THE EFFECTS OF CHANGING C.E.T. RATES: THE BARBADOS CASE

BY

CLYDE A. MASCOLL
&
NADINE HARDING
RESEARCH DEPARTMENT
CENTRAL BANK OF BARBADOS

For Presentation at the XXIV Regional Programme of Monetary Studies Annual Conference, Central Bank of Bahamas
October 1992

SEPTEMBER 1992

INTRODUCTION

The Common External Tariff (CET) is regarded as the prime instrument of consensus among member countries of CARICOM, yet it is characterised by disagreement[1]. The recent revisions to the structure of the CET and changes in the CARICOM Rules of Origin are viewed as a real step forward in regional economic co-operation and integration. Brewer (1991). However, agreement on the new structure is threatened as some member states are concerned with the effects of the rates on the cost of living and the level of protection for some sectors of the economy. On the other hand, other member states favour the maintenance of the new ra. - 0 to 45% - which are under severe scrutiny from international organisations such as the World Bank and the IMF. Amidst this uncertainty a technical committee[2] was established to analyse the effects of the recently proposed working rate structure - with a maximum rate of 35% - on some macroeconomic variables[3].

Apart from the internal differences among CARICOM member states, the recent formation of the North American Free Trade Association[4] (NAFTA) has created an additional source of pressure for total agreement to be reached on the CET rates. The high level of

---

[1] Agreement is reached in principle but implementation is always difficult. The CET agreement became effective in 1973 but by the mid-1980s its implementation was not completed in all member states. Similarly the new CET has not been implemented by four of the member states.

[2] It is a six-member team comprising representatives from the Caribbean Development Bank, the University of the West Indies, East Caribbean Central Bank, Central Bank of Trinidad and Tobago and United Nations ECLAC.

[3] These include 1) revenue and other fiscal implications; 2) cost of living; 3) balance of payments; and 4) unemployment.

[4] The members are the United States, Canada and Mexico. If the treaty becomes reality, half the present tariffs in the NAFTA area (estimated at about 9,000) would be scrapped immediately and the rest phased out over 15 years.

protection offered by the CET is against the spirit of 'hemispheric trade liberalisation'. And there is fear that with the creation of NAFTA, the region may become marginalised as investment is diverted to Mexico, (Caribbean Insight September 1992). Furthermore preferential trading arrangements such as CBI and CARIBCAN may be dismantled.

Notwithstanding the absence of political union, the introduction of a Common External Tariff suggests some acceptance of the merits of a Customs Union (see Appendix A). Although several other objectives[5] are identified, the desire to protect specific economic activities seem to be an overriding concern for implementing the CET within CARICOM.

This paper addresses the empirical implications of making changes to the existing rates of the CET on :-

1. Sectoral Protection[6]
   a) current levels offered by the CET;
   b) impact on (a) of lowering the CET rates.

2. Revenue Implications:
   a) resulting from the CET i.e. potential and actual;
   b) impact on (a) of lowering the CET rates.

3. Cost of living of impact of changing the CET rates.

STRUCTURE OF THE CET

The CET rate structure is common and is based on two categories of goods in terms of economic usage, namely:-

a) inputs; and
b) final goods.

Inputs cover primary, intermediate and capital goods. Final or consumer goods are broken down into basic and non-basic goods. Further, the rate structure differentiates between competing and non-competing goods. Goods are considered to be competing if the regional manufacturer has the potential to supply 75 percent of the regional market. This is effective whether or not this potential is actually realized.

[5] There are: 1) revenue generation; 2) simplification of the tariff structure; 3) unrestricted intra-regional competition; 4) reduction in dispersion of tariff protection; and 5) higher rates on consumer goods and products deemed to be of adequate regional supply.

[6] Whitehall (1984) analysed both nominal and effective rates of protection for twenty-four manufacturing activities over the period 1960-80 - the methodology was different.

The economic classification and rate structures are given in the table below:-

Table A C.E.T. RATE STRUCTURES

	Group A (Non-competing)	Group B (Competing)	Group C (Non-basic Competing)	Group D (Non-basic Non-competing)
INPUTS				
Primary	5%	20%		
Intermediate	10%	30%		
Capital	10%	20%		
Final Goods	10%*	30%*	45%	30%

* Basic Category
Source: Caricom Secretariat

Import data for 1990 and the pre-1991 CET rates are presented in Table 1. In Table 2, given the change in the classification of imports to the Harmonized System (HS) code, import data for the period April-December 1991 and the 1991 CET rates are presented. Prior to April 1991, the import data was coded according the Standard International Trade Classification (SITC) system. Although the two sets of data are not strictly comparable, they illustrate the change in the distribution of tariff positions (column 3), relative import shares by tariff (column 5), potential revenue (column 6) which is computed as the tariff rate times the import value and the actual revenue for 1991 alone. (The data was not available in the classifications presented in Table A.)

The change to the HS code gave rise to an increase in tariff positions from 2,401 to 3,899, as the new system is more disaggregated. The accompanying change to the new CET structure in 1991 implied a reduction in the number of rates from fifteen to eleven, as a result of eliminating the 35%, 40%, 55% and 65% rates. Although the new structure is supposed to have rates ranging from 0% to 45%, Table 2 still shows rates of 50%, 60% and 70 %. These rates are applied to goods (such as alcoholic beverages) which carry an *ad valorem tariff*.

The first three rates - 0%, 5% and 10% - accounted for 42.3% of the tariff positions in 1990 and 58.7% in 1991. The 10% rate alone represented 41.5% of the positions in 1991, an increase of just over 30 percentage points when compared to 1990. This is not surprising, according to Table A the rate structure suggests that the 10% rate applies to non-competing intermediate, capital and final goods. These categories include most items in consumer durables, intermediate and capital goods which represent the bulk of imports in any given year. On the other hand, the shares for the 0% and 5% rates fell by just about 7 percentage points. The overall increase in the distribution of tariff positions among the three lowest rates represents a move towards a lower level of protection offered by the new CET in 1991.

The potential revenue share generated by the first three rates increased from 13.9% in 1990 to 20.0% in 1991. This less than proportionate increase in potential revenue, given the 30 percentage points increase in tariff positions, furthe demonstrates the lower tariff regime resulting from the new CET structure. The recovery rate - that is the ratio of actual to potential revenue - was 37.1% in 1991. This low recovery rate implies that considerable exemptions and concessions may have been granted to local importers in 1991. It may also represent under reporting or inadequate collection methods.

The next three tariff rates - 15%, 20% and 25% - accounted for 21.5% of the tariff positions in 1990 compared to 3.4% in 1991. The percentage distribution of tariff positions for the 25% rate fell from 10.5% in 1990 to a mere 0.9% in 1991, as there is no real provision for the 25% rate in the new structure according to Table A. Though not as dramatic, the distributions for the 15% and 20% rates fell from 5.9% and 5.1% to 1.2% and 1.3% respectively. The fall in the 20% rate may be explained by its application to competing primary and capital goods which do not constitute a substantial share of imports. As a result of the dramatic fall in the shares of tariff positions and import values, the potential revenue from the three rates fell from 26.9% in 1990 to 10.5% in 1991.

Two tariff rates of 30% and 45% accounted for 35.4% of the tariff positions in 1991; whereas the range between 30% and 45% comprising four rates accounted for 32.4% of the positions in 1990. According to Table A, the 30% rate is applied to competing intermediate and final goods and non-basic non-competing goods, while the 45% rate is applied to non-basic competing goods which include motor cars. The share of imports over the 30-45% range increased from 24.3% in 1990 to 31.1% in 1991. The absolute value of imports ($141.1 million) for the 45% category over the period April-December 1991 was higher than the $113.1 million for the same category over the entire year of 1990. While the share of imports rose, the increase in potential revenue of 14 percentage points was striking. Even more striking, the 30% and 45% rates were responsible for 76.5% of the actual revenue collected from import duties for the period April to December 1991. (Actual revenue was not available for 1990.)

Rates in excess of 45% accounted for 3.8% of the tariff positions, 3.1% of imports and 9.3% of the potential revenue in 1990. By 1991, these same rates accounted for 1.5% of the tariff positions, 1.6% of the imports and 5.6% of potential revenue. However their share of actual revenue was just 1.2% in 1991.

SIMULATION RESULTS

Sectoral Protection

This section employs a measure of weighted average nominal rates[7] to assess the relative levels of protection offered by the CET to various sectors of the economy (see Appendix I). The nominal rates of protection are weighted by the value of imports. However, it must be noted that weighted nominal rates of protection would normally be lower than unweighted protection, just because products with high tariffs tend to be less often imported and vice-versa. SINTIA-T User's Guide (1988).

Table 3 and 4 illustrate the sectoral and sub-sectoral distribution of the weighted average nominal rates of protection for the Barbados economy in 1990. For the overall economy, the rate of protection averaged 18.2% which is almost the same as in the Manufacturing sector (18.7%). However the sub-sectoral distribution of protection in the Manufacturing sector is very varied

[7] The World Bank's SINTIA-T program is used to provide a systematic description of the nominal protection resulting from official tariffs and other import duties. In addition possible revenue calculations can be made under various assumptions about import elasticities and devaluation.

with rates as high as 35.1% for the Textiles and Leather industry and as low as 10.6% for Basic metals. The Agriculture and Mining sectors are almost equally protected with rates of 8.3% and 8.2% respectively.

Simulation 1 which constrains the maximum nominal rate to 45% suggests that protection for the overall economy declines only marginally by 0.3 percentage points or 1.6%. This is indicative of the fact that the four rates in excess of 45% represented only 91 tariff positions or 3.8% of the total, and accounted for only 3.2% of imports No sector is losing substantially from the imposition of a maximum tariff of 45% according to the 1990 data (see Table 4).

On the other hand, Simulation 3 with a maximum rate of 20% implies a weighted average rate of protection of 12.9% for the overall economy, that is a reduction of 5.3 percentage points or 29.2%. The manufacturing sector loses the most protection of 5.5 percentage points, with Textiles and Leather being the hardest hit. Having benefitted from the greatest level of protection prior to 1991, the Textiles and Leather sub-sector experienced a dramatic fall in protection from 35.1% to 19.4% as a result of the imposition of a maximum CET rate of 20%. Basic metals was least affected as protection moved from 10.6% to 10.4% in the post simulation scenario. Of the other sub-sectors, Wood, Cork products and Metal products experienced reductions of protection of 31.2% and 29.9% respectively.

A less radical change to a maximum rate of 35% (Simulation 2) implies a fall in protection of 9.6% for the overall economy. Unlike the scenario with the maximum rate of 20% protection falls by less in the Manufacturing sector than for the overall economy (see Table 3). This is the result of initial high levels of protection in the Manufacturing sector.

The effect of raising the minimum CET rate from 0% to 5% is not significant for the overall economy according to the nominal weighted rates of protection - these results are shown in Tables 3 and 4, under simulation 4. However, the changes in protection are significant for the agriculture and mining sectors and some manufacturing sub-sectors. The simulated effects on revenue and cost of living are less than one percent on either side of zero. (See Tables 5 and 6).

Protection in the agricultlural sector increased by 4 percentage points or 47.0%. that is the nominal weighted rate of protection moved from 8.2% to 12.2% as the minimum CET rate was raised from 0% to 5%. It must be noted that agricultural machinery and fertilizers among other primary imputs, which carry a zero rate, are the most significant imports in the sector. Similarly, a significant amount of items in the mining sector carry a zero rate.

In the manufacturing sub-sectors, protection in food. beverages and tobacco increased by 1.7 percentage points or 10.4%, but the largest increases were in wood and cork products (29.4%) and paper and printing (21.6%).

Revenue Effects

The rate structure of the CET has effects on government's revenue, more precisely on the level of import duties as is classified by the Customs Department. However, neither the direction nor the magnitude of the effects are easy to determine; an increase in the tariff does not guarantee more revenue and conversely lowering the tariff does not imply less revenue. Depending on the elasticity of demand for Non-Caricom goods in Barbados, the change in tariff on the goods may/may not have an adverse effect on revenue.

The SINTIA-T program allows the user to simulate the effect on revenue from import duties of changes in the import duties as well as changes in the value of imports. Changes in imports may occur endogenously and exogenously (see appendix II). The user may change the values of the following variables:

t_2 import duty used in the simulation;

m exogenous change in the value of imports;

d rate of devaluation;

p percentage by which domestic consumer prices increase as a result of changes in exchange rate and scarcity rents; and

e price elasticity of import demand.

In doing the simulations on revenue, the following elasticity assumptions are made based on standard import groups:

	Imports	Case 1	Case 2
(i)	Agriculture (raw materials)	-1.00	-1.00
(ii)	Mining (raw materials)	-1.00	-1.00
(iii)	Consumer Goods	-2.00	-1.00
(iv)	Intermediate Goods	-1.00	-1.00
(v)	Capital Goods	-0.50	-1.00

Additional assumptions are made:

(i) maximum nominal rates of protection have been changed to the values listed in the column (1) to 45%, 35% and 20% and the minimum rate of protection 0% raised to 5% in Tables 3, 4, 5, 6 and 7.

(ii) there are no exogenous changes in the volume of imports; and

(iii) no devaluation.

As a result of assumptions (ii) and (iii), the simulated value of imports for a product or sub-sector for a product or sub-sector may be written, from step 4 in Section 2 of Appendix II, as

$$M_2 = M_1[1 + e\{(1 + t_2)/(1 + t_1) - 1\}] \qquad (1)$$

and

$$R_2 = M_2 t_2 \qquad (2)$$

In Tables 5 and 6, the total hypothetical revenue is calculated by summing the hypothetical revenues for all commodities. R_2 is compared to R_1 to determine the hypothetical percentage change in revenue associated with the simulated changes (shown in column 5 of the two Tables). The simulated import value M_2 is shown in column 3 and the percentage change in the value of imports in local currency is shown column 6 of the tables.

Under Case 1, the imposition of a maximum rate of 45% causes import duties to decline by import duties decline by almost 1%. (It is instructive to note that the potential revenue from import duties in 1990 was approximately $232.3 million, however actual collection was $112.3 million.) Thus in dollar terms, the 1% decline might have represented a loss of 1.1 million. Similar moves to maximum rates of 35% and 20% imply declines in import duty revenue of 5.4% and 25.6% respectively. On the other hand raising the zero-rated items to 5% increased import duty revenues by 3.0% or $3.3 million more than the collection of$112.3 million in 1990.

Under Case (2) the lowering of the maximum rates each yielded a greater loss of revenue than in Case (1). The differences in the simulation are the reduction in elasticity of demand for consumer imports from -2.0 to -1.0 and the raising of the elasticity of demand for capital imports from 0.5 to -1.0. and raising of the elasticity of demand for capital imports of -0.5 to -1.0. By lowering the elasticity of demand for consumer goods, the value of imports increased by less and therefore resulted in less revenue (see equations 1 and 2 on Page 11). This loss in revenue was more than enough to wipe-out the gain from increasing the elasticity of demand for Capital goods.

Although the SINTIA-T program does not permit an analysis of any change in the pattern of trade resulting from changes in the rates of CET, in the short run the pattern of trade is not likely to change. Lower rates on extra-regional goods may result in less demand for Caricom goods, especially in the medium to long term. If such a phenomenon occurs in the short term, an increase in import duty may result as demand switches from Caricom to Non-Caricom goods. Thus a change in the pattern of trade is likely to affect the analysis.

Cost of Living Effects

The SINTIA-T program permits an indirect way of analysing the cost of living effects by changing the nominal rates of protection on imports. According to equation 2a in Section 2 of Appendix II, the ratio of the simulated value of domestic consumer price of importables (P_2) to the original value of domestic consumer price of importables (P_1) may be represented as

$$P_2/P_1 = (1 + p)\ (1 + t_2/(1 + t_1)$$

Our analysis assumes that p = o since there is no devaluation of the currency, i.e. d = o and there is no increase in price due to rents. As a result

$$P_2/P_1 = (1 + t_2)/(1+t_1)$$

where

t_2 is import duty used in the simulation which is approximately equal to the unweighted nominal rate of protection; and

t_1 is the initial import duty for a product or average import duty for a sub-sector.

Table 7 illustrates the approximate increases in the cost of living resulting from adjustments to the nominal rates of protection as stated under the various simulations used in the study. It is to be noted that the impact of changing the level of protection is dependent on the sectoral distribution of imports. Lowering the maximum rates to 45%, 35% and 20%, *ceteris paribus*, result in an average decline in the cost of living of -0.5%, -2.1% and -6.7% respectively, for the overall economy. On the other hand, an increase to 5%, *creteris paribus*, in the goods carrying a zero rate raises the cost of living by less than 1% for the overall economy.

The most radical change of lowering the maximum rate to 20%, yields the largest decline in the cost of manufactured items (-6.9) followed by agricultural goods (-5.8%) and minerals (-0.5%). In the manufacturing sub-sectors, the cost of consumer goods fell by -10.4%, capital goods by -4.0% and intermediate goods by -2.7%.

The major concern of the cost of living effect is in the proposal to raise the rate to 5%on goods which carry a rate of 0%. The items which have a 0% rate include food imports such as meats, milk, eggs, vegetables, wheat, rice, fish, flour, poultry, seasoning, butter, cheese and live animals; mineral imports such as chalk, cements, earths, slate, coal, petroleum, metallic ores; steel and steel products; medicaments and vaccines; glass and its related products; fertilizers; wood and books to name a few.

The simulation results suggest that the increase to 5% raises the cost of living by 0.7% for the overall economy. The greatest increase is the mining sector (3.4%) followed by the agricultural sector (1.7%). Increases in the sub-sectors of manufacturing are kept to less than 1% with intermediate goods realising the biggest increase of 0.9%.

The cost of living implications of changing the CET rates are also dependent on trade patterns. Consumption and production patterns are influenced by changes in the prices of imports and also exports which can be affected indirectly. Increased prices of imports used in production (raw materials) affect costs which in turn affect prices of domestically produced products and their export prices. Thus, the CET affects the whole price structure and therefore exerts an influence on the cost of living in Barbados.

CONCLUSION

The empirical results indicate that lowering the maximum rate of the CET reduces the level of protection particularly in the manufacturing sector. Government revenue may fall and as such alternative sources of revenue may have to be found. On the other hand, the cost of living may decline. These findings suggest that a decision to lower the maximum rate of the CET may depend on the priorities of the Barbados Government - of course the CET rates cannot be changed unilterally. If protection and revenue requirements are priorities, it may be difficult to lower the maximum rate. But if reducing the cost of living is given priority then the lowering of the rate is recommended.

Government's priorities may include other macroeconomic concerns such as unemployment and the balance of payments which are not addressed in the study because of the unavailability of data. But it does not require data to suggest that to lower the rate on non-basic competing final goods may imply greater competition from extra-regional sources. The additional competition may result in job losses and an increase in the level of imports. Unfortunately, without data to settle the issues, others may argue that protection is not an effective or efficient way to improve manufacturing capability and competitiveness.

In a wider context the lowering of the maximum CET rate may be desirable as it is consistent with the spirit of 'hemispheric trade liberalisation'. And given that the hemispheric move is on course with the creation of NAFTA, the region is forced to consolidate its position on several outstanding issues in CARICOM. Alternatively it is conceivable that CARICOM could become a member of NAFTA, least the region becomes marginalised as Mexico attracts all the investment from North America.

APPENDIX A: THEORY

Protection refers to any measure, tariff or non-tariff, which is adopted to give domestic producers a competitive advantage over foreign producers of the same product or service. Numerous arguments for protection have been identified in the literature[8], ranging from improvement in the current account to increases in employment. But the classic argument in developing countries is the infant industry argument[9]. In addition it is argued that improvements in a terms of trade may result from trade restriction. Notwithstanding the above arguments, the imposition of trade tariffs in many developing countries may have revenue generation as the primary objective.

However within the context of a customs union, it may be argued that protection is the primary objective. But protection which is offered to member states in the customs union can be questioned in terms of its welfare implications. Thus the rationale used to justify the traditional and current arguments for protection is itself questionable.

Therefore the issue of protection within a customs union (CU) must be preceeded by the theoretical justification for a customs union in the first place. Viner (1950) provided the first rigorous analysis of the theory of customs union in trying to resolve the question does a customs union represent an improvement over the status quo. His research revealed that a customs union was not necessarily welfare improving and depended on how it affected the patterns of trade. This conclusion was reached theoretically by the use of trade-creating and trade-diverting models[10]. Some fifteen years later Cooper and Masell (1965) and later still Berglas (1979), under very restrictive assumptions, suggested that a Unilateral Tariff Reduction (UTR) is necessarily superior to a customs union or other preferential trading arrangement.

---

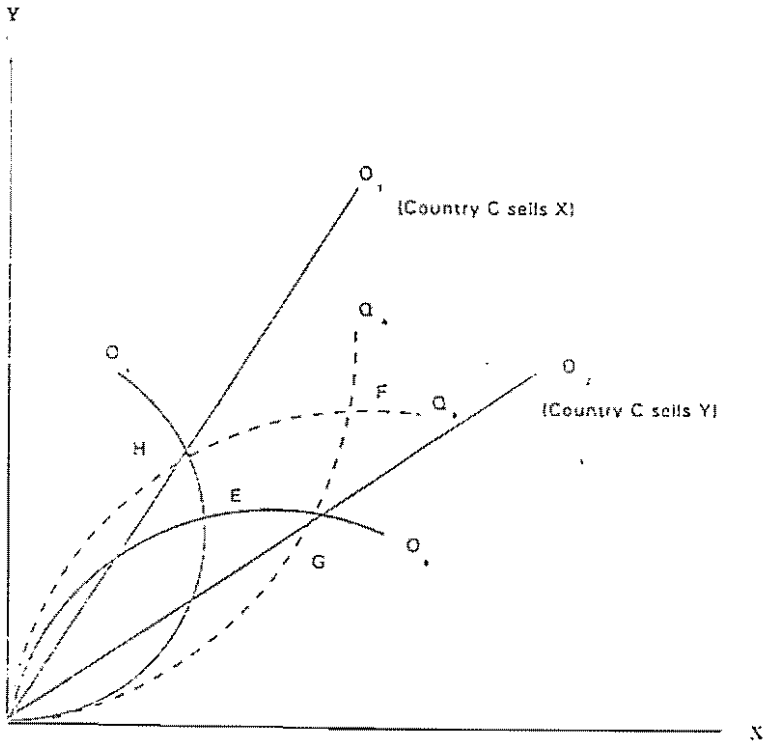
[8] See Balassa (1971) and Corden (1971).

[9] According to Corden (1987) this argument can rest on either of two bases. First, it could be based on imperfections in the real capital market, or it can rest on the presumed existence of exterernal economies of a dynamic kind apply to a group of firms.

[10] A 'good' CU is one that raises income through trade creation - that is , a move toward free trade. A 'bad' union reduces income through trade diversion - that is, a more protectionist policy. Cooper and Massell (1965).

Wonnacott and Wonnacott (1981) relaxed the restrictive assumptions - absence of economies of scale and changes in terms of trade - and showed that a customs union may be better than a UTR. In a recent paper, Wonnacott and Wonnacott (1992) enhanced their earlier finding by demonstrating that a CU may be preferable to a UTR in the realistic situation where the members of the customs union trade with the outside world.

Using the diagram below where the customs union's members are A and B, and the outside Country is C, Wonnacott and Wonnacott (1992) illustrated that point F is superior to E as a result of forming the customs union. O_1 represents the terms of trade at which Country C is willing to buy good Y and sell good X; O_2 represents the lower price of X at which Country C is willing to buy in exchange for Y. With the formation of a customs union, the offer curves of countries A and B shift from O_a and O_b to Q_a and Q_b respectively. Within the wedge (OGFH) created by Country C's import and export prices - due to C's tariffs and /or transport costs - a move from E to F is deemed superior, resulting from the formation of the customs union.



After consideration of several issues raised in the literature, Wonnacott and Wonnacott (1992) concluded that:-

1) Tariffs and transportation costs with third countries open up a price wedge within which a customs union may provide benefits not available to its members separately through Unilateral Tariff Reduction.

2) The benefits can be denied if it is possible to establish that UTR is superior to a customs union. However this is achievable by way of some rather heroic assumptions that:-

   a) the partner's tariff can be ignored:

   b) ignore the possibility of a wedge, by assuming that there are no tariffs,export taxes, or transportation costs in trade with large country C.

Inspite of their findings, they state "However we are not arguing the opposite - that a CU is necessarily superior to UTR. Rather, our purpose is to reopen the CU issue. Without a detailed study of a CU, we cannot tell what is the best policy: the status quo, a CU, or UTR." While this issue remains unresolved theoretically, the existing body of literature still offers some direction to the policy-makers. The trend of establishing regional free trade associations seems to have accepted the need to form customs unions as a preliminary step towards achieving world-wide free trade. As part of the movement, CARICOM must decide whether or not to accept the existing Common External Tariff - that is, a Customs Union narrowly defined - in its present form or to make changes which are not appropriate and practical for the region. In addition CARICOM may have to consider the possibility of being involved in a larger customs union sach as NAFTA, which will reopen the debate on the theoretical justification of a CU.

APPENDIX I: CALCULATION OF WEIGHTED NOMINAL PROTECTION

Section 1. Using Economic Indicators At Nominal Values

Weighted average nominal rates of protection using economic indicators at their nominal value are calculated according to the following formula:

$$A_j = \sum_i (T_{ij} W_{ij}) / \sum_i W_{ij}$$

where A is the weighted average nominal rate of protection for sector j. If the weights are at the CCCN or HS level, T is nominal rate of protection (e.g., customs tariff) that corresponds to product i of sector j, and W is the value of the economic indicator that corresponds to product i. If the weights are at the sub-sector level, T is a simple arithmetic mean of the nominal rates of protection the correspond to sub-sector i of sector j, and W is the value of the economic indicator that corresponds to sub-sector i.

The overall weighted nominal rate of protection for a group of sectors is calculated according to the following formula:

$$A = \sum_j (\sum_i [T_{ij} W_{ij}]) / \sum_j (\sum_i W_{ij})$$

Section 2. Using Economic Indicators At Deflated Values

Weighted average nominal rates of protection using economic indicators approximated at world prices are calculated according to the following formula:

$$A_j = \sum_i T_{ij} (W_{ij} / [1+T_{ij}/100]) / \sum_i (W_{ij} / [1+T_{ij}/100])$$

where A is the weighted average nominal rate of protection for sector j. If the weights are at the CCCN or HS level, T is the nominal rate of protection (e.g., customs tariff) that corresponds to product i of sector j, and W is the value of the economic indicator that corresponds to product i. W is deflated by (1 + T) to approximate its value at world prices. If the weights are at the the sub-sector level, T is a simple arithmetic mean of the nominal rates of protection that correspond to sub-sector i of sector j, and W is the value of the economic indicator that corresponds to sub-sector i.

The overall weighted nominal rate of protection for a group of sectors is calculated according to the following formula:

$$A = \sum_j (\sum_i [T_{ij} W_{ij} / (1+T_{ij}/100)]) / \sum_j (\sum_i W_{ij} [1+T_{ij}/100])$$

APPENDIX II: CALCULATION OF THE REVENUE EFFECT IN A SIMULATION

Section 1: Calculation of the Initial Import Duty Revenue

Total hypothetical revenue from initial import duties is calculated by summing the product of import duties and corresponding import values. The initial value of imports for a product or for a sub-sector (i.e. groups of products) can be represented as follows:

$$M_i = Q_i F E_i$$

where,

M_i = initial value of imports

Q_i = initial quantity of imports

F = price of imports in foreign exchange

E_i = initial exchange rate (local currency per unit of foreign currency)

The hypothetical revenue, assuming duties are collected as listed, in calculated as follows:

$$R_i = M_i t_i$$

where,

t_i = initial import duty for a product or average import duty for a sub-sector

Section 2. Calculation of the Simulated Import Duty Revenue

A simulation may involve changes in the value of imports on which revenue calculations are based, as well as changes in the import duties. The quantity of imports may be changed exogenously, based on theuser's estimates. Endogenous changes in quantity may arise because of demand response duties, the exchange rate, or scarcity rents.

The value of imports will also change if the exchange rate is adjusted. The new import tax base is calculated by adjusting the initial import tax base (M_i), taking into account exogenous changes in the volume of imports, devaluation or revaluation, import demand elasticities, and changes in consumer prices caused by changes in import duties or exchange rates. The following variables can be selected by the user through the simulation menus (subscript 2 indicates a simulated value):

t_2 import duty used in the simulation (the default is t):

m exogenous change in the volume of imports (the default is zero);

d rate of devaluation -- i.e., the percentage by which the local currency value of foreign exchange has risen (the default is zero);

p percentage by which domestic consumer prices (P) increases as a result of changes in the exchange rate and scarcity rents, separate from the effect of changes in import duties[1] (if d is entered, then a choice must be made between p-0, p-d, or $0 < /p/ < /d/$: if d is not entered, then p-0);

---

[1]. The difference between d and p implicitly captures the extent to which rents on traded goods have diminished. These rents may be attributable to scarcity (induced by quantitative restrictions)or other sources of monopoly power of distributors of importable. Let P represent the domestic consumer price of importable and r represent the increase in price due to rents to:

$$P_1 = FE_1(1+t_1)(1+r_1)$$
$$P_2 = FE_2(1+t_2)(1+r_2)$$

Substituting E_2-E_1 (1+d), the ratio of the domestic consumer price after all the changes to the initial price is:

$$P_2/P_1 = (1+d)(1+t_2)(1+r_2)/(1+t_1)(1+r_1)$$

Let $p = (1+d)(1+r_2)/(1+r_1) - 1$. Then $(1+p)/(1+d) = (1+r_2)/(1+r_1)$., i.e. the ratio of the impact of devaluation on domestic prices relative to the impact on border prices equals the ratio of the impact on rents on domestic prices after devaluation (and any associated policy changes) to before devaluation. If devaluation eliminated all rents for a commodity, then $r_2=0$ and $p = (1+d)/(1+r_1) - 1$.

e price elasticity of import demand, defined as the ratio of the total percentage change in quantity demanded of the import to the percentage change in domestic price associated with the change in other variables:

$$e = \frac{(Q_2 - Q_1)/Q_1}{(P_2 - P_1)/P_1}$$

Any or all of the above variables can be entered, m, d, and p are entered as percentages. m and p can be entered for standard or user-defined import groups. e is entered as a negative value or as zero for no endogenous change in the import tax base. It can be entered for standard or user-defined import groups. If non-zero elasticities are chosen, the default is -0.5 for capital goods, -1.0 for agriculture, mining and intermediate goods, and -2.0 for consumer goods. It should be noted that these are illustrative figures, not empirical estimates.

The formula for the calculation of the new import tax base is derived in the following steps:

1. Exogenous change in the volume of imports:

$$Q_1 = Q_1(1+m)$$

2. Endogenous change in the volume of imports, assuming non-zero import demand elasticities:

a. Impact of changes in import duties, the exchange rate, and scarcity rents on domestic prices:

$$P_2/P_1 = (1+p)(1+t_2)/(1+t_1)$$

b. From the elasticity formula, starting from exogenously changed imports as a base:

$$Q_2 = Q_1 [1+e(P_2/P_1 - 1)]$$

Substituting from (1) and (2.a):

$$Q_2 = Q_1(1+m) [1+e\{1+p)(1+t_2)/(1+t_1) - 1)]$$

3. As a result of devaluation:

$$E_2 = E_1 (1+d)$$

4. Substituting into $M_2=Q_2FE_2$ (the simulated value of imports for a product or a sub-sector) from (2.b) and (3):

$$M_2 = FE_1(1+d)Q_1 (1+m) [1+e\{(1+p)(1+t_2)/(1+t_1) -1\}]$$

$$= M_1(1+d) (1+m) [1+e\{(1+p)(1+t_2)/(1+t_1) -1\}]$$

This is the formula used in the simulation. For zero elasticity, the formula reduces to:

$$M_2 = M_1(1+d)(1+m)$$

The hypothetical revenue is calculated by summing the hypothetical revenues for all commodities. R_2 is compared to R_1 to determine the hypothetical percentage change in revenue associated with the simulated changes. M_2 is also listed, together with the percentage change in the local currency value of import[12]

[12]If the change in the local currency value of imports is c, then the change in the foreign exchange value of imports would be equal to (1+c)/(1+d) - 1.

TABLE 1

Report on Import data for 1990

Tariff Rates	No. of Positions	% Distribution	Import Value ('000)	% Distribution	Potential Revenue ('000)	% Distribution
0	407	17.0	201,840	17.0	0	0
5	336	14.0	145,798	12.3	7,290	3.4
10	272	11.3	228,535	19.3	22,854	10.5
15	141	5.9	101,015	8.5	15,152	7.0
20	123	5.1	50,022	4.2	10,004	4.6
25	253	10.5	132,630	11.2	33,193	15.3
30	263	11.0	114,932	9.7	34,480	15.9
35	77	3.2	24,830	2.1	8,690	4.0
40	113	4.7	35,566	3.0	14,226	6.6
45	325	13.5	113,128	9.5	50,908	23.5
50	22	0.9	18,573	1.6	9,286	4.3
55	2	0.1	328	0.0	180	0.1
60	55	2.3	15,179	1.3	9,108	4.2
65	3	0.1	2,299	0.2	1,494	0.7
70	9	0.4	116	0.0	81	0.0
TOTAL	2,401	100.0	1,184,790	100.0	216,911	100.0

TABLE 2

Report on Import duties for 1991

Tariff Rates	No. of Positions	% Distribution	Import Value ('000)	% Distribution	Potential Revenue ('000)	% Distribution	Actual Revenue	% Distribution
0	409	10.5	152,514	17.3	0	0.0	251	0.4
5	260	6.7	50,581	5.7	2,529	1.6	1,277	2.1
10	1,617	41.5	296,878	33.7	29,688	18.4	7,837	13.1
15	45	1.2	54,506	6.2	8,176	5.1	668	1.1
20	51	1.3	25,464	2.9	5,093	3.2	420	0.7
25	35	0.9	14,072	1.6	3,518	2.2	3,000	5.0
30	649	16.6	133,095	15.1	39,929	24.7	19,731	32.9
45	773	19.8	141,155	16.0	63,520	39.3	26,026	43.3
50	25	0.6	2,253	0.3	1,126	0.7	193	0.3
60	9	0.2	2,007	0.2	1,204	0.7	115	0.2
70	26	0.7	9,609	1.1	6,726	4.2	402	0.7
TOTAL	3,899	100.0	882,134	100.0	161,509	100.0	59,919	100.0

TABLE 3

Nominal Weighted Rates of Protection by Sectors (1990)

	Nominal Rate of Protection	Agriculture	Mining	Total Manufacturing	Consumer Goods	Intermediate Goods	Capital Goods	Overall Average
Original		8.3	8.2	18.7	25.5	13.9	15.0	18.2
Simulation 1	45%	8.1	8.2	18.4	25.0	13.7	15.0	18.0
%Δ		2.4	0	-1.6	-2.0	0	0	-1.1
Simulation 2	35%	7.5	8.2	17.3	22.4	13.7	14.7	16.9
%Δ		9.6	0	-6.0	-12.2	-1.5	-2.0	-7.1
Simulation 3	20%	5.2	7.8	13.2	15.3	11.8	12.0	12.9
%Δ		37.3	-4.9	-29.4	-40.0	-15.1	-20.0	-29.1
Simulation 4	5%	12.2	10.7	19.4	26.5	14.8	15.3	19.1
%Δ		47.0	30.5	3.7	4.0	6.5	2.0	5.0

%Δ compares simulated value with original value

TABLE 4

Nominal Weighted Rates of Protection by Manufacturing Sub-sectors (1990)

	Nominal Rate of Protection	Food, Beverages & Tobacco	Textiles & Leather	Wood Cork & Products	Paper & Printing	Chemicals, Petroleum, Coal	Non-metallic Minerals	Basic Metal	Metal Products	Other Manufacturing	Overall Average
Original		16.4	35.1	10.9	12.5	17.5	19.5	10.6	20.4	24.0	18.7
Simulation 1	45%	16.1	35.1	9.9	12.4	17.3	19.5	10.6	20.2	23.5	18.4
%Δ		-1.8	0	-9.2	-0.8	-1.1	0	0	-1.0	-2.1	-1.6
Simulation 2	35%	14.9	31.2	9.2	11.7	16.7	19.4	10.6	18.8	22.8	17.3
%Δ		-9.1	-11.1	-15.6	-6.4	-4.6	-0.5	0	-7.8	-5.0	-7.5
Simulation 3	20%	10.7	19.4	7.5	9.9	13.3	15.4	10.4	14.3	18.6	13.2
%Δ		-34.8	-44.7	-31.2	-20.8	-24.0	-21.0	0	-29.9	-22.5	-29.4
Simulation 4	5%	18.1	35.2	14.7	15.2	17.8	20.4	10.7	20.6	24.0	19.4
%Δ		10.4	0.3	29.4	21.6	1.7	4.6	0.9	1.0	0	3.7

TABLE 5

Total Revenue of Tariff Changes (1990)

Nominal Rates of Protection		Total Value of Imports	Imports Duty Revenue	%+increase/-decrease Revenue	%+increase/-decrease Imports
	Original	1,155,729,250	232,347,500		
45%	Simulation 1	1,158,300,590	229,416,910	-1.3	0.2%
35%	Simulation 2	1,170,378,300	215,681,560	-7.2	1.3%
20%	Simulation 3	1,210,756,270	165,986,530	-28.6	4.8%
5%	Simulation 4	1,148,153,320	239,555,020	+3.1	0.7

Source: World Bank SINTIA-T computer Program.
Note: Elasticity = -1
Multiply values by 100 to get actual values.

TABLE 6

Total Revenue of Tariff Changes (1990)

Nominal Rates of Protection		Total Value of Imports	Imports Duty Revenue	%+increase/-decrease Revenue	%+increase/-decrease Imports
	Original	1,155,729,250	232,347,500		
45%	Simulation 1	1,160,415,030	230,368,400	0.9	0.4%
35%	Simulation 2	1,182,336,220	219,866,830	-5.4	2.3%
20%	Simulation 3	1,245,251,060	172,885,490	-25.6	7.7%
5%	Simulation 4	1,145,596,790	239,427,200	+3.0	-0.9

Source: World Bank SINTIA-T computer Program.
Note: Elasticity = -1, -1, -2, -1, -.5
For agriculture, mining, consumer, intermediate and capital goods respectively.
Multiply values by 100 to get actual values.

TABLE 7

Report on Change in Price Level by Sectors (1990)

	Nominal Rate of Protection	Agriculture	Mining	Total Manufacturing	Consumer Goods	Intermediate Goods	Capital Goods	overall Average
Original		17.9	4.6	22.0	30.3	13.5	15.9	21.3
Simulation 1	45%	17.7	4.6	21.4	29.4	13.3	15.3	20.7
%0		-0.2	0	-0.5	-0.7	-0.2	-0.5	-0.5
Simulation 2	35%	16.6	4.6	19.2	25.5	12.6	14.8	18.7
%0		-1.1	0	-2.3	-3.7	-0.8	-0.9	-2.1
Simulation 3	20%	11.1	4.1	13.6	16.7	10.4	11.3	13.2
%0		-5.8	-0.5	-6.9	-10.4	-2.7	-4.0	-6.7
Simulation 4	5%	19.9	8.2	22.7	30.8	14.5	16.2	22.1
%0		1.7	3.4	0.6	0.4	0.9	0.3	0.7

REFERENCES

Balassa, Bela, et al, 1971, *The Structure of Protection in Developing Countries*, Johns Hopkins University Press. Baltimore.

Berglas, Eitan (1979), Preferential Trading Theory: The n Commodity Case, *Journal of Political Economy*, Vol. 87, No. 2, pp 315-331.

Caricom Secretariat, 1991, Common External Tariff of the Caricom Common Market: An Explanation of its Scope and Operational Features.

Cooper, C.A. and Massell, B.F. (1965), "A New Look at Customs Union Theory", *Economic Journal*, Vol. 75, No. 3, pp. 742-747.

Corden, W.M., 1971, *The Theory of Protection*, Oxford University Press.

Corden, W.M., 1987, *Protection and Liberalization: A Review of Analytical Issues*, Occasional Paper No. 54, International Monetary Fund.

Todman, McW., 1963, Report on a Customs Union of Barbados, the Leeward and Windward Island.

Viner, Jacob (1950. *The Customs Union Issue*, New York, Carnegie Endowment for International Peace.

Whitehall, P., *Protectionism in the Manufacturing Sector of Barbados 1960-80*, Economic Review, Vol. XI, Central Bank of Barbados.

Wonnacott, Paul and Wonnacott, Roland (1981), "Is Unilateral Tariff Reduction Preferable to a Customs Union? The Curious Case of the Missing Foreign Tariffs", *American Economic Review*, Vol. 71, No. 4, pp. 704-714.

Wonnacott, Paul and Wonnacott, Roland (1992), The Customs Union Issue Re-opened", *The Manchester School*, Vol. LX, No. 2.

World Bank, 1988, Software for Industrial, Trade, and Incentives Analysis, (SINTIA-T), Tariff and Nominal Protection Analysis.