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External Tariff Liberalization in CARICOM: A Commodity-Level Analysis

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Abstract

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represent those of the IMF or IMF policy. Working Papers describe research in progress by the
author(s) and are published to elicit comments and to further debate.

This paper estimates the impact of the tariff liberalization in four largest CARICOM
countries (Barbados, Guyana, Jamaica, and Trinidad and Tobago) on their trade flows. I
trace changes in the product-line imports from CARICOM and non-CARICOM countries
against time and commodity-level variation in external tariffs. I find that in each country
the reduction of the external tariff, which eroded preferences enjoyed by member imports,
increased the ratio of imports from non-member countries to imports from member
countries. In Trinidad and Tobago, the higher ratio was largely the result of non-member
imports crowding out member imports. In the three other countries, the ratio increased
mainly because of higher non-member imports; there is little evidence that tariff reductions
had an impact on member imports. Findings suggest that in Trinidad and Tobago
liberalization of the external tariff reversed some of the trade diversion effects of
CARICOM.

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I. INTRODUCTION

After years of being overshadowed by multilateral liberalization efforts, preferential trading arrangements (PTAs) have become more prominent beginning the early 1990s. Of the 215 PTAs in force by the late 2006, 171 were established after 1993. This sharp turnaround in the attitude of the policy-makers toward PTAs was triggered by the change in the U.S. policy to complement open multilateral system with a possibility of bilateral trade liberalization.[2] Almost every country currently participates in at least one PTA, and more than one third of the world trade takes place within such agreements. New preferential trade initiatives include proposals to create a Free Trade Area of Americas, expand the network of PTAs in Asia, and negotiate new PTAs among the existing trading blocks. PTAs vary by size and income levels of their members, commitment levels, and extent of preferences granted to members as well as the coverage of areas outside trade.

The large number of PTAs formed in 1990s has prompted a renowned interest among researchers to study their impact on member countries, particularly on trade flows and their welfare implications. However, the theoretical literature failed to reach a consensus on the welfare effects of PTAs as the second-best nature of trade liberalization undertaken in the context of PTAs does not guarantee welfare benefits even for the member countries. Moreover, on empirical front, finding a clear answer to a related but distinct question— whether trade creation outweighs trade diversion—has proven extremely difficult.

While the literature has studied PTAs among large advanced economies in great detail, PTAs between the small and developing economies attracted limited attention.[3] This may be understandable given limited potential for trade between small and developing countries. Yet, such PTAs have become widespread, constituting about half of the all arrangements that entered into force since 1990s; and their number keeps growing. This paper attempts to fill the void by focusing on the trade patterns of the four largest economies of the Caribbean Community (CARICOM).[4]

Upon the formation of CARICOM in 1973, its members removed duties on intra-regional trade and set up high external tariffs on imports from third countries. Such discrete and significant

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[2] The United States signed its first bilateral trade agreement with Israel in 1985, which in 1989 was followed by the Canada-USA Free Trade Agreement (CUSFTA), expanded later to NAFTA.

[3] NAFTA is arguably the most studied agreement mainly because it spurred controversy for being the first trading arrangement that included both developed and developing countries and partly due to availability of detailed data.

[4] CARICOM comprises Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Suriname, Trinidad and Tobago.

adjustment in tariffs must have led to changes in the volume, content, and sourcing of imports. A study of how imports from member and non-member countries responded to revisions in the tariff structure, which granted large preferential margins for member imports, would shed some light on the Community's impact on trade. Unfortunately, detailed study using commodity level imports and tariffs is impossible given the lack of data for the early years of CARICOM. Yet, external trade liberalization undertaken in 1990s offers another opportunity.

Over the 1990s, CARICOM countries gradually lowered external tariffs imposed on imports from non-member countries, while maintaining duty-free access on the most of intra-regional trade. Along with less protection for domestic products, lower external tariffs reduced preference margins afforded to CARICOM members, partially reversing the existing incentives for regional imports. As a consequence, one would expect an increased volume of imports from third countries displacing domestic products or crowding out imports from member countries. In this paper, I estimate the impact of the reduction in the external tariff on the commodity-level imports from non-member and member countries. The approach focuses on tracing time and commodity-level variation in the external tariff rates from 1992 to 2002 and matching it with the changes in commodity imports. I look specifically at how the tariff reductions affected the ratio of non-member imports to member imports which allows me to assess the extent of substitution between the two sources of imports, while controlling for unobserved variations. The study covers four largest members of the community: Barbados, Guyana, Jamaica, and Trinidad and Tobago.

I find that imports are sensitive to small changes in tariffs as consumers are willing to substitute between the alternative sources. Lower external tariff is associated with higher ratio of non-member imports to member imports—the ratio increased the most in commodities with the largest reductions in the external tariff. In all countries, except Trinidad and Tobago, the ratio of non-member imports to member imports increased mainly due to the higher imports from non-member countries as member imports were little affected by the external liberalization. Only in Trinidad and Tobago was the increase in non-member imports accompanied with a decline in member imports—evidence of reversal of trade diversion.

The paper is organized as follows. Section 2 provides a short overview of integration within the CARICOM. In section 3, I review previous work in this area. Section 4 describes the data. Section 5 develops theoretical framework and introduces estimating equations. Section 6 discusses empirical results, with section 7 concluding.

II. THE CARIBBEAN COMMUNITY

The Caribbean Community (CARICOM) was established by the Treaty of Chaguaramas in 1973 as a successor to the Caribbean Free Trade Association created in 1969. The key objective of CARICOM is to achieve economic integration of the member states by creating a common market with the free movement of goods and services, capital, and labor. However,

the treaty and subsequent initiatives on economic integration focused mainly on creating the regional market with a free flow of goods and implementing the high common external tariff (CET) to facilitate import substitution by diverting imports from non-member countries and left liberalization of services and free movement of capital and labor unaddressed. Despite their objective to achieve a free flow of goods and services, countries could select products to be exempted from the duty-free trade, and the CET was not fully harmonized due to implementation delays. Throughout the 1970s and 1980s, the treaty saw mixed progress toward integration and varying enthusiasm of leaders in promoting its agenda. The picture, at least in its legal dimension, changed in 1990s when member countries began working towards establishing a CARICOM Single Market and Economy (CSME), which envisioned free movement of service and factor inputs as well as coordination of macroeconomic policies. The treaty creating CSME was signed in 2001, and the full establishment of the single-market component of the CSME is scheduled for 2008.

Special features of CARICOM countries have important implications for the scope of trade integration. On one hand, their small size, under-diversified production base, and lack of product complementarity offer limited possibilities for increased intra-regional trade. On the other hand, new production activities—particularly those exhibiting economies of scale, which could not be supported by small domestic markets of individual countries, may become viable following the creation of the larger common market. Trade integration may also deepen to the extent the creation of the common market with high external trade barriers may encourage tariff-jumping FDI by multinational firms wishing to retain export markets. There is also a separate but related concern that regional integration may erode tariff revenues if imports were to divert from non-member goods toward duty-free imports from member countries. This is of particular concern to small developing countries that rely strongly on tariff revenues.

III. RELATED LITERATURE

Despite the increased importance of PTAs in the global trading arrangements, their welfare implications remain unknown. This ambiguity stems from the second-best nature of liberalization under PTA. As pointed first by Viner (1950), a country lowering its trade barriers levied on imports from PTA members experiences both trade creation, where consumption shifts from inefficient domestic production to the lower-cost imports from member countries, as well as trade diversion, where more efficient imports from third countries are displaced by higher-cost imports from member countries. While the former results in net welfare gains, the latter reduces welfare—because of tariff revenue losses—as imports from member countries benefit from lower preferential tariffs. When large, welfare effects of trade diversion can offset the benefits of trade creation, resulting in net welfare loss from joining PTA. Isolating and

estimating trade creation and trade diversion represent a challenge to researchers, as both phenomena are associated with the increased trade among member countries.[5]

The subsequent empirical literature on trade creation and trade diversion has developed two main approaches: ex-ante computer simulations of the general equilibrium effects of PTA and ex-post econometric studies of changes in trade patterns. The computable general equilibrium (CGE) models have their advantages and shortfalls. They are generally rich in microeconomic structure and can predict detailed effects of trade liberalization on production and trade patterns, real incomes, and welfare based on assumed production structure, consumer preferences, factor endowments, and trade barriers. However, they do not typically fit actual data with sufficient accuracy and are highly sensitive to assumed parameters of the model. These studies typically predict that, for example, under a perfectly competitive environment and static settings, NAFTA would have had a small positive welfare impact, which could be greater, if one assumed monopolistically competitive market structure with increasing returns or dynamic structure with factor accumulation (Kehoe and Kehoe 1995, Brown, Deardorf and Stern 1995, Cox 1995, Sobarzo 1995).

To assess the impact of PTAs on trade flows, ex-post empirical studies (Frankel and Wei 1995, Bayoumi and Eichengreen 1997) use gravity-type models, which estimate the impact of the dummy variable capturing countries' joint membership in PTA on bilateral aggregate trade while controlling for other relevant variables. While the results are mixed, some studies (Gould 1998, and Soloage and Winters 1998) find that PTAs increase trade flows between member countries, but there is little evidence that external trade is smaller than in the absence of PTA. However, such studies suffer from two sources of weakness: a reliance on aggregate trade data and the use of dummy variables to capture the effect of PTAs. First, aggregate trade data conceal variations in product or industry trade flows. Yet, countries joining PTAs negotiate tariff rates at a very detailed product level. Second, the use of dummy variables to distinguish the effects of PTA is too simplistic as they may capture inadvertently other factors that are difficult to separate from the pure trade effects of PTAs, failing to indicate the extent of trade creation relative to trade diversion.

To address these problems, several studies—most relevant to the paper—exploit variations in tariff rates at the detailed commodity level. Using U.S. import data from 1989 to 1994, Clausing (2001) finds that growth in US imports from Canada was related to tariff preferences granted to Canada, but did not suppress imports from third countries. She concludes that CUSFTA has resulted in trade creation and finds no evidence of trade diversion. Romalis (2005) makes an important contribution to literature as his original difference-in-difference

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[5] Moreover, finding that there is more trade creation than trade diversion does not necessarily entail welfare improvement.

technique allows him to separate trade impact of CUSFTA and NAFTA from that of unobserved cost shocks and other concurrent events. He achieves this by comparing how differently the EU and the United States source their commodity imports from Mexico and third countries and attributing changes in relative imports to tariff liberalization under the NAFTA. He finds that supply and demand are very sensitive to price changes and that NAFTA has had substantial effect on trade volumes associated with both trade creation and trade diversion, but that its price and welfare effects were modest. Krueger (1999, 2000) estimates trade impact of NAFTA using 3- and 4-digit SIC industry level data and finds that, factoring out other events, especially affecting Mexican trade via the change in the real exchange rate and unilateral trade liberalization, NAFTA had a modest positive impact on trade among the member countries. In contrast to above papers, Chang and Winters (2002) focus on changes in import prices of goods originating from non-member relative to the price of imports from member countries following the formation of MERCOSUR. For Brazil, they find that tariff preferences granted to Argentina, Uruguay, and Paraguay put a competitive pressure on firms from third countries such as United States, Japan, and Korea, forcing them to lower export prices to retain market competitiveness.

The analytical literature on the trade integration in CARICOM is limited. I am aware of only Egoume-Bossogo and Mendis (2002) who apply gravity equation to test the trade implications of CARICOM using aggregate bilateral trade data that covers 1980–99. They find that CARICOM promoted intra-CARICOM trade, but there is little evidence of trade diversion. They also show that the lowering of the CET in 1990s increased trade with the rest of the world. The main departure of this paper from Egoume-Bossogo and Mendis is its focus on commodity level import and tariff data and use of alternative estimation approach. By concentrating on detailed data, I am able to minimize the loss in tariff and commodity variation that occurs with aggregating and better control for unobserved events within the CARICOM. I confirm their finding that external liberalization in 1990s resulted in higher trade with the rest of the world. Key advantage of the commodity-level approach is that it allows me to identify whether the increased trade with the rest of the world occurred at the expense of imports from member countries. In particular, my findings suggest that in Trinidad and Tobago external liberalization reversed the trade diversion.

IV. DATA DESCRIPTION

A. Evolution of External Tariffs

In response to mounting pressures to liberalize and amid indications that the early import-substitution policies did not generate expected results, the CARICOM countries adopted and started implementing a four-stage tariff reduction schedule in 1993 aimed to reduce the CET

to 0–20 percentage point range.[6] Table 1 presents the timetable of the tariff reduction, which shows that all four countries implemented tariff reductions, albeit with frequent delays. These reductions allow to shed some light on the trade effects of the CARICOM's external tariff.

The data comes from two sources; both are available through the World Integrated Trade Solution (WITS) system. First, for each country in the study, I obtain ad valorem tariff rates in Harmonized System (HS) classification at 6, 8, or 10-digit level (depending on the availability). I go back as far as 1991, which is the first year tariff rates are available for at least one of the countries. Thereafter, the rates are available for most years with few breaks in mid-and late 1990s. Second, for every year for which tariff rates are available, I obtain country's commodity-level bilateral imports with its trading partners at 6-digit HS level. The data on imports come from the COMTRADE database of the UN. For each 6-digit commodity, I calculate country's imports from member and non-member countries by summing import values over the corresponding country group. I drop Colombia, the Dominican Republic, and Venezuela from the list of non-member countries, as their exports may have benefited from preferential trade agreements signed between these countries and the CARICOM in the 1990s. Failure to exclude them from the non-member sample may result in underestimation of the impact of the external tariff liberalization on imports from non-member countries.

I calculate tariff rate at 6-digit level by aggregating (by averaging) over the corresponding higher digit levels (8 or 10 digits) because the tariff schedule is generally available at a finer disaggregation than 6-digit import data. Despite the aggregation, the 6-digit line provides detailed tariff data covering approximately 5,000 commodities. Hence, the dataset contains country imports from CARICOM members and non-members for each of the 6-digit commodities and the corresponding tariff rate. I assemble such dataset for each of the four countries. Table 2 presents data availability and its use by country and year.

Figures 1–4 show the distribution of import tariffs in 1992, 1996, and 2002 for Barbados, Guyana, Jamaica, and Trinidad and Tobago.[7] The average external tariff rates in all four countries declined substantially between 1992 and 1996, on average by 8.2 percentage points from around 18 percent in 1992. In most countries, this was achieved through lowering the predominant tariff rate of 10 percent in 1992 to 5 or zero in 1996 and by cutting or eliminating the number of commodities subject to high rates (30 percent or more). The latter lead to a higher incidence of tariffs between 20 and 30 percent. Jamaica and Trinidad and Tobago

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[6] Actual tariff rates imposed on third country imports vary as some members have implemented tariff reductions with delays.

[7] While throughout the paper I refer to the CET as a tariff schedule common to CARICOM members, the description of tariffs in this section shows that tariffs were not fully harmonized within the union. A close line by line comparison reveals differences, particularly in early 1990s, but shows that these were eliminated by 2002.

undertook relatively deep tariff cuts, whereas Barbados and Guyana, while in general pursuing tariff reductions too, maintained or even increased the maximum rate applied on selected goods. The developments since 1996 were in similar direction albeit at a much reduced pace. As a consequence of liberalization, by 2002 the overwhelming majority of imported products was subject to tariff rates below 20 percent. The exception to the gradual elimination of high tariffs is Barbados, which imposed high rates on selected agricultural products. Taken together, pre-1996 and post-1996 developments entail substantial tariff liberalization. The figures also show a large variation in tariff rates within fine product classifications. This variation within narrow product categories makes detailed commodity level data essential in the analysis of trade flows.

B.   External Tariff and Import Patterns

Before turning to regressions, I consider some illustrations of data. For 1992 and 2002, 6-digit commodities are divided into five "tariff" groups according to their external tariff rates. Table 3–6 present the value of total imports, the share of imports from CARICOM members, and the number of 6-digit commodities for each group. It is not surprising that both in 1992 and 2002 imports from member countries were heavily concentrated in commodities with relatively high external tariffs. The third column of the tables shows that imports from member countries of the commodities subject to the external tariff greater than 25 accounted on average for 25 and 19 percent of total imports of that tariff group in 1992 and 2002, respectively. For commodities subject to zero or less than 5 percent tariff, the same share averaged only 6 percent and 3 percent in 1992 and 2002. The fourth column provides additional support; it presents the share of the relevant tariff group in the total imports from CARICOM, which shows that the majority of intra-CARICOM trade took place in products in which large preference margins were granted. This is particularly relevant in 1992, when around 60 percent of total imports from member countries concentrated in products subject to at least 25 percent external tariff. Finally, the comparison of the last two columns in 1992 and 2002 shows that, despite the external liberalization, the share of the low tariff groups in the total imports from CARICOM increased only marginally.

To see the impact of the reduction in tariffs on the sourcing of imports, consider figure 5 which shows the shares of imports from member countries in total imports for two different commodity groups based on the extent of liberalization during 1992–2002. For the purposes of this exercise, I define the most liberalized commodity as a commodity for which import tariffs were lowered by at least 20 percentage points between 1992 and 2002. Likewise, a commodity is classified as the least liberalized if the applied rate did not decline (and might have even increased) over the same period. For all countries, except Jamaica, the figure reveals a noticeable decline in the share of intra-community imports for the most liberalized commodity group. The decline is most pronounced in 1992–99, but ceases after 2000, reflecting much slower pace of liberalization or even reinstatements of higher tariffs on specific commodities by Barbados and Guyana. On the other hand, the share of intra-community imports for the least

liberalized commodity group has increased or remained broadly unchanged. In summary, figure 5 suggests that the share of intra-community imports in total imports varied with the depth of liberalization—it declined in the most liberalized commodities, but remained broadly unchanged in the least liberalized categories.

V. THE MODEL AND EMPIRICAL STRATEGY

A. External Liberalization in the Context of PTA

Before developing a model and estimation strategy, it may be worthwhile to discuss the implications of the external tariff liberalization in the context of the existing PTA. To facilitate the discussion, consider a hypothetical (and unlikely) case when a country raises import tariffs on goods from PTA members while keeping unchanged tariffs on non-member imports (Table 7). In a simplified and static environment, this erosion of preferences would reverse changes in consumption and imports that occurred when the PTA was formed (scenario A). Consumption of the product previously imported from the member country may shift toward domestically produced good or non-member imports. The shift to the former would signal the reversal of trade creation that took place when the PTA was formed, while the shift to the latter would indicate the reversal of trade diversion. This could be tested empirically to see which of the two shifts is prevalent.

Things are different when the country cuts tariffs only on imports from non-member countries as was the case when the CARICOM countries liberalized their external trade (scenario B). Such cut would erode preferences within the PTA, making non-member imports more competitive relative to both member imports and domestically produced goods. However, unlike the case when preferential tariffs are raised, external liberalization would not change the price of member imports relative to the price of domestically produced goods. An increase in non-member imports in expense of member imports would signal the reversal in trade diversion, while that in expense of domestically produced goods would be a sign of a typical non-discriminatory trade liberalization. It follows from this exercise that the external tariff liberalization undertaken by CARICOM in 1990s would allow me to assess the extent of reversal in trade diversion only. I will not be able to say anything on the (reversal in) trade creation since detecting it requires a policy-induced shift in the relative price of the domestic goods and member imports, which could happen only if preferential tariffs changed.

B. Theoretical Model and Empirical Strategy

The paper attempts to identify the impact of external trade liberalization on the import flows using product trade and tariff data. The reduction of the external tariff lowers the preference margins afforded to goods from CARICOM and creates an incentive for consumers to substitute their consumption toward third country imports. To detect the response of imports to such changes, I measure the impact of the reductions in tariffs on imports from member and

non-member countries and estimate demand elasticities. In this section, I develop estimation equations for the empirical part of the paper following the approach adopted by Clausing (2001) and extended by Romalis (2005).

I assume that at time t consumers in a representative country maximize their preferences given by the Cobb-Douglas utility function by consuming X_{it} units of commodity produced by industry i,

$$U_t = \int_0^1 \alpha_i \ln X_{it} di \text{, with } \int_0^1 \alpha_i di = 1 \tag{1}$$

where α_i is the share of income consumer allocates on the consumption of commodity i.

In every period t, consumers differentiate over varieties of commodity i produced in each country j; their sub-utility function comes from a constant elasticity of substitution (CES) demand structure, taking the following form,

$$X_{it} = \left[\sum_{j=1}^N x_{ijt}^{\frac{\sigma_i-1}{\sigma_i}} \right]^{\frac{\sigma_i}{\sigma_i-1}},$$

where x_{ijt} represents the consumption of a variety of commodity i produced in country j, and $\sigma_i > 1$ is the elasticity of substitution between different varieties of commodity i.

Firms in industry i of country j operate in a perfectly competitive market and produce country-specific variety of commodity i at marginal cost c_{ijt}. I assume iceberg type transport costs, with $g_{ijt} \geq 1$ units of commodity i needed to be shipped from country j for 1 unit to arrive to the representative country. I assume that the representative country imposes an ad valorem tariff on imports of commodity i produced in country j, where τ_{ijt} is one plus the ad valorem tariff rate. Together transport costs and import tariffs raise the consumer price from marginal cost c_{ijt} to domestic tariff-inclusive price, $p_{ijt} = c_{ijt} \cdot g_{ijt} \cdot \tau_{ijt}$.

Optimization of (1) subject to the consumer's budget constraint,

$$\sum_{j=1}^N p_{ijt} \cdot x_{ijt} = \alpha_i \cdot Y_t \tag{2}$$

yields the demand for variety of commodity i produced in country j,

$$x_{ijt} = \frac{p_{ijt}^{-\sigma_i} \cdot \alpha_i \cdot Y_t}{P_{it}^{1-\sigma_i}}, \tag{3}$$

where $P_{it} = \sum_{j=1}^{N} \left(p_{ijt}^{1-\sigma_i} \right)^{\frac{1}{1-\sigma_i}}$ is the aggregate price index for commodity i at time t in representative country. In what follows, I assume that the elasticity of substitution is equal across all commodities ($\sigma_i = \sigma, \forall i$).

Multiplying both sides of (3) by $c_{ijt} \cdot g_{ijt}$ and taking logarithms, I obtain the equation for the cost, insurance, and freight (CIS) import values of commodity i from country j,

$$
\begin{aligned}
\ln M_{ijt} = &-\sigma \ln \tau_{ijt} + (1-\sigma) \ln c_{ijt} + \\
&+ (1-\sigma) \ln g_{ijt} - (1-\sigma) \ln P_{it} + \ln(\alpha_i \cdot Y_t)
\end{aligned}
\tag{4}
$$

where $M_{ijt} = x_{ijt} \cdot \left(c_{ijt} \cdot g_{ijt} \right)$.

Equation (4) forms the basic specification of the empirical model. In what follows, I assume that the commodity and time fixed effects capture variations in production cost c_{ijt} and transport costs g_{ijt}. I also assume that variations in aggregate price of commodity i, P_{it}, and consumption expenditure on i, $\alpha_i Y_t$, are captured by the commodity and time fixed effects, while the uncaptured part is orthogonal to variations in the tariff rates. These assumptions allow me to write the following estimation equation,

$$
\ln M_{ijt} = \eta + \sigma \ln(1 + Tariff_{ijt}) + \text{Commodity FE} + \text{Time FE} + \varepsilon_{ijt}
\tag{5}
$$

where $Tariff_{ijt}$ is an ad valorem tariff rate imposed on imports of commodity i from country j at t.

The assumption that variations in aggregate price P_{it} and consumption expenditure $\alpha_i Y_t$ that remain after controlling for the commodity and time fixed effects are uncorrelated with variations in tariff rates will probably not hold. Changes in tariff rates on commodity i will affect its aggregate domestic price P_{it}, causing consumers alter their consumption pattern. The estimate of elasticity coefficient σ will be biased if, for example, tariff changes were undertaken in commodities with high consumer expenditure levels. To lessen the potential bias, I eliminate the last two terms in equation (4) by taking the difference between logarithms of commodity i imports from any two countries j and k, which yields the relative import demand equation,

$$
\ln \left[\frac{M_{ijt}}{M_{ikt}} \right] = -\sigma \ln \left(\frac{\tau_{ijt}}{\tau_{ikt}} \right) + (1-\sigma) \ln \left(\frac{c_{ijt}}{c_{ikt}} \right) + (1-\sigma) \ln \left(\frac{g_{ijt}}{g_{ikt}} \right).
\tag{6}
$$

Equation (6) shows that keeping the relative tariff exclusive import prices for commodity i, ($c_{ijt} \cdot g_{ijt} / c_{ikt} \cdot g_{ikt}$), unchanged, an increase in the ad valorem tariff rate on imports from country j relative to tariff on imports from country k reduces demand on commodity i imports from j relative to k. As with equation (5), I assume that the commodity and time fixed effects capture variations in marginal production and transportation costs, producing empirical equation for the relative import demand,

$$\ln\left[\frac{M_{ijt}}{M_{ikt}}\right] = -\sigma \ln\left(\frac{1+Tariff_{ijt}}{1+Tariff_{ikt}}\right) + Commodity\ FE + Time\ FE + \varepsilon_{ijt}. \qquad (7)$$

For each commodity i, the CARICOM country imposes two different tariff rates, the preferential rate on imports from members and the MFN tariff rate on imports from third countries. If in equation (7), j and k represent a member and non-member country respectively,

$$\left(\frac{1+Tariff_{ijt}}{1+Tariff_{ikt}}\right)$$ expresses the preference margin afforded to a member country. For the empirical estimation, I aggregate imports of each commodity from CARICOM countries and from non-members into two separate groups.

VI. RESULTS AND ROBUSTNESS CHECKS

Tables 8–11, with sections (a) and (b), present estimation results based on equation (5) for each the four countries in the study. Sections (a) report regressions where the dependent variable is the logarithm of commodity-level imports from CARICOM, while sections (b) report results on the imports from non-CARICOM countries. The independent variable in all specifications is the logarithm of one plus the ad valorem tariff rate on imports from non-CARICOM countries. All regressions include commodity and time dummy variables to capture variations in marginal production and transportation costs. The variable of interest σ is the tariff elasticity of imports from CARICOM (sections a) and non-CARICOM countries (sections b).

Each of the tables 8–11 reports results for five alternative specifications. In the first column, the dependent variable includes all commodity imports. To check the robustness of the results to the potential estimation bias caused by large intra-CARICOM trade (from Trinidad and Tobago to the other three countries) in oil products, specification (2) excludes oil products. Specification (3) checks whether the results are sensitive to taking logarithm of imports, which drops many observations with zero import values. Small economy of CARICOM countries implies limited demand for certain narrow product varieties, making it difficult for exporters to reach the economies of scale in transportation and distribution. The resultant high prices for imported varieties constrain trade. Furthermore, the small size also implies specialization in the

narrow list of products, restricting the potential for intra-CARICOM trade. The data provide ample evidence—many 6-digit commodities are not traded at all. For example, Trinidad and Tobago—the largest economy in community—ships only 1420 of the 5050 commodities available within the 6-digit classification from CARICOM, while a comparable figure for its imports from non-member countries is 4516. Taking the logarithm of the zero import values drops these observations from regressions, potentially leading to a serious estimation bias. To check if there is a bias, specification (3) assigns value of one whenever zero imports are reported. In other words, $M_{ijt} = 1$ whenever $M_{ijt} = 0$. Specification (4) tests the sensitivity of results to outliers by dropping commodities with import values lower than US$10,000 or greater than US$10 million. Finally, specification (5) reports regression estimates corrected for the first-order serially correlated residuals using the Prais-Winston correction estimator given some evidence of serial correlation in disturbances of the baseline estimation.

Changes in the external tariff had a statistically significant and large positive effect on Trinidad and Tobago's imports from CARICOM (Table 8, section a). Baseline regression (1) indicates that a 1 percent decline in one plus ad valorem tariff rate is associated with a 3.12 percent decline in imports from CARICOM. From 1992 to 2002, average tariff in Trinidad and Tobago declined from 18 percent to 8 percent, while its imports from CARICOM increased from 70 million to 89 million U.S. dollars. The last two sentences suggest that, everything else constant, the external tariff liberalization in 1992–2002 would have led to a 27 percent decline in imports from CARICOM.[8] Put differently, imports from CARICOM would have amounted to a higher figure, around 115 million, if no external trade liberalization were undertaken. The estimate of the tariff elasticity of imports from non-CARICOM countries is negative and statistically significant (Table 8, section b). Starting from the tariff rate of 13 percent (mean over the sample period), a one percentage point reduction in the external tariff is associated with a 3½–4 percent increase in the non-member imports. This implies that a 10 percentage point reduction over 1992–2002 can explain 36–42 percent increase in non-member imports over the same period.[9] Regressions show that the tariff liberalization resulted largely in squeezing out member imports in favor of the low-cost non-members imports, suggesting a reversal in trade diversion. All estimates are robust to different specifications (2–5), though their magnitudes decline in the Prais-Winsten regression.

Table 9 presents results for Jamaica. In contrast to the results for Trinidad and Tobago, I find only a weak evidence that the external tariff liberalization in 1990s caused a decline in imports from CARICOM. The coefficient estimates of elasticity are insignificant, albeit negative (section a). Turning to non-member imports, I find that the external tariff reduction lead to

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[8] $\approx 3.12 * \ln \dfrac{1+0.18}{1+0.08}$.

[9] Non-CARICOM imports more than doubled over this period.

their increase; a one percentage point reduction in the rate (starting from 13 percent sample mean) would explain a 2.0–2.6 percent increase in non-member imports (section b). This, combined with insignificant elasticity estimates in regressions where the dependent variable is member imports, suggests that there has been little, if any, crowding out of member imports by non-member imports. The results are broadly similar for Barbados and Guyana. Tables 10–11 show that the decline in tariffs had no impact on imports from CARICOM while it was associated with a strong growth in non-member imports. For Guyana, the estimated size of the tariff elasticity of non-member imports is in line with the results for Jamaica and Trinidad and Tobago. The lower estimate for Barbados can be explained by the use of the more aggregated 4-digit data.

The regressions presented up to now use annual data with the commodity fixed effects and therefore are likely to be affected by the noise resulting from the timing of the tariff cuts and sluggish import response to tariff changes. I address this in table 12, where I consider a long-differenced form for the baseline specification, which absorbs the commodity level variations. Under this specification, the regressions estimate an elasticity that measures the effect of changes in tariffs over a longer period (1992–2002) on import growth. The results confirm that the tariff liberalization in the 1990s led to a growth of imports from non-member countries, but shows no support for the hypothesis that it occurred at the expense of imports from CARICOM, as estimates in column (1) are insignificant. The failure to find statistical link between tariffs and CARICOM imports is consistent with earlier results based on annual data, with exception of Trinidad and Tobago.

A. Relative Import Regressions

Relative import demand equation derived in section 5 by eliminating the aggregate price index and income allows me to control for correlation between the variations in the aggregate price, income level, and tariff rates. The results presented in table 13 show that changes in the external tariff had a statistically significant impact on the relative sourcing of imports in all four countries, confirming the earlier findings that that the liberalization in the 1990s led to a rapid growth of imports from non-member countries relative to intra-CARICOM imports. While less prone to estimation bias (and therefore more reliable than regressions on import levels), the relative import equations cannot answer whether the increase in non-member imports came at the expense of member imports—which would signal the reversal of evidence of trade diversion—or domestic producers.

The magnitude of the impact varies greatly—from a very modest 1.5 for Barbados to 8.5 for Trinidad and Tobago. Differences among countries can be reconciled with the help of level regressions run separately on member and non-member imports, which indicated a reversal in trade diversion in Trinidad and Tobago, but failed to find it in the other three countries. Coefficients in baseline regressions, -8.5 for Trinidad and Tobago and -7.0 for Jamaica, suggest that starting from an average tariff rate (13 percent) a one percentage point decrease is

associated with 7.5 percent and 6.2 percent increase in the ratio of imports from non-member to imports from member countries.

Substitution elasticities from relative import equations can be compared to estimates obtained by Romalis (2005) in his study of trade and welfare effects of NAFTA. His estimates of substitution elasticity using U.S. and EU imports are in order of 10, which is somewhat higher than elasticities obtained for Jamaica and Trinidad and Tobago. This should not be surprising given wider substitution opportunities available to consumers in United States and EU relative to those in CARICOM.

VII. CONCLUSIONS

I use commodity trade and tariff data to estimate the effect of the external tariff liberalization in CARICOM on its members' trade, focusing on the four largest economies: Barbados, Guyana, Jamaica, and Trinidad and Tobago. The data point to three observations. First, the external tariff declined significantly in the 1990s. Second, intra-community imports tended to concentrate in products subject to high external tariff, both prior and after the liberalization. Third, the share of goods from non-member countries in total imports of CARICOM increased most in the highly liberalized products.

Regressions show that relative imports, i.e. the ratio of imports from member countries to those from non-member countries, are sensitive to small changes in tariffs, as consumers are willing to substitute between alternative sources. In particular, the external liberalization led to a higher share of imports from non-member countries in total imports. Moreover, this share increased most in commodities with the largest reductions in the external tariff.

While the regressions using relative imports are more resilient to the potential estimation bias, they cannot explain whether the higher ratio of member imports to non-member imports was due to the increase in the former or a decline in the latter. Turning to the regressions in import levels, I find that the reduction of external tariff led to an increase in non-member imports in all four countries, but no change in member imports in Barbados, Guyana, and Jamaica. Only in Trinidad and Tobago, were the higher non-member imports associated with a decline in member imports—evidence of reversal of trade diversion.

One possible reason for the differential impact could be the relative competitiveness of exporters in Trinidad and Tobago compared to the other CARICOM countries. If Trinidadian exporters were resilient to the increased competition from non-member imports, they would be able to maintain their exports to the other CARICOM countries. This, combined with the high share of Trinidadian products in intra-CARICOM trade, would explain why member imports of Barbados, Guyana, and Jamaica were not affected by the external liberalization. An alternative explanation could come from the narrow production base of CARICOM countries, which limits opportunities for consumption to shift to regionally produced goods even when

preferential tariffs provide price advantages. If the tariff preferences did not lead to higher intra-regional imports in the first place, the lowering of the external tariff would not increase non-member imports at the expense of member imports. Rather, lower external tariff would increase non-member imports by crowding out domestic production, which would be consistent with the experience of a typical nondiscriminatory tariff liberalization.

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Data Appendix

For commodities subject to low tariffs, TRAINS often does not provide the exact ad valorem rate, only reporting its range (0–5 percent). Fortunately, the problem is limited to only few years. I overcome it by looking up the exact rate from the website of the Free Trade Area for Americas (www.ftaa-alsa.org). When the data is not available from the website, I set the tariff rate equal to the rate reported by TRAINS for the nearest preceding year.

I drop all observations with the commodities subject to specific rates. Converting specific rates to an ad valorem equivalent is impossible without the import volume or price data at the same tariff line. Majority of the specific rates were at a very fine (8 or 10 digit) level and varied markedly within the corresponding 6-digit lines, while price data are available only at 6-digit level. Fortunately, less than 2 percent of commodities in the early 1990s were subject to specific tariffs, which were largely eliminated by the end of the decade. Dropping these observations can lead to an underestimation of the scale of trade liberalization, particularly given that the majority of specific rates were eliminated over the 1990s. This, of course, can bias (either way) the estimate of the impact of trade liberalization.

Tariff and import data used in regressions for Barbados are in SITC-3 classification. The most finely disaggregated commodity imports of Barbados for the early 1990s are reported only in 5-digit SITC-3. Using concordances to convert them to the HS classification results in many commodity lines being dropped. Instead, I convert and recode tariff and trade data for the late 1990s, available in HS, to 5-digit SITC-3 classification. Few different HS codes are reclassified under the same SITC-3 code. In such cases, I calculate import-weighted average tariff rate and the sum of imports over all HS codes corresponding to the same SITC-3 code. The 5-digit SITC-3 covers around 3,000 commodities.

Figure 1. Trinidad and Tobago: Evolution of Import Tariffs (1992, 1996, 2002).

	Mean	Std. Dev.	Max
1992	18.1	14.7	70
1996	9.7	11.2	40
2002	7.9	10.8	70
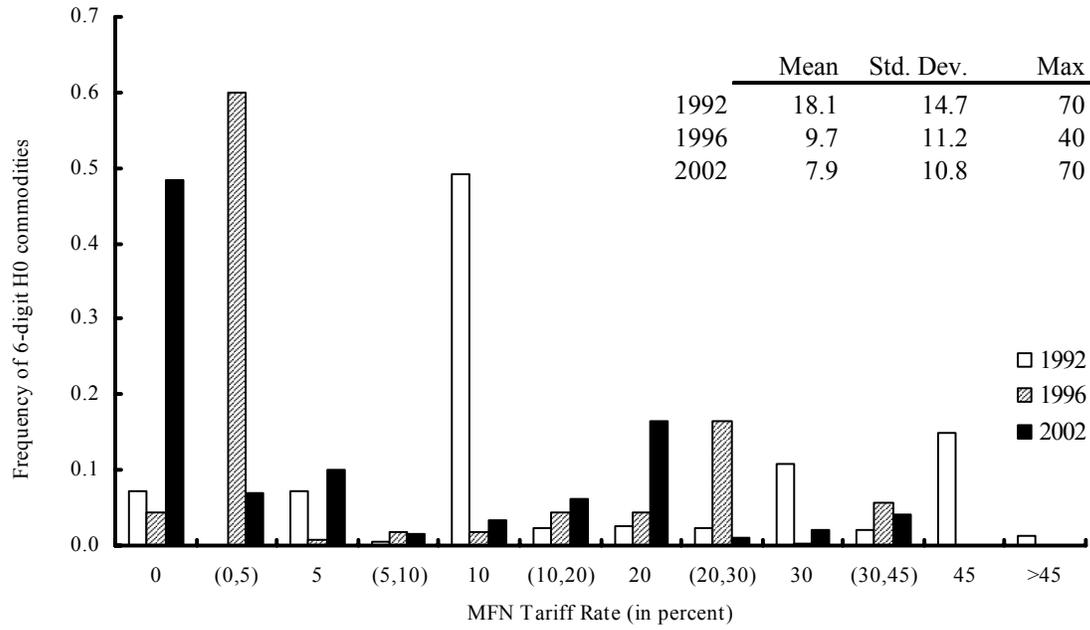
Figure 2. Jamaica: Evolution of Import Tariffs (1992, 1996, 2002).

	Mean	Std. Dev.	Max
1992	18.1	14.7	70
1996	9.6	11.1	40
2002	7.2	11.2	75
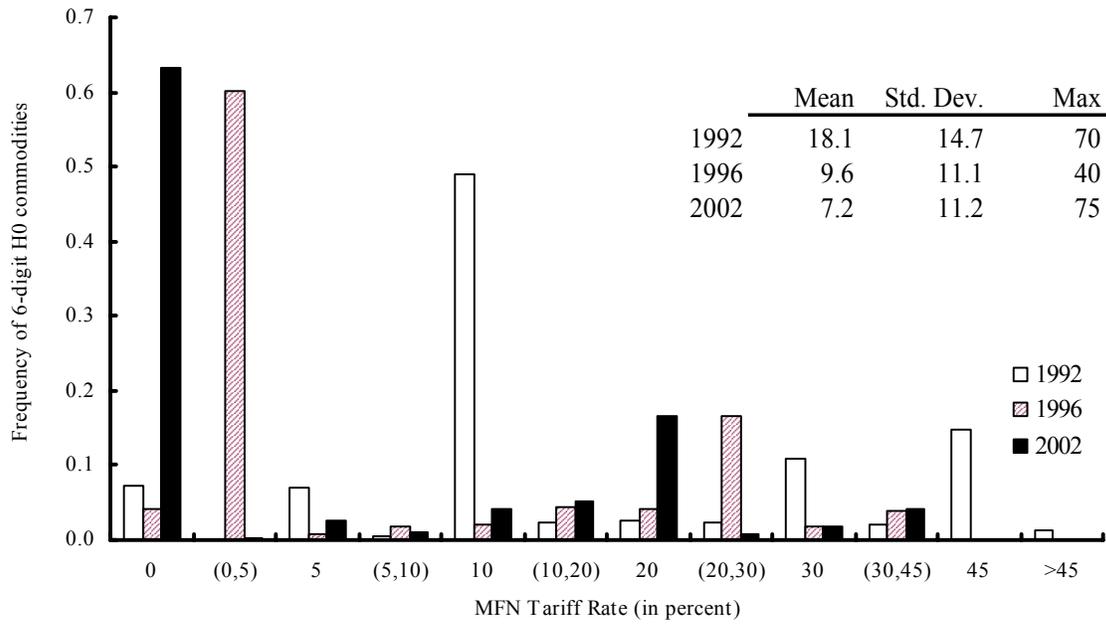
Figure 3. Barbados: Evolution of Import Tariffs (1992, 1996, 2002).

	Mean	Std. Dev.	Max
1992	18.1	14.7	70
1996	9.7	11.8	70
2002	13.0	19.8	224

□ 1992
▨ 1996
■ 2002

Frequency of 6-digit H0 commodities

MFN Tariff Rate (in percent)
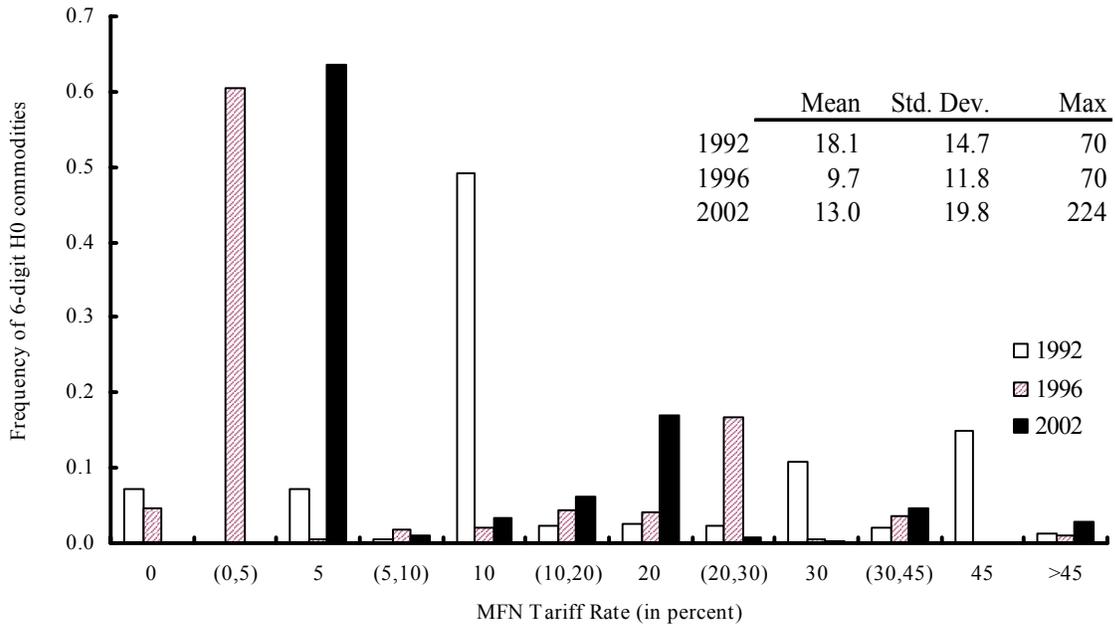
Figure 4. Guyana: Evolution of Import Tariffs (1992, 1996, 2002).

	Mean	Std. Dev.	Max
1992	18.1	14.7	70
1996	10.3	13.4	100
2002	11.0	11.9	100

□ 1992
▨ 1996
■ 2002

Frequency of 6-digit H0 commodities

MFN Tariff Rate (in percent)
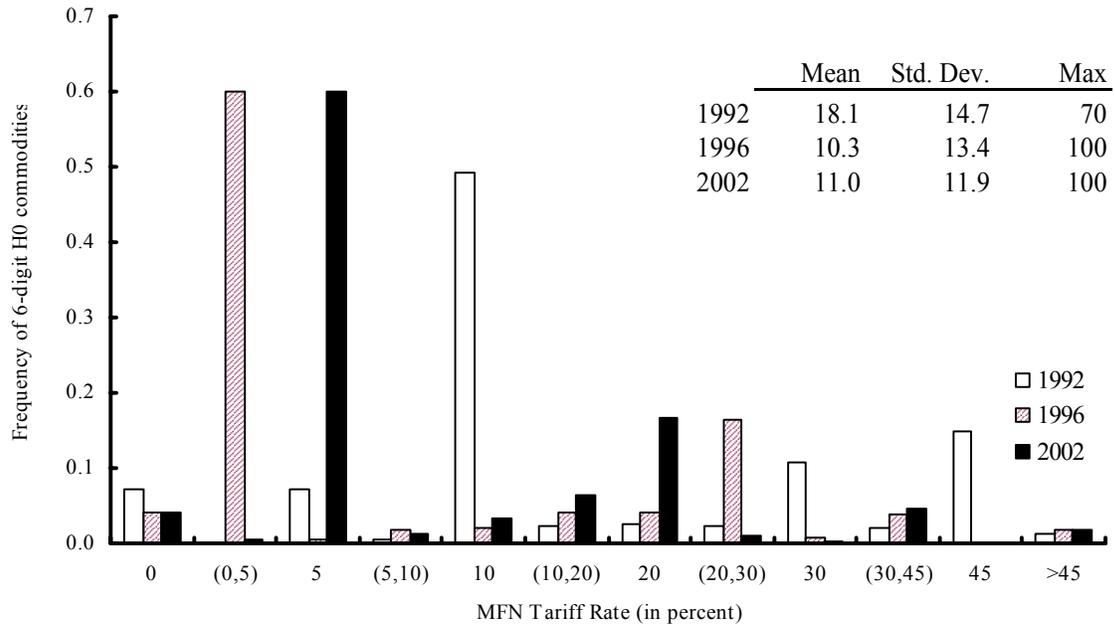
Figure 5. Share of imports from CARICOM:

The most and the least liberalized commodities (1991−2003).

Trinidad and Tobago
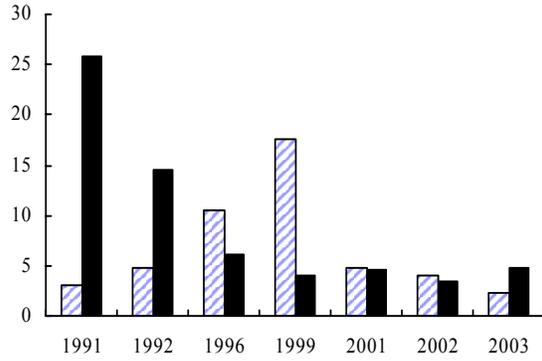
Jamaica
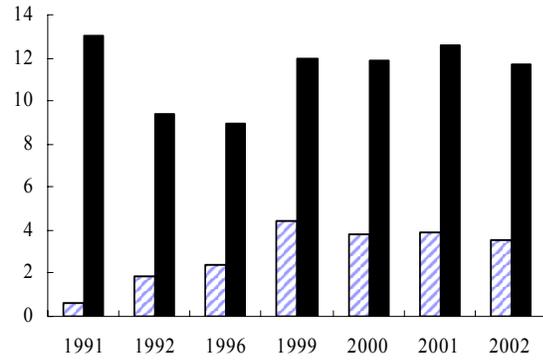
Barbados
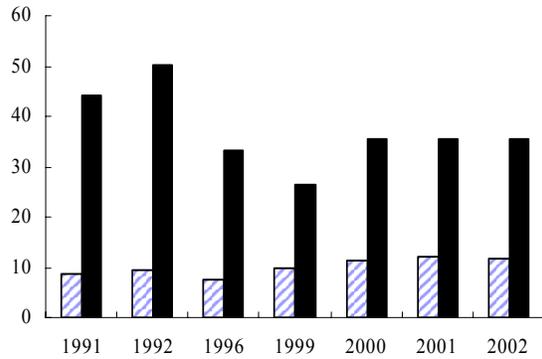
Guyana
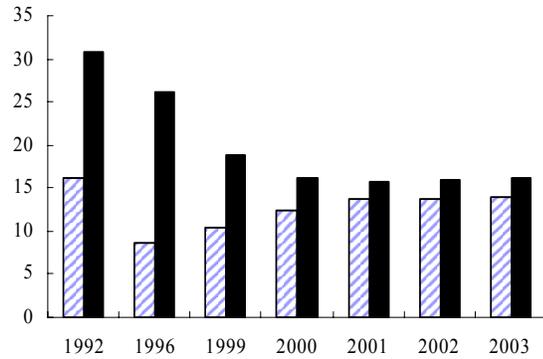
  - no reduction in the external tariff

  - 20 percent or more reduction in the external tariff

Table 1. Implementation of Tariff Reductions in CARICOM.

	Phase I Jan-June 1993 0-35 percent	Phase II Jan-June 1995 0-30 percent	Phase III Jan-June 1997 0-25 percent	Phase IV Jan-June 1998 0-20 percent
Barbados	April 1, 1993	April 1, 1995	April 1, 1997	April 1, 1998
Guyana	January 1, 1994	September 1, 1995	November 1, 1997	April 30, 1999
Jamaica	April 1, 1993	April 1, 1993	January 1, 1995	January 1, 1999
Trinidad and Tobago	January 1, 1993	January 1, 1996	January 1, 1997	July 1, 1998

Source: IMF (2005).

Table 2. Tariff and Imports Data Availability by Commodity Classification. 1/

|	Trinidad and Tobago			Guyana			Jamaica			Barbados		
	Availability		Usage	Availability		Usage	Availability		Usage	Availability		Usage
	Tariffs	Imports		Tariffs	Imports		Tariffs	Imports		Tariffs	Imports	
1991	H0	H0	H0	…	H0	H0	…	H0	H0	…	…	…
1992	H0	H0	H0	…	H0	H0	…	H0	H0	…	S3	S3
1996	H0	H0	H0	H0	H0	H0	H0	H0	H0	H0	S3	S3
1999	H1	H1	H0	H1	H1	H0	H1	H1	H0	H1	H1	S3
2000	…	…	…	H1	H1	H0	H1	H1	H0	H1	H1	S3
2001	H1	H1	H0	H1	H1	H0	H1	H1	H0	H1	H1	S3
2002	H1	H1	H0	H1	H1	H0	H1	H1	H0	H1	H1	S3
2003	H1	H1	H0	H1	H1	H0	H1	…	…	H1	H1	S3

Source: WITS database.

1/ H0 and H1 are the headings (revisions) of the Harmonized System Code (HS) commodity classification.
  S3 denotes revision 3 of the Standard International Trade Classification (SITC).

Table 3. Trinidad and Tobago: Tariff rates, commodity imports, and share of CARICOM imports.

1992

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	99332	0.4	0.6	363
(0,5]	79774	0.5	0.5	362
(5,10]	575272	1.3	10.7	2528
(10,25]	158950	5.6	13.1	343
>25	294200	17.4	75.0	1492
Total	1207529	5.7	100.0	5088

2002

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	1589400	1.8	32.9	2393
(0,5]	722760	0.2	2.0	836
(5,10]	154482	5.5	9.5	236
(10,25]	594100	5.6	37.1	1154
>25	75300	21.9	18.5	322
Total	3136042	2.8	100.0	4941

Table 4. Jamaica: Tariff rates, commodity imports, and share of CARICOM imports.

1992

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	261833	0.3	1.2	363
(0,5]	71222	0.0	0.0	362
(5,10]	594426	1.2	11.1	2528
(10,25]	213700	7.3	23.4	343
>25	365100	11.8	64.3	1492
Total	1506281	4.5	100.0	5088

2002

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	1241600	0.9	6.3	3102
(0,5]	121800	5.6	3.7	146
(5,10]	481500	4.5	11.7	255
(10,25]	709000	15.5	60.0	1092
>25	346400	9.6	18.2	313
Total	2900300	6.3	100.0	4908

Table 5. Barbados: Tariff rates, commodity imports, and share of CARICOM imports.

1992

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	30901	19.1	6.1	260
(0,5]	12875	0.6	0.1	278
(5,10]	133275	3.2	4.4	1503
(10,25]	106900	28.0	31.1	214
>25	200000	28.0	58.2	856
Total	483951	19.9	100.0	3111

2002

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	...	...	...	...
(0,5]	302416	3.1	9.4	1871
(5,10]	78784	7.6	6.0	156
(10,25]	346200	14.8	51.1	654
>25	147500	22.7	33.5	237
Total	874900	11.4	100.0	2918

Table 6. Guyana: Tariff rates, commodity imports, and share of CARICOM imports.

1992

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	25563	4.5	3.0	160
(0,5]	49240	0.5	0.6	125
(5,10]	166400	6.9	29.2	1096
(10,25]	40201	11.9	12.3	179
>25	48200	44.4	54.9	883
Total	329603	11.8	100.0	2443

2002

MFN Tariff Rate	Imports, thousand US$	CARICOM's Share in imports, percent	Share in Imports from CARICOM, percent	Number of SITC-3 commodities
zero	46964	9.3	5.8	122
(0,5]	145551	3.1	6.0	1706
(5,10]	65600	32.8	28.5	200
(10,25]	138700	27.2	50.0	966
>25	33155	22.0	9.7	179
Total	429971	17.6	100.0	3173

Table 7. Erosion of tariff preferences within the PTA.

Scenario A:	increase in preferential tariffs (no change in external tariffs)	preference margins are eroded	1) member imports decline and consumption of domestically produced goods increases	→ reversal of trade creation
			2) member imports decline and non-member imports increase	→ reversal of trade diversion
Scenario B:	cut in external tariffs (no change in peferential tariffs)	preference margins are eroded	1) member imports decline and consumption of domestically produced goods declines	→ classic nondisriminatory liberalization
			2) member imports decline and non-member imports increase	→ reversal of trade diversion

Table 8. Trinidad and Tobago: Imports and Tariff Rates, 1991−2003.

a) Imports from CARICOM

	(1)	(2)	(3)	(4)	(5)
σ	3.45	3.12	3.67	2.72	2.42
	(1.74)	(1.68)	(0.58)	(1.29)	(0.83)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	3885	3866	34572	2787	3866
Commodities	1429	1420	5050	1022	1420
R-squared (adjusted)	0.65	0.65	0.58	0.67	

Dependent variable, ln(imports of Trinidad and Tobago from CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Trinidad and Tobago on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

b) Imports from outside CARICOM.

	(1)	(2)	(3)	(4)	(5)
σ	-3.94	-4.01	-3.44	-2.95	-3.52
	(0.57)	(0.58)	(0.89)	(0.49)	(0.45)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	23115	22948	34572	20674	22948
Commodities	4551	4516	5050	4242	4516
R-squared (adjusted)	0.74	0.74	0.65	0.75	

Dependent variable, ln(imports of Trinidad and Tobago from non-CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Trinidad and Tobago on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

Table 9. Jamaica: Imports and Tariff Rates, 1991−2003.

a) Imports from CARICOM

	(1)	(2)	(3)	(4)	(5)
σ	1.14	1.04	-1.07	0.01	0.36
	(2.03)	(2.06)	(0.59)	(1.65)	(1.02)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	4195	4170	34546	3159	4170
Commodities	1501	1493	5050	1153	1493
R-squared (adjusted)	0.65	0.65	0.58	0.70	

Dependent variable, ln(imports of Jamaica from CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Jamaica on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

b) Imports from outside CARICOM.

	(1)	(2)	(3)	(4)	(5)
σ	-2.85	-2.93	-2.17	-2.93	-2.5
	(0.60)	(0.61)	(0.98)	(0.53)	(0.46)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	23984	23828	34546	21415	23828
Commodities	4655	4622	5050	4345	4622
R-squared (adjusted)	0.75	0.75	0.66	0.75	

Dependent variable, ln(imports of Jamaica from non-CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Jamaica on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

Table 10. Barbados: Imports and Tariff Rates, 1991–2003.

a) Imports from CARICOM

	(1)	(2)	(3)	(4)	(5)
σ	1.02	1.01	0.56	0.59	0.88
	(0.63)	(0.63)	(0.53)	0.30	(0.45)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	6045	5998	20964	4119	5998
Commodities	1640	1623	3063	1177	1623
R-squared (adjusted)	0.75	0.75	0.72	0.81	

Dependent variable, ln(imports of Barbados from CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Barbados on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

b) Imports from outside CARICOM.

	(1)	(2)	(3)	(4)	(5)
σ	-0.66	-0.67	-0.64	-0.55	-0.68
	(0.36)	(0.33)	(0.52)	(0.24)	(0.32)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	16233	16028	20694	14322	16028
Commodities	2925	2882	3063	2664	2882
R-squared (adjusted)	0.80	0.80	0.72	0.81	

Dependent variable, ln(imports of Barbados from non-CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Barbados on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

Table 11. Guyana: Imports and Tariff Rates, 1991–2003.

a) Imports from CARICOM

	(1)	(2)	(3)	(4)	(5)
σ	-0.40	-0.52	-1.74	-0.59	-1.44
	(1.35)	(1.38)	(0.91)	(1.75)	(0.76)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	5646	5596	22608	3770	5596
Commodities	1973	1957	4261	1317	1957
R-squared (adjusted)	0.67	0.67	0.55	0.68	

Dependent variable, ln(imports of Guyana from CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Guyana on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

b) Imports from outside CARICOM.

	(1)	(2)	(3)	(4)	(5)
σ	-3.15	-3.19	-3.00	-3.46	-1.11
	(0.68)	(0.69)	(0.73)	(0.59)	(0.74)
Commodity Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	Prais-Winsten
N	22556	22408	22608	17884	22608
Commodities	4274	4242	4261	3734	4261
R-squared (adjusted)	0.64	0.64	0.62	0.65	

Dependent variable, ln(imports of Guyana from non-CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed by Guyana on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator.

Table 12. Imports from CARICOM and non-CARICOM and Tariff Rates.

Long-Differenced Approach, 1992-2002.

	(1)	(2)
Trinidad and Tobago	1.90	-4.26
standard error	(2.51)	(0.69)
N (or commodities)	247	2306
Jamaica	2.60	-3.07
standard error	(2.47)	(0.66)
N (or commodities)	247	2424
Guyana	1.45	-2.16
standard error	(1.42)	(0.83)
N (or commodities)	359	2018
Barbados	1.35	-1.04
standard error	(0.70)	(0.50)
N (or commodities)	496	1671

Dependent variable, ln(2002 imports from CARICOM)-ln(1992 imports from CARICOM) by SITC-2 6-digit commodity for specification (1) and ln(2002 imports from non-CARICOM)-ln(1992 imports from CARICOM) by SITC-2 6-digit commodity for specification (2) is regressed on ln(1+2002 tariff rate)-ln(1+1992 tariff rate). Tariff rate is an advalorem MFN rate imposed on imports from non-CARICOM countries. Robust standard errors are reported in parantheses the below coefficient estimates.

Table 13. CARICOM and non-CARICOM Relative Imports and MFN Tariff Rates.

	(1)	(2)	(3)	(4)	(5)
Trinidad and Tobago	-8.94	-8.53	-7.12	-7.00	-6.85
	(2.39)	(2.32)	(0.97)	(2.04)	(1.25)
Jamaica	-7.11	-7.02	-1.10	-5.03	-4.60
	(2.31)	(2.35)	(1.03)	(2.18)	(1.16)
Guyana	-4.13	-4.13	-1.26	-2.77	-2.71
	(1.70)	(1.72)	(1.05)	(1.41)	(0.90)
Barbados	-1.59	-1.58	-1.19	-1.30	-1.61
	0.84	(0.84)	(0.76)	(0.64)	(0.64)

Dependent variable, ln(imports from non-CARICOM) - ln(imports from CARICOM) by year and SITC-2 6-digit commodity, is regressed on ln(1 + tariff rate). Tariff rate is an advalorem MFN rate imposed on imports from non-CARICOM countries. Robust standard errors clustered on each 6-digit commodity are reported in parantheses below coefficient estimates. Equation specifications: (1) baseline specification with all commodity imports; (2) excludes oil products; (3) adds back observations with zero import values by setting them to one. Other specifications drop zero value observations due to logarithming; (4) drops observations with import values less than US$10,000 or exceeding US$10 million; (5) reports estimates of regression corrected for first-order serially correlated residuals using Prais-Winston correction estimator. All specifications include commodity and time dummy variables.