

Economic Convergence in the Caribbean Community

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Preliminary Results (first draft)

Abstract

It has been argued that economic convergence between member countries is a prerequisite for the introduction of a single currency, the deeper integration of financial markets and the diffusion of benefits for the participants of the economic union. However, differences in macroeconomic circumstances has given way to wide disparities in exchange rates and the polarisation of intraregional trade and capital flows, factors which may have frustrated convergence. Accordingly, the study explores the distribution of benefits of the Caribbean economic union, and whether there is catching up between low and high income countries in the union. A number of cross sectional and time series techniques are employed to investigate the convergence process. These include the testing of Gini coefficients, the testing of Beta hypothesis, an examination of sigma convergence, and Panel estimation. Ultimately the study is able to identify convergence clubs.

Introduction

The resurgence of the discussion on economic convergence has been motivated by both theoretical developments and with regards to the empirical assessment of regional trading blocs. On the theoretical front, the debate has occurred between the neoclassical and endogenous models.¹ The neoclassical model predicts convergence between low and high income countries towards a steady state, while the endogenous model emphasizes the importance of national economic policies and consequently the divergence of economies. At the same time, numerous studies have employed these ideas to conduct an empirical examination of the success of trading blocs with regards to the improvement of welfare through the use of per capita income.²

The discussion is of utmost importance to the Caribbean Community (CARICOM), as it embarks on the formation of the Caribbean Single Market Economy (CSME).³ Economic

¹ See for example, Baumol (1986), Barro and Sala-i-Martin (1991, 1992) and Mnkiew et al (1992).

² See Lim and McAleer (2000), Lee et al (1998), Canova (2002 and Ajexady nd Tomkins (2004), just to name a few.

³ While CARICOM was formed in 1973 by the treaty of chagaramus, the heads of government decided in 1992 to move to a single market stage of integration.

integration is deemed as particularly desirable, in order to create favourable conditions for a single regional currency, foster financial integration, and allow for the enhanced diffusion of benefits to member countries. However, the process to integration has been off-set somewhat by differences in macroeconomic circumstances and has given way to wide disparities in exchange rates and the polarisation of intraregional trade and capital flows. Moreover, economies, by differences in their production structures, have reacted differently to economic shocks, thus driving a wedge in their relative performances.⁴

To date, most of the studies on the subject in the region have been undertaken through official policy documents.⁵ A notable exception, is the study by Carter and Greenidge (2000). They undertook an econometric based study using data for the period 1977-1997. However, the main variable of interest, GDP per capita, was not scaled to factor out price difference between member countries and their statistical results were based on the application of a single statistical technique, the maximum likelihood, which was performed on pooled data.

This study carries the discussion further by employing multiple statistical techniques, both cross sectional and time series, and covers the period 1980-2000. It examines convergence among the following countries, Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, and Trinidad and Tobago. The next section highlights the definitional issues associated with convergence, featuring the techniques employed in the study. This is followed by an examination of per capita income pertaining to the study. Finally the outcome of the empirical investigation and inferences drawn are outlined.

⁴ An example of this is with regards to upward movements in oil prices. Trinidad and Tobago economy benefits directly from such developments, but the price increases are detrimental to the welfare of the other territories.

⁵ The most notable is the study on economic convergence and performance, produced by the Caribbean Centre for Monetary Studies on a half yearly basis.

The Concept of Convergence

Real economic convergence between economies can be viewed as the reduction in inequalities between economies over time. In this regard, GDP per capita is often used as the variable of focus. The neoclassical growth model predicts that real GDP per capita would converge to a common long-run equilibrium once countries are similar with respect to structural parameters and technology. These models are based on the idea that there are diminishing returns to scale to the accumulation of factors of production, and that steady state growth is likely to be influenced by the rate of savings and population growth.

The neoclassical model assumes that economies grow towards their own steady state. However, the model predicts that convergence will occur where economies share the same steady state path, as may be influenced by the rate of technological progress. This suggests that inequalities between economies are likely to reflect different stages in economic development relative to their steady state growth paths. Thus economies with common steady state growth may reflect differential income levels, with the poor economies catching up with the more wealthy ones.

The most popular methods of measuring convergence has been in terms of beta (β) and sigma (σ) convergence. Indeed, these methods when applied to cross sections of data for the OECD countries have found evidence in favour of the convergence hypothesis. In addition, Gini coefficients has been adopted as a direct measurement of inequality across country populations. Moreover, the economic literature has recently sought to address stochastic convergence.

Cross-sectional data are normally used to find β convergence such that future output is examined in relation to initial output. The basic regression is given as:

$$g_{i0T} = \alpha + y_{i0}\beta + x_{it}\gamma + \varepsilon_{it}$$

where g_{i0T} is the log of the ratio of GDP per capita for economy i at time T to y_{i0} ; y_{i0} is initial GDP per capita, x_{it} is a set of control variables and β and γ are parameters. OLS estimation is frequently used as the choice of estimation method. Beta convergence is said to occur where $\beta < 0$ and is statistically significant. Absolute convergence is said to occur where $\gamma = 0$. This method offers a convenient way of estimating the speed of convergence through the following

$$\beta = (1 - e^{-bT})/T$$

where b represents the speed at which per capita income approaches its steady state level. Moreover, the number of years required to fill in half the gap to the steady state level is then given by

$$0.5 = e^{-bT}.$$

Beta convergence suggests that poorer countries are growing faster than richer ones and consequently there is catching up with the latter set of economies. However, two drawbacks can be noted. First, the degrees of freedom can be restricted as the number of cross-sectional data points may be confined by the subject of the study. Second, this methodology does not distinguish between short and long-run dynamics.⁶

⁶ See for example Nahar and Inder (2002).

Further, the existence of Beta convergence do not necessarily imply sigma convergence. Rather sigma convergence is a stronger form of convergence, and it measures the dispersion of real per capita GDP. Sigma convergence is said to occur where there is a reduction in the magnitude of this variable over time. The standard deviation is a popular method of measuring this dispersion.

The existing level of inequality of GDP per capita between countries can also be examined in terms of the Gini coefficient. This ratio considers the cumulative frequency of the population of the economies in the sample against the cumulative share of total income of these economies. The coefficient can be given as:

$$G = \frac{1}{2Y} \sum_{i=1}^N \sum_{j=1}^N P_i P_j |Y_i - Y_j|$$

where G is the Gini Coefficient, P_i is the population of country i ; P_j is the population of country j , Y_i is GDP per capita for country i and Y_j is the GDP per capita for country j . The coefficient ranges between 0 and 1, with 0 indicating complete equality between countries and 1 indicating complete inequality.

Given the shortcomings of the use of cross-sectional data, recent studies have turned to the use of time series, but such studies have not been very successful in finding convergence. The notion of convergence used here is with respect to the stationarity of difference between economies, such that

$$Y_{i,t} - Y_{j,t} = \mu + \alpha t + \beta(Y_{i,t-1} - Y_{j,t-1}) + \sum_{s=1}^n \delta_s \Delta(Y_{i,t-s} - Y_{j,t-s}) + \varepsilon_t .$$

The economies diverge if $Y_{i,t} - Y_{j,t}$ contains a unit root ($\beta=1$). However, there is convergence if there is no stochastic trend ($\beta < 1$). Under this situation, if $\alpha=0$, this implies that there is no deterministic trend, and there is long run convergence between countries i and j . On the other hand, if $\alpha \neq 0$, then there is cointegration between the countries.

Stylized Facts

All data for the study were extracted from the Penn World Tables. The GDP per capita was with respect to the real GDP per capita at constant prices using the Laspeyres method. The variable is measured in L\$ at 1996 prices.

Over the 20 year period, all economies recorded bouts of negative economic growth. This can be gleaned from Figure 1 by observing the declines in GDP per capita for the various economies. The negative growth was most severe in the case of Jamaica, as it recorded consecutive positive growth in only three periods, 1986-1990.

Figure 1 Log of Real GDP Per Capita, 1980-2000

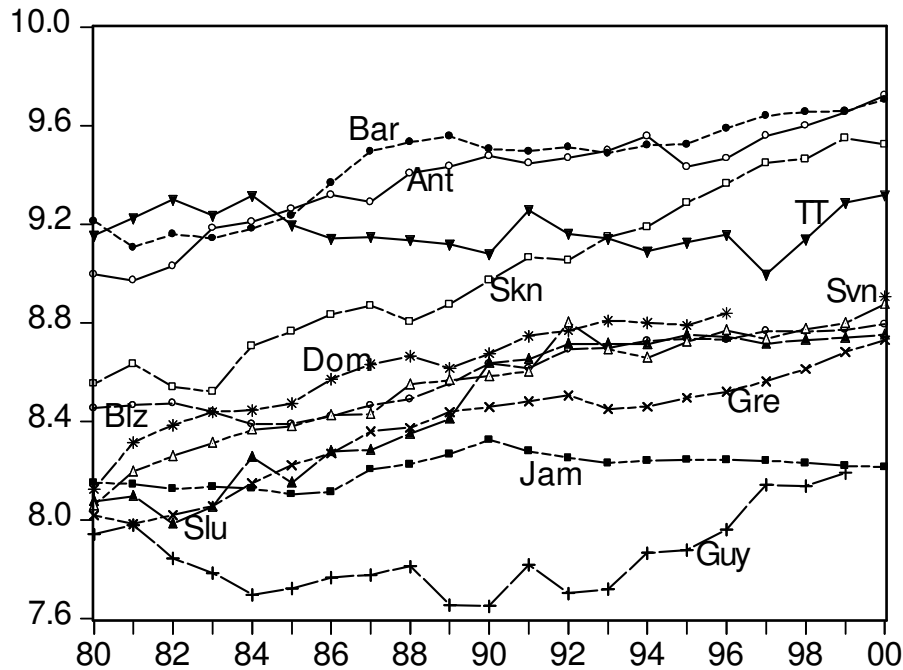


Table 1 Increase in GDP per capita in 2000 over 1980

	Ant	Bar	Blz	Dom	Gre	Guy	Jam	Slu	Skn	Svn	TT
Per Capita GDP in 2000	16,679	16,413	6,597	7,378	6,186.7	3,611	3,692	13,672	13,671	7,146	11,147.8
Increase over 1980	2.05	1.10	1.14	2.24	1.96	1.19	1.09	1.09	2.67	2.26	1.06

Apart from this, growth was volatile, even though countries were able to improve their GDP per Capita in 2000, over their 1980 levels, in some cases doubling the ratio of the two, see Table 1. Indeed, in most cases, the OECS territories recorded the largest increases in per capita income. At the same time, the larger territories recorded smaller increases in per capita income, with Trinidad and Tobago recording the smallest increases.

Results

Beta Convergence

An examination of the scatter plot between average per capita growth and the log of initial real per capita GDP suggests that there is no distinctive linear pattern between the two variables for the various countries, see Figure 2. The correlation between these variables were very low at negative 0.05, see Table 2. Not surprisingly, therefore, beta turned out to be negative and insignificant. Thus, beta convergence was not found when the entire sample of countries was examined.

Figure 2 Per Capita Growth Rate (1980-2000) vs Initial GDP Per Capita (1980)

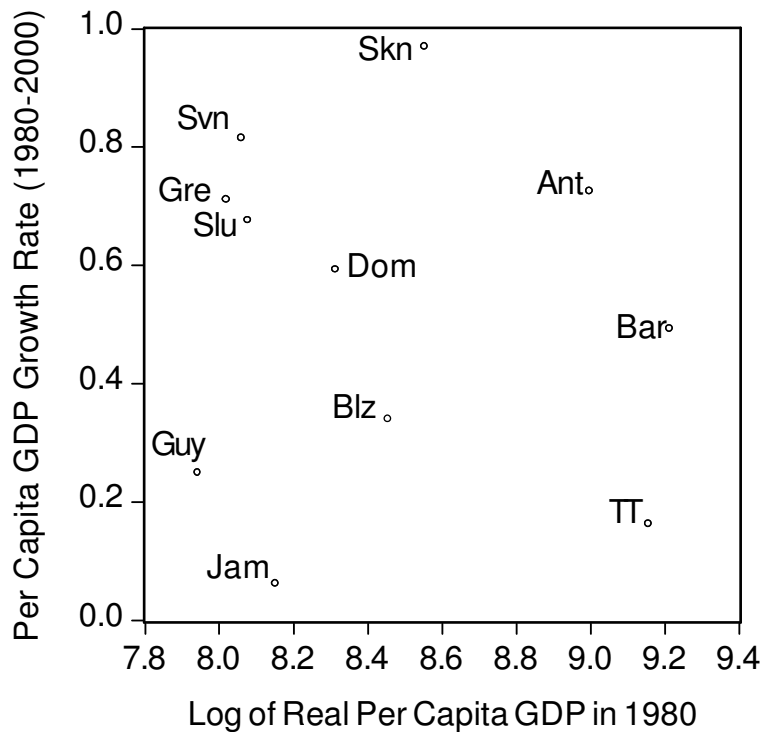
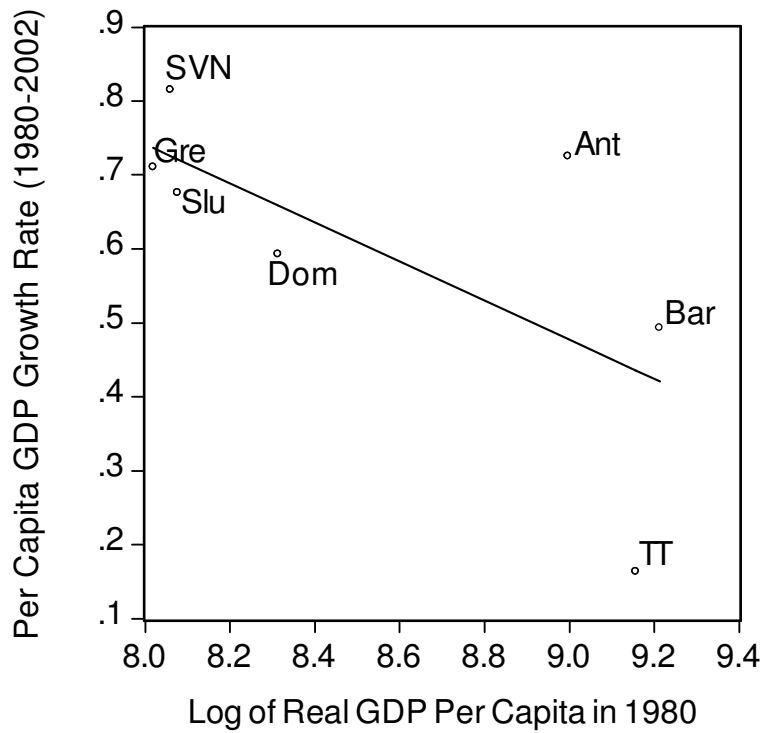


Table 2 Test for Beta Coefficient

	CARICOM 11	CARICOM 7
Beta	-0.05	-0.26
t statistic	0.82	-2.02*
F statistic	0.82	4.06*
Correlation	-0.08	-0.67
Countries Excluded	—	Belize, Guyana, Jamaica, and St. Kitts and Nevis

Notes: Countries considered are Antigua and Barbuda, Barbados, Belize Dominica, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago

Figure 3 Per Capita Growth Rate (1980-2000 Verses Initial GDP 1980 (Select Countries))

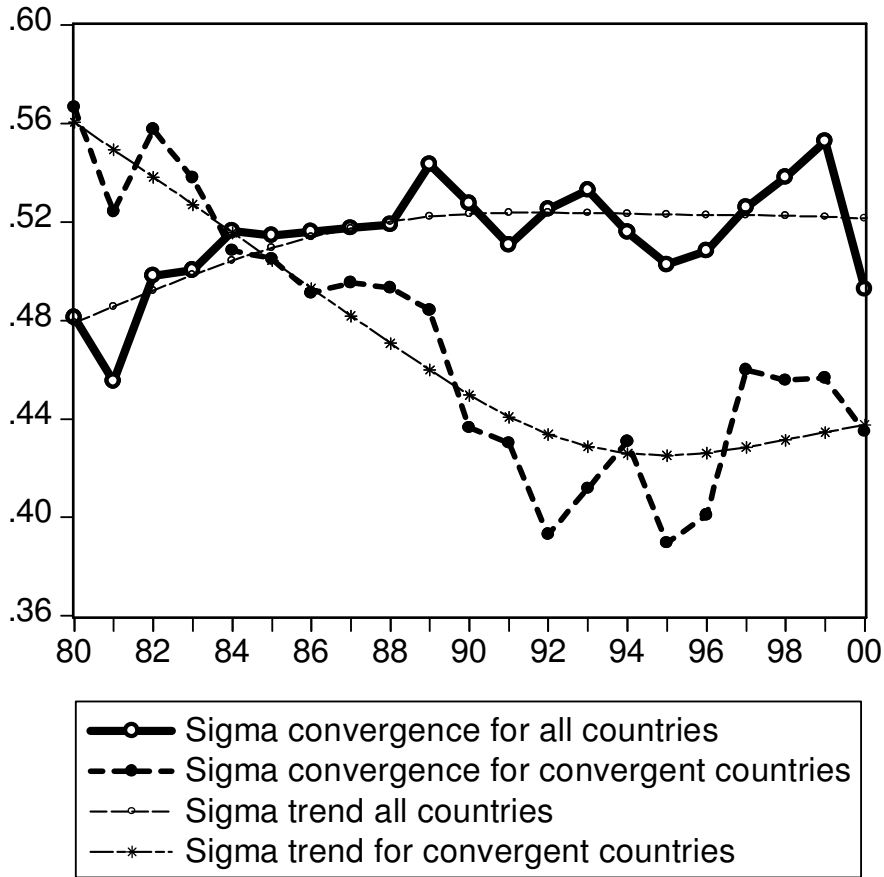


When however, certain countries were excluded, the regression results improved significantly. Accordingly, with Belize, Guyana, Jamaica and St. Kitts and Nevis omitted, beta turned out to be negative and significant at 0.26, see Table 2 and Chart 3. Moreover, the beta implied a speed of convergence of 9.2 per cent per annum with half the time to reach steady state being 7.7 years. In light of this, the overall sample would be referred to as the C11 countries, while the 7 countries for which there was beta convergence would be referred to as the c7 countries. It must be noted, however, that these results are subject to selection bias and limited degrees of freedom.

Sigma Convergence

Compared to beta convergence, sigma convergence presents a stronger notion of convergence. When this concept is applied to all countries in the sample, a downward trend as required for convergence was not obtained, see Figure 4.

Figure 4 Standard Deviation of the Log of Real GDP Per Capita



When only the C7 countries are considered, however, the trend is downwards, though it increases slightly from the mid 1990s. Effectively though, the sigma convergence reinforces the beta convergence results with regards to the countries that must remain in the sample for convergence to occur.

Gini Coefficient

The Gini Coefficient shows the concentration of the distribution of per capita income in favour of a few countries. In 1980 for example, countries which accounted for 10 per cent of the combined population among the sample of countries selected, accounted for 46 per cent of the combined per capita income. This increased in 2000 to 58 per cent. Moreover, the countries which accounted for 18 per cent of the population in the region, accounted for 72 per cent of combined per capita GDP in 1980 and 81 per cent in 2000.

Table 3 Income Distribution by country population

	1980	2000
Gini Coef. All Countries	0.006015	0.012869
Gini Coef. Convergent Countries	0.000137	0.001158
Top 10% of the population (9.9% for 1980 and 9.6% for 2000)	46.10386	58.05676
Top 18% of the population (18.1% for 1980 and 18.4% for 2000)	72.14101	81.33461
Top 55% of the population (56% for 1980 and 54% for 2000)	93.86238	96.26527

Overall, the dispersion widened between 1980 and 2000 from 0.006 to 0.013 respectively. Interestingly, when only the C7 countries were considered, the dispersion narrows considerably. Thus the results suggest that inequality between country populations widen when the entire sample is considered compared to where the sample is limited to the C7 countries.

Stochastic Convergence

The Augmented Dicky Fuller tests were used to test the stationarity of the stochastic differences between countries, see Table 4. The results were somewhat different to the cross sectional results when stochastic convergence was considered. There were no definitive boundaries from which to conclude that convergence clubs exists.⁷ The closest boundaries were between Barbados and the OECS, but these boundaries were not closed nor were they absolute. For example, while Barbados exhibit absolute convergence with Antigua and Dominica, there was no convergence between Antigua and Dominica.

Table 4 Unit Root Test

	Bar	Dom	Gre	Guy	Jam	Skn	Slu	TT	Svn	Blz
Ant	^a -4.7**	-1.9	^a -3.3**	^a -3.6**	-1.3	-2.2	-5.5	-2.9	^a -3.9**	-2.4
Bar		^a -4.1**	^a -4.3**	^b -4.1**	-0.6	-2.19	-2.4	-1.9	^a -3.7**	-1.8
Dom			^a -4.1**	^a -4.0**	^a -3.3**	0.23	^b -3.7**	-2.2	^a -4.0**	^a -4.9**
Gre				-1.1	-2.6	-1.8	^b -3.6*	-1.7	^a -3.7**	^a -3.1**
Guy					-0.9	-1.7	-0.8	-2.6	^a -2.7*	-1.1
Jam						-1.1	-1.8	-1.6	^b -3.6*	-1.6
Skn							-1.6	-2.4	-3.1	-2.4
Slu								0.66	-3.1	-1.4
TT									-2.0	-2.4
Svn										^a -4.8**

Notes: Ant is Antigua and Barbuda; Bar is Barbados; Dom is Dominica; Gre is Grenada; Guy is Guyana; Jam is Jamaica; Skn is St. Kitts and Nevis; Slu is St. Lucia; TT is Trinidad and Tobago; Svn is St. Vincent and the Grenadines; Blz is Belize. ** is significant at least at a 5% level, and * is significant at a 10% level. Absolute convergence is indicated by 'a' catching up is indicated by 'b'.

Interestingly, St. Kitts and Nevis, and Trinidad and Tobago, do not share the same time series properties with the other territories. Perhaps in the case of Trinidad and Tobago, it being the major energy supplier in the group, its boom and bust cycles may not necessarily share the same pattern as the other territories.

⁷ Convergence clubs are defined as existing where economies share the same long run path.

Conclusion

The cross sectional indicators suggest that the entire region is not converging to the same steady state. However, the results suggests that the C7 countries, Antigua and Barbuda, Barbados, Dominica, Grenada, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago are converging. Indeed, there is non convergence when Belize, Guyana, Jamaica and St. Kitts and Nevis are added to the list. In spite of this, the time series properties do not completely support this result. Instead it suggests that the convergence boundaries are neither closed or absolute. Thus, while the cross sectional data suggest there was convergence between time intervals for some countries, the countries do not all share the same economic cycles.

Another interesting result is with respect to the polarity in income distribution across populations of member countries, with 18 per cent of the population of the region accounting for about three quarters of the combined GDP of the region. Moreover the distribution widened between 1980 and 2000. However, the gap in income was considerably lower between the C7 countries. This further provides evidence to suggest the C7 countries are candidates to form a convergence club.

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