"External Competitiveness and Trade in the Caribbean: A Non-Stationary Panel Approach."

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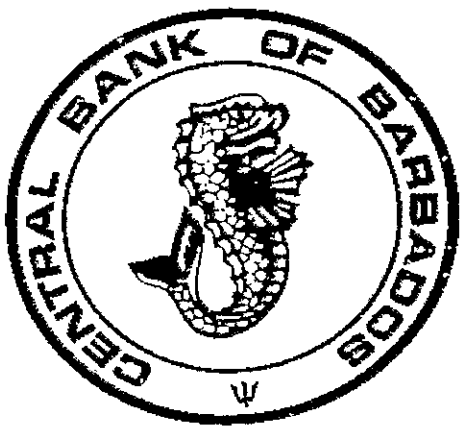

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External competitiveness and trade in the Caribbean: a non-stationary panel approach

by

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Abstract

Most Caribbean countries usually experience wide fluctuations in their current account balances. Although characteristic of countries, which export mainly primary commodities, it may also suggest that the country's exchange rate is not consistent with a sustainable external position. This paper uses a non-stationary panel approach to examine whether export competitiveness is a significant determinant of fluctuations in Caribbean trade flows. The study finds that external competitiveness does seem to be an important determinant of trade fluctuations in the Caribbean.

JEL classification: C33; C32; F32
Keywords: Export competitiveness; non-stationary panel tests

1. Introduction

Caribbean countries rely heavily on international trade to generate foreign exchange, much of which is re-invested into the productive sectors of the economy to stimulate growth and employment. In addition, trade encourages faster absorption of technological innovations into these economies. Undoubtedly, the global trading environment is evolving at a rapid pace; with the formation of more developed trading blocks such as the Free Trade Area of the Americas and the Caricom Single Market and Economy in recent years, and the steady liberalisation of foreign trade under the World Trade Organisation's regime. Thus, faced with the many challenges of a changing international trading environment, and given the importance of trade to the development and growth of the Caribbean, it is imperative that these countries place great emphasis on continuously enhancing their competitive position in export markets.

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Table 1 gives the growth in real trade flows, real gross domestic product (GDP), real foreign GDP and the real effective exchange rate (reer) for a sample of twelve (12) Caribbean countries (Antigua and Barbuda, Barbados, Belize, Dominica, the Dominican Republic, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago). From the Table it can be gleaned that growth in real trade has, on average, been below 1% with a relatively high variance of 0.153. Indeed, three countries in the sample - Barbados, Belize and the Dominican Republic - experienced declining real merchandise trade flows. The relatively low growth in real trade flows can be linked to a decline in external competitiveness (or growth in the reer). Only three countries in the sample registered increases in external competitiveness, these were the Dominican Republic, Guyana and Trinidad and Tobago. The gains, however, came mainly as a result of currency devaluations in each of the countries listed.

There are several potential benefits of maintaining a high degree of external competitiveness. Firstly, it reduces the dependence on preferential trading agreements with industrialised countries. Secondly, it can facilitate greater accumulation of foreign reserves and reduce the economic spill-over effects from foreign-exchange shortage, including balance of payments problems, pressure on the exchange rate and inflation. Nevertheless, historical data indicates that most Caribbean countries usually experience wide fluctuations in their current account balances, which may suggest that the country's exchange rate is not consistent with a sustainable external position. As such, establishing the link between export competitiveness and trade performance could greatly assist Caribbean countries in devising appropriate strategies to promote the success of their exports in the international market place. This paper, therefore, examines whether export competitiveness is a significant determinant of fluctuations in Caribbean trade levels, using a non-stationary panel approach. This approach is chosen given its superiority over single equation cointegration techniques used in much of the literature. The study focuses on real merchandise trade flows since these industries are usually the recipients of tariff and other non-tariff protective measures.

The remainder of the paper is organised as follows. Section 2 provides a review of the relevant literature addressing both the measurement of external competitiveness and its link to trade. In Section 3, the theoretical underpinnings, data issues and the econometric approach are discussed. Section 4 presents an analysis of the empirical results and Section 5 concludes.

2. Literature review

2.1 Measuring external competitiveness

The most popular measure of external competitiveness is the *reer*. It calculates how nominal exchange rates, adjusted to take into account price differentials between a country and its trading partners, change over a specified period of time. Thus, if the prices of a country's exports are rising relative to its trading partners, this will be reflected in an appreciation of the *reer* or a decline in external competitiveness. There are two general approaches to estimating the *reer*. The first, defines the *reer* as the weighted index of the price level abroad relative to that at home:

$$reer_1 = \sum_{i=1}^{N} w_i (p / e_i . p_i^*) \tag{1}$$

where w_i is the weight attached to country i, e_i the bilateral nominal exchange rate defined as the domestic currency price of foreign exchange, p_i^* is a measure of prices in trading partner country i, and p the domestic price index. One drawback in estimating the index is that there is no general agreement on which price index to use, with consumer prices, export prices and producer prices all being employed (see Nilsson, 1999). Furthermore, the *reer* may be calculated as either a weighted average or an unweighted average.

An alternative definition of the *reer* is to calculate it as the domestic relative price of tradables to that of non-tradables:

$$reer_2 = \sum_{i=1}^{N} w_i (p^{NTR} / e_i . p_i^{TR}) \tag{2}$$

where p_i^{TR} is the price of tradables and p^{NTR} the price of non-tradables. This measure of the *reer* is close to the dependent economy literature (see Chinn, 2002) and suggests that if the *reer* depreciates, the profitability of producing tradables rises, which induces a shift in resources from the non-tradable to the tradable sectors. The major shortcoming of this second approach to estimating the *reer* is that it is not easily applied empirically. This is because most available price indices are contaminated with some element of both tradable and non-tradable prices.

Bynoe-Mayers (1997) attempts to overcome this empirical difficulty of calculating the $reer_2$ by using (GDP) deflators. The author decomposes the nominal and real GDP statistics of ten countries into tradable and non-tradable activities. Total nominal GDP for the traded sector

is then divided by real GDP for the traded sector to generate a deflator index. The same procedure is also applied to calculate a price index for the non-traded sector. Data on Barbados, Jamaica, Trinidad, Guyana, Mexico, Honduras, Costa Rica, the Dominican Republic, Columbia and Venezuela over the period 1970 to 1995 is used in the author's empirical analysis. However, when the calculated *reer* indices are compared to those generated by the International Monetary Fund (IMF), in its International Financial Statistics (IFS) database, a significant divergence in the two estimates is observed. As noted above, this result reflects the difficulty of decomposing prices into traded and non-traded components especially in small open economies. Bynoe-Mayers also reports that those countries, which devalued their nominal exchange rates significantly, did not show substantial gains in external competitiveness.

Boamah (1989) also attempts to estimate external competitiveness in the region, however, unlike Bynoe-Mayers (1997), the author utilises the $reer_1$ measure of the real effective exchange rate. Data on the nominal wage rate in the domestic manufacturing sector serves as a proxy for domestic prices, while an index of world market prices for developing countries' exports captures the foreign price component. The export tax rate is also taken into account in the analysis. The *reer* is estimated for the period 1980-1987 for Barbados, Guyana, Jamaica and Trinidad and Tobago. Boamah's results show that Barbados is less internationally competitive than all the other countries considered, while Jamaica is the most competitive. In contrast to Bynoe-Mayers, Boamah finds that nominal exchange rate devaluations did play an important role in improving external competitiveness in some Caribbean countries. However, Boamah advises the reader to interpret the results with caution, in light of the data limitations of the study. The main shortcoming observed is that the calculated *reer* seems more a measure of manufacturing competitiveness than external competitiveness, and this may explain Barbados' relatively poor performance since it is primarily a service driven economy.

2.1 External competitiveness and trade

Rose (1991) provides one of the first studies relating external competitiveness to trade using modern econometric modelling techniques. The author derives a reduced form equation relating a country's balance of trade to the *reer*, domestic output and foreign output. Rose estimates the

reduced form equation for the United Kingdom, Canada, Germany, Japan and the US using monthly data covering the period 1975 to 1986. All the series are non-stationary in levels; however, there is no evidence of cointegration for the five countries studied. The model is therefore estimated in first differences to examine whether the *reer* significantly affects changes in the external trade balance. Nevertheless, changes in the *reer* do not prove to be a significant determinant of changes in the country's balance of trade. However, the author's results seem to be related to the low power of the Engle and Granger (1987) two-step procedure.

In contrast, Chinn and Johnston (1996) use the Johansen procedure to tests for cointegration in separate import and export equations. The authors conduct the analysis using US trade flow data. Unlike Rose, Chinn and Johnston find positive evidence relating trade flows to the *reer* in both the short and long-run. Craigwell and Samaroo (1997) also employ cointegration and error correction models to estimate current account functions for Barbados and Trinidad and Tobago. Utilising annual time series and pooled data for the period 1967 to 1991, the study finds that the real exchange rate, the level of foreign incomes, the budget surplus to GDP ratio and the lagged current account are significant variables influencing long-run current account behaviour in Trinidad and Tobago. For Barbados, however, the government budget variable and the terms of trade are the important explanatory variables in the long run.

Marsh and Tokarick (1996) provide an alternative explanation of Rose's (1991) findings. The authors argue that different measures of the *reer* should be exploited when examining more than one country. For example, in France only unit labour cost deflated *reer* indices are successful, in the US, all of the alternative measures are equally successful, while in Canada no measure of the *reer* seems to influence trade.

Most of the econometric evidence on the impact of the *reer* on trade flows in developing countries has been conducted using data on East Asian countries. Cerra and Gulati (1999) examine the factors that influence China's real trade flows. The authors estimate reduced form equations, which relate imports to the *reer*, income, a measure of the availability of foreign exchange and the capacity of the world to supply imports to China. Exports, on the other hand, are expressed as a function of the *reer*, world income and an index of domestic production capacity. Quarterly data for the period 1983-1997 is used to estimate both equations. The authors find evidence of cointegration in both the import and export equations and that the *reer*

significantly affects exports and imports. The results also suggest that the responsiveness of trade to the *reer* usually rises with greater trade liberalisation.

Wilson (2001) conducts an analysis of the impact of the *reer* on trade flows in Singapore, Malaysia and Korea. The author does not find any evidence of a relationship between trade flows and the *reer*. This, however, seems to be related to the rather odd price indices used. Wilson exploits the domestic wholesale price index as a measure of domestic prices, while the domestic consumer price index serves as a proxy for foreign prices.

3. Methodology

This section of the study presents a simple theoretical framework to link real trade flows to the *reer*. The methods used to estimate the reduced form equation are then discussed. The quantity of exports demanded (x^d) is assumed to depend on foreign income, y^*, and the relative price of domestic exports compared to foreign goods:

$$\ln x^d = \alpha \ln p_x - \alpha \ln p_x^* + \phi \ln y^*; \qquad \alpha < 0, \phi > 0 \tag{3}$$

where $\ln p_x$ is the domestic price of exports, and $\ln p_x^*$ is the foreign price of exports. Thus, a decrease in relative prices would lead to an increase in export demand, while an expansion in world income increases export demand. The export supply (x^s) equation is specified as a function of export prices and domestic prices:

$$\ln x^s = \beta \ln p_x + \beta \ln \left[\frac{e}{p_d} \right]; \qquad \beta > 0 \tag{4}$$

where e is the exchange rate and p_d is the domestic price index. Thus, as the prices of exports rises relative to the prices available domestically, then firms would be encouraged to export more. Assuming the equilibrium condition that $x^d = x^s = x$ and solving Equations (3) and (4) simultaneously and simplifying, one obtains:

$$\ln x = \alpha^* \ln reer + \phi^* \ln y^*; \qquad \alpha^* < 0, \phi^* > 0 \tag{5}$$

Thus, in equilibrium the actual level of exports would be inversely related to the *reer* and positively related to foreign income.

Focusing now on imports, it is assumed that import demand (m^d) will depend on domestic income, y, and the relative price of imports:

$$\ln m^d = \varphi \ln p_m + \varphi \ln \left[\frac{e}{p_d}\right] + \theta \ln y; \qquad \varphi < 0, \theta > 0 \tag{6}$$

where p_m is import prices. Therefore an increase in import prices should lead to a decline in import demand while a rise in domestic incomes should be positively related to import demand. The import supply (m^s) equation is modelled as a function of relative prices:

$$\ln m^s = \gamma \ln p_m - \gamma \ln p_m^*; \qquad \gamma > 0 \tag{7}$$

where p_m^* is the price of competing foreign imports. Assuming the equilibrium condition that $m^d = m^s = m$ and solving Equations (6) and (7) simultaneously one obtains:

$$\ln m = \varphi^* \ln reer + \theta^* \ln y; \qquad \varphi^* > 0, \qquad \theta^* > 0 \tag{8}$$

Adding Equations (5) and (8) together one obtains:

$$\ln t = \ln x + \ln m = (\alpha^* + \varphi^*) \ln reer + \phi^* \ln y^* + \theta^* \ln y \tag{9}$$

Thus, trade flows are influenced by the *reer*, domestic income and foreign income. Rewriting in stochastic form and in a panel setting one obtains:

$$\ln t_{it} = \alpha_i + \beta_{1i} \ln y_{it} + \beta_{2i} \ln y_t^* + \beta_{3i} \ln reer_{it} + u_{it} \tag{10}$$

where α_i is a country-specific intercept and u_{it} is the error term which is assumed to have normal properties.

The sign of the domestic income variable should be positive ($\beta_{1i} > 0$) since it is expected that increases in domestic income would lead to rising consumer imports and higher demand for inputs in domestic production to satisfy local demand. Similarly, foreign incomes and trade should move in the same direction ($\beta_{2i} > 0$) because, as foreign incomes rise, more exports are demanded from Caribbean countries. The coefficient on the *reer* is ambiguous since, a decline in the *reer*, or an increase in external competitiveness, could lead to greater or lesser trade flows. For example, as the demand for exports expand, domestic activity/incomes increases due to greater investment and employment opportunities. The rise in incomes also causes the demand for imports to rise and therefore, total trade flows should grow as a country becomes more competitive externally. On the other hand, the reer is negatively related to the level of export

demand. Thus, the final sign of the coefficient depends on the relative strength of the two offsetting effects.

One can also obtain the extreme scenario whereby as a country becomes more competitive, exports expand but imports do not rise as fast, or actually fall due to trade restrictions. In this scenario, the coefficient on the *reer* would be positive and could signal that restrictions on trade are hampering domestic economic activity.

3.1 Data

The data are annual observations over the twenty-six year period from 1975 to 2001. They are compiled from the IMF's International Financial Statistics (IFS) CD-Rom, the Eastern Caribbean Central Bank's Economic and Financial Review (various issues), the Central Bank of Barbados' Annual Statistical Digest 2001, the Central Bank of Guyana's Statistical Bulletin and the Central Bank of Jamaica's Statistical Digest. Trade is proxied by total merchandise imports and exports deflated by the GDP deflator for each country. Domestic income is given by real GDP in each country, while foreign income is represented by real GDP in the US given that the US is the principal trading partner in most Caribbean countries. An alternative proxy for foreign GDP is a weighted average of the GDPs of the major trading countries such as the US, UK and Canada. However, this measure does not yield significantly different results when employed in this study. The *reer* is taken from the IFS database, while for Barbados and Jamaica it was estimated using the procedure defined in the appendix. The natural logarithm of all variables is used.

3.2 Econometric approach

Given the small sample size and the low power of single equation cointegration techniques, a non-stationary panel approach is employed (see Baltagi, 2001). First, tests for unit roots in the variables under consideration are done using the panel unit root test developed by Im, Pesaran and Shin (1997). The approach was chosen over competing panel unit root tests due to its superior finite sample properties when N is small and T is large (Choi, 1999). Let s_{it} represent

real trade, real GDP or *reer*. Im, Pesaran and Shin allow for heterogeneity by proposing a unit root testing procedure based on averaging the individual unit root *t-adf* statistics. The regression used is:

$$\Delta s_{it} = \alpha_i + \rho_i s_{it-1} + \sum_{j=1}^{\rho_i} \theta_{ij} \Delta s_{it-j} + \varepsilon_{it} \tag{11}$$

The null hypothesis is that each series in the panel contains a unit root, i.e. $H_0 : \rho_i = 1$ for all i and the alternative hypothesis is that at least one of the individual series in the panel is stationary, i.e. $H_1 : \rho_i < 1$ for at least one i. The Im, Pesaran and Shin *t-bar* statistic is defined as the average of all the individual *t-adf* statistics. The *t-bar* statistic is then compared to the critical values tabulated by Im, Pesaran and Shin.

Second, the Larsson, Lyhagen and Lothgren (2001) panel cointegration test is utilised to test for cointegration among the variables specified in Equation (10). Consider a heterogeneous panel error correction model:

$$\Delta s_{it} = \Pi_i s_{it-1} + \sum_{k=1}^{k_i - 1} \Gamma_{ik} \Delta s_{it-k} + \varepsilon_{it} \tag{12}$$

where Π_i is a $p \times p$ matrix. To test the null of cointegration, $H_0 : rank(\Pi_i) = r_i < r$ where r is the number of cointegrating relationships among the p variables. The Larsson, Lyhagen and Lothgren technique calculates the standardised $\bar{LR}$ statistic, given below:

$$\bar{LR} = \sqrt{N} \left[\frac{\bar{LR}_{NT} - E(Z_k)}{\sqrt{Var(Z_k)}} \right] \tag{13}$$

where $\bar{LR}_{NT}$ is the average of the N individual trace statistics, $E(Z_k)$ is the asymptotic mean and $Var(Z_k)$ is the asymptotic variance of the test statistic. The technique is chosen due to its superiority over competing panel cointegration procedures, as T gets larger. Finally, if the variables are cointegrated a heterogeneous panel approach (Baltagi, 2001) is employed to derive the long-run coefficients for Equation (10).

4. Empirical results

4.1 Tests for unit roots and cointegration

Table 2 presents the individual country-specific unit root test results. The selection of the ADF lag length is done using the Akaike Information Criteria. Deterministic components, such as a trend, are not included in the unit root tests since these decrease the power of the panel unit root test (Choi, 1999). The most common result is that all the variables are stationary in first differences, or could be classified as I(1) variables.

The panel unit root tests statistics are given in Table 3. When compared to the one-tailed critical value of the N(0,1) distribution at the 1% level, 2.326, the results suggest that all three of the variables are non-stationary in levels but stationary in first differences. One can therefore move on to test for cointegration among the four variables given in Equation (10).

The trace statistics for each country-specific regression are reported in Table 4 along with the panel cointegration test value. The critical value used to test for cointegration is again the one tailed value from the standard normal distribution of 2.326. Thus, the results imply that there exists at most one cointegrating relationship in the system. Therefore, the coefficients for Equation (10) are derived from a heterogeneous panel model, with each equation estimated using OLS to obtain the long-run coefficient estimates.

4.2 Heterogeneous panel estimates

These results are presented in Table 5. The t-statistics are not given since they are not valid (Entorf, 1997). The pooled mean group coefficient estimates suggest that trade is most responsive to changes in domestic income since the elasticity estimate is above one. This finding is not surprising given the import-dependent nature of most countries in the region. It implies that as Caribbean countries experience faster rates of economic expansion real trade grows at an even quicker pace. This occurs because domestic industries, such as tourism, require a high level of imported inputs to function. In addition, as incomes expand due to greater job opportunities, a larger amount of imports are necessary to satisfy consumer demand.

The coefficient on the foreign income variable is also positive but is of a significantly smaller magnitude - less than one. This finding reflects the superiority of imports on trade flows over exports within the Caribbean. It also suggests that regional economies are significantly dependent on the performance of foreign economies to sustain their external trade patterns. As such, they are more susceptible to economic downturns in the economies of their major trading partners.

On the other hand, it can be seen that trade and the *reer* are inversely related. This suggests that as a country becomes more competitive - a decline in the *reer* - real trade flows usually expand. The implication is that fluctuations in the *reer* are partially responsible for the variations in the current account outturns in the region. It therefore means that Caribbean countries should address the issue of declining external competitiveness by focussing on areas such as productivity and unrealistic wage increases. It is also noteworthy that the results given in Table 5 show that in every country, excluding the Dominican Republic, St. Vincent and the Grenadines, the *reer* was inversely related to real trade flows. These findings agree with our analysis of the descriptive statistics. This could indicate that the reported results are robust to the data and country studied.

4.3 Homogenous panel regression results

To tests the robustness of the results to alternative model specifications, Equation (10) is also estimated using homogenous panel estimation techniques. However, since it was noted that all the variables considered are non-stationary in levels, the model is estimated in first differences using pooled OLS and the estimation results are provided in Table 6. The coefficient estimates obtained have the same signs as those shown in Table 5 but the only significant variable at classical levels of testing is the growth in domestic income. The finding that growth in foreign income is an insignificant determinant of trade flows seems at odds with the highly open nature of Caribbean economies and is perhaps reflective of the misleading inferences possible when imposing cross-country homogeneity restrictions.

5. Conclusions

This paper has attempted to examine the impact of the real effective exchange rate on real trade flows in the Caribbean. The analysis is undertaken using a non-stationary panel approach and data covering the period 1975 to 2001. The signs of all the variables agree with *a priori* economic reasoning. Real domestic and foreign incomes are both positively related to real trade flows. However, the elasticity of the domestic income variable is twice the size of the foreign income variable. The results also suggest that external competitiveness is positively related to trade flows, with the most competitive economies experiencing the highest levels of trade. These findings imply that countries in the region need to focus on improving productivity, one of the major determinants of variations in the real effective exchange rate, to encourage greater levels of trade.

As Caribbean countries become more dependent on services for the generation of foreign exchange, the studies of trade flows will increasingly emphasis the current account. Future research could perhaps investigate the impact of external competitiveness for both goods and services. This would facilitate a more complete examination of the overall external competitiveness of the region. However, such an analysis would require the derivation of exchange rate indices that take into account the changes in domestic and foreign prices of services (see approach suggested by Worrell, Boamah and Campbell (1996)).

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Appendix – data sources and related issues

This study employs data in annual frequencies, covering the period 1975 to 2001. The definition and sources of the main variables in the econometric model are given below. Note that these variables are used in their natural logarithmic form, represented by the symbol 'ln'.

reer = Real effective exchange rate index. These series are obtained mainly from the IMF's IFS CD-Rom; however, the authors estimated the indices for Barbados and Jamaica.

t = Real trade, which is proxied by the sum of merchandise exports and imports deflated by the GDP deflator for each country. The deflator series is obtained by dividing nominal GDP by real GDP from the IFS CD-Rom; while merchandise trade is obtain from a combination of the IFS CD-Rom, the Central Bank of Guyana's Statistical Digest and the Eastern Caribbean Central Bank's Economic Review.

y = Domestic income, given by real GDP of each country, taken from the same sources as above, in addition to the Central Bank of Barbados' Annual Statistical Digest.

y^* = Foreign income, represented by real GDP in the US, which is the principal trading partner for most Caribbean countries. The relevant sources are the same as for domestic income.

Calculating the real effective exchange rate for Barbados and Jamaica

The real effective exchange rate calculated in this study is defined as the trade weighted index of the price level abroad relative to that in the domestic economy. The formula used in the construction of the index series is as follows:

$$reer = \sum_{i=1}^{N} w_i \left(p / e_i p_i^* \right) \qquad \text{(A.1)}$$

Where e_i is the bilateral nominal exchange rate expressed in units of the domestic currency per unit of foreign currency; p_i^* refers to prices in trading partner country i measured in foreign currency; p is the domestic price index measured in domestic currency; and w_i is the weight attached to country i. The nominal exchange rate is obtained from the IMF's IFS CD-Rom, and

the domestic and foreign price indices are represented by consumer prices, also taken from the IFS database. While there are a number of alternative price indices, including producer prices, export prices and unit labour costs, which are sometimes used in the derivation of the *reer*, the decision to utilise the consumer price index (CPI) in this instance, was influenced by data availability.

When calculating the *reer*, weighting schemes that cover a relatively broad set of countries are generally preferred. As such, for both Jamaica and Barbados, the sum of total merchandise imports and exports was used to approximate total trade with 14 countries, which include the USA, Europe, Canada, Guyana, Trinidad and Tobago, Dominica, Grenada, St. Vincent, St. Lucia, Antigua, St. Kitts, Belize, Montserrat and 'Other'. Each of the trading partners are then allocated a weight based on its share of the total merchandise trade in the base year (1995).

Derivation of Reduced Form Equation

Assuming the equilibrium condition that $x^d = x^s = x$ and solving Equations (3) and (4) simultaneously yields the equilibrium price level:

$$\ln p_x = \frac{\alpha}{\alpha - \beta} \ln p_x^* + \frac{\beta}{\alpha - \beta} \ln \frac{e}{p_d} - \frac{\phi}{\alpha - \beta} \ln y^* . \qquad \text{(A.2)}$$

Substituting the equilibrium price level given by Equation (A.2) into Equation (3) gives the following reduced form for exports:

$$\ln x = -\frac{\alpha\beta}{\alpha - \beta} \left[\ln \frac{p_d}{e \times p_x^*} \right] - \frac{\beta\phi}{\alpha - \beta} \ln y^* . \qquad \text{(A.3)}$$

where $\left[\ln \frac{p_d}{e \times p_x^*} \right]$ is the *reer*. The derivation of the import equation is obtained using a similar approach.

Table 1: Growth in real trade, GDP and external competitiveness

Country	trade		gdp		gdpf		reer	
	Mean	St. dev	Mean	St. dev	Mean	St. dev	Mean	St. dev
Antigua and Barbuda	0.023	0.137	0.0467	0.035	0.030	0.020	0.000	0.035
Barbados	-0.011	0.117	0.013	0.037	0.030	0.020	0.063	0.087
Belize	-0.025	0.254	0.044	0.042	0.030	0.020	0.003	0.051
Dominica	0.040	0.130	0.038	0.034	0.030	0.020	0.012	0.049
Dominican Republic	-0.097	0.214	0.041	0.038	0.030	0.020	-0.015	0.111
Grenada	0.023	0.020	0.041	0.027	0.030	0.020	0.010	0.056
Guyana	0.024	0.228	0.009	0.061	0.030	0.020	-0.090	0.280
Jamaica	0.021	0.227	0.019	0.028	0.030	0.020	0.005	0.143
St. Kitts and Nevis	0.027	0.110	0.055	0.027	0.030	0.020	0.002	0.035
St. Lucia	0.013	0.109	0.040	0.044	0.030	0.020	0.009	0.039
St. Vincent	0.013	0.115	0.043	0.036	0.030	0.020	0.005	0.036
Trinidad and Tobago	0.018	0.172	-0.003	0.037	0.030	0.020	-0.028	0.112
Average	0.006	0.153	0.032	0.037	0.030	0.020	0.002	1.035

Note: $Growth = \ln y_{it} - \ln y_{it-1}$

Table 2: Individual country unit root tests

Country/ Variable	ADF Lag	t-ratio	
		Levels	First Differences
Antigua and Barbuda			
reer	0	-1.449	-4.134**
gdp	0	-1.673	-3.232*
trade	0	-1.527	-4.082**
Barbados			
reer	0	-1.725	-1.181
gdp	1	-1.434	-3.352*
trade	0	-1.853	-3.627*
Belize			
reer	0	-1.227	-3.436*
gdp	1	-0.163	-2.076
trade	0	-2.410	-2.802
Dominica			
reer	0	-1.928	-3.289*
gdp	0	-1.510	-4.981**
trade	0	-1.412	-4.333**
Dominican Republic			
reer	0	-2.626	-4.734**
gdp	0	1.666	-3.220*
trade	0	-2.079	-2.996
Grenada			
reer	1	-1.330	-3.525*
gdp	1	-0.319	-2.459
trade	0	-0.101	-3.701*
Guyana			
reer	0	-0.988	-1.812
gdp	0	1.078	-2.000
trade	0	-0.643	-4.337**
Jamaica			
reer	0	-2.533	-2.778
gdp	0	-7.276**	-1.678
trade	0	-3.056	-4.523**
St. Kitts and Nevis			
reer	0	-0.949	-2.826
gdp	0	-0.325	-4.593**
trade	1	-0.710	-4.127**
St. Lucia			
reer	0	-0.710	-3.753*
gdp	0	-2.468	-2.960
trade	0	-1.261	-4.221**
St. Vincent			
reer	0	-1.293	-2.466
gdp	0	-1.075	-5.294**
trade	0	-2.395	-4.271**
Trinidad			
reer	0	-6.669**	-3.411*
gdp	0	0.035	-1.235
trade	0	0.995	-2.841
World			
gdp	0	0.173	-3.792**

Note: *,** indicates significance at the 5% and 1% levels, respectively.

Table 3: Panel unit root tests

Variable	t-ratio	
	Levels	First differences
Reer	-1.952	-3.112
Gdp	-1.122	-3.090
Trade	-1.371	-3.822

Table 4: Panel cointegration test

Country	Lag	Trace statistic			
		r = 0	*r = 1*	*r = 2*	*r= 3*
Antigua & Barbuda	2#	27.218	11.145	0.582	0.114
Barbados	1	39.474	22.091	7.951	1.753
Belize	2	40.254	15.493	5.864	2.574
Dominica	1	80.405	18.360	5.369	0.562
Dominican Republic	1	36.194	17.424	7.435	1.093
Grenada	1	67.221	34.599	14.226	0.084
Guyana	2	75.641	19.759	4.865	1.108
Jamaica	1	48.011	28.726	15.576	7.508
St. Kitts & Nevis	1	57.506	17.227	3.310	1.038
St. Lucia	1	50.902	29.957	10.959	3.105
St. Vincent and the Grenadines	1	30.468	12.975	4.156	0.127
Trinidad and Tobago	1#	53.744	19.777	6.452	1.331
Panel cointegration test statistic		11.769	3.951	1.220	-1.311

Note: # indicates that a trend is included

Table 5: Heterogeneous panel results

Country	Dependent variable: *ltrade*				
	c	*lgdp*	*lgdpf*	*lreer*	*R-squared*
Antigua and Barbuda	5.871	0.467	-0.067	-0.598	0.629
Barbados	1.642	1.025	-0.141	-0.256	0.446
Belize	26.255	-0.078	0.169	-1.385	0.294
Dominica	4.908	1.053	-0.595	-0.180	0.587
Dominican Republic[#]	-61.175	4.727	3.410	0.812	0.982
Grenada	25.923	-0.645	1.456	-0.176	0.652
Guyana	-6.018	1.683	-0.634	-0.319	0.869
Jamaica	-3.892	1.572	-0.256	0.011	0.351
St. Kitts and Nevis	20.853	-0.837	1.780	-0.441	0.581
St. Lucia	16.342	0.411	0.203	-1.644	0.899
St. Vincent and the Grenadines	5.306	1.361	-1.606	0.407	0.343
Trinidad and Tobago	-15.783	2.519	0.388	-0.602	0.882
Average	1.686	1.105	0.342	0.364	

Note: [#] indicates that a trend is included

Table 6: Homogenous panel results

Regressors	Dependent variable: $\Delta trade$
Δgdp	1.570**
	(0.238)
$\Delta gdpf$	0.240
	(0.580)
$\Delta reer$	-0.146
	(0.086)
C	-0.054
	(0.032)
R-squared	0.169
Obs	239

Note: *,** indicates significance at the 5 and 1% levels, respectively.
Standard errors are reported in parentheses.