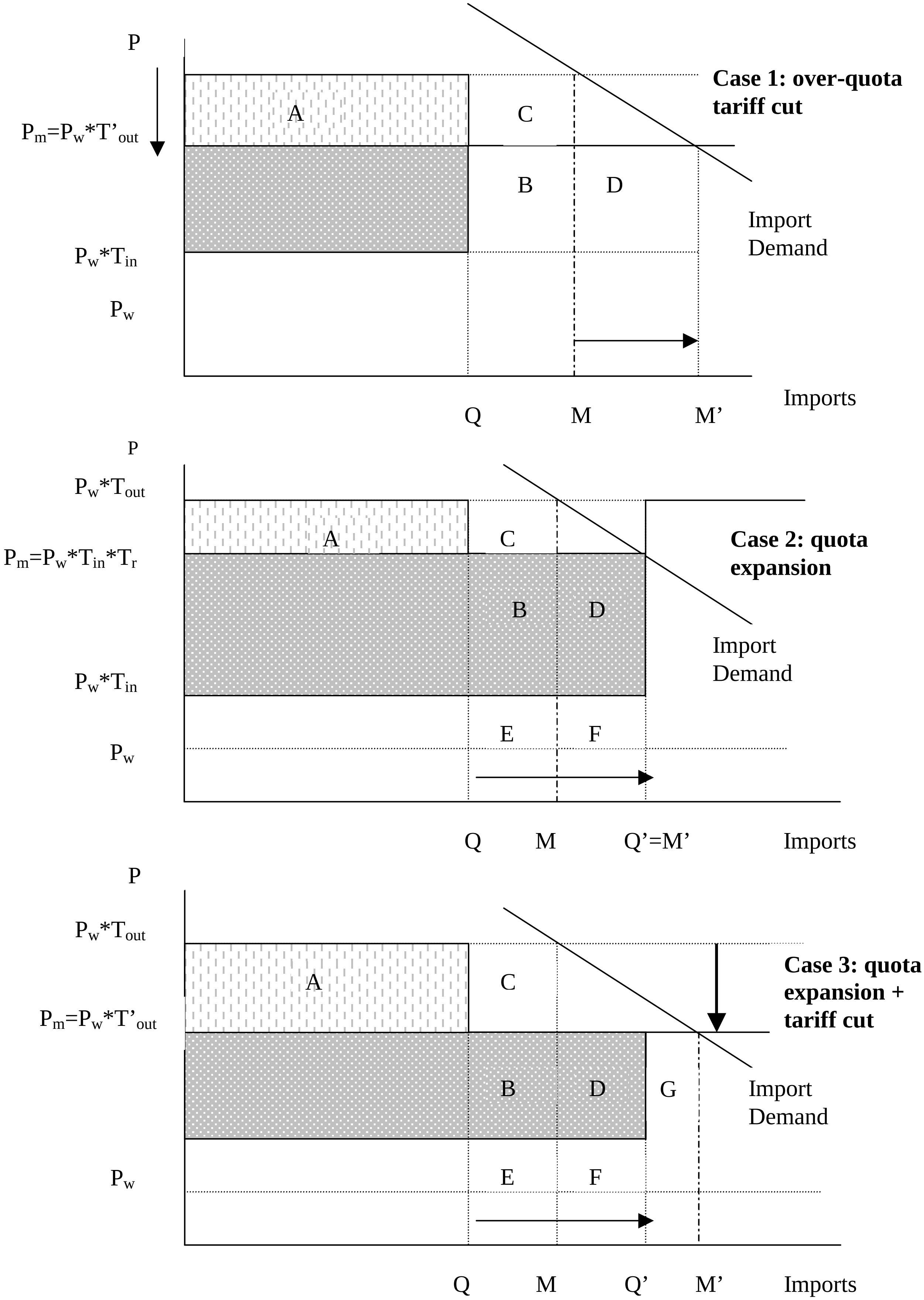


Table 1 Shares of sugar imports for US, EU and Japan (Benchmar database, 1995)

Importers:	JPN	USA	EU
Exporters:			
Australia (AUS)	35.0	7.6	0.3
Philippines (PHL)	0.9	7.2	0.0
Thailand (THL)	25.6	1.2	0.3
United States (USA)	5.0	0.0	0.5
Brazil (BRA)	0.0	10.2	0.6
Carrabean Americas (CAC)	9.0	28.1	5.6
Rest of Latin America (RLA)	0.3	17.7	3.5
European Union (EU)	2.4	0.8	66.6
South Africa (SAF)	8.7	2.2	2.5
Rest of Africa (RAF)	0.0	3.7	10.2
Others	13.0	21.3	9.8
TOTAL	100.0	100.0	100.0

Table 2 Sugar tariff rate quota data for the US and the EU (1996).

	Total imports ($US M) [1]	*Tariff quota ($US M)* [1]	*In-quota imports ($US M)* [1]	*Quota/ total imports*	*In-quota Ad valorem tariff2*	*Out-of quota Ad valorem tariff3*
United States	1,134.96	865.15	839.36	0.76	2.44	129.00
European Union	1,351.44	1,169.81	1,169.81	0.87	0.00	147.00

1 Values represent trade weighted average using WTO country submissions for tariff quota commodities and using average 1995-97 world import unit values from UNCTAD TRAINS.

Table 3 Model scenarios for sugar import regime liberalization

Simulation	*Description*
US_T	Reduction of over-quota tariff rate for US sugar TRQ by 33%
US_Q	Expansion of sugar quota volume for US by 33%
US_TQ	Reduction of over-quota tariff rate and expansion of quota volume for US sugar TRQ by 33%
EU_T	Reduction of over-quota tariff rate for EU sugar TRQ by 33%
EU_Q	Expansion of sugar quota volume for EU by 33%
EU_TQ	Reduction of over-quota tariff rate and expansion of quota volume for EU sugar TRQ by 33%
MULTI_T	Multilateral sugar import regime liberalization: global cut in import tariffs or over-quota tariffs by 33%
MULTI_TQ	Multilateral sugar import regime liberalization: global cut in import tariffs or over-quota tariffs and quota volume expansion by 33%

Table 4 Sugar market access liberalization: import effects ($US 1995 millions)[1]

Scenarios	*US sugar TRQ Liberalization* US_T	US_Q	US_TQ	*EU sugar TRQ Liberalization* EU_T	EU_Q	EU_TQ	*Multilateral sugar import Liberalization* MULTI_T	MULTI_TQ
Japan	4.1	0.3	4.1	-2.2	-1.1	-2.3	205.6	205.5
	(0)	(0)	(0)	(-0.2)	(-0.1)	(-0.3)	(15.6)	(15.6)
Korea	0.8	0.1	0.8	0.5	0.2	0.5	24.4	24.4
	(0)	(0)	(0)	(0)	(0)	(0)	(1.9)	(1.9)
China	-5.3	-1	-5.5	-5.4	-3.1	-5.6	53.4	53.1
	(-0.3)	(-0.1)	(-0.3)	(-0.3)	(-0.2)	(-0.4)	(2.9)	(2.9)
Taiwan	-0.9	-0.2	-0.9	-2.3	-1.1	-2.3	7.8	7.7
	(-0.9)	(-0.2)	(-1)	(-1.4)	(-0.7)	(-1.4)	(3.5)	(3.4)
India	-0.7	-0.1	-0.8	-2.2	-1	-2.3	97.6	97.5
	(-0.3)	(0)	(-0.3)	(-0.5)	(-0.2)	(-0.5)	(29.2)	(29.2)
Rest of Asia	2	0.1	1.9	5.5	1.7	5.4	95.9	95.8
	(0)	(0)	(0)	(0.1)	(0)	(0.1)	(5.7)	(5.7)
Canada	23.4	1.1	23.4	-0.6	-0.2	-0.5	34.1	34.2
	(1.9)	(0)	(1.9)	(-0.2)	(-0.1)	(-0.2)	(3.1)	(3.2)
United States	222.3	18.2	222	-9.4	-4.9	-9.7	220.5	219.9
	(14.5)	(1.2)	(14.5)	(-0.7)	(-0.3)	(-0.7)	(14.2)	(14.2)
Rest of Latin America	5.3	0.3	5.3	5.4	2.1	5.4	49.9	49.9
	(0.5)	(0)	(0.5)	(0.8)	(0.3)	(0.8)	(8.3)	(8.3)
European Union	-1.3	-0.3	-1.3	380.3	122.5	378.7	445.5	443.6
	(-0.1)	(0)	(-0.1)	(7.1)	(2.3)	(7)	(8.0)	(8.0)
MENA	5	0.2	5	76.5	29.4	76.3	274.2	273.9
	(-0.1)	(0)	(-0.1)	(0.5)	(0.2)	(0.5)	(5.2)	(5.1)
Rest of Africa	0.2	0	0.3	47.2	19.7	49.6	108.7	111.3
	(-0.1)	(0)	(-0.1)	(3.9)	(1.7)	(4.2)	(10.1)	(10.4)
Rest of World	-0.4	-0.2	-0.5	54.1	20.2	54.2	394.4	394.5
	(-0.2)	(0)	(-0.2)	(1.1)	(0.4)	(1.1)	(6.7)	(6.7)
Total	280	20.4	279.4	555	187.5	555	2064.1	2063.7
	(1.14)	(0.08)	(1.13)	(2.02)	(0.63)	(2.02)	(7.51)	(7.50)

Source: Authors simulations

[1]: percent change in parentheses

Table 5 Sugar market access expansion and sugar output effects
(percent)

	US sugar TRQ Liberalization			EU sugar TRQ Liberalization			Multilateral sugar import Liberalization	
Scenarios	*US_T*	*US_Q*	*US_TQ*	*EU_T*	*EU_Q*	*EU_TQ*	*MULTI_T*	*MULTI_TQ*
Australia	0.20	0.00	0.20	0.31	0.15	0.32	3.06	3.08
Japan	0.00	0.00	0.00	0.14	0.07	0.14	-7.90	-7.90
Korea	0.01	0.01	0.01	0.10	0.05	0.11	6.72	6.73
Philippines	2.01	0.00	2.00	0.47	0.22	0.48	3.02	3.03
Thailand	0.07	0.01	0.07	0.28	0.13	0.29	2.64	2.65
China	0.01	0.01	0.02	0.60	0.26	0.61	-0.83	-0.81
Taiwan	-0.57	-0.04	-0.56	0.47	0.23	0.48	-1.84	-1.82
India	0.03	0.01	0.03	0.05	0.02	0.06	-0.60	-0.60
Rest of Asia	0.02	0.00	0.02	0.38	0.15	0.38	-0.46	-0.46
Canada	3.90	0.07	3.91	-0.01	0.01	0.00	5.78	5.81
United States	-3.85	-0.34	-3.84	0.52	0.23	0.53	-2.91	-2.89
Mexico	0.00	-0.02	0.01	0.87	0.31	0.87	1.07	1.08
Brazil	0.09	0.01	0.09	0.12	0.05	0.12	0.18	0.19
Carrabean Americas	0.72	0.05	0.67	1.72	0.74	1.68	2.98	2.89
Rest of Latin America	0.45	0.05	0.45	1.12	0.50	1.13	1.41	1.42
European Union	0.06	0.01	0.06	-3.84	-1.52	-3.82	-2.47	-2.44
North Africa & Middle East	0.03	0.01	0.03	-0.03	0.00	-0.03	-1.43	-1.42
South Africa	0.12	0.01	0.13	1.26	0.48	1.28	1.82	1.83
Rest of Africa	0.15	0.00	0.15	3.20	1.08	3.17	3.12	3.09
Rest of World	0.06	0.01	0.07	0.98	0.37	0.99	-2.38	-2.37

Table 6 Sugar market access liberalization: export effects

Scenarios	*US sugar TRQ Liberalization*			*EU sugar TRQ Liberalization*			*Multilateral sugar import Liberalization*	
	US_T	*US_Q*	*US_TQ*	*EU_T*	*EU_Q*	*EU_TQ*	*MULTI_T*	*MULTI_TQ*
Australia	8.5	0	8.6	13	6.3	13.5	128.5	129
	(0.3)	(0)	(0.4)	(0.5)	(0.3)	(0.6)	(5.3)	(5.3)
Philippines	18.8	-0.1	18.7	3.6	1.6	3.7	23.8	23.8
	(13)	(0)	(12.9)	(2.5)	(1.1)	(2.5)	(16.4)	(16.4)
Thailand	2.1	0.4	2.3	8.4	4	8.7	81.8	82.2
	(0.1)	(0)	(0.1)	(0.4)	(0.2)	(0.4)	(4.2)	(4.2)
China	-5.5	-0.6	-5.4	16.2	6.3	16.3	28.2	28.4
	(-1.9)	(-0.2)	(-1.9)	(6.2)	(2.4)	(6.3)	(11.2)	(11.2)
Taiwan	-4.9	-0.5	-4.9	0.5	0.2	0.5	-3	-3
	(-24.2)	(-2.6)	(-24.2)	(2.2)	(1.0)	(2.3)	(-14.6)	(-14.6)
India	5.4	0.9	5.4	10	3.9	10	19.6	19.7
	(4.4)	(0.8)	(4.5)	(8.3)	(3.2)	(8.3)	(16.2)	(16.3)
Rest of Asia	0.5	0.1	0.6	44.8	17.6	45	72.9	73.1
	(0.2)	(0)	(0.2)	(15)	(5.9)	(15.1)	(24.6)	(24.7)
United States	111.8	9.5	111.9	16.6	6	16.7	168	168.3
	(18.5)	(1.6)	(18.5)	(2.8)	(1)	(2.8)	(27.8)	(27.9)
Mexico	4.2	0.1	4.2	14.6	5.2	14.7	22.1	22.2
	(4.2)	(0.1)	(4.2)	(14.8)	(5.3)	(14.9)	(22.4)	(22.5)
Brazil	16.6	1.4	16.4	19.9	8.5	20.7	32.6	33.1
	(0.5)	(0)	(0.5)	(0.6)	(0.3)	(0.6)	(1.0)	(1.1)
Carrabean Americas	28.9	2	27.2	59.7	25.5	57.8	120.9	117.3
	(1.2)	(0.1)	(1.1)	(2.4)	(1)	(2.3)	(4.8)	(4.7)
Rest of Latin America	38.2	3.8	38	92.2	40.4	92.2	162.2	162
	(4)	(0.4)	(.4.0)	(9.4)	(4.1)	(9.4)	(16.7)	(16.7)
European Union	10.9	2.8	12	-355.7	-151.9	-351.3	266.7	272.4
	(0.2)	(0)	(0.2)	(-8.9)	(-3.7)	(-8.8)	(-2.6)	(-2.5)
South Africa	7.9	0.6	7.9	81.9	29.7	81.6	120.6	120.3
	(1.7)	(0.1)	(1.7)	(17.9)	(6.5)	(17.8)	(26.3)	(26.2)
Rest of Africa	15.1	-0.9	15	357.5	119.5	352.6	399.6	394.5
	(1.4)	(-0.1)	(1.4)	(32.7)	(10.9)	(32.2)	(36.5)	(36.1)
Rest of World	4.6	0.5	4.7	157	59.2	157.5	324.9	325.6
	(0.6)	(0.1)	(0.6)	(19.6)	(7.4)	(19.7)	(40.5)	(40.6)
Total	280	20.4	279.4	555	187.5	555	2064.1	2063.7

Table 7 Welfare effects of sugar import liberalization

Scenarios	US sugar TRQ Liberalization			EU sugar TRQ Liberalization			Multilateral sugar import Liberalization	
	US_T	*US_Q*	*US_TQ*	*EU_T*	*EU_Q*	*EU_TQ*	*MULTI_T*	*MULTI_TQ*
	Welfare ($US million)							
Australia	-15.7	20.6	0.8	3.5	2.6	4.3	31.8	49.4
Japan	8.8	-3.8	5.2	-0.5	-10.4	-8.3	300.4	289.1
Korea	0.4	0.5	0.7	1.4	0.2	1.3	-2.1	-1.9
Philippines	-24.4	34.1	3.1	1.8	0.9	2.0	-23.6	4.3
Thailand	1.3	0.6	1.7	8.2	4.6	9.1	70.6	72.0
China	-4.3	-0.9	-4.6	-11.3	-5.5	-11.5	-29.7	-30.3
Taiwan	-0.6	-0.3	-0.8	-0.6	-1.1	-1.2	-1.1	-1.8
India	-0.9	-0.3	-1.1	-8.7	3.7	-2.6	45.9	51.8
Rest of Asia	-1.3	-0.5	-1.6	2.2	0.4	2.1	6.4	6.0
Canada	4.5	3.0	6.6	-5.4	-2.2	-5.4	-6.9	-4.8
United States	352.1	-348.8	63.1	-25.6	-18.0	-29.9	306.1	8.9
Mexico	-3.4	7.8	2.7	2.5	1.2	2.9	1.5	7.9
Brazil	-39.4	52.1	2.3	7.7	1.9	6.9	-32.0	9.1
Carrabean Americas	-88.3	134.8	20.2	-70.9	125.2	63.0	-133.5	112.8
Rest of Latin America	-64.2	83.0	2.8	-75.1	68.1	10.4	-144.3	9.4
European Union	-13.1	-9.5	-19.0	1008.8	-264.4	416.8	845.0	247.0
MENA	-2.6	-0.1	-2.4	4.7	2.4	4.9	10.8	11.3
South Africa	-9.2	10.7	-0.6	-57.0	44.2	-0.8	-61.9	3.0
Rest of Africa	-15.9	19.2	-0.8	-238.4	213.3	18.2	-254.1	17.6
Rest of World	-0.7	2.3	1.2	13.5	66.3	65.7	372.0	424.4
Global	83.0	4.5	79.6	561.0	233.4	548.0	1301.5	1285.0
	Changes in quota rents ($US million)							
Australia	-15.1	16.4	-2.0	0.1	0.0	0.1	-14.5	-1.3
Japan	-1.9	-0.1	-1.9	0.0	0.8	0.8	-2.9	-2.1
Korea	-0.3	0.0	-0.3	0.1	0.1	0.2	-0.4	-0.3
Philippines	-25.2	27.8	-2.7	0.2	0.1	0.2	-24.8	-2.2
Thailand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
China	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taiwan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
India	0.0	0.0	0.0	-6.5	4.1	-0.9	-6.6	-1.0
Rest of Asia	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
United States	-30.2	32.8	-3.4	0.2	0.1	0.2	-30.6	-3.9
Mexico	-5.5	5.9	-0.7	0.2	0.1	0.2	-5.3	-0.5
Brazil	-37.4	39.9	-4.8	0.3	0.2	0.4	-37.2	-4.6
Carrabean Americas	-94.4	103.5	-8.3	-110.2	74.5	-4.0	-203.6	-8.3
Rest of Latin America	-60.8	67.9	-5.4	-73.5	50.9	-3.2	-136.8	-10.2
European Union	-0.7	0.1	-0.6	-156.1	99.9	-19.8	-162.3	-27.7
MENA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Africa	-7.8	8.4	-1.0	-50.6	32.8	-6.3	-58.1	-7.0
Rest of Africa	-14.3	16.7	-1.3	-245.1	173.8	-21.3	-260.7	-24.0
Rest of World	-1.9	2.0	-0.2	-49.2	31.7	-6.0	-55.8	-12.3
	Changes in tariff revenues ($US million)							
United States								
In-quota tariff revenues	-13.0	-54.6	-66.7	-0.4	-0.2	-0.4	-13.5	-67.8
Over-quota tariff revenues	69.6	-285.9	-138.8	-7.5	-3.7	-7.7	68.6	-142.4
European Union								
In-quota tariff revenues	-0.9	-0.1	-0.9	-14.8	-129.0	-138.4	-14.4	-137.7
Over-quota tariff revenues	-8.8	-1.7	-9.2	589.0	-352.2	82.4	631.7	126.2