ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Khadan, Jeetendra; Hosein, Roger

**Working Paper**

# Trade, economic and welfare impacts of the CARICOM-Canada free trade agreement

IDB Working Paper Series, No. IDB-WP-678

**Provided in Cooperation with:**
Inter-American Development Bank (IDB), Washington, DC

*Suggested Citation:* Khadan, Jeetendra; Hosein, Roger (2016) : Trade, economic and welfare impacts of the CARICOM-Canada free trade agreement, IDB Working Paper Series, No. IDB-WP-678, Inter-American Development Bank (IDB), Washington, DC, https://doi.org/10.18235/0000454

This Version is available at:
https://hdl.handle.net/10419/173811

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

http://creativecommons.org/licenses/by-nc-nd/3.0/igo/legalcode

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

IDB WORKING PAPER SERIES Nº IDB-WP-678

# Trade, Economic and Welfare Impacts of the CARICOM-Canada Free Trade Agreement

Jeetendra Khadan
Roger Hosein

Inter-American Development Bank
Country Department Caribbean Group

October 2016

Inter-American Development Bank

# Trade, Economic and Welfare Impacts of the CARICOM-Canada Free Trade Agreement

Jeetendra Khadan*
Roger Hosein**

Inter-American Development Bank*
The University of the West Indies, St. Augustine, Trinidad**

October 2016

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Khadan, Jeetendra.
Trade, economic, and welfare impacts of the CARICOM-Canada Free Trade Agreement / Jeetendra Khadan, Roger Hosein.
p. cm. — (IDB Working Paper Series ; 678)
Includes bibliographic references.
1. Free trade-Caribbean Area. 2. Free trade-Canada. 3. Caribbean Area-Commercial treaties. 4. Canada-Commercial treaties. 5. Comparative advantage (International trade). I. Hosein, Roger. II. Inter-American Development Bank. Country Department Caribbean Group. III. Title. IV. Series.
IDB-WP-678

http://www.iadb.org

Copyright © 2016 Inter-American Development Bank. This work is licensed under a Creative Commons IGO 3.0 Attribution-NonCommercial-NoDerivatives (CC-IGO BY-NC-ND 3.0 IGO) license (http://creativecommons.org/licenses/by-nc-nd/3.0/igo/legalcode) and may be reproduced with attribution to the IDB and for any non-commercial purpose, as provided below. No derivative work is allowed.

Any dispute related to the use of the works of the IDB that cannot be settled amicably shall be submitted to arbitration pursuant to the UNCITRAL rules. The use of the IDB's name for any purpose other than for attribution, and the use of IDB's logo shall be subject to a separate written license agreement between the IDB and the user and is not authorized as part of this CC-IGO license.

Following a peer review process, and with previous written consent by the Inter-American Development Bank (IDB), a revised version of this work may also be reproduced in any academic journal, including those indexed by the American Economic Association's EconLit, provided that the IDB is credited and that the author(s) receive no income from the publication. Therefore, the restriction to receive income from such publication shall only extend to the publication's author(s). With regard to such restriction, in case of any inconsistency between the Creative Commons IGO 3.0 Attribution-NonCommercial-NoDerivatives license and these statements, the latter shall prevail.

Note that link provided above includes additional terms and conditions of the license.

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its Board of Directors, or the countries they represent.

CET@iadb.org

Jeetendra Khadan: jeetendrak@iadb.org; Roger Hosein: roger.hosein@sta.uwi.edu

**Abstract**

This paper estimates the trade, revenue, and welfare effects of the proposed Caribbean Community (CARICOM)–Canada free trade agreement (FTA) on CARICOM countries using a partial equilibrium model. The welfare analysis also takes into account the Economic Partnership Agreement, which was signed in 2008 by the CARIFORUM (CARICOM and the Dominican Republic) countries and the European Union. The revealed comparative advantage index, trade complementarity index, and transition probability matrices are used to examine the dynamics of comparative advantage for CARICOM countries' exports to Canada. The results obtained from the partial equilibrium model indicate adverse revenue and welfare effects for CARICOM member states. The results from various trade indices used do not provide evidence to suggest that an FTA between CARICOM countries and Canada can improve trade outcomes.

**JEL classification codes**: F13, F14, F17
**Keywords:** CARICOM-Canada FTA, partial equilibrium model, welfare effects, comparative advantage

## 1. Introduction

The economic effects of North-South free trade agreements (FTAs) do seem to outline positive benefits for small, developing countries compared with South-South FTAs (Schiff 1997; El Agraa 1999). Most South-South FTAs involve countries with similar factor endowments and economic constraints that hinder developing countries from realizing the gains from freer trade. Schiff (1997) and Schiff and Winters (2003) have argued that North-South FTAs offer more benefits to developing countries. In particular, Schiff and Winters (2003, 15) noted the following:

> If a developing country is going to pursue regionalism, it will almost always do better to sign up with a large rich country than with a small poor one. In trade terms, a large rich country is likely to be a more efficient supplier of most goods and a source of greater competition for local producers.

North-South trade arrangements can facilitate growth in developing countries by providing their south counterparts with access to larger markets, greater transfer of technology, and positively influencing total factor productivity in developing countries (Grossman and Helpman 1991; Coe and Hoffmaister 1999; Schiff and Wang 2003).[1] In contrast, Cernat (2003) noted that trade arrangements among developing countries can be used as a mechanism to assist small countries in the globalization process. Regionalism can facilitate the building of institutional capacity whereby government bureaucrats can learn a significant amount of the techniques required for engaging the multilateralization process. However, previous studies have shown that North-South FTAs results in adverse trade, revenue, and welfare outcomes for developing countries (Greenaway and Milner 2006; Nicholls, Nicholls, and Colthrust 2001). This paper explores this issue by estimating the trade, revenue, and welfare effects of the proposed CARICOM–Canada FTA on CARICOM countries.

Despite seven rounds of negotiations since 2007, CARICOM and Canada were unable to reach an agreement on the establishment of an FTA to replace the existing Caribbean Canada Trade Agreement (CARIBCAN) in 2015. With the long-term options of either a trade agreement in the future or no trade agreement and the CARIBCAN waiver is not renewed, there will be implications for the region. At the request of Canada, the World Trade Organization extended the CARIBCAN waiver until 2023, (World Trade Organization 2015). The main feature of the CARIBCAN is that it offers preferential duty free access to the Canadian market for a broad range of goods produced within the Commonwealth Caribbean region. However, as a nonreciprocal arrangement, the CARIBCAN is inconsistent with the WTO principles and

[1] See also Behar and Crivillé (2010), Mayda and Steinberg (2007), Arora and Vamvakidis (2004), and Vamvakidis (1998).

commitments and requires a World Trade Organization (WTO) Most Favoured Nation (MFN) waiver. Canada had initially indicated it will not seek to renew the waiver but instead negotiate an FTA with the CARICOM. It is against this backdrop that Canada and the CARICOM explored the prospects of forming an FTA, until negotiations broke down in 2015. At this stage, it is unclear as to when or whether both parties will return to negotiations under the extended CARIBCAN waiver. Despite this uncertainty, it is important to determine whether Canada is a good trading partner for the CARICOM region.

The formation of a CARICOM–Canada FTA is likely to create both opportunities and challenges for CARICOM countries. In particular, the FTA would mean secured duty-free access for CARICOM countries' merchandise exports to the Canadian market. In addition, the CARICOM–Canada FTA would expand duty-free market access to trade in services and provide CARICOM countries with development assistance. The implementation of the CARICOM–Canada FTA would result in liberalization of tariffs on all imports from Canada. The removal of tariff barriers on regional imports is expected to result in adverse implications in terms of declining tariff revenues, regional production, and intra-CARICOM trade as a result of increased competition from Canadian imports (Girvan 2009).

This paper examines the competitiveness of CARICOM countries' exports to Canada using a revealed comparative advantage index, a transition probability matrix, and a trade complementarity index. We also estimate the trade, revenue, and welfare effect of liberalizing tariffs on CARICOM countries' imports from Canada. The results from the competitiveness analysis show that room for increasing exports from CARICOM countries and Canada is weak, as the number of commodities in which CARICOM countries have comparative advantage with Canada mostly dwindles away over time. Trade complementarity between the two trading partners is also low and has been on a downward trend over the past two decades. When we examine the effect of removing tariffs on revenue and welfare we also observe a negative effect for all CARICOM countries. The results from the three approaches are consistent with theory, in that, when countries engage in trade agreements where trade complementarity is low, the welfare outcomes will also be low. We also find that trade complementarity for trade in services between CARIOM countries and Canada is higher than for merchandise trade. This paper therefore suggests that closely examining trade in services may provide a more positive outlook on the FTA.

The contribution of this paper is twofold: First, this study provides an empirical assessment of the trade and welfare outcomes for CARICOM countries associated with a proposed CARICOM–Canada FTA; second, it provides relevant empirics for policy makers to

streamline policies to benefit from or mitigate any potential losses from a proposed FTA. The rest of this paper is structured as follows: Section 2 examines the economic preconditions of the proposed CARICOM–Canada FTA; Sections 3 and 4 outline a partial equilibrium model and results, respectively; Section 5 concludes the paper.

## 2. Economic Preconditions of the Proposed CARICOM–Canada FTA

In theory, as a country removes barriers to trade with respect to a partner country (or the world), there is likely to be a process of adjustment occurring in the country's production structure. The country should begin to specialize in those sectors in which it has a comparative advantage relative to the trading partner. As a result, an important ingredient for the success of a FTA depends on the prospective members having a strong comparative advantage in different products (Kemal 2004; Pitigala 2005). Recent theoretical work by Schiff (2001) on the natural trading partner hypothesis has established that a high level of trade complementarity among prospective members of a FTA should increase the likelihood that the FTA will be welfare enhancing. Therefore, evaluating the pattern and persistence of comparative advantage and trade complementarity are very important indicators for determining the success of the proposed FTA between CARICOM countries and Canada.

### 2.1 Revealed Comparative Advantage Index and Transition Probability Matrix

The most popular measure of comparative advantage in the literature was developed by Balassa (1965) and has been used in many studies to determine the comparative advantage structure of countries (for example, Fertő and Hubbard 2003; Hinloopen and van Marrewijk 2004; Bojnec and Fertő 2006; Sinanan and Hosein 2012). The RCA index, also known as the Balassa index, is outlined as follows:

$$RCA_{ij} = \frac{X_{ij} / X_{it}}{X_{wj} / X_{wt}} \quad (1)$$

Where $RCA_{ij}$ is the RCA index for country *i* in commodity *j*, *X* is exports, *w* is world, *i* is country, *j* is commodity, and *t* is a set of countries.

The RCA index compares the share of exports of commodity *j* in country *i*'s total exports to the share of exports of commodity *j* in the world's total exports (world accounts for all other supply sources). The notion is that if the share of exports for commodity *j* in country *i*'s total exports is larger than the share of exports for commodity *j* in world total exports, then country *i* is considered to have a comparative advantage in commodity *j*. The RCA index has a theoretical

range from a value greater than zero (0) to less than infinity (∞), which is divided into two groups: 0< $RCA_j$ < 1, which means the country has a comparative disadvantage in commodity *j*; and 1< $RCA_j$ < ∞, which means the country has a comparative advantage in commodity *j*.

Hinloopen and van Marrewijk (2001) provided a further decomposition of the theoretical range of the RCA index by dividing the latter range into three parts. The decomposition of the theoretical range of the RCA index permits the identification of weak, medium and strong comparative advantage for the export industries of a country (Table 1). The persistence or mobility of a country's comparative advantage over time can be examined by applying a transition probability matrix and Markov chains to the classification of the RCA index (see Proudman and Redding 2000; Brasili, Epifani, and Helg 2000; Hinloopen and van Marrewijk 2001; Hosein 2008; Sinanan and Hosein 2012).

**Table 1. Categorization of the Balassa Index**

| States | Range | Interpretation |
|---|---|---|
| Class a | 0 < RCA < 1 | Industries with a comparative disadvantage. |
| Class b | 1< RCA < 2 | Industries with a weak comparative advantage. |
| Class c | 2 < RCA < 4 | Industries with a medium comparative advantage. |
| Class d | 4 < RCA | Industries with a strong comparative advantage. |

*Source*: Hinloopen and van Marrewijk 2001.

A discrete time Markov chain is characterized by a finite set of states at discrete time intervals and probabilities ($p_{ij}$) for transition between these states. The transition probability ($p_{ij}$) is the probability of a process being in state i at time t and moving to state j at time t+1. The matrix of probabilities ($p_{ij}$) for all states is usually referred to as the transition probability matrix of the Markov chain. A Markov chain can be formally expressed as follows:

$$P\{X_{t+1} = j | X_0 = i_0, \ldots, X_{t-1}, X_t = i\}, \quad (2)$$

$$= P\{X_{t+1} = j | X_t = i\} \quad (3)$$

In terms of the RCA index, a transition probability matrix can shed light on the evolution of comparative advantage from one time period to another period for an economy. The transition probability matrix determines the probability of a commodity moving from one state (say, comparative disadvantage (a)) to another state (for example, strong comparative advantage (d)) from an initial time period (t) to another time period (t+1). The probability of a commodity being in state *d* in the next time period (t+1) given that it is presently (t) in state *a* is a one-step transition probability denoted as $P_{ad}^{t,t+1}$ (see Anderson 2011 and Hunter 2012), where:

$$P_{ad}^{t,t+1} = P\left\{X_{t+1} = d \middle| X_t = a\right\} \quad (4)$$

In addition, the degree of mobility or persistence in the RCA index is summarized by various mobility indices. Shorrocks (1978) developed an index denoted as ($M_1$) which captures the relative magnitude of the diagonal and off-diagonal elements in a transition probability matrix.[2] The index ranges from $0 \leq M_1 \leq 1$, where a value of 0 indicates that there is imperfect mobility or total persistence and this occurs when the elements of the leading diagonal of the transition probability matrix are equal to one. When there is perfect mobility the index takes on a value of one and this occurs when the trace of the transition probability matrix is equal to one and all of the elements in the transition probability matrix have the same value. The Shorrocks index is defined as follows:

$$M_1 = \frac{K - tr(P)}{K - 1} \quad (5)$$

Where *K* is the number of classes in the transition probability matrix, *P* is the transition probability matrix, and *tr*(*P*) is the trace of the transition probability matrix.

### 2.2 Data

The RCA and trade complementarity indices are computed at the Standard International Trade Classification (SITC) 3 digit level for the period 2000–10 using trade data from the UN Comtrade database. A sample of six CARICOM members' exports to Canada is firstly examined using the RCA index. The RCA index is then used to calculate a transition probability matrix for each

[2] See also Bartholomew (1973) and Sommers and Conlisk (1979).

CARICOM member's exports to Canada. The intertemporal changes in the RCA index for each CARICOM member are briefly summarized in the Tables A3–A8.

### 2.3 Evolution of Comparative Advantage for CARICOM Members' Exports to Canada

The results from the transition probability matrices indicate that those commodities in the comparative disadvantage class (a) for CARICOM countries' exports to Canada have a high probability of persistence. The high probability values in class (a) imply that commodities revealing a comparative disadvantage are likely to remain in a state of comparative disadvantage over time. In contrast, The Bahamas, Jamaica, and Trinidad and Tobago have recorded a relatively high probability of persistence in the strong comparative advantage class (d). Jamaica revealed the highest probability of persistence (0.80) for commodities in class d, followed by Trinidad and Tobago (0.71) and The Bahamas (0.67). These findings mean that commodities with a comparative advantage in The Bahamas, Jamaica, and Trinidad and Tobago have a high probability of maintaining their comparative advantage rank over time as compared with other CARICOM countries. The persistence of commodities in class b and c for all the selected CARICOM countries' exports to Canada appear to be very weak, with the exception of Jamaica for the weak comparative advantage class.

The dynamic changes in the comparative advantage structure of an economy is usually observed through the off-diagonal elements of the transition probability matrix, that is, by comparing the lower triangular to the upper triangular matrix. It is preferred to have a strong upper triangular matrix as it indicates that commodities are migrating from a lower class of comparative advantage to a higher class of comparative advantage. However, from Table 2 there appears to be a relatively weak upper triangular matrix as compared with the lower triangular matrix. The weak upper triangular matrix of the transition probability matrix indicates that the probability of commodities moving from a lower class of comparative advantage to a higher class of comparative advantage is very low for all of the selected CARICOM countries in relation to Canada. Furthermore, the probability of losing comparative advantage from the start of the period (2000) to the end of the period (2010) is very high for the selected CARICOM members.

**Table 2. Transition Probability Matrix of the RCA Index for Selected CARICOM Countries in Relation to Canada (2000–02 to 2008–10)**

| Barbados | | | | | | The Bahamas | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | To | | | | | | To | | | |
| | | a | b | C | d | | | a | b | c | d |
| From | a | 0.94 | 0.03 | 0.00 | 0.03 | From | A | 0.98 | 0.01 | 0.00 | 0.01 |
| | b | 0.83 | 0.17 | 0.00 | 0.00 | | B | 1.00 | 0.00 | 0.00 | 0.00 |
| | c | 0.43 | 0.14 | 0.43 | 0.00 | | C | 1.00 | 0.00 | 0.00 | 0.00 |
| | d | 0.73 | 0.09 | 0.09 | 0.09 | | D | 0.17 | 0.17 | 0.00 | 0.67 |
| | $M_1$ | 0.79 | | | | | $M_1$ | 0.78 | | | |
| **Guyana** | | | | | | **Jamaica** | | | | | |
| | | To | | | | | | To | | | |
| | | a | b | C | d | | | a | b | c | d |
| From | a | 1.00 | 0.00 | 0.00 | 0.00 | From | A | 0.99 | 0.01 | 0.00 | 0.00 |
| | b | 0.50 | 0.00 | 0.00 | 0.50 | | B | 0.00 | **1.00** | 0.00 | 0.00 |
| | c | 1.00 | 0.00 | 0.00 | 0.00 | | c | 0.00 | 1.00 | 0.00 | 0.00 |
| | d | 0.67 | 0.00 | 0.00 | 0.33 | | d | 0.00 | 0.00 | 0.20 | 0.80 |
| | $M_1$ | 0.89 | | | | | $M_1$ | 0.40 | | | |
| **Trinidad and Tobago** | | | | | | **St. Vincent and the Grenadines** | | | | | |
| | | To | | | | | | To | | | |
| | | a | b | C | d | | | a | b | c | d |
| From | a | 0.99 | 0.00 | 0.00 | 0.00 | From | a | 0.94 | 0.02 | 0.01 | 0.03 |
| | b | 0.67 | 0.33 | 0.00 | 0.00 | | b | 0.25 | 0.25 | 0.50 | 0.00 |
| | c | 1.00 | 0.00 | 0.00 | 0.00 | | c | 0.75 | 0.00 | 0.00 | 0.25 |
| | d | 0.14 | 0.00 | 0.14 | 0.71 | | d | 0.50 | 0.00 | 0.13 | 0.38 |
| | $M_1$ | 0.65 | | | | | $M_1$ | 0.81 | | | |

*Note:* RCA = revealed comparative advantage.
*Source*: Calculations based on UN Comtrade 2012.

## 2.4 Trade Complementarity between CARICOM and Canada

The ability of an FTA to improve the economic outcomes of its members can also be determined by an examination of their bilateral trade structures. The more complementary the nature of the trading relation between the prospective members of an FTA, the greater the likelihood that the FTA will improve the economic outcomes for its members.[3] The level of trade complementarity between the CARICOM bloc and Canada is evaluated by a trade complementarity index.[4] The

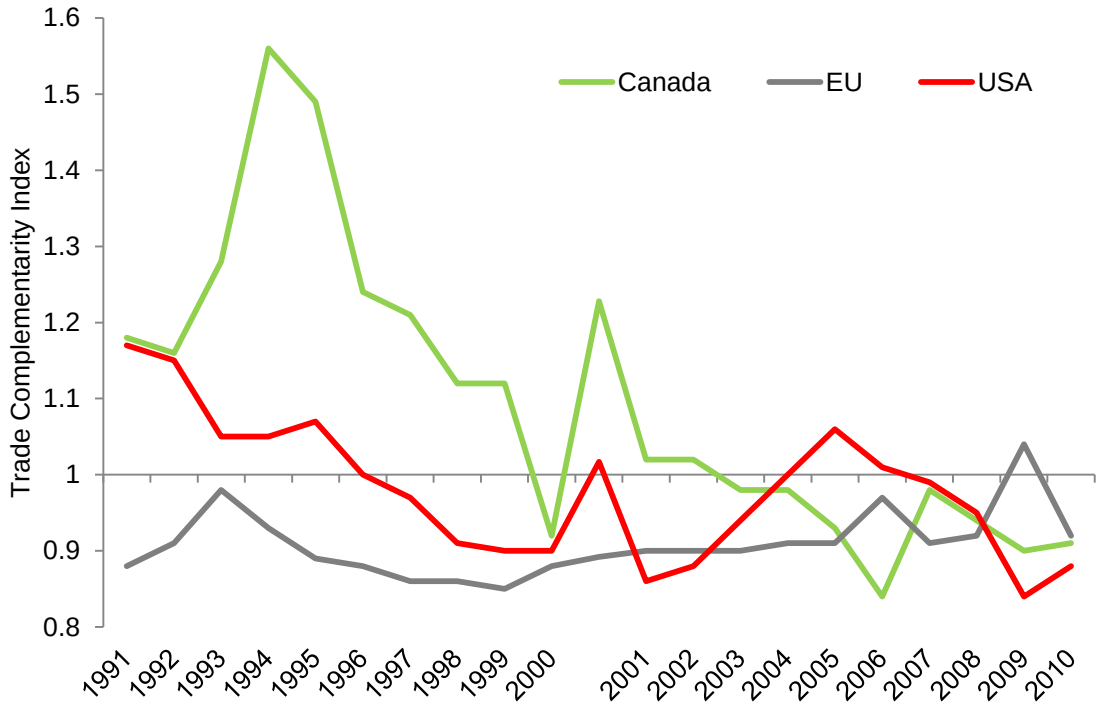
[3] This means that if an importing country's comparative disadvantage is matched by an exporting country's comparative advantage, then an FTA between those countries is more likely to improve economic welfare (see Schiff 2001).
[4] Drysdale (1967) outlined the trade complementarity index as follows:

$$C_{ij} = \sum_k \left\{ \frac{X_i^k}{X_i} * \frac{M_j^k}{M_j} * \frac{M_w - M_i}{M_w^k - M_i^k} \right\}$$

Where $C_{ij}$ is a trade complementarity index which relates the comparative advantage of the exporting country to the comparative disadvantage of the importing partner weighted against world trade (which accounts for all other supply sources), $X$ is exports, $k$ is commodity to the world, $X_i$ is country $i$'s total exports, $M_j$ is country $j$'s total imports, $M_i$ is country $i$'s total imports, and $M_w$ is world imports.

main proponents (Michaely 1996; Yeats 1998) of the trade complementarity index argued that the higher the value of the trade complementarity index the more likely the proposed FTA will succeed (Pitigala 2005). The trade complementarity index has a theoretical range from a value greater than 0 to less than ∞. If the value of the trade complementarity index is greater than unity then bilateral trade complementarity exists, however, if the value of the index is less than unity then bilateral trade complementarity is not present. Figure 1 shows the results of the trade complementarity index for the CARICOM bloc in relation to Canada, the European Union, and the United States. The trade complementarity index indicates that the level of trade complementarity between CARICOM and Canada is generally low and has been declining over the past two decades. The level of trade complementarity is much lower for Canada as compared with the European Union in the past decade.[5]

**Figure 1. Trade Complementarity between CARICOM and Major Trading Partners for Merchandise Trade**

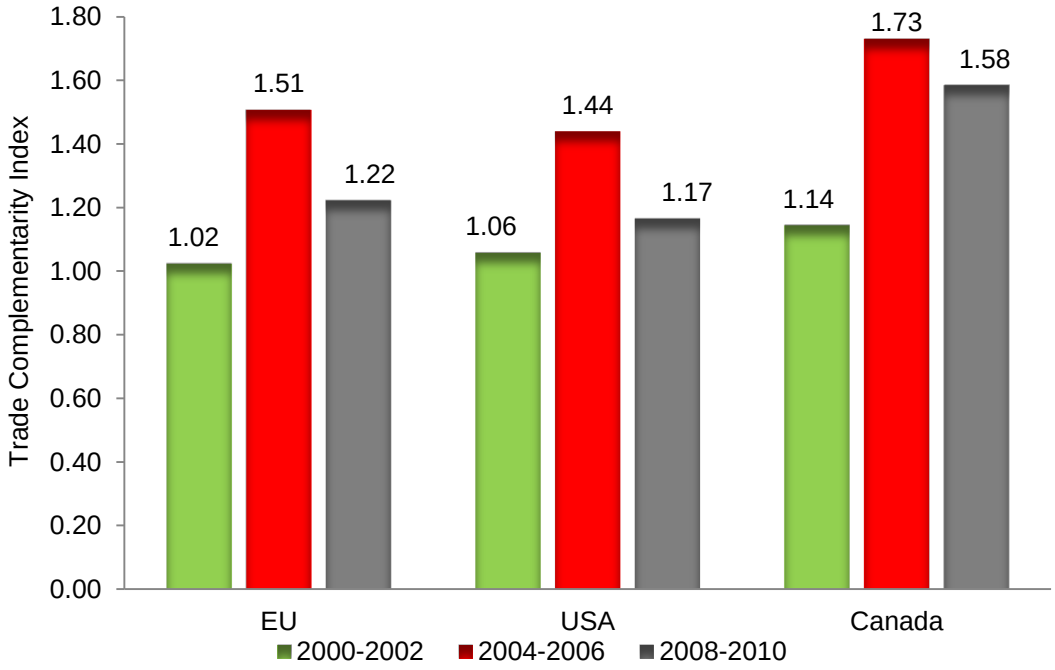



*Source*: Calculations based on UN Comtrade 2013. [6]

[5] See also Khadan (2014) and Khadan and Hosein (2013).
[6]The trade complementarity index was applied to SITC three-digit level data for each aforementioned country and then aggregated across 264 SITC three-digit commodities to derive the country index for each year.

Figure 2 shows that the level of trade complementarity in services trade reported improvements in the region's three major source markets with the largest increase in the trade complementarity index occurring in the Canadian market. However, in the latter part of the decade there was a simultaneous decline in complementarity with the United States, European Union, and Canada. The level of trade complementarity in services was the largest for Canada compared to the European Union and the United States for the period 2008–10.

**Figure 2. Trade Complementarity between CARICOM and Major Trading Partners for Services Trade**




*Source*: Calculations based on UN Comtrade 2012.

The low level of bilateral trade complementarity between the CARICOM region and Canada implies that bilateral merchandise trade is not likely to improve with the FTA. In this regard, the next section outlines the mechanics of a partial equilibrium model to determine the economic effects that liberalizing tariffs on merchandise imports from Canada would have on CARICOM countries.

### 3. Measuring the Welfare Effects of the CARICOM–Canada FTA

Partial equilibrium models have been widely used in the literature to assess the trade and welfare effects of proposed FTAs (see McKay, Milner, and Morrissey 2000; Greenaway and Milner 2006; Gasiorek and Winters 2004; Busse, Borrmann, and GroBmann 2004; Karingi et al. 2005; Zouhon-Bi and Nielsen 2007; Busse and Luehje 2007; Hosein 2008; Fontagne, Laborde,

and Mitaritonna 2011). The major benefits of using a partial equilibrium model include its ability to provide a detailed analysis from a product and country perspective (Lang 2006). A partial equilibrium analysis allows for the identification of commodity groups that are most likely to be affected and the extent of the effect on account of freer trade with a prospective trading partner. Moreover, the partial equilibrium model facilitates the estimation of trade creation, trade diversion, tariff revenues, and welfare implications associated with liberalizing trade barriers (see, for example, McKay, Milner, and Morrissey 2000; Greenaway and Milner 2006; Zouhon-Bi and Nielsen 2007). The literature identifies two branches of the partial equilibrium model, namely the perfect substitution model and the imperfect substitution model. The perfect substitution model assumes a homogeneous product, and that perfectly competitive and imported goods are perfect substitutes for domestically produced goods. The perfect substitution model is most applicable in situations where there are specific markets and where the producers are price takers. The imperfect substitution model is grounded in the Armington (1969) principle of product differentiation. The imperfect substitution variant is more applicable for industrial markets where product differentiation becomes essential to the analysis. This paper uses the imperfect substitution approach since it allows for the identification of the various trade source substitution effects that arise when a FTA is formed. The remainder of this section outlines a partial equilibrium model to evaluate the trade and welfare effects of the proposed CARICOM–Canada FTA.

**Imperfect Substitution Model**

The imperfect substitution model outlined by Greenaway and Milner (2006) defines the trading players in the world as belonging to an intraregional group (for example, CARICOM) and an extraregional group.

The following are intraregional trading partners:

HC – home country

PC – partner country

The following are extraregional trading partners:

CAN – Canada

ROW – rest of the world, excluding Canada.

The initial trading environment is one that is characterized by a situation where the HC and the PC belong to a regional trade agreement. Assume that the regional trade agreement imposes a nondiscriminatory tariff on imports from all extraregional import sources. Then the

price facing consumers in the HC's market would be $P_P$, $P_{ROW}$ (1+t) and $P_{CAN}$ (1+t) from the PC, the ROW and Canada, respectively. The initial volume of imports by the HC is given as $M_1$, $M_2$, and $M_3$ from CARICOM (1), the ROW (2), and Canada (3), respectively.

Next, suppose that CARICOM and Canada form an FTA. The CARICOM–Canada FTA will result in the removal of tariffs on imports from Canada but not for imports from the ROW. This change in relative import prices would alter the trading opportunities for consumers in the HC. For example, as the price of imports from Canada falls, the consumers in the HC would increase their demand for imports from Canada and simultaneously reduce their imports from the ROW and the PC. The overall trade effects associated with the CARICOM–Canada FTA can be disaggregated into three parts. The three trade effects are known as a trade diversion effect, a consumption induced trade creation effect, and a displacement of regional imports effect (Greenaway and Milner 2006). The trade effects are outlined in the next section.

### 3.1 Trade Creation Effect

The trade creation effect represents the increase in imports from Canada by the HC in the FTA environment. The trade creation effect occurs when the tariff is removed on imports from Canada such that the price of Canadian goods in the HC falls from $P_{CAN}$ (1+t) to $P_{CAN}$, where $P_{CAN}$ (1+t) > $P_{CAN}$. This will result in increased imports from Canada of the amount $M_3$ to $M'_3$ where $M'_3 > M_3$. The change in imports from Canada ($\Delta M_3$) by the HC can be measured empirically by the following:

$$\Delta \mathrm{M}_3 = \left(\frac{-t}{1+t}\right) e_m^d M_3 \quad (6)$$

Where $\Delta M_3 = M'_3 - M_3$ is the change in imports from Canada, *t* is the tariff rate, $e^d_m$ is the elasticity of demand for imports, $M_3$ is amount imported from Canada before the formation of the FTA, and $M'_3$ is new imports from Canada.

### 3.2 Trade Diversion Effect

A switch of imports from one extraregional partner (ROW) to another extraregional partner (Canada) in the FTA environment represents the trade diversion effect. Trade diversion occurs when some of the HC's imports from the ROW are diverted to Canada; for example, the HC's imports from the ROW fall from $M_2$ to $M'_2$, where $M'_2 < M_2$. The change in imports from the ROW ($\Delta M_2$) can be measured empirically in a similar way as the change in imports from Canada as follows:

$$\Delta M_2 = \left(\frac{-t}{1+t}\right)\sigma_{23}M_2 \quad (7)$$

Where $\Delta M_2$ is the change in imports from the ROW, t is the tariff rate, $\sigma_{23}$ is the elasticity of import substitution for CARICOM countries between imports from the ROW and Canada, $M_2$ is the amount imported from the ROW before the formation of the FTA, and $M'_2$ is new imports from the ROW.

### 3.3 Displacement of Regional Imports

The FTA between the regional trade agreement (HC + PC) and Canada also results in some of the HC's imports from the PC's market being replaced by imports from Canada, for example, from $M_1$ to $M'_1$ where $M'_1 < M_1$. The change in imports from the PC can be measured in a similar way as the change in imports from Canada and the change in imports from the ROW. The new imports from Canada are determined by the change in the import price, initial imports and the elasticity of import demand:

$$\Delta M_1 = \left(\frac{-t}{1+t}\right)\sigma_{13}M_1 \quad (8)$$

Where: $\Delta M_1$ is the change in imports from PC, *t* is the tariff rate, $\sigma_{13}$ is the elasticity of import substitution between CARICOM countries and Canada, $M_1$ is the amount imported from the PC before the formation of the FTA, and $M'_1$ is new imports from PC.

### 3.4 Revenue and Welfare Effects

The welfare effect for a HC in the CARICOM sphere from the CARICOM–Canada FTA originates from two sources, namely the change in tariff revenues and the change in consumer surplus for the HC. First, the FTA between CARICOM countries and Canada alters the relative import prices for the HC consumers from the various sources of supply (Canada, ROW, and CARICOM). As a result, consumers in the HC will benefit from a lower import price with the preferential partner country (Canada). This results in an increase in imports from the preferential market at a lower price, thus leading to an increase in consumer surplus and a positive effect on the HC's welfare. The HC consumers can substitute imports from intraregional partners CARICOM) and extraregional partners (ROW) with Canadian imports. The substitution of intraregional imports with extraregional imports has no effect on tariff revenues since there is a regional trade agreement among the intraregional partners. However, the reallocation of imports among the extraregional partners (from the ROW to Canada) will negatively affect the HC's

welfare through losses in tariff revenues. The loss in tariff revenues for the HC takes two forms: the loss in revenues from Canada and the loss in tariff revenues on the amount of imports diverted from the ROW to Canada. The change in tariff revenues is determined by the difference between the initial revenues obtained in the pre-FTA environment and the new revenues obtained in the FTA environment. The following is the basic algebra associated with the change in revenues.

$$\Delta R = R_1 - R_0 \quad (9)$$

$$R_1 = tM_2^{'} \quad (10)$$

$$R_0 = tM_3 + tM_2 \quad (11)$$

$$\Delta R = t\Delta M_2 - tM_3 \quad (12)$$

Where $t\Delta M_2$ is the tariff revenues associated with a change in imports from the ROW, $tM_3$ is the initial tariff revenues collected from Canadian imports in the pre-FTA environment, $R_1$ is the new tariff revenues for the HC in the FTA environment, $R_0$ is the initial tariff revenues for the HC in the pre-FTA environment, and $\Delta R$ is the change in tariff revenues.

Therefore, the change in welfare is a function of the change in consumer surplus and the change in tariff revenues. This is outlined as follows:

$$\Delta W = \Delta CS + \Delta R \quad (13)$$

Substituting $\Delta$CS and $\Delta$R into the $\Delta$W yields the following:

$$\Delta W = \frac{1}{2} t(\Delta M_3) + \Delta R \quad (14)$$

**Data: Import Demand and Substitution Elasticities**

The estimation of trade creation and trade diversion in an imperfect substitution setting requires knowledge of various elasticities. Specifically, the Greenaway and Milner (2006) model calls for information on the import demand elasticities and the elasticities of substitution between preferred and nonpreferred trading partners.

In the literature, several studies have used various estimates of import demand and substitution elasticities. For example, Busse and Shams (2005) followed the standard Dutch convention, which assumed that the values for import demand elasticity and the elasticity of

substitution were 0.5 and 2.0, respectively. According to Busse and Shams (2005), the assumed elasticity values of the standard Dutch convention were very similar to the estimates of import demand and substitution elasticities developed by Kee, Olarreaga, and Nicita (2004); and Gallaway, McDaniel, and Rivera (2003). Busse, Borrmann, and GroBmann's (2004) study on the Economic Partnership Agreement between the Economic Community of West African States and the European Union, assumed values for the import demand and substitution elasticities respectively since reliable estimates for both import demand and substitution elasticities were not available. In particular, Busse, Borrmann, and GroBmann (2004) established three scenarios; a low, a mid, and a high. The import demand and elasticity of substitution values were different in each scenario and were also based on the degree of homogeneity for the products which were differentiated between agricultural products, raw materials, and manufactured goods. The elasticity values assumed by Busse, Borrmann, and GroBmann (2004) were similar to elasticity values in other developing countries (see Sawyer and Sprinkle 1999; Gallaway, McDaniel, and Rivera 2003; and Kee, Olarreaga, and Nicita 2004). Greenaway and Milner (2006) used the import demand elasticities based on Stern, Francis, and Schumacher (1976) while the relevant import source substitution elasticities were acquired from the Global Trade Analysis Project behavioural parameters file (Hertel et al. 1997). For enhanced comparability with the Greenaway and Milner (2006) study, the experiments conducted in this paper also applied the various elasticities used by Greenaway and Milner (2006).[7]

The Greenaway and Milner (2006) method for determining trade and welfare effects is then applied to SITC two-digit data for a selected group of 11 CARICOM countries for the years 1998 and 2008 (see Table A2 for data sources). Similar to Greenaway and Milner (2006) and Hosein (2008), both the import demand elasticities and the import source substitution elasticities are assumed to be the same across CARICOM countries for a particular product group. Moreover, we assume complete tariff liberalization of Canadian exports into the CARICOM market (for similar assumptions, see Busse, Borrmann, and GroBmann 2004; Greenaway and Milner 2006; Lang 2006; and Hosein 2008).

## 4. Results and Discussion

This section now turns to the results of the trade and welfare effects of the proposed CARICOM–Canada FTA.[8] It should be noted that this is a static study and will undertake several

[7] The reference to Greenaway and Milner (2006) is to compare trade and welfare effects of CARIFORUM–EU Economic Partnership Agreement with the proposed CARICOM–Canada.

[8] The trade, revenue, and welfare effects computed here are based on the assumption that a FTA is formed between Canada and CARICOM in either 1998 or in 2008 so that tariffs on import originating from Canada (and other prospective preferential trading partners outlined in the various experiments) are eliminated.

permutations. Specifically, comparative FTA experiments with CARICOM countries and Canada as well as with other countries for the years 1998 and 2008 are examined. The grounding in 1998 is for comparison with Greenaway and Milner (2006). The remainder of this section is divided into three parts: [9]

I. Trade effects of full liberalization of tariffs on imports from Canada only, European Union only, and European Union and Canada only.
II. Revenue effects of full liberalization of tariffs on imports from Canada only, European Union only, and European Union and Canada only.
III. Welfare effects offull liberalization of tariffs on imports from Canada only, European Union only, and European Union and Canada only.

### The Effect of Full Liberalization of Tariffs on Imports from Canada Only, European Union Only, and Both European Union and Canada

This part considers four issues. It examines three trade effects associated with the proposed CARICOM–Canada FTA; it updates the work of Greenaway and Milner (2006); and it compares the results of the proposed CARICOM–Canada FTA to the updated results associated with the Economic Partnership Agreement.[10] In addition, an experiment involving the liberalization of tariffs on imports from Canada and the European Union is examined.[11] The trade effects for each experiment are aggregated across all SITC two-digit commodities and are provided in the Tables. In columns 1 and 2, the trade creation on existing imports from the prospective trading partners are reported while in columns 3 and 4 the change in imports from CARICOM countries (displacement of regional imports) is shown and columns 5 and 6 show the change in extraregional imports (trade diversion).

### Trade Effects of the Proposed CARICOM–Canada FTA

The first experiment indicates that the percentage increase in trade creation range from 8.4 percent for Trinidad and Tobago to 17.7 percent for Grenada. In actual dollars, Jamaica and Trinidad and Tobago are the two CARICOM countries expected to benefit the most from trade creation on existing Canadian imports (see Table 3). Trade creation for Trinidad and Tobago and Jamaica using 2008 data is estimated to be US$21.79 million and US$22.11 million,

[9] The CARIFORUM–EU Economic Partnership Agreement was signed in October 2008 and thus will therefore not affect the experiments undertaken for liberalizing EU imports or Canada imports.
[10] Greenaway and Milner computed the trade and welfare effects for full liberalization of tariffs on EU imports for 9 CARICOM countries for 1998; this study extends the list to 11 CARICOM countries' and compare the results with similar experiments for 2008.
[11] See Bernal 2013.

respectively. Belize recorded the least trade creation from liberalizing tariffs on Canadian imports amounting to US$0.74 million, an increase by 11.2 percent.

The percentage decline in regional imports ranges from 17.9 percent for Barbados to 28.12 percent for Belize. In actual dollars, the displacement of regional imports toward Canada is likely to be the greatest for Barbados, Guyana, and Jamaica. The results imply that Jamaica's imports from CARICOM are expected to decrease by US$303.97 million (18.6 percent) while for Barbados and Guyana they are likely to fall by US$79.41 million (17.9 percent) and US$78.90 million (22.9 percent), respectively.[12]

Extraregional trade diversion, which measures the switch in import source from the ROW to Canada, ranges from 39.6 percent for Trinidad and Tobago to 64.6 percent for St. Lucia. Other CARICOM countries to report significant extraregional trade diversion are The Bahamas, Barbados, Guyana, and Jamaica. The extraregional trade diversion effect represents a significant opportunity for an increase in Canadian exports to the CARICOM market (an estimated total of US$10.398 billion), on account of the relatively lower FTA import price for CARICOM consumers.

[12] These values are uniform for all the various experiments. It represents the decline in import from the CARICOM market by each CARICOM member state.

**Table 3. Trade Effects Associated With the Proposed CARICOM–Canada FTA (US$mn)**

| | Trade Creation on Existing Canadian Imports | | Change in CARICOM Imports | | Change in Extraregional Imports | |
|---|---|---|---|---|---|---|
| | Canada (1998) | Canada (2008) | Canada (1998) | Canada (2008) | Canada (1998) | Canada (2008) |
| The Bahamas | 7.12 | 1.44 | –1.49 | –8.48 | –1009.22 | –1522.70 |
| Belize | 0.93 | 0.74 | –2.73 | –3.44 | –144.06 | –308.03 |
| Barbados | 4.56 | 5.90 | –34.17 | –79.41 | –492.94 | –676.30 |
| Dominica | 0.45 | 0.82 | –8.87 | –15.87 | –54.63 | –84.36 |
| Grenada | 1.09 | 1.78 | –13.95 | –24.76 | –80.28 | –138.65 |
| Guyana | 2.17 | 2.11 | –17.80 | –78.90 | –197.70 | –432.65 |
| Jamaica | 16.16 | 22.11 | –89.73 | –303.97 | –1580.60 | –3000.23 |
| St. Kitts and Nevis | 0.56 | 1.08 | –6.55 | –12.30 | –67.18 | –163.58 |
| St. Lucia | 1.71 | 1.87 | –18.32 | –47.61 | –147.93 | –285.26 |
| St. Vincent and the Grenadines | 0.65 | 1.23 | –12.25 | –23.77 | –71.15 | –142.95 |
| Trinidad and Tobago | 16.42 | 21.79 | –25.56 | –34.26 | –1092.64 | –3643.57 |
| | | | **Percentage change** | | | |
| The Bahamas | 18.68 | 12.79 | –34.9 | –20.81 | –57.81 | –50.24 |
| Belize | 16.01 | 11.18 | –25.8 | –28.12 | –52.60 | –48.93 |
| Barbados | 11.06 | 10.20 | –21.0 | –17.96 | –60.51 | –54.81 |
| Dominica | 16.42 | 13.05 | –25.6 | –22.33 | –56.48 | –55.00 |
| Grenada | 17.25 | 17.66 | –25.1 | –22.88 | –58.16 | –56.66 |
| Guyana | 13.02 | 11.71 | –23.5 | –19.62 | –49.11 | –46.80 |
| Jamaica | 17.94 | 16.83 | –28.9 | –18.59 | –63.29 | –45.64 |
| St. Kitts and Nevis | 16.71 | 16.10 | –23.6 | –22.31 | –57.31 | –62.30 |
| St. Lucia | 14.92 | 15.85 | –26.0 | –23.78 | –58.79 | –64.60 |
| St. Vincent and the Grenadines | 13.65 | 15.56 | –26.0 | –23.31 | –50.77 | –54.37 |
| Trinidad and Tobago | 15.79 | 8.40 | –24.4 | –27.93 | –39.14 | –39.64 |

*Source*: Calculations based on UN Comtrade 2012.

### Trade Effects of the Economic Partnership Agreement with the European Union

With respect to the European Union, the percentage increase in trade creation ranges from 12.6 percent for Trinidad and Tobago to 19.3 percent for The Bahamas using 1998 data. For 2008, there was a small increase in trade creation (in actual dollars) for all CARICOM countries except The Bahamas. This is not a surprising trend as one would expect that over time in a rapidly globalizing world economy trade source substitution toward the European Union and Canada would increase, albeit small. Trinidad and Tobago and Jamaica recorded the largest increase in trade creation on EU imports from 1998 to 2008 (see Table 4). The decline in extraregional imports ranged from 40.1 percent for Trinidad and Tobago to 64.9 percent for St. Lucia in 2008. There is a general increase in extraregional trade diversion (in actual dollars) for all CARICOM

countries. Moreover, Trinidad and Tobago recorded the largest increase in trade diversion in actual dollars from the listed CARICOM countries.

**Table 4. Trade Effects Associated With the Economic Partnership Agreement (US$mn)**

| | Trade Creation on Existing EU Imports | | Change in CARICOM Imports | | Change in Extraregional Imports | |
|---|---|---|---|---|---|---|
| | 1998 | 2008 | 1998 | 2008 | 1998 | 2008 |
| The Bahamas | 13.62 | 7.61 | –1.49 | –8.36 | -982.56 | –1500.49 |
| Belize | 4.30 | 5.24 | –2.73 | –3.38 | –121.69 | –288.00 |
| Barbados | 26.53 | 32.83 | –34.17 | –71.81 | –311.22 | –589.44 |
| Dominica | 3.18 | 3.41 | –8.87 | –15.72 | –41.38 | –75.47 |
| Grenada | 4.44 | 5.86 | –13.95 | –24.59 | –62.77 | –124.95 |
| Guyana | 10.15 | 14.94 | –17.80 | –64.81 | –171.50 | –412.83 |
| Jamaica | 44.93 | 85.32 | –89.73 | –294.12 | –1310.64 | –2842.30 |
| St. Kitts and Nevis | 2.57 | 3.40 | –6.55 | –12.09 | –55.23 | –154.85 |
| St. Lucia | 7.89 | 9.63 | –18.32 | –47.30 | –112.88 | –258.87 |
| St. Vincent and the Grenadines | 6.03 | 8.77 | –12.25 | –23.71 | –50.26 | –119.85 |
| Trinidad and Tobago | 59.51 | 150.18 | –25.56 | –32.47 | -969.14 | –3312.19 |
| **Percentage change** | | | | | | |
| The Bahamas | 14.6 | 19.26 | –34.9 | –20.66 | –58.1 | –49.97 |
| Belize | 15.7 | 15.21 | –25.8 | –27.87 | –48.2 | –47.86 |
| Barbados | 15.5 | 14.25 | –21.0 | –18.32 | –45.5 | –53.03 |
| Dominica | 15.4 | 15.39 | –25.6 | –22.34 | –52.2 | –54.62 |
| Grenada | 15.5 | 15.16 | –25.1 | –22.87 | –54.3 | –57.65 |
| Guyana | 13.4 | 13.69 | –23.5 | –20.19 | –50.5 | –45.15 |
| Jamaica | 15.8 | 16.75 | –28.9 | –18.22 | –56.9 | –45.72 |
| St. Kitts and Nevis | 15.0 | 16.01 | –23.6 | –22.31 | –54.2 | –62.18 |
| St. Lucia | 15.0 | 17.47 | –26.0 | –23.70 | –54.9 | –64.89 |
| St. Vincent and the Grenadines | 14.7 | 16.20 | –26.0 | –23.31 | –48.4 | –55.26 |
| Trinidad and Tobago | 12.2 | 12.57 | –24.4 | –27.66 | –39.9 | –40.09 |

*Source*: Calculations based on UN Comtrade (2012) and Greenaway and Milner (2006) for 1998 values for European Union only.

### Trade Effects of the Proposed CARICOM–Canada FTA and the Economic Partnership Agreement

Another relevant experiment is to examine the effect of removing tariffs on imports from both European Union and Canada simultaneously on CARICOM countries as this is likely to be the most practical scenario in the medium term. This permutation explores the CARICOM–Canada FTA in the context of an already signed Economic Partnership Agreement with the European Union. The results associated with this experiment are provided in Table 5. The effect of full tariff liberalization of EU and Canadian imports on CARICOM countries showed that the

increase in trade creation is higher as compared with the two previous individual country cases discussed earlier. The two major beneficiaries from trade creation are again Trinidad and Tobago and Jamaica. A similar trend was observed for the extraregional trade diversion. In general, adding Canada to the mix does not create any significant optimism for CARICOM countries, especially the smaller island states. The inclusion of Canada to CARICOM's list of FTA trading partners although not counterproductive in a dynamic trading environment does not add significant value from a trade creation (diversion) perspective.

**Table 5. Trade Effects of the Proposed CARICOM–Canada FTA and the Economic Partnership Agreement (US$mn)**

| | **Trade Creation** | | **Displacement in regional imports** | | **Trade diversion** | |
|---|---|---|---|---|---|---|
| | Canada and European Union | | Canada and European Union | | Canada and European Union | |
| | 1998 | 2008 | 1998 | 2008 | 1998 | 2008 |
| The Bahamas | 20.73 | 9.05 | –1.49 | –8.48 | –964.9 | –1494.79 |
| Belize | 5.22 | 5.98 | –2.73 | –3.44 | –129.05 | –284.97 |
| Barbados | 31.56 | 38.72 | –34.17 | –79.41 | –392.81 | –551.30 |
| Dominica | 3.86 | 4.23 | –8.87 | –15.87 | –42.27 | –71.97 |
| Grenada | 5.54 | 7.63 | –13.95 | –24.76 | –64.10 | –118.24 |
| Guyana | 12.32 | 17.05 | –17.80 | –78.90 | –162.10 | –376.82 |
| Jamaica | 62.09 | 107.4 | –89.73 | –303.97 | –1425.72 | –2733.90 |
| St. Kitts and Nevis | 3.16 | 4.48 | –6.55 | –12.30 | –57.78 | –150.29 |
| St. Lucia | 10.8 | 11.5 | –18.32 | –47.61 | –114.78 | –249.80 |
| St. Vincent and the Grenadines | 6.72 | 10 | –12.25 | –23.77 | –51.37 | –114.70 |
| Trinidad and Tobago | 76.65 | 172 | –25.56 | –34.26 | -916.8 | –3226.98 |
| **Percentage change** | | | | | | |
| The Bahamas | 15.75 | 17.83 | –34.9 | –20.81 | –58.41 | –49.97 |
| Belize | 15.81 | 14.56 | –25.8 | –28.12 | –52.32 | –47.89 |
| Barbados | 14.76 | 13.44 | –21.0 | –17.96 | –61.17 | –54.95 |
| Dominica | 15.37 | 14.87 | –25.6 | –22.33 | –56.82 | –54.86 |
| Grenada | 15.84 | 15.67 | –25.1 | –22.88 | –58.60 | –57.39 |
| Guyana | 13.35 | 13.41 | –23.5 | –19.62 | –49.58 | –46.22 |
| Jamaica | 16.26 | 16.76 | –28.9 | –18.59 | –64.64 | –45.08 |
| St. Kitts and Nevis | 15.11 | 16.03 | –23.6 | –22.31 | –57.99 | –62.27 |
| St. Lucia | 14.45 | 17.18 | –26.0 | –23.78 | –60.96 | –64.64 |
| St. Vincent and the Grenadines | 14.32 | 16.11 | –26.0 | –23.31 | –52.41 | –54.95 |
| Trinidad and Tobago | 12.83 | 11.83 | –24.4 | –27.93 | –39.89 | –40.35 |

*Source:* Calculations based on UN Comtrade 2012.

### Comparison of the Trade Effects for the Proposed CARICOM–Canada FTA and the Economic Partnership Agreement

In the first instance, trade creation in actual dollars recorded for the full liberalization of tariffs on Canadian imports by CARICOM economies is lower than on EU imports for both years in which the experiments are conducted. These results imply that the liberalization of tariffs on EU imports yields significantly greater positive results for CARICOM countries from a trade creation perspective as compared with the liberalization of tariff on imports from Canada.

### CARICOM Countries' Dependence on Import Duties

Before turning to the tariff revenue effects of the FTAs on CARICOM countries, this section will examine the extent to which CARICOM countries depend on import duties. The dependence on tariff revenues is examined using three indicators: (a) import duties as a share in current revenues, (b) import duties as a share in tax revenues, and (c) import duties as a share in GDP for the period 2000–11. Nicholls, Nicholls, and Colthrust (2001) identified three levels of tariff revenue dependence for an economy. In the first instance, a country is classified as having a low dependence on tariff revenues if import duties account for less than 15 percent of government revenues, moderate dependence if import duties account for greater than 15 percent of government revenues but less than 30 percent of government revenues and high dependence if import duties account for more than 30 percent of government revenues. Table 6 shows the level of tariff revenue dependence for a selected group of CARICOM countries for the period 2000–11. According to the categories of tariff revenue dependence, countries belonging to the Organization of Eastern Caribbean States (OECS) are classified as having a moderate level dependence on tariff revenues while Jamaica and Trinidad and Tobago have a low level of tariff revenue dependence (see Table 6).[13] It is important to note that there is a regional trend to replace import duties with value-added tax.[14] Therefore, over the long term and depending on the effectiveness of the value-added tax collection system, the adverse fiscal effects of liberalizing tariffs would ease.

[13] Organization of the Eastern Caribbean States (OECS) members are Anguilla, Antigua and Barbuda, British Virgin Islands, Dominica, Grenada, Montserrat, St. Lucia, St. Kitts and Nevis, and St. Vincent and the Grenadines.
[14] https://caricom.org/jsp/community/cota/general_assembly/18cota-surveyontaxsystems.pdf

**Table 6. Dependence on Import Duties for Selected CARICOM Countries, 2000–12**

| | % in current revenues | % in tax revenues | % in GDP |
|---|---|---|---|
| **Selected CARICOM countries[a]** | | | |
| Dominica | 14.74 | 16.69 | 3.75 |
| Grenada | 21.21 | 22.84 | 4.23 |
| Jamaica | 6.42 | 7.77 | 2.03 |
| St. Kitts and Nevis | 16.38 | 22.49 | 4.45 |
| St. Lucia | 21.58 | 21.58 | 5.08 |
| St. Vincent and the Grenadines | 9.44 | 10.51 | 2.30 |
| Trinidad and Tobago | 4.89 | 5.89 | 1.47 |
| **Other developing countries and the United States** | | | |
| Bolivia | 3.88 | 5.41 | 0.81 |
| Brazil | 2.38 | 3.59 | 0.55 |
| Colombia | 3.93 | 6.93 | 0.88 |
| Costa Rica | 3.17 | 5.48 | 0.78 |
| Dominican Republic | 8.43 | 9.32 | 1.30 |
| El Salvador | 5.32 | 7.38 | 0.93 |
| Guatemala | 9.16 | 9.64 | 1.08 |
| Honduras | 4.93 | 6.98 | 1.04 |
| Peru | 4.40 | 5.80 | 0.77 |
| Paraguay | 7.38 | 12.75 | 1.43 |
| United States | 1.11 | 1.90 | 0.19 |
| Uruguay | 4.00 | 6.06 | 1.09 |

*Source:* Calculations based on World Development Indicators 2014.
[a] Data for other CARICOM members are not available.

Tariff revenues as a share in tax revenues and current revenues averaged almost 20 percent for OECS members with the highest being observed for St. Lucia at 21.58 percent. In addition, CARICOM countries have a higher level of tariff revenue dependence compared with other developing countries in Latin and Central America. In this regard, the removal of tariffs on imports can have adverse implications on CARICOM countries, particularly, the OECS members.

**Revenue Effects of Full Liberalization of Tariff on EU and Canada Imports**

Table 7 reports the revenue effects associated with the full liberalization of tariffs on Canadian imports only, EU imports only, and Canadian and EU imports only. The four CARICOM countries expected to experience the most losses in actual dollars from liberalizing tariffs on Canadian imports are Trinidad and Tobago (US$429 million), Jamaica (US$411.4 million), and The Bahamas (US$199.9 million). The revenue losses from the simultaneous removal of tariffs on imports from the European Union and Canada are obviously higher. Although the tariff revenue losses are higher than the two previous FTA experiments, they are not significantly different, especially for the listed OECS countries. The percentage decline in tariff revenues from liberalizing tariffs on Canadian imports ranges from 51.4 percent for Trinidad and Tobago to 72.7 percent for St. Kitts and Nevis. The findings from the three FTA scenarios indicate the smaller economies (Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines) are likely to experience a higher percentage decline on tariff revenues than the larger CARICOM countries (see Table 7). The fall in tariff revenues from liberalizing tariffs on EU imports only revealed similar results.

The loss in tariff revenues would present a greater challenge for the smaller economies since they have a higher dependence on tariff revenues as a source of their total revenues compared with the larger CARICOM countries.

**Table 7. Revenue Effects Associated With Various Trade Agreements**

| | Change in Revenue (US$mn) | | | | | |
|---|---|---|---|---|---|---|
| | **Canada (1998)** | **Canada (2008)** | **European Union (1998)** | **European Union (2008)** | **Canada and European Union (1998)** | **Canada and European Union (2008)** |
| The Bahamas | –132.06 | –196.93 | –133.21 | –197.82 | –134.77 | –198.16 |
| Belize | –18.63 | –36.84 | –19.36 | –37.58 | –19.60 | –37.80 |
| Barbados | –64.42 | –88.65 | –67.50 | -94.85 | –69.18 | -95.25 |
| Dominica | –7.44 | –11.19 | –8.08 | –11.82 | –8.17 | –11.95 |
| Grenada | –10.77 | –18.89 | –11.54 | –19.98 | –11.75 | –20.28 |
| Guyana | –24.43 | –51.42 | –27.38 | –57.72 | –26.96 | –55.36 |
| Jamaica | –228.91 | –411.42 | –234.99 | –428.74 | –237.90 | –427.85 |
| St. Kitts and Nevis | -9.19 | –23.39 | -9.58 | –23.91 | -9.79 | –24.07 |
| St. Lucia | –21.33 | –39.62 | –22.35 | –41.08 | –23.38 | –41.35 |
| St. Vincent and the Grenadines | –8.82 | –18.81 | –10.12 | –20.42 | –10.30 | –20.66 |
| Trinidad and Tobago | –132.63 | –429.04 | –144.33 | –461.89 | –147.07 | –467.14 |
| | **Percentage change in revenue decline** | | | | | |
| The Bahamas | –69.28 | –61.87 | –69.9 | –62.14 | –70.70 | –62.26 |
| Belize | –65.38 | –59.98 | –68.0 | –61.16 | –68.78 | –61.53 |
| Barbados | –74.47 | –71.28 | –78.1 | –73.77 | –79.97 | –76.58 |
| Dominica | –69.47 | –68.17 | –75.1 | –71.74 | –76.31 | –72.83 |
| Grenada | –69.39 | –67.35 | –74.4 | –71.07 | –75.71 | –72.31 |
| Guyana | –65.60 | –59.49 | –71.6 | –61.28 | –72.40 | –64.06 |
| Jamaica | –74.71 | –60.93 | –76.7 | –63.08 | –77.64 | –63.37 |
| St. Kitts and Nevis | –69.19 | –72.72 | –73.0 | –74.13 | –73.74 | –74.84 |
| St. Lucia | –71.89 | –72.06 | –76.8 | –74.57 | –78.78 | –75.19 |
| St. Vincent and the Grenadines | –62.75 | –66.27 | –72.0 | –71.84 | –73.31 | –72.76 |
| Trinidad and Tobago | –57.22 | –51.40 | –61.8 | –55.28 | –63.45 | –55.97 |

*Source*: Calculations based on UN Comtrade (2012) and Greenaway and Milner (2006) for 1998 values for European Union only.

### 4.7.1 Effect of Revenue Decline on the Macroeconomy

The effect of a decline in tariffs on tax revenues is expected to be largest for the least developed countries in the CARICOM region. For example, St. Kitts and Nevis and St. Lucia are likely to experience a decline in tax revenue of about 15 percent (see Table 8). Therefore, although the larger economies in the CARICOM are expected to experience larger tariff revenues losses in actual dollars, the smaller economies are expected to experience more adverse effects on their macroeconomy.

**Table 8. Effect of Revenue Decline on Tax Revenues and GDP**

| | Canada (2008) | | European Union (2008) | | Canada and European Union (2008) | |
|---|---|---|---|---|---|---|
| | Tax Revenue (%) | GDP (%) | Tax Revenue (%) | GDP (%) | Tax Revenue (%) | GDP (%) |
| Dominica | -9.86 | –2.42 | –10.41 | –2.56 | –10.53 | –2.59 |
| Grenada | –11.77 | –2.27 | –12.46 | –2.40 | –12.64 | –2.44 |
| Jamaica | –11.55 | –3.15 | –12.04 | –3.28 | –12.01 | –3.28 |
| St. Kitts and Nevis | –15.03 | –3.16 | –15.36 | –3.23 | –15.47 | –3.26 |
| St. Lucia | –14.79 | –3.38 | –15.33 | –3.50 | –15.43 | –3.52 |
| St. Vincent and the Grenadines | –11.36 | –2.69 | –12.33 | –2.92 | –12.47 | –2.96 |
| Trinidad and Tobago | –5.20 | –1.53 | –5.60 | –1.65 | –5.66 | –1.67 |

*Source*: Calculations based on UN Comtrade (2012) and World Development Indicators (2012).

### Welfare Effects of Full Liberalization of Tariffs on EU and Canada Imports Only

This part compares the welfare effects of full liberalization of tariffs on EU imports only, Canadian imports only and EU and Canadian imports only. The decline in welfare for CARICOM countries caused by the full liberalization of tariffs on EU imports is recorded in Table 9. The Bahamas, Jamaica, and Trinidad and Tobago are the three CARICOM countries expected to be the most affected, while Dominica and St. Vincent and the Grenadines recorded the least negative effects using 1998 data. For 2008, Trinidad and Tobago and Jamaica again stand out as the countries that are expected to experience major declines in welfare. In comparison, the fall in welfare for CARICOM countries associated the full liberalization of tariffs on Canada imports is slightly lower than the fall in welfare associated with the full liberalization of tariffs on European Union imports for each of the listed CARICOM member states (see Table 9). The welfare loss for most CARICOM countries on account of liberalizing tariffs on EU and Canadian

imports are not significantly different from the welfare loss associated with liberalizing tariffs on EU imports.

**Table 9. Welfare Effects of Various Trade Agreements**

| | Change in Welfare (US$mn) | | | | | |
|---|---|---|---|---|---|---|
| | **Canada (1998)** | **Canada (2008)** | **European Union (1998)** | **European Union (2008)** | **Canada and European Union (1998)** | **Canada and European Union (2008)** |
| The Bahamas | –89.66 | –146.25 | -90.64 | –146.89 | -91.87 | –147.17 |
| Belize | –12.89 | –24.68 | –16.10 | –25.22 | –13.65 | –25.42 |
| Barbados | –32.12 | –50.56 | –48.73 | –55.83 | –36.16 | –56.12 |
| Dominica | –5.38 | –7.73 | –5.54 | –8.23 | –5.94 | –8.33 |
| Grenada | –7.60 | –13.99 | –8.08 | –14.91 | –8.37 | –15.11 |
| Guyana | –15.23 | –36.97 | –18.03 | –42.21 | –17.32 | –40.28 |
| Jamaica | –126.30 | –303.44 | –203.61 | –313.67 | –133.01 | –315.81 |
| St. Kitts and Nevis | –6.87 | –17.89 | –7.54 | –18.26 | –7.34 | –18.38 |
| St. Lucia | –14.79 | –24.90 | –15.78 | –26.10 | –16.40 | –26.27 |
| St. Vincent and the Grenadines | –6.79 | –13.46 | –6.05 | –14.76 | –7.99 | –14.92 |
| Trinidad and Tobago | –103.61 | –359.63 | –108.37 | –387.55 | –115.78 | –392.00 |

*Source*: Calculations based on UN Comtrade (2012) and Greenaway and Milner (2006) for 1998 values for European Union only.

### 4.8.1 Impact of Welfare Decline on the Macroeconomy

Table 10 shows that the macroeconomies of the OECS countries are likely to be affected the most by a decline in welfare from the CARICOM-Canada FTA.

**Table 10. Impact of Welfare Decline on GDP (%)**

| | Canada (2008) | European Union (2008) | Canada and European Union (2008) |
|---|---|---|---|
| Dominica | –1.67 | –1.78 | –1.80 |
| Grenada | –1.68 | –1.79 | –1.82 |
| Jamaica | –2.32 | –2.40 | –2.42 |
| St. Kitts and Nevis | –2.42 | –2.47 | –2.49 |
| St. Lucia | –2.12 | –2.22 | –2.24 |
| St. Vincent and the Grenadines | –1.93 | –2.11 | –2.14 |
| Trinidad and Tobago | –1.28 | –1.38 | –1.40 |

*Source*: Calculations based on UN Comtrade and World Development Indicators 2012.

## 5. Conclusion and Policy Implications

The results obtained from the partial equilibrium model show that while there is likely to be some trade creation from the CARICOM–Canada FTA, the overall revenue and welfare effects from a static perspective will be unfavourable for CARICOM countries. The extent of the trade creation effects varies considerably among CARICOM countries with the major beneficiaries being members of the MDCs, namely, Trinidad and Tobago and Jamaica. Together, Trinidad and Tobago and Jamaica account for approximately 72 percent of the estimated trade creation from the CARICOM–Canada FTA. The countries expected to least benefit from trade creation are those that belong to the OECS. Comparing trade creation obtained from liberalizing imports from the European Union, the trade creation on existing Canadian imports is significantly lower.

The effect of liberalizing tariffs on imports from Canada is expected to have a greater adverse revenue effect on members of the OECS, as they are more dependent on trade taxes as a source of fiscal revenue than Trinidad and Tobago and Jamaica. All CARICOM member states experience losses in welfare in each of the three experiments.

The room for increased exports from CARICOM countries and Canada also appears to be weak given the results of the revealed comparative advantage index, the transition matrices and the trade complementarity test. In particular, the number of commodities in which the listed CARICOM countries have comparative advantage with Canada dwindles away over the time

period for the most part. Furthermore, the inability of at least three of the listed CARICOM countries to maintain strong comparative advantage in relation to Canada over time as well as the lack of trade complementarity between CARICOM countries and Canada does not offer encouraging signs for enhancing merchandise trade.

The findings of the partial equilibrium model, the evolution of comparative advantage and trade complementarity presented in this paper do not provide evidence to suggest that an FTA between CARICOM and Canada will yield considerable positive benefits for CARICOM countries, especially from a merchandise trade perspective. In this regard, the negotiations of the FTA should take a cautious route so as to mitigate the direct and indirect negative effects on CARICOM countries. The CARICOM would need to identify vulnerable product lines that would need provisional protection from the liberalization of tariffs on Canadian imports. The continued protection of such industries would be of significant importance for the region.

Furthermore, a serious look at trade in services may provide a more positive outlook on the FTA. Notably, trade in services is not currently covered by the CARIBCAN trade arrangement. Importantly however, the services sector is the largest and contributes the most to GDP for most of the CARICOM economies. Chaitoo (2009, 2013) noted that the services sector in CARICOM has the potential to account for the largest new benefits from the CARICOM–Canada FTA. However, Girvan (2009) warned that even the prospective benefits from trade in services may be minimal as the services exports that originate from the region presently do not necessarily require an FTA to thrive in the Canadian economy.

Moreover, as the FTA provides greater market access, the negotiations should focus on mechanisms that would assist CARICOM countries to take advantage of the opportunities in the Canadian market. Negotiations from a CARICOM outlook should also place emphasis on Aid for Trade and public-private partnerships among other mechanisms through which greater trade can be nurtured in the FTA.

## References


Anderson, David F. 2011. "Discrete Time Markov Chains." Accessed September 17, 2013. http://www.mi.parisdescartes.fr/~glaunes/MasterBME/StochBioChapter3.pdf

Armington, Paul S. 1969. "A Theory of Demand for Products Distinguished by Place of Production." *International Monetary Fund Staff Paper* 16 (1): 159–76.

Arora, Vivek, and Athanasios Vamvakidis. 2004. "The Impact of U.S. Economic Growth on the Rest of the World: How Much Does It Matter?" *Journal of Economic Integration* 21 (1): 21–39.

Balassa, Bela. 1965. "Trade Liberalization and Revealed Comparative Advantage." *Manchester School of Economic and Social Studies* 33 (2): 99–123.

Bartholomew, David J. 1973. *Stochastic Models for Social Processes*. 2nd ed. London, England: Wiley.

Behar, Alberto, and Laia Crivillé C. 2010. "The impact of North-South and South-South trade agreements on bilateral trade." Working Paper 30, Centre for the Study of African Economies, University of Oxford, United Kingdom.

Bojnec, Štefan, and Imre Ferto. 2006. "Comparative Advantages and Competitiveness of Hungarian and Slovenian Agro-Food Trade in the EU Markets." Paper presented at the 98th European Association of Agricultural Economists Seminar, Chania, Crete, Greece. June 29 to July 2, 2006.

Brasili, Andrea, Paolo Epifani, and Rodolfo Helg. 2000. "On the Dynamics of Trade Patterns." *De Economist* 148 (2): 233–57.

Busse, Matthias, and Rasul Shams. 2005. "Trade Effects of the East African Community." *The Estey Center Journal of International Law and Trade Policy* 6 (1): 62–83.

Busse, Matthias, and Simon Luehje. 2007. "Should the Caribbean Countries Sign an Economic Partnership Agreement with the EU? Challenges and Strategic Options." *Journal of Economic Integration* 22 (3): 598–618.

Busse, Matthias, Axel Borrmann, and Harald GroBmann. 2004. "The Impact of ACP/EU Economic Partnership Agreements on ECOWAS Countries: An Empirical Analysis of the Trade and Budget Effects." Hamburg Institute of International Economics, Hamburg, Germany.

Cernat, Lucian. 2003. "Assessing South- South Regional Integration: Same Issues, Many Metrics." Policy Issues in International Trade and Commodities Series 21. United Nations Conference on Trade and Development, Geneva, Switzerland.

Chaitoo, Ramesh. 2008. “Canada and the Caribbean Community: Prospects for an Enhanced Trade Arrangement.” *Canadian Foreign Policy Journal* 14 (3): 47–64.

Chaitoo, Ramesh. 2013. “Time to Rethink and Re-Energize Canada-CARICOM Relations” *Caribbean Journal of International Relations & Diplomac*y 1 (1): 39–67.

Coe, David T., and Alexander W. Hoffmaister. 1999. “Are There International R&D Spillovers Among Randomly Matched Trade Partners? A Response to Keller.” Working Paper 99/18, International Monetary Fund, Washington, DC.

El-Agraa, Ali M. 1999. *Regional Integration: Experience, Theory, and Measurement*. London, England: Macmillan Press.

Fertő, Imre, and Lionel J. Hubbard. 2003. “Revealed Comparative Advantage and Competitiveness in Hungarian Agri–Food Sectors.” *The World Economy* 26 (2): 247–59.

Fontagne, Lionel, David Laborde, and Cristina Mitaritonna. 2011. “An Impact Study of the EU-ACP Economic Partnership Agreements (EPAs) in the Six ACP Regions.” *Journal of African Economies* 20 (2): 179–216.

Gallaway, Michael P., Christine A. McDaniel, and Sandra A. Rivera. 2003. Short-run and long-run industry-level estimates of U.S. Armington elasticities. *The North American Journal of Economics and Finance* 14: 49–68.

Gasiorek, Michael, and Alan L. Winters. 2004. “What Role for the EPAs in the Caribbean.” *The World Economy*, 27 (9): 1336–62.

Girvan, Norman. 2009. *The Caricom-Canada FTA: What’s the Hurry?* Accessed April 3, 2013. http://www.normangirvan.info/wp-content/uploads/2009/03/the-caricom-canada-fta-whats-the-hurry.pdf

Greenaway, David, and Chris Milner. 2006. “EU Preferential Trading Arrangements with the Caribbean: A Grim Regional Economic Partnership Agreements? *Journal of Economic Integration* 21 (4): 657–80.

Grossman, Gene M., and Elhanan Helpman. 1991. *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.

Hertel, Thomas W., Kent D. Lanclos, Kenneth R. Pearson, and Padma V. Swaminathan. 1997. “Aggregation and Computation of Equilibrium Elasticities.” In *Global Trade Analysis: Modeling and Applications*, edited by Thomas W. Hertel, 149–63. Cambridge, England: Cambridge University Press.

Hinloopen, Jeroen, and Charles van Marrewijk. 2001. “On the Empirical Distribution of the Balassa Index.” *Weltwirtschaftliches Archiv* 137 (1): 1–35.

Hinloopen, Jeroen, and Charles van Marrewijk. 2004. “Dynamics of Chinese Comparative Advantage.” Working Paper 034/2, Tinbergen Institute, Amsterdam.

Hosein, Roger. 2008. “CARIFORUM-EU Economic Partnership Agreement: The Welfare Impact and Implications for Policy in Trinidad and Tobago.” *Journal of Business, Finance and Economics in Emerging Economies* 3 (1): 217–48.

Hunter, Jeffrey J. 2012. “Markov chain properties in terms of column sums of the transition matrix.” *Actaet Commentationes Universitatis Tartuensis de Mathematica* 16 (1): 33–51.

Karingi, Stephen, Remi Lang, Nassim Oulmane, Romain Perez, Mustapha S. Jallab, and Hakim B. Hammouda. 2005. “Economic and Welfare Impacts of the EU-Africa Economic Partnership Agreements.” Working Paper 10, United Nations Economic Commission for Africa, Addis Ababa.

Kee, Hiau L., Alessandro Nicita, and Marcelo Olarreaga. 2004. “Import Demand and Export Supply Elasticities.” Policy Research Working Paper 3452, World Bank, Washington, DC.

Kemal, Abdul R. 2004. “Exploring Pakistan’s Regional Economic Cooperation Potential.” *The Pakistan Development Review* 43 (4): 313–34.

Khadan, Jeetendra. 2014. “Will CARICOM's Real Natural Trading Partner Please Stand Up?” PhD Thesis. The University of the West Indies, St. Augustine, Trinidad.

Khadan, Jeetendra, and Roger Hosein. 2013. “New Empirical Insights into the “Natural Trading Partner” Hypothesis for CARICOM Countries,” MPRA Paper 50493, University Library of Munich, Germany.

Lang, Remi. 2006. “A Partial Equilibrium Analysis of the Impact of the ECOWAS-EU Economic Partnership Agreement.” Paper presented at the 9th Annual Conference on Global Economic Analysis: Multilateralism, Bilateralism, and Development, Addis Ababa June 2006.

Mayda Anna M., and Chad Steinberg. 2007. “Do South-South Trade Agreements Increase Trade? Commodity-Level Evidence from COMESA.” Working Paper 40, International Monetary Fund, Washington, DC.

McKay, Andrew, Chris Milner, and Oliver Morrissey. 2000. “The Trade and Welfare Effects of a Regional Economic Partnership Agreement.” Research Paper 08, University of Nottingham, United Kingdom.

Michaely, Michael. 1996. “Trade Preferential Agreements in Latin America: An Ex-Ante Assessment.” Policy Research Working Paper 1583, World Bank, Washington DC.

Nicholls, Shelton, Janice Christopher-Nicholls, and Philip Colthrust. 2001. “Evaluating the Fiscal Impact of a Regional Economic Partnership Agreement (REPA) between the European Union and CARICOM.” Paper presented at GLM Workshop, University of Nottingham, United Kingdom, March 5, 2001.

Pitigala, Nihal. 2005. “What Does Regional Trade in South Asia Reveal about Future Trade Integration? Some Empirical Evidence.” Working Paper 3497, World Bank Policy Research, World Bank, Washington, DC.

Proudman, James, and Stephen Redding. 2000. “Evolving Patterns of International Trade.” *Review of International Economics* 8 (3): 373–96.

Bernal, L. Richard. 2013. *Globalization, Trade, and Economic Development: The CARIFORUM-EU Economic Partnership Agreement.* New York: Palgrave Macmillan.

Sawyer, Charles, and Richard L. Sprinkle. 1999. *The Demand for Imports and Exports in the World Economy*. Aldershot, England: Ashgate.

Schiff, Maurice, and Alan L. Winters. 2003. *Regional Integration and Development*. Oxford, England: Oxford University Press.

Schiff, Maurice, and Yanling Wang. 2003. “NAFTA, Technology Diffusion and Productivity in Mexico.” *The Latin American Journal of Economics* 40 (121): 469–76.

Schiff, Maurice. 1997. “Small is Beautiful: Preferential Trade Agreements and the Impact of Country Size, Market Share, and Smuggling.” *Journal of Economic Integration* 12 (3): 359–87.

Schiff, Maurice. 2001. “Will the Real ‘Natural Trading Partner’ Please Stand Up?” *Journal of Economic Integration* 16 (2): 245–61.

Shorrocks, Anthony F. 1978. “The measurement of mobility.” *Econometrica* 46 (5): 1013–24.

Sinanan, Damie, and Roger Hosein. 2012. “Transition Probability Matrices and Revealed Comparative Advantage Persistence in a Small Hydrocarbon-based Economy.” *The West Indian Journal of Engineering* 34 (1/2): 16–29.

Sommers, Paul M., and John Conlisk. 1979. “Eigenvalue Immobility Measures for Markov Chains.” *Journal of Mathematical Sociology* 6 (2): 253–76.

Stern, Robert M., Jonathan Francis, and Bruce Schumacher. 1976. *Price Elasticities in International Trade: An Annotated Bibliography.* London: Macmillan Press LTD.

Vamvakidis, Athanasios. 1998. “Regional Integration and Economic Growth?” *World Bank Economic Review* 12 (2): 251–70.

World Trade Organization. 2013. “CARIBCAN: Request for Extension of Waiver.” World Trade Organization, Geneva, Switzerland.

World Trade Organization. 2015. “CARIBCAN: Request for Extension of Waiver.” World Trade Organization, Geneva, Switzerland.

Yeats, Alexander. 1998. “Does Mercosur’s Trade Performance Raise Concerns about the Effects of Regional Trade Arrangements?” *World Bank Economic Review* 12 (1): 1–28.

Zouhon-Bi, Simplice G., and Lynge Nielsen. 2007. “ECOWAS – Fiscal Revenue Implications of the Prospective Economic Partnership Agreement with the EU.” Working Paper 103, World Bank, Washington, DC.

## APPENDIX

**Table A1. CARICOM Countries Trade With Canada, 2008–10**

| CARICOM countries exports to Canada, US$mn | | | |
|---|---|---|---|
| | **2008** | **2009** | **2010** |
| Antigua and Barbuda | 0.00 | 0.11 | 0.30 |
| Bahamas | 32.67 | 22.64 | 15.19 |
| Belize | 1.13 | 1.12 | 0.62 |
| Barbados | 9.19 | 9.66 | 7.61 |
| Dominica | 0.06 | 0.06 | - |
| Grenada | 0.89 | - | 0.00 |
| Guyana | 215.12 | 267.30 | 356.26 |
| Jamaica | 257.52 | 125.52 | 162.02 |
| St. Kitts and Nevis | 0.00 | 0.00 | 0.04 |
| St. Lucia | 0.38 | 0.00 | 0.00 |
| St. Vincent and the Grenadines | 0.06 | 0.04 | 0.04 |
| Suriname | 251.24 | 375.79 | 577.42 |
| Trinidad and Tobago | 192.03 | 61.18 | 175.53 |
| Total | 960.29 | 863.41 | 1295.03 |
| **CARICOM countries imports from Canada, US$mn** | | | |
| Antigua and Barbuda | 0.00 | 9.26 | 7.36 |
| Bahamas | 11.44 | 14.03 | 16.03 |
| Belize | 7.05 | 6.11 | 5.46 |
| Barbados | 58.48 | 50.95 | 52.66 |
| Dominica | 6.31 | 4.03 | 4.20 |
| Grenada | 10.06 | 7.18 | 0.00 |
| Guyana | 18.05 | 26.00 | 44.64 |
| Jamaica | 131.58 | 106.67 | 91.72 |
| St. Kitts and Nevis | 6.74 | 4.85 | 5.47 |
| St. Lucia | 11.86 | 0.00 | 0.00 |
| St. Vincent and the Grenadines | 7.89 | 6.85 | 19.12 |
| Suriname | 7.11 | 47.77 | 11.85 |
| Trinidad and Tobago | 260.69 | 149.00 | 183.98 |
| Total | 537.27 | 432.68 | 442.49 |

*Source*: World Integrated Trade System 2013.

**Table A2. Data Sources**

| Variable | Description | Source |
|---|---|---|
| | **Partial equilibrium model** | |
| Imports | Value of imports for each of the selected CARICOM member states at the SITC two-digit level (revision 3). | UN Comtrade database. http://comtrade.un.org/db/ |
| Elasticities | Import demand elasticities and elasticities of substitution between preferred and nonpreferred trading partners. | Greenaway and Milner (2006) |
| Tariff | Extra regional tariff (%) | Greenaway and Milner (2006) |
| | **Trade indices** | |
| Trade complementarity index | Value of exports to the various destinations in US$mn. | UN Comtrade database. http://comtrade.un.org/db |
| RCA index | Value of exports to the various destinations in US$mn. | UN Comtrade database. http://comtrade.un.org/db |

*Note:* RCA = revealed comparative advantage.

**Table A3. Intertemporal Changes in The Bahamas RCA With Canada**

| SITC | Description | 2000–2002 | 2008–2010 |
|---|---|---|---|
| | **Sectors that lost comparative advantage (7)** | | |
| 112 | Alcoholic beverages | 13.89 | 0.00 |
| 516 | Organic chemicals, n.e.s. | 1.64 | 0.00 |
| 523 | Metallic salts and peroxysalts of inorganic acids | 1.01 | 0.00 |
| 597 | Prepared additives for mineral oils; liquids for hydraulic transmissions; antifreezes and de-icing fluids; lubricating preparations | 3.92 | 0.00 |
| 635 | Wood manufactures, n.e.s. | 1.44 | 0.00 |
| 792 | Aircraft and associated equipment; spacecraft (including satellites) and spacecraft launch vehicles; and parts thereof | 2.41 | 0.55 |
| 896 | Works of art, collectors' pieces and antiques | 3.81 | 0.02 |
| | **Sectors that gained comparative advantage (5)** | | |
| 282 | Ferrous waste and scrap; remelting ingots of iron or steel | 0.00 | 53.79 |
| 515 | Organic-inorganic compounds, heterocyclic compounds, nucleic acids and their salts | 0.14 | 158.26 |
| 676 | Iron and steel bars, rods, angles, shapes and sections, including sheet piling | 0.00 | 1.13 |
| 699 | Manufactures of base metal, n.e.s. | 0.08 | 1.17 |
| 749 | Nonelectric parts and accessories of machinery, n.e.s. | 0.00 | 2.12 |
| | **Sectors that retained comparative advantage (5)** | | |
| 036 | Fish, dried, slated or in brine; smoked fish (whether or not cooked before or during the smoking process); flours, meals and pellets or fish, fit for human consumption | 353.53 | 32.90 |
| 269 | Worn clothing and other worn textile articles; rags | 171.45 | 52.39 |
| 278 | Crude minerals, n.e.s. | 43.29 | 4.02 |
| 291 | Crude animal materials, n.e.s. | 15.14 | 4.17 |
| 553 | Perfumery, cosmetics, or toilet preparations, excluding soaps | 9.54 | 3.61 |

*Note:* RCA = revealed comparative advantage, n.e.s. = not elsewhere specified.
*Source*: Calculations based on UN Comtrade 2012.

**Table A4. Intertemporal Changes in Barbados' RCA With Canada**

| SITC | Description | 2000–02 | 2008–10 |
|---|---|---|---|
| | **Sectors that lost comparative advantage (15)** | | |
| 881 | Photographic apparatus and equipment, n.e.s. | 61.72 | 0.38 |
| 098 | Edible products and preparations, n.e.s. | 15.78 | 0.28 |
| 883 | Cinematographic film, exposed and developed, whether or not incorporating sound track or consisting only of sound track. | 13.08 | 0.00 |
| 091 | Margarine and shortening. | 12.75 | 0.16 |
| 111 | Nonalcoholic beverages, n.e.s. | 11.87 | 0.66 |
| 695 | Tools for use in the hand or in machines. | 8.71 | 0.74 |
| 813 | Lighting fixtures and fittings, n.e.s. | 7.40 | 0.01 |
| 884 | Optical goods, n.e.s. | 4.42 | 0.09 |
| 054 | Vegetables, fresh, chilled, frozen or simply preserved; roots, tubers, and other edible vegetable products, n.e.s., fresh or dried | 2.71 | 0.01 |
| 696 | Manufactures of base metal, n.e.s. | 2.60 | 0.00 |
| 511 | Hydrocarbons, n.e.s. and their halogenated, sulfonated, nitrated or nitrosated derivatives | 1.59 | 0.00 |
| 581 | tubes, pipes and hoses of plastics | 1.55 | 0.00 |
| 764 | Telecommunications equipment, n.e.s.; and parts, n.e.s., and accessories of apparatus falling within telecommunications | 1.26 | 0.09 |
| 057 | Fruit and nuts (not including oil nuts), fresh or dried | 1.23 | 0.02 |
| 723 | Civil engineering and contractors' plant and equipment | 1.09 | 0.00 |
| | **Sectors that gained comparative advantage (13)** | | |
| 897 | Jewellery, goldsmiths' and silversmiths' wares, and other articles of precious or semiprecious materials, n.e.s. | 0.53 | 6.74 |
| 727 | Food-processing machines (excluding domestic) | 0.21 | 1.46 |
| 658 | Made-up articles, wholly or chiefly of textile materials, n.e.s. | 0.18 | 1.13 |
| 699 | Manufactures of base metal, n.e.s. | 0.02 | 10.12 |
| 899 | Miscellaneous manufactured articles, n.e.s. | 0.02 | 5.86 |
| 885 | Watches and clocks | 0.02 | 8.21 |
| 848 | Articles of apparel and clothing accessories of other than textile fabrics; headgear of all materials | 0.02 | 1.74 |
| 841 | Men's or boys' coats, jackets, suits, trousers, shirts, underwear of woven textile fabrics (except swimwear and coated or laminated apparel) | 0.00 | 1.17 |
| 831 | Trunks, suitcases, vanity cases, binocular and camera cases, handbags, wallets of leather; travel sets for personal toilet, sewing | 0.00 | 2.04 |
| 291 | Crude animal materials, n.e.s. | 0.00 | 47.42 |
| 612 | Manufactures of leather or composition leather, n.e.s.; saddlery and harness | 0.00 | 101.28 |
| 282 | Ferrous waste and scrap; remelting ingots of iron or steel | 0.00 | 38.15 |
| 525 | Radioactive and associated materials | 0.00 | 8.68 |
| 061 | Sugars, molasses, and honey | 0.00 | 1.34 |
| | **Sectors that retained comparative advantage (8)** | | |
| 112 | Alcoholic beverages | 97.56 | 84.46 |
| 001 | Live animals other than animals of division 03 | 21.72 | 2.88 |
| 896 | Works of art, collectors' pieces and antiques | 5.31 | 1.82 |
| 034 | Fish, fresh (live or dead), chilled or frozen | 3.63 | 2.33 |
| 292 | Crude vegetable materials, n.e.s. | 3.03 | 2.07 |
| 893 | Articles, n.e.s. of plastics | 2.58 | 1.60 |
| 792 | Aircraft and associated equipment; spacecraft (including satellites) and spacecraft launch vehicles; and parts thereof | 2.17 | 2.17 |
| 048 | Cereal preparations and preparations of flour or starch of fruits or vegetables | 1.86 | 1.51 |

*Note:* RCA = revealed comparative advantage, n.e.s. = not elsewhere specified.
*Source*: Calculations based on UN Comtrade 2012.

**Table A5. Intertemporal Changes in Guyana's RCA With Canada**

| SITC | Description | 2000–02 | 2008–10 |
|---|---|---|---|
| | **Sectors that lost comparative advantage (2)** | | |
| 034 | Fish, fresh (live or dead), chilled or frozen | 3.83 | 0.69 |
| 843 | Men's or boys' coats, capes, jackets, suits, blazers, trousers, shirts (except swimwear or coated apparel), knitted or crocheted textile fabric | 1.32 | 0.00 |
| | **Sectors that gained comparative advantage (5)** | | |
| 282 | Ferrous waste and scrap; remelting ingots of iron or steel | 0.00 | 53.79 |
| 515 | Organic-inorganic compounds, heterocyclic compounds, nucleic acids and their salts | 0.14 | 158.26 |
| 676 | Iron and steel bars, rods, angles, shapes and sections, including sheet piling | 0.00 | 1.13 |
| 699 | Manufactures of base metal, n.e.s. | 0.08 | 1.17 |
| 749 | Nonelectric parts and accessories of machinery, n.e.s. | 0.00 | 2.12 |
| | **Sectors that retained comparative advantage (1)** | | |
| 285 | Aluminium ores and concentrates (including alumina) | 10.86 | 1.44 |

*Note:* RCA = revealed comparative advantage.
*Source:* Calculations based on UN Comtrade 2012.

**Table A6. Intertemporal Changes in Jamaica's RCA With Canada**

| SITC | Description | 2000–02 | 2008–10 |
|---|---|---|---|
| | **Sectors that lost comparative advantage (4)** | | |
| 056 | Vegetables, roots and tubers, prepared or preserved, n.e.s. | 1.11 | 0.22 |
| 074 | Tea and mate | 1.01 | 0.53 |
| 111 | Nonalcoholic beverages, n.e.s. | 1.17 | 0.49 |
| 551 | Essential oils, perfume and flavor materials | 1.29 | 0.39 |
| | **Sectors that gained comparative advantage (3)** | | |
| 045 | Cereals, unmilled (other than wheat, rice, barley and maize) | 0.00 | 1.78 |
| 057 | Fruit and nuts (not including oil nuts), fresh or dried | 0.79 | 1.00 |
| 282 | Ferrous waste and scrap; remelting ingots of iron or steel | 0.03 | 9.23 |
| | **Sectors that retained comparative advantage (8)** | | |
| 024 | Cheese and curd | 2.25 | 1.39 |
| 048 | Cereal preparations and preparations of flour or starch of fruits or vegetables | 1.58 | 1.04 |
| 054 | Vegetables, fresh, chilled, frozen or simply preserved; roots, tubers and other edible vegetable products, n.e.s., fresh or dried | 5.06 | 3.70 |
| 058 | Fruit preserved, and fruit preparations (excluding fruit juices) | 13.52 | 7.14 |
| 075 | Spices | 8.85 | 5.22 |
| 098 | Edible products and preparations, n.e.s. | 2.06 | 1.17 |
| 112 | Alcoholic beverages | 5.90 | 9.97 |
| 285 | Aluminium ores and concentrates (including alumina) | 426.68 | 285.73 |

*Note:* RCA = revealed comparative advantage, n.e.s. = not elsewhere specified.
*Source*: Calculations based on UN Comtrade 2012.

## Table A7. Intertemporal Changes in St. Vincent and the Grenadines RCA With Canada

| SITC | Description | 2000–02 | 2008–10 |
|---|---|---|---|
| | **Sectors that lost comparative advantage (10)** | | |
| 635 | Wood manufactures, n.e.s. | 9.84 | 0.33 |
| 759 | Parts and accessories suitable for use solely or principally with office machines or automatic data processing machines | 2.93 | 0.14 |
| 898 | Musical instruments, parts and accessories thereof; records, tapes, and other sound or similar recordings (excluding photographic film) | 1.17 | 0.01 |
| 022 | Milk and cream and milk products other than butter or cheese | 66.71 | 0.00 |
| 579 | Waste, parings and scrap, of plastics | 26.79 | 0.00 |
| 112 | Alcoholic beverages | 8.75 | 0.00 |
| 034 | Fish, fresh (live or dead), chilled, or frozen | 3.49 | 0.00 |
| 036 | Crustaceans molluscs, aquatic invertebrates fresh (live/dead) crustaceans | 2.91 | 0.00 |
| 659 | Floor coverings | 1.40 | 0.00 |
| 774 | Electrodiagnostic apparatus for medical, surgical, dental, or veterinary sciences and radiological apparatus | 1.11 | 0.00 |
| | **Sectors that gained comparative advantage (15)** | | |
| 883 | Cinematographic film, exposed and developed, whether or not incorporating sound track or consisting only of sound track | 0.00 | 438.62 |
| 881 | Photographic apparatus and equipment, n.e.s. | 0.00 | 61.06 |
| 001 | Live animals other than animals of division 03 | 0.00 | 23.44 |
| 273 | Stone, sand, and gravel | 0.00 | 13.54 |
| 282 | Ferrous waste and scrap; remelting ingots of iron or steel | 0.00 | 8.78 |
| 288 | Nonferrous base metal waste and scrap, n.e.s. | 0.00 | 2.72 |
| 657 | Special yarns, special textile fabrics and related products | 0.00 | 1.79 |
| 763 | Sound recorders or reproducers; television image and sound recorders or reproducers | 0.00 | 1.77 |
| 792 | Aircraft and associated equipment; spacecraft (including satellites) and spacecraft launch vehicles; and parts thereof | 0.00 | 3.20 |
| 713 | Internal combustion piston engines and parts thereof, n.e.s. | 0.00 | 6.17 |
| 874 | Measuring, checking, analysing and controlling instruments and apparatus, n.e.s. | 0.07 | 1.08 |
| 111 | Nonalcoholic beverages, n.e.s. | 0.26 | 100.95 |
| 764 | Telecommunications equipment, n.e.s.; and parts, n.e.s., and accessories of apparatus falling within telecommunications | 0.28 | 3.04 |
| 058 | Fruit preserved, and fruit preparations (excluding fruit juices) | 0.56 | 1.75 |
| 098 | Edible products and preparations, n.e.s. | 0.63 | 1.29 |
| | **Sectors that retained comparative advantage (8)** | | |
| 892 | Printed matter | 1.19 | 2.01 |
| 813 | Lighting fixtures and fittings, n.e.s. | 1.49 | 2.72 |
| 745 | Nonelectrical machinery, tools and mechanical apparatus, and parts thereof, n.e.s. | 1.81 | 1.66 |
| 054 | Vegetables, fresh, chilled, frozen or simply preserved; roots, tubers, and other edible vegetable products, n.e.s., fresh or dried | 2.94 | 5.54 |
| 845 | Articles of apparel, of textile fabrics, whether or not knitted or crocheted, n.e.s. | 6.77 | 16.25 |
| 821 | Furniture and parts thereof; bedding, mattresses, mattress supports, cushions, and similar stuffed furnishings | 10.22 | 2.73 |
| 057 | Fruit and nuts (not including oil nuts), fresh or dried | 44.15 | 20.91 |
| 075 | Spices | 1397.42 | 214.84 |

*Note:* RCA = revealed comparative advantage, n.e.s. = not elsewhere specified.
*Source*: Calculations based on UN Comtrade 2012.

**Table A8. Intertemporal Changes in Trinidad and Tobago's RCA With Canada**

| SITC | Description | 2000–02 | 2008–10 |
|---|---|---|---|
| | **Sectors that lost comparative advantage (6)** | | |
| 676 | Iron and steel bars, rods, angles, shapes, and sections, including sheet piling | 42.92 | 0.00 |
| 292 | Crude vegetable materials, n.e.s. | 2.61 | 0.36 |
| 062 | Sugars, molasses, and honey | 2.53 | 0.95 |
| 016 | Meat and edible meat offal, salted, in brine, dried or smoked; edible flours and meals of meat or meat offal | 1.45 | 0.00 |
| 112 | Alcoholic beverages | 1.38 | 0.97 |
| 054 | Vegetables, fresh, chilled, frozen or simply preserved; roots, tubers, and other edible vegetable products, n.e.s., fresh or dried | 1.34 | 0.67 |
| | **Sectors that gained comparative advantage (2)** | | |
| 035 | Fish, dried, slated, or in brine; smoked fish (whether or not cooked before or during the smoking process); flours, meals and pellets or fish, fit for human consumption | 0.47 | 2.54 |
| 343 | Natural gas, whether or not liquefied | 0.00 | 18.51 |
| | **Sectors that retained comparative advantage (6)** | | |
| 671 | Pig iron and spiegeleisen, sponge iron, iron or steel granules, and powders and ferroalloys | 553.20 | 210.47 |
| 334 | Petroleum oils and oils from bituminous minerals (other than crude), and products therefrom containing 70 percent (by weight) or more of these oils, n.e.s. | 24.34 | 3.47 |
| 512 | Alcohols, phenols, phenol-alcohols and their halogenated, sulfonated, nitrated, or nitrosated derivatives | 19.66 | 202.22 |
| 034 | Fish, fresh (live or dead), chilled or frozen | 15.42 | 7.06 |
| 111 | Nonalcoholic beverages, n.e.s. | 11.50 | 4.25 |
| 075 | Spices | 8.88 | 4.75 |

*Note:* RCA = revealed comparative advantage, n.e.s. = not elsewhere specified.
*Source*: Calculations based on UN Comtrade 2012.

**Previous Working Papers by the Caribbean Economics Lab**

Sex, Violence, and Drugs Among Latin American and Caribbean Adolescents: Do Engaged Parents Make a Difference? (IDB-WP-664)

Transitioning the Tax System to Take Advantage of the Natural Gas-Rich Economy in Trinidad and Tobago (IDB-WP-661)

Privately Managed Public Secondary Schools and Academic Achievement in Trinidad and Tobago: Evidence from Rule-Based Student Assignments (IDB-WP-637)

Religion As An Unemployment Insurance Scheme: The Case of the Caribbean and Latin America (IDB-WP-601)

Information and Communication Technologies, Prenatal Care Services and Neonatal Health in Latin America and the Caribbean (IDB-WP-598)

Understanding Economic Growth in the Caribbean: A Conceptual and Methodological Study (IDB-WP-595)

Do Remittances Help Smooth Consumption During Health Shocks? Evidence from Jamaica (IDB-WP-522)

Risk Management with Thinly Traded Securities: Methodology and Implementation (IDB-WP-458)

Information and Communication Technology, Agricultural Profitability, and Child Labor in Rural Peru (IDB-WP-454)