Understanding Economic Growth in the Caribbean Region

A Conceptual and Methodological Study

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Abstract[1]

A renewed interest in explaining growth in the Caribbean countries is motivated by the somewhat slow but uneven performance in the past decade: per capita GDP gaps in Caribbean countries have widened in relation to the United States, whereas standard theories would predict convergence. This study (a) examines the question using methods developed in the recent growth literature on economic growth and (b) characterizes the main elements of growth by estimating empirical models. On the basis of time-series and comparative static estimations, the study finds that the combination of domestic policies, high indebtedness, and outside shocks (e.g., oil price changes or main trading partners' tourism demand) explain well the gap in growth of the six IDB member countries (The Bahamas, Barbados, Guyana, Jamaica, Suriname, and Trinidad and Tobago). Moreover, the study shows evidence that the member countries' small size and their synchronicity with the U.S. business cycle influenced growth performance. In general, the influence of good policies on growth is still evident from the analysis.

Key words: economic growth, small states, policies, Caribbean
JEL codes: B4, E6, O1, O4

CONTENTS

1. Introduction

Understanding economic growth in the Caribbean requires approaching the issue from different perspectives, by using various tools. This paper aims to set up a methodological framework to analyze economic growth in the Caribbean, a region with similar institutions but dissimilar patterns of economic growth. The countries analyzed are The Bahamas, Barbados, Guyana, Jamaica, Suriname, and Trinidad and Tobago. The paper examines growth, taking into account four essential characteristics: (a) their small size, (b) the fact that many are highly indebted, (c) their lack of diversification, and (d) the fact that they are potentially susceptible to large fluctuations and costly damages resulting from various outside shocks, as proposed by Mercer-Blackman (2012).

We address the issue of growth in the region using two standard methods. First, we estimate the relationships among key variables in a full cross-country panel regression and conduct comparative statics on the effect of policy variables on growth.[2] Then, taking the values of the independent variables and the growth rates for different periods, we consider how the changes in average growth rates between two periods can be attributed to changes in the explanatory factor (e.g., policies and structural factors).

A second approach is a time-series analysis of per capita GDP at the individual country level and its relationship to policy changes. From a simple stochastic neoclassical growth model, it is possible to derive a stochastic process for per worker GDP, which is modeled as a function of a deterministic trend, lags of GDP per worker, and a random shock. The paper not only estimates the model but also tests and pinpoints structural breaks, which provides insights on the time period where structural changes may have occurred as a result of idiosyncratic shocks or policy changes in individual countries (Chumacero and Fuentes, 2006; Fuentes, 2011).

In this paper, we incorporate issues relevant for the region, with special emphasis on the effect of the high public debt-to-GDP ratios, the generally

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[2] Although some recent literature uses panel data of countries in this way, it includes only economies in the region (e.g., see Economic Commission for Latin America and the Caribbean, 2009; Peters, 2001; Greenidge et al., 2012). Thus, it loses some gains in the efficiency of estimating larger panel data, where the heterogeneity across countries is captured through interactions between factors and policy (Loayza, Fajnzylber, and Calderon, 2005; Chang, Kaltani, and Loayza, 2009; Calderon and Fuentes, 2012).

undiversified export structure, and the consequences of being small. More specifically:

- We incorporate the concept of thresholds for the effect of public debt on growth (see the approaches in Calderon and Fuentes [2013] and Greenidge et al. [2012]). Using the estimates from the first paper, we not only analyze the debt and growth relationship in the Caribbean but also consider the type of policies that could mitigate the negative effect of public debt on growth.

- We consider how trade openness is complementary with financial openness and other structural factors that affect economic growth.

- We consider how the undiversified structure of trade and the susceptibility to external shocks may have contributed to lower long-run growth rates. The empirical literature, since the pioneer work of Ramey and Ramey (1995), provides evidence which supports the negative effect of aggregate and policy volatility on growth.

- We consider impulse-response functions to examine how exogenous factors have a powerful effect on economic growth and volatility in small states. The analysis of growth in small states is based on the works by Easterly and Kraay (2000), Armstrong and Read (2002), and Read (2004), but has been recently reexamined by the International Monetary Fund (2013) and Ruprah, Melgarejo, and Sierra (2014).

- We look at tourism and the origin of visitors and its relationship to growth. Thacker, Acevedo, and Perrelli (2012) identified the tourism sector as an important contributor to economic growth across countries. This sector was significantly hit by the post-Lehman crisis and is the main export sector for half of the countries in our analysis. Thacker and colleagues found that the high debt-to-GDP ratio negatively affected growth through the investment channel.

In general, the findings suggest that—as in other developing countries—trade and financial openness, macroeconomic policies, and public debt explain the main difference in the growth rate across the Caribbean economies but that outside shocks seem to have a somewhat larger and negative effect. The

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dependence on the U.S. economy stands out clearly when analyzing tourism and business cycle synchronization of these countries. This means that Caribbean countries do not have the luxury of lax policy discipline because other external factors will overwhelm their course. However, when policy reforms have been undertaken, the payoff in terms of growth seems to have been very high.

The paper is divided as follows. Section 2 presents the methodological framework for analyzing growth that will be used and reviews the growth literature, including the literature that looks specifically at Caribbean growth. Section 3 selects which sources of data are more adequate for the analysis and distinguishes whether countries have a problem of growth or a problem of levels in income per capita. Section 4 analyzes the time series of GDP per capita for each economy. Section 5 uses the cross-country estimates of Calderon and Fuentes (2013) to conduct comparative statics along the lines mentioned earlier. Section 6 analyzes some specific issues relevant to the economies of the Caribbean, including the effect of external shocks. Section 7 concludes.

2. Methodological Framework for Analyzing Growth

Two important and related issues in economic development require attention. The first is how to explain differences in the growth rate across countries and differences in the growth rate over time in a country. The second is how to explain the persistent differences in income per capita and standards of living across countries. This section[3] describes methods for using these models in the practical analysis of growth.

In the traditional neoclassical framework, the growth rate is exogenous.[4] Therefore, economic policies and types of institutions determine the steady-state level of income per capita, and they affect growth only during the transition from one steady state to another. In endogenous growth models with convex technology, economic policies and types of institutions will affect the growth rate.[5] Moreover, in models that depart from perfect competition (e.g.,

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[3] The recent book by Acemoglu (2009) makes a comprehensive overview of the theory of growth.
[4] Solow (1956), Cass (1965), and Koopmans (1965).
[5] Jones and Manuelli (1990) and Rebelo (1991).

those with externalities and endogenous technological change),[6] economic policies and quality of institutions will also have a growth effect. A new strand of the literature mixes aspects of the latter type of model (endogenous technological change) with the neoclassical model's interpretation of long-term growth processes to explain differences in the level of income per capita across countries.[7] Other papers incorporate these features to focus on certain characteristics (such as size), whereas empirical studies look specifically at the Caribbean experience. Appendix A presents an extensive review of all relevant growth studies.

2.1 Theoretical Literature and Its Application to Small Countries

One important issue for the Caribbean economies is whether the size of the country matters for growth. Alesina and colleagues (2005) looked at this issue and summarized it as follows:

- Small countries do not have the scale economies in the provision of public goods. Fixed costs in the provision of some public goods are apportioned by taxpayers (e.g., the Central Bank, the Administration of the State).

- Small countries cannot diversify across regions. Business cycles may have different origins in different regions, similar to natural disasters. If the country is large, there are more possibilities to diversify that risk.

- Small countries are more subject to foreign aggression. Having a large population and income may act as deterrence against foreign aggression.

- Small countries may not have the scale effects of the growth rate. As discussed in Section 6, being large may affect the growth rate in models with spillovers or nonrival knowledge.

Alesina and colleagues (2005) also discussed some disadvantages (costs) of being too large, including having ethnic fragmentation (although some of the Caribbean countries studied have some ethnic diversity as well).[8]

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[6] Lucas (1988), Romer (1986, 1990), Aghion and Howitt (1991), Grosman and Helpman (1991).
[7] Howitt (2000) and Comin and Hobijn (2010).
[8] Among the costs of being large, Alesina and colleagues (2005) mentioned administrative and congestion costs. As the countries become larger, the marginal cost of public administration and congestion cost become too large, overcoming the benefits; thus, heterogeneity in population. There is evidence that heterogeneity in preferences may reduce growth. For example, Easterly and Levine (1997) showed evidence that ethnolinguistic fractionalization (as a proxy for heterogeneity) is responsible for the poor performance of the African countries.

According to the literature, the most important factor for small economies is the scale. How does economies of scale effect enter the models? Jones (1999) noted that the first generation of theoretical endogenous growth papers modeled the scale effect in the growth rate (Romer, 1990; Grossman and Helpman, 1991; Aghion and Howitt, 1992). This theoretical setup was unwieldy given that the models did not exhibit a balanced growth path unless the population growth was zero. The key assumption was that the growth rate of technology depended linearly on the share of people involved in research and development. Thus, a permanent increase in the research-and-development effort generates an increase in the growth rate of technological change. The second-generation models of innovation (Jones, 1995b; Kortum, 1997; Segerstrom, 1998) assume that the growth rate of technology exhibits diminishing returns, thus avoiding a built-in scale effect in the growth rate. However, in these types of models, the research-and-development effort and the level of population involved affect the level of income per capita.[9]

To analyze the relation between trade and the size of an economy, Alesina and colleagues (2005) developed a model within the neoclassical framework. The model assumes that there is a large set of intermediate inputs produced only with capital. These inputs could be traded at no cost within the boundaries of the country, but there is a cost for using the foreign market. The demand for capital will depend on the size of the country and whether it is cheaper to import a specific input. Trade openness and size of the country have a positive effect on income per capita in the steady state, but they are substitutes in the sense that income depends negatively on the interaction between size and openness. This means that size is less important for a more open economy, while openness is less important for large countries. Similar effects are found for the growth rate around the steady-state level of income per capita.

In summary, some theoretical arguments suggest that size matters for the level of income per capita but not necessarily for the growth rate. The empirical

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[9] Agion and Howitt (1998), Dinopoulos and Thompson (1998), and Young (1998) developed models where the scale effect in the growth rate is absent. The key assumption is that the spillover effect is limited in each sector and that technological progress increases the number of products in the economy.

analysis of the relation between size and growth must take into account the level of openness of the economy.

2.2 The Empirical Literature

Empirical studies on growth have followed different paths. A time-series approach focuses on testing which type of model is more suitable for analyzing growth.[10] This subset of studies considers whether a policy shock has a permanent effect on the level of income per capita or whether such a shock has a transitory effect. Most have found evidence that a transitory shock has no effect on the long-run level of income per capita.

Other empirical studies (e.g., Calderon and Fuentes, 2013) involve cross-country regressions or panel data estimations. The underlying model implies *convergence*—poorer countries grow faster than do rich countries—and is conditional on the value of specific variables that may affect the steady state. The variables typically used are quality of domestic policies, financial and trade openness, quality of institutions, human capital, and financial market development. These empirical studies confirmed the traditional negative sign for the coefficient of initial GDP per capita with growth, which shows convergence. They have also found that economic policy shock affects not only the long-run level of GDP per capita but also the growth rate in the transition toward that equilibrium.

2.3 Review of the Empirical Literature on Growth in the Caribbean Region

The existing literature on economic performance in the Caribbean region could be divided into two strands: (a) papers that use a large sample of countries to derive specific lessons for the region, where not all Caribbean countries are included[11]; and (b) papers that use a sample that includes only Caribbean economies. Tables A1 and A2 in Appendix A summarize all of the studies. Few empirical growth studies focus specifically on the Caribbean region, probably because of lack of data.

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[10] Jones (1995a) and Kocherlakota and Yi (1996, 1997).
[11] Some papers use panel data analysis to make inferences for some countries in the Caribbean, usually the two largest (Jamaica or Trinidad and Tobago).

The papers in the first group have documented a robust and positive effect of good economic policies on growth (Loayza et al., 2005; Chang et al. 2009; Calderon and Fuentes, 2012). Moreover, they have found that the negative effect of high public debt on growth is mitigated by good governance and good economic policy (Calderon and Fuentes, 2013).

Regarding tourism, size, and growth, many studies that analyze large panel data have found a positive relation between tourism and growth, although they have causality-related issues (Eugenio-Martín, Martín, and Scarpa, 2004; Sequeira and Nunes, 2008). Regarding country size, early literature has found no differences in economic performance between small and large economies (Easterly and Kraay, 2000), although the question of whether vulnerability of small economies may hamper growth continues (Armstrong and Read, 2004; Charveriart, 2000). In more comprehensive studies, Thacker and Acevedo (2010) and Thacker, Acevedo, and Perrelli (2012) have confirmed that tourism has a positive effect on growth performance, whereas small size and island condition have a negative effect.

The literature that exploits panel data of Caribbean countries also confirms that a poor macroeconomic environment, low quality of institutions, and high level of microeconomic inefficiency are the main drawbacks for growth in the nineties for the region (Kida, 2005) and the lack of total factor productivity growth and investment during the same period (Economic Commission for Latin America and the Caribbean, 2009). Caribbean data also confirm the findings of Calderon and Fuentes (2013) that public debt is detrimental for growth (Greenidge, Craigwell, Thomas, and Drakes, 2012; Thacker and Acevedo, 2010). Regarding natural disasters, the literature has found short-lived effects on growth (Crowards, 2000; Sosa and Cashin, 2009). Usually, a disaster negatively affects growth for 2 years after the event. Another relevant issue for the Caribbean region was the effect of the recent financial crisis, which shows that the economies of the Caribbean tend to amplify the U.S. cycles as a result of a large exposure to that economy (Kouame and Reyes, 2010). The World Bank (2005) concluded that there may be growth opportunities derived from the development of comparative advantage in

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services (especially tourism) that could be seized from economic integration with the region and the rest of the world.

More recently, Ruprah, Melgarejo, and Sierra (2014) and Ruprah (2013) have shown evidence that small economies seem to have performed worse in terms of sustainable growth over the past decade and that this is attributable mostly to the low growth of the small Caribbean countries. In other words, comparing small and large economies using many structural indicators, small economies have performed worse, but within the category of small economies (defined as those countries with fewer than 3 million people), the Caribbean has performed even worse on average. The Caribbean may thus be reducing the average for all small economies.

3. Data Issues: Growth or Level Problem?

To dissect the problem, we first decompose the GDP and growth data available for these countries. Figures 1a and 1b exhibit the comparison of GDP per capita for the six economies using data from the World Bank, the International Monetary Fund, and the Penn World Tables. For some economies, the evolution of GDP per capita is similar, independent of the source; however, the series follow different paths in some specific episodes. This is especially true for Barbados (in the 1960s and 1970s) and for Suriname along the entire period of analysis (1960 to 2010). Considering the continuous modifications of the data in different versions of the Penn World Tables 7.1, it is not recommended to use this database for time-series analysis, but it is useful for international comparisons. For the time-series analysis, it is better to use the series in constant prices from the World Development Indicators (2012), given that the International Monetary Fund series is too short for some countries.

Figure 1a. GDP Per Capita (Constant Prices): World Economic Outlook Versus Penn World Table (PPP)
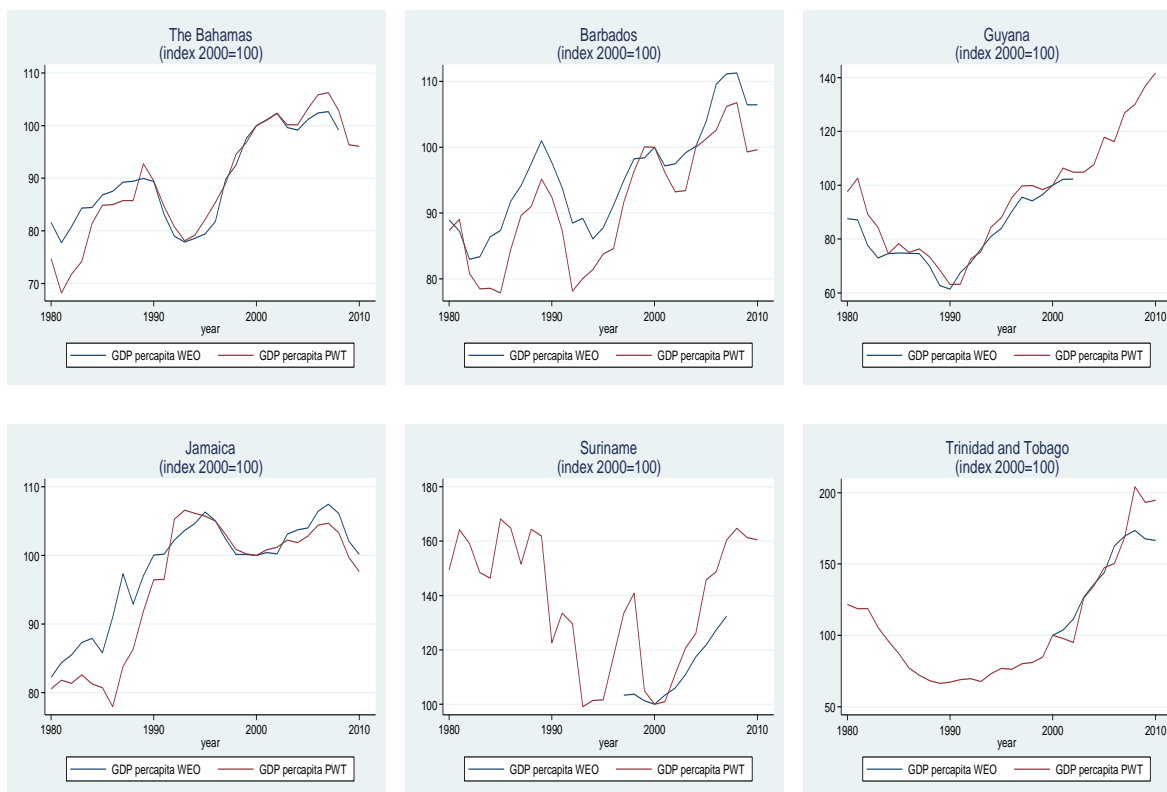
Source: International Monetary Fund and Penn World Table 7.1.

Figure 1b. GDP Per Capita (Constant Prices): World Development Indicators Versus Penn World Table (PPP)
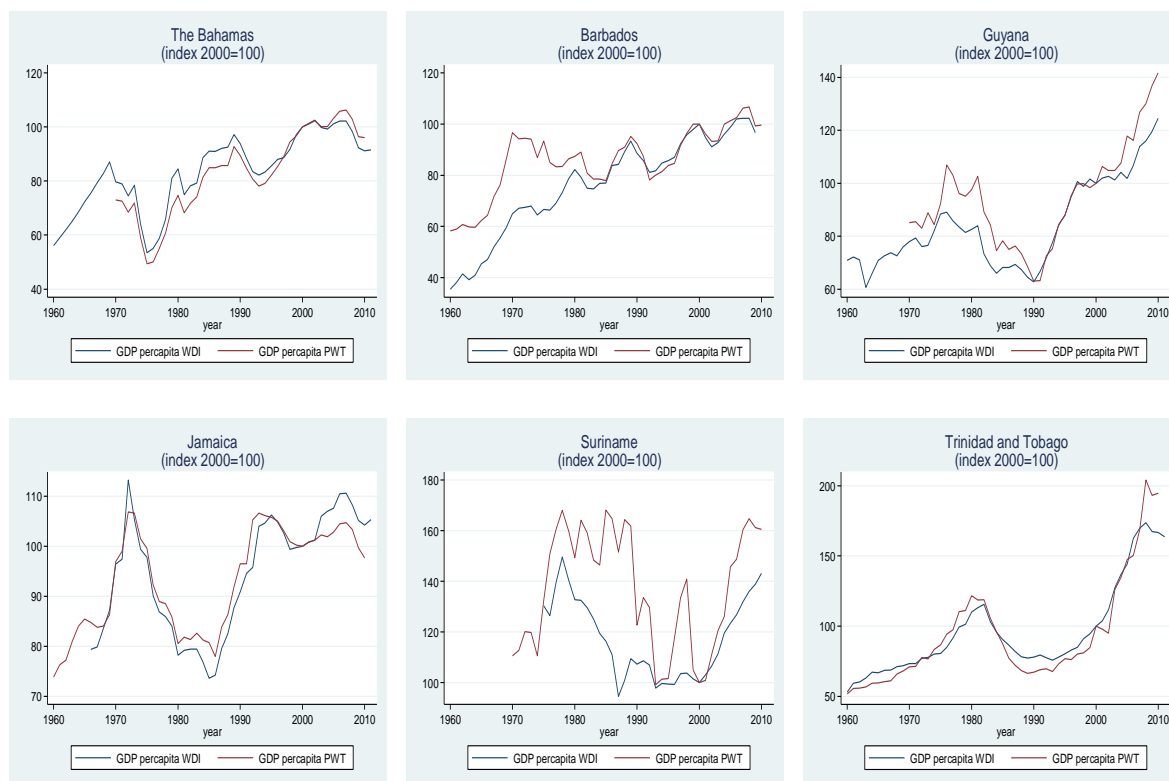
Source: World Bank and Penn World Table 7.1.

At first sight, all of the economies exhibit high volatility in the growth rate, with some showing periods of slow or negative growth and others exhibiting several spikes in the per capita GDP. Guyana and Trinidad and Tobago have shown a pattern of continuous growth since 1990, while the process for Suriname started in 2000. Jamaica experienced some positive growth from the mid-1980s until the mid-1990s. Barbados and Bahamas have tended to show a positive trend in growth over the entire period but with large swings in the growth rate. Nevertheless, as a result of swings in the growth rate, it is difficult to determine the long-run growth trend.

When comparing the per capita GDP of these economies with that of the United States, two findings are clear: the low relative growth in the region and the large dispersion in per capita income levels in the region (see Figure 2). All of the countries except Trinidad and Tobago have lost ground relative to the

United States, which means that they have grown at a lower speed than the U.S. economy's average 2 percent per capita long-run growth rate. This finding runs counter to the convergence theory, which states that less developed economies have a higher per capita growth rate than do their more advanced peers. Moreover, there is heterogeneity: The ratio of per capita income is relatively high for The Bahamas, Barbados, and Trinidad and Tobago. Although Jamaica used to have 40 percent of the per capita income of the United States in the early 1960s, today the ratio is closer to that of Guyana and Suriname.

Figure 2. Per Capita GDP Relative to the United States

Source: Penn World Table 7.1.

In what follows, we use the time-series analysis of data on individual countries and derive policy implications from the comparative statics described in Section 1.

4. Time-Series Analysis of Per Capita GDP

To model the growth rate, we use a canonical neoclassical growth model that assumes that GDP per worker is trend-stationary. To ensure a closed-form solution of the model, we assume logarithmic preferences[12] and a Cobb-Douglas production function in a stochastic one-sector growth model. The production function exhibits constant return to scale in capital and labor, has labor-augmenting technological change, and technology is modeled as log-normal. The technology shocks follow an AR (1) process. Appendix B shows that the closed form solution of this GDP per worker problem to be as follows:

$$\ln y_t = \phi_0 + \phi_1 t + \phi_2 \ln y_{t-1} + \phi_3 \ln y_{t-2} + \varepsilon_t \qquad (1)$$

where y is output per worker, t is the trend, and ε is a white noise disturbance. The long-term growth rate is given by $\phi_1/(1-\phi_2-\phi_3)$. The estimation of Equation 1 provides the parameters of the stochastic process behind the GDP per worker, assuming that there is one regime throughout the entire estimation period.

It is highly likely that there have been structural changes over the ensuing period. For example, changes in the tax system, the tax burden, trade openness, or financial market development can alter the steady-state level of per capita GDP of the economy, thus affecting the growth rate in the transition to a new steady state. We carry out a procedure to test endogenously the existence of breakpoints.[13] The finding of those break points will shed some light on structural factors (e.g., institutions, volatility of shocks) or economic policies (e.g., taxes, openness), which may have affected the growth rate of the economy. The main shortcoming of this method is the need for a long time series to identify the potential breaks.

The stochastic neoclassical growth model has an analytical solution, when assuming logarithmic preferences or a Cobb-Douglas production function (see Appendix B for the derivation). Moreover, if technology shocks follow an AR (1) process, the output per worker will follow an AR (2) process with a deterministic trend. The stochastic process for GDP per worker could be written as follows:

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[12] This is equivalent to assuming a constant relative risk aversion equal to one.
[13] Bai and Perron (1998, 2001) provided several tests for endogenous breakpoints.

$$\ln y_t = \phi_0 + \phi_1 t + \phi_2 \ln y_{t-1} + \phi_3 \ln y_{t-2} + \varepsilon_t \quad (2)$$

where y is GDP per worker, t stands for trend, and ε is a white noise process. Table 1 shows the estimation results and the implicit long-run growth rate using time-series data for each individual country. All per capita GDP growth rates are less than 2 percent, which is the long-term growth rate of the United States; the only exception is Suriname, but its rate is not statistically different from 0, meaning that it has a large standard deviation or volatility in the growth rate. The three countries with the highest long-run per capita GDP growth rates are Guyana, Suriname, and Trinidad and Tobago. These three economies have one important characteristic in common—they are commodity exporters. At the same time, they also have the largest standard deviation of the estimated growth rate, which is consistent with the idea that commodity exporters face more volatile shocks that induce more aggregate volatility.

Table 1. Estimation of Univariate Time-Series Model

1962 - 2011	The Bahamas	Barbados	Guyana	Jamaica	Suriname	Trinidad and Tobago
Constant	2.532**	0.905**	1.093	1.439*	0.080	0.539*
	(0.746)	(0.409)	(0.694)	(0.762)	(0.214)	(0.314)
Per capita GDP in t-1 (log)	1.210**	1.144**	1.231**	1.187**	1.137**	1.548**
	(0.129)	(0.149)	(0.141)	(0.150)	(0.180)	(0.112)
Per capita GDP in t-2 (log)	-0.471**	-0.258*	-0.320**	-0.306*	-0.180	-0.601**
	(0.129)	(0.141)	(0.144)	(0.150)	(0.192)	(0.114)
Trend (t)	0.002**	0.001	0.001*	0.001	0.001	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Long-run growth rate	0.008**	0.0106**	0.015**	0.004	0.026	0.019**
	(0.002)	(0.005)	(0.007)	(0.004)	(0.058)	(0.007)

Note: Significant at the 5 (**) or 10(*) percent levels. Estandar errors in parenthesis. Estimation period: The Bahamas (1962 - 2011), Barbados (1962 - 2009), Guyana (1962 - 2010), Jamaica (1968 -2011), Suriname (1977 -2010), Trinidad and Tobago (1962 - 2011).

The next step is to explore whether there are common structural changes across these economies, checking whether the breaks occurred at common dates. Finding the occurrence of structural changes is not unusual when analyzing long time series. To do this, the date of the break is estimated as another unknown parameter. Moreover, the number of breaks is also unknown,

so they also need to be estimated. Bai and Perron (1998, 2001) proposed a battery of tests for multiple unknown structural breaks. Table 2 presents a summary of the results from the tests.

The results show that The Bahamas and Barbados have only one structural break, which took place in the 1970s; but whereas The Bahamas increased the growth rate in the second period from –2.8 percent to 0.6 percent, Barbados reduced the growth rate from 6.4 percent to 1.1 percent. Suriname and Trinidad and Tobago also experienced just one structural break, but it took place in the 1980s. During the second period, both economies increased the growth rate. This is especially noticeable in the case of Suriname, which increased the growth rate from –3 percent in the period 1977–1989 to 3.7 percent in the period 1990–2010.

Table 2. Estimation of Potential Breaks

Country [a]	Dates	Growth Rate [b]
The Bahamas (1)	1962–1976	–0.028 (0.033)
	1977–2011	0.006 (0.003)
Barbados (1)	1962–1971	0.064 (0.008)
	1972–2011	0.011 (0.001)
Guyana (2)	1962–1974	0.016 (0.003)
	1975–1990	–0.023 (0.003)
	1991–2011	0.019 (0.006)
Jamaica (3)	1968–1973	0.067 (0.003)
	1974–1985	–0.021 (0.007)
	1986–1994	0.042 (0.001)
	1995–2011	0.038 (0.002)
Suriname (1)	1977–1989	–0.030 (0.004)
	1990–2010	0.037 (0.019)
Trinidad and Tobago (1)	1962–1982	0.028 (0.004)
	1983–2011	0.041 (0.012)

[a] Number of breaks in parentheses.
[b] Standard deviation in parentheses.

The historical events in each country provide some explanations for these findings. First, most of the economies experience a break around 1973, which coincides with the oil shock and the international recession. The exception is Trinidad and Tobago (there are no data to evaluate the case of Suriname), which is an oil exporter and therefore did not suffer from the shock. After the shock, the economies reacted differently, but it took time for all of them to revert to their old trend. To some extent, the type of policies that followed determined whether there was another break. For example, Guyana[14] and Jamaica[15] implemented an inward-oriented economic policy with higher government intervention. In both cases, when those policy regimes ended, a new structural break was generated. In the case of Guyana, the growth rate reverted to the same level as in the 1960s, while in Jamaica it did not recover.

Some recent work compares the effects of policies on the growth of Barbados and Jamaica. According to Henry and Miller (2009), the observed disparity in growth rates between these two countries is attributable to macroeconomic policies. Henry and Miller (2009) presented a comparison of these two economies given similar colonial institutions inherited from Great Britain but with a very different performance in terms of economic growth, which explains today's large difference in per capita GDP. Fiscal management, the exchange rate policy, and trade orientation seem to explain the difference. While both economies suffered from a structural break in the 1970s, the per capita GDP growth rate in Jamaica became negative, while for Barbados it was low but still positive. Moreover, the structural break in 1994 for Jamaica (there was no break for Barbados) coincides with a deep and costly financial crisis that affected the growth rate of the subsequent period.

Trinidad and Tobago is slightly different because it is a major energy exporter, but its structural break takes place as a result of a mix of changes in the external conditions and macroeconomic mismanagement. In the 1970s, this oil-rich country experienced high economic growth, driven by the high price of oil. Unfortunately, the growth was accompanied by a rapid rise in government expenditures, a real appreciation of the exchange rate that stifled the tradable

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[14] See World Bank (2003a).
[15] See World Bank (2003b, 2011).

sector, and a 40 percent increase in real wages between 1973 and 1980. The world recession and the terms of trade shock of 1982 then induced a change in the policy orientation. After that, the growth rate of the economy increased.

The structural breaks found for these Caribbean countries seem to be triggered by external conditions combined with inadequate structural policies, so we subsequently analyze this point further. The structural policies seem to be largely responsible for the growth trajectories that ensue immediately after the shock.

5. Comparative Statics Using Cross-Country Estimates

The comparative static approach takes advantage of the cross-section estimates to measure the effect of policies on economic growth. In the model we postulate that per capita GDP growth is explained by the initial level of per capita GDP, structural factors (e.g., human capital, governance, financial market development), policy factors (inflation, government burden, trade, and financial openness), and aggregate or policy volatility. One potential drawback of this method is that the coefficients estimated are assumed to be the same for all countries. However, because they include interactions among the explanatory variables, it is possible to capture heterogeneity across countries. This idea is illustrated with the following dynamic equation:

$$\begin{aligned} y_{it} - y_{it-1} &= \alpha y_{it-1} + \phi' S_{it} + \gamma' P_{it} + \pi' S_{it} \cdot P_{it} + + \mu_t + \eta_i + \varepsilon_{it} \\ &= \alpha y_{it-1} + \beta' X_{it} + \mu_t + \eta_i + \varepsilon_{it} \end{aligned} \tag{3}$$

where y denotes the (log of) real GDP per capita, S represents structural factors and institutions driving growth, and P is a set of policy environment variables. The term μ_t denotes an unobserved common factor affecting all countries, and η_i represents a country effect capturing unobserved country characteristics. In a situation in which there is one policy variable and one structural factor, and φ and π are scalars, the magnitude of the effect of a policy factor P_{it}, on growth according to Equation (3) is defined by the coefficients: $\phi + \pi S_{it}$. In other words, the effect will depend on the level of the structural factor S for country i at time

t. For example, suppose that P_s = public debt and S_s = a structural factor such as good governance, and $\phi > 0, \pi < 0$. Taking only the coefficient ϕ implies that good governance improves growth, but if the interaction term is negative, it means that the high public debt negatively counteracts good governance. In this way, it is possible to map the effect of policy variables on growth.

Following Calderon and Fuentes (2013), economic growth is explained by convergence (initial GDP per capita, y_0), structural factors (human capital [*h*], financial development [*FD*], and quality of institutions [*INS*]); the so-called outward policy environment (*OPE*, which includes trade and financial openness), domestic policy environment (*DPE*, which includes inflation and fiscal balance), and public debt (*PD*).

Calderon and Fuentes (2013) conducted two exercises that are useful for the purpose of the present work. First, they compared the growth rate of each country between the 1991–1995 and 2001–2005 time periods and derived how much of this difference could be explained by each aforementioned factor. Second, they forecasted the growth rate for the 2011–2020 decade for each economy, assuming that each factor reaches the level of the 90th percentile of the sample. Thus, if an economy has policy indicators below that level, it will improve its performance by reaching a higher level and will increase its growth rate. The equation with coefficients estimated by Calderon and Fuentes (2013) is as follows:[16]

$$g = -1.70\,y_0 + 1.61\,h + 0.75\,FD + 3.55\,INS - 0.66\,DPE + 0.40\,OPE - 0.83\,PD + 0.35\,PDxDPE + 0.12\,PDxOPE$$
(4)

Only two out of the six countries (Jamaica and Trinidad and Tobago) were analyzed in Calderon and Fuentes (2013) as a result of insufficient data for the other countries. The main problem is that the measure of financial openness (*OPE*), the log of the stock of equity-based foreign liabilities to GDP expressed in 1995 US$, was not available for The Bahamas, Barbados, Guyana, and Suriname. However, there is information on foreign direct investment flows.

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[16] The domestic policy index is calculated as follows: DPE = –1.1299 * Inflation + 0.2489 * Fiscal Balance while the outward policy index is computed as follows: OPE = 3.1238 * Trade Openness + 0.9869 * Financial Openness.

Therefore, we regress the stock of equity-based foreign liabilities-to-GDP on FDI-to-GDP for the available economies, and use the resulting coefficients to predict the values for the economies that are missing.[17]

Table 3 shows the results of the exercise using the estimated coefficient by the authors. The first and second columns exhibit the actual change in the growth rate between the periods 1991–1995 and 2001–2005 and the difference projected by the empirical model, respectively. As expected, it is difficult to make a good fit for individual countries from panel data estimates; however, the model performs very well for the cases of Jamaica and Suriname, while for the rest the fit is rather poor. This is because the model attempts to capture long-run growth rather than short-term shocks that may affect the growth rate significantly even over a specific 5-year period for some economies.

Table 3. Explaining Changes in Economic Growth for Caribbean Countries Over Time: 2001–05 Versus 1991–95, in Percentage Points of GDP

Country	Actual Change	Projected Change	Transitional Convergence	Structural Factors	Policy Environment	Public Debt
The Bahamas	2.09	−1.04	−0.31	0.21	−0.34	−0.60
Barbados	0.40	−1.03	−0.38	0.19	−0.35	−0.50
Guyana	−6.66	−1.30	−0.96	0.87	−1.59	0.38
Jamaica	−1.67	−1.45	−0.33	−0.28	−0.57	−0.27
Suriname	5.81	4.19	−0.05	0.48	0.51	3.25
Trinidad and Tobago	6.69	−0.49	−0.60	−0.38	0.04	0.45

Table 3 shows the effect of economic policies on performance.[18] The model does not explain well the performance of The Bahamas and Barbados, precisely because of shocks to the economy that are different from policies. The model predicts a reduction in the growth rate of The Bahamas as a result of an increase in the public deficit (which deteriorates the domestic policy environment); nonetheless, there was an important resumption to steady state

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[17] Using the fixed-effects method to estimate a linear specification of stock of equity-based foreign liabilities to GDP on FDI over GDP, we obtain the following relation: log(Equity Foreign Liabilities/GDP) = −91.72 + 20.45 * log(1+FDI/GDP).

[18] Appendix C shows the decomposition of each policy index in more detail.

after the very severe recession during the 1991–95 period. A similar result was obtained for Barbados, where the widening fiscal deficit worsened the domestic policy environment predicting lower growth, even though actual growth was mildly positive.

Guyana exhibited the worst policy indicators (with the exception of inflation), despite lower public debt in the second period. This was the result of incorporating Guyana into the Heavily Indebted Poor Countries initiative, which generated a reduction in the public debt from 620 percent of GDP to 120 percent of GDP[19]. Overall, the model predicts a reduction in the growth rate; however, in the actual data the reduction was dramatic. From the excellent performance in the period 1991–1995, in which the economy grew 7 percent, the economy declined to an average growth of 0.4 percent in 2001–05. This would be due to other factors not captured by transitional convergence and policy factors.

The model predicts well the reduction of the growth rate in Jamaica. This fall in the growth rate is attributed to an increase of the public debt-to-GDP ratio from 87 percent to 104 percent during the period analyzed. The negative effect was in part ameliorated by an increase in the domestic policy environment in Jamaica. The economy experienced a severe banking crisis in the late 1990s, which led the government to assume the financial sector liabilities with the corresponding negative effect on the fiscal accounts and public debt.

The model also predicts well the increase in Suriname's growth rate (Table 3); a strong public debt reduction (International Monetary Fund, 2012) accompanied by an improvement in the domestic and external policy environment boosted economic growth in the second period. Growth improved by 5.81 percentage points on average between those two periods. Restrictive fiscal and monetary policies were implemented in the early 2000s (International Monetary Fund, 2005) and were accompanied by some improvements in external competitiveness (i.e. structural factors).

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[19] Successful completion of this Initiative led to the forgiveness of Guyana's external public debt by multilateral and bilateral creditors.

As with Guyana, the model did not predict well the extraordinary improvement in growth rates in Trinidad and Tobago during that time period, which was tied to commodity prices. This is because the performance of the economy was and is closely tied to the price of oil, and it coincided with the discovery and development push of the natural gas sector. Therefore, it is not surprising that the economy experienced a much higher growth rate in the second period than in the first period, even though policy conditions did not change that much between both periods.

Forecasts

We proceed further with this analysis to consider what would have happened with the growth rate of these economies in the 2001–2010 decade had the policy environment and public debt-to-GDP ratios been better. In other words, the exercise poses the question: What would the average growth rate have been if the value of these variables improved to reach the level of the 90th percentile of the entire sample of countries? This approach measures the effect of better policies on growth. We decompose the actual versus predicted hypothetical growth into growth attributed to a better policy environment and growth attributed to the effect of a high public debt burden.

The results show that all six economies would have had higher growth rates, as shown in Table 4. Trinidad and Tobago would have had a growth rate 1.4 percentage points higher during the period. Suriname's growth rate would have been 3.75 percentage points higher, and 2.5 percentage points of that were attributed to the low quality of policy environment. Guyana and Jamaica could have increased their growth rate by more than 2 percentage points had they reduced their public debt-to-GDP ratio to the 90th percentile level. Table 4 thus corroborates the negative effect of a high public debt on growth, given that improving that factor will make the growth rate higher by 1 percentage point on average over a 10-year period.[20]

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[20] Guyana is the only economy that would experience negative growth if the policy environment reaches the 90th percentile. Because its economy is very open to trade, the 90th percentile implies a reduction in the degree of openness, as measured here.

Table 4. Forecasting the Growth Rate for the Period 2001–10 Under a Scenario of the 90th Percentile

Country	Overall Projected Change	Change Attributed to: Policy Environment	Public Debt
The Bahamas	1.95	0.48	1.48
Barbados	2.25	0.49	1.75
Guyana	1.55	–0.84	2.39
Jamaica	3.72	0.89	2.83
Suriname	3.75	2.47	1.28
Trinidad and Tobago	1.41	0.41	1.00

Notes: Trade in Guyana and Suriname with data only for the period 2001–05.

6. Characterizing Caribbean-Specific Issues

This section addresses the following specific issues concerning the performance of Caribbean economies: (a) the fact that exports are concentrated in tourism or commodities; (b) the synchronicity of their economic cycle with the United States, used to examine how strongly the economic performance of the Caribbean countries depends on fluctuations in U.S. economic activity; and (c) the effect of being small on growth performance. In this section, we follow the methods of Alesina and colleagues (2005) and Calderon and Fuentes (2013), adding the size of the economy as an independent variable. We also discuss the connection between the size variable and the quality of policies.

6.1 Undiversified Export Structures and Shocks: Tourism Versus Commodities

According to their export structure, the six economies can be divided into two groups: those that are mainly tourism exporters (The Bahamas, Barbados, and Jamaica) and those that are primarily commodity exporters (Guyana and Suriname in agriculture; Trinidad and Tobago in oil and gas). As shown in Figure

3, export revenues from tourism represent around 65 percent for The Bahamas, 55 percent for Barbados, and 45 percent for Jamaica; for the other three economies, tourism is 10 percent or less. The dependency on tourism is illustrated by the number of tourists as a percentage of total population, as shown in Table 5 for the year 2011. The number of visitors per year in The Bahamas is equal to almost four times the national population, in comparison with Trinidad and Tobago, where they are only 29 percent of the total. Most tourists to The Bahamas and Jamaica originate from the United States, and from the United Kingdom for Barbados, which also illustrates the lack of diversification of tourism by origin.

Figure 3. Tourism in Total Exports
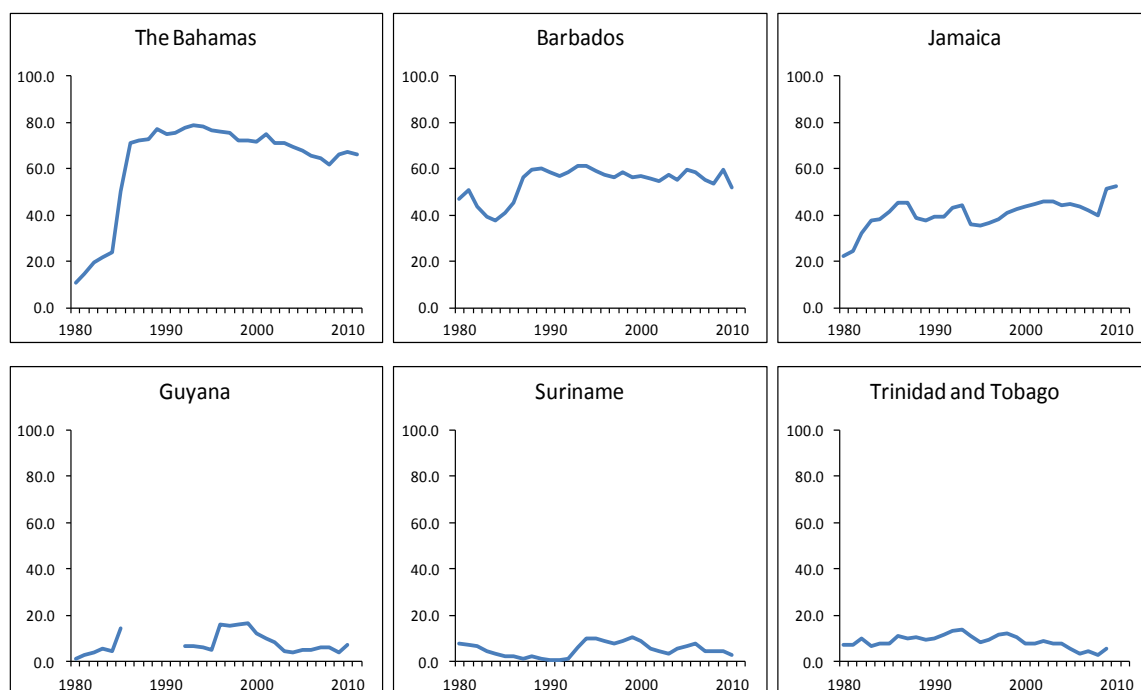
Source: ECLAC

Table 5. Arrivals, by Main Market 2011 (% of Total)

	The Bahamas	Barbados	Guyana	Jamaica	Suriname	Trinidad and Tobago*
United States	79	25	53	63	4	51
Canada	9	13	15	19	1	13
Europe	6	40	5	13	49	10
Others	6	23	26	5	47	33
Total of tourists	1,344,190	567,724	156,910	1,951,752	220,475	360,661
Population	347,176	273,925	756,040	2,706,500	529,419	1,346,350
Tourists/population	3.87	2.07	0.21	0.72	0.42	0.29

Source: Caribbean Tourism Organization; World Bank.
Note: arrivals exclude daily stopovers (such as cruise passengers)
* Data for Trinidad and Tobago are for 2010.

The characterization of the countries being small and vulnerable means that they are susceptible to external shocks with trading partners (mostly tourism exporters) and with the price of the main traded commodities (e.g., oil imports, gold and natural gas exports). Therefore, we consider the hypothesis that the direction of these variables (commodity prices and trading-partner GDP growth) determines a significant part of the Caribbean countries' growth trajectory. To see how these external variables influence each of the individual countries, a simple cointegration relationship was established with some of the variables, following Sheridan, Tumbarello, and Wu's (2012) study of Pacific Islands. The econometric analysis surmises the potential growth spillovers from the United States (the United Kingdom in the case of Barbados) to each of the Caribbean economies and looks at the effect of commodity prices.

We use a vector error correction model for each of the six countries to gauge the impact, with annual data from 1980 to the present.[21] The analysis considers the long-term growth dynamics. A cointegration technique is used to identify the long-run relation between GDP in the Caribbean countries and the GDP of the main trading partners, using real variables expressed in log levels. In many cases, a long-run cointegration relationship is achieved if we also include the prices of one of the main export or import commodities, particularly oil. From the long-run relation, we test the effect of a shock of the exogenous

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[21] Or the earliest available date, which for some countries was 1990. Quarterly data, when available, did not go as far back as annual data.

variable on the GDP of the Caribbean countries. The results are shown in Figure 4.

Figure 4. Impulse-Response Functions of Shocks of Exogenous Variables on GDP of The Bahamas, Barbados, Guyana, Jamaica, Suriname, and Trinidad and Tobago
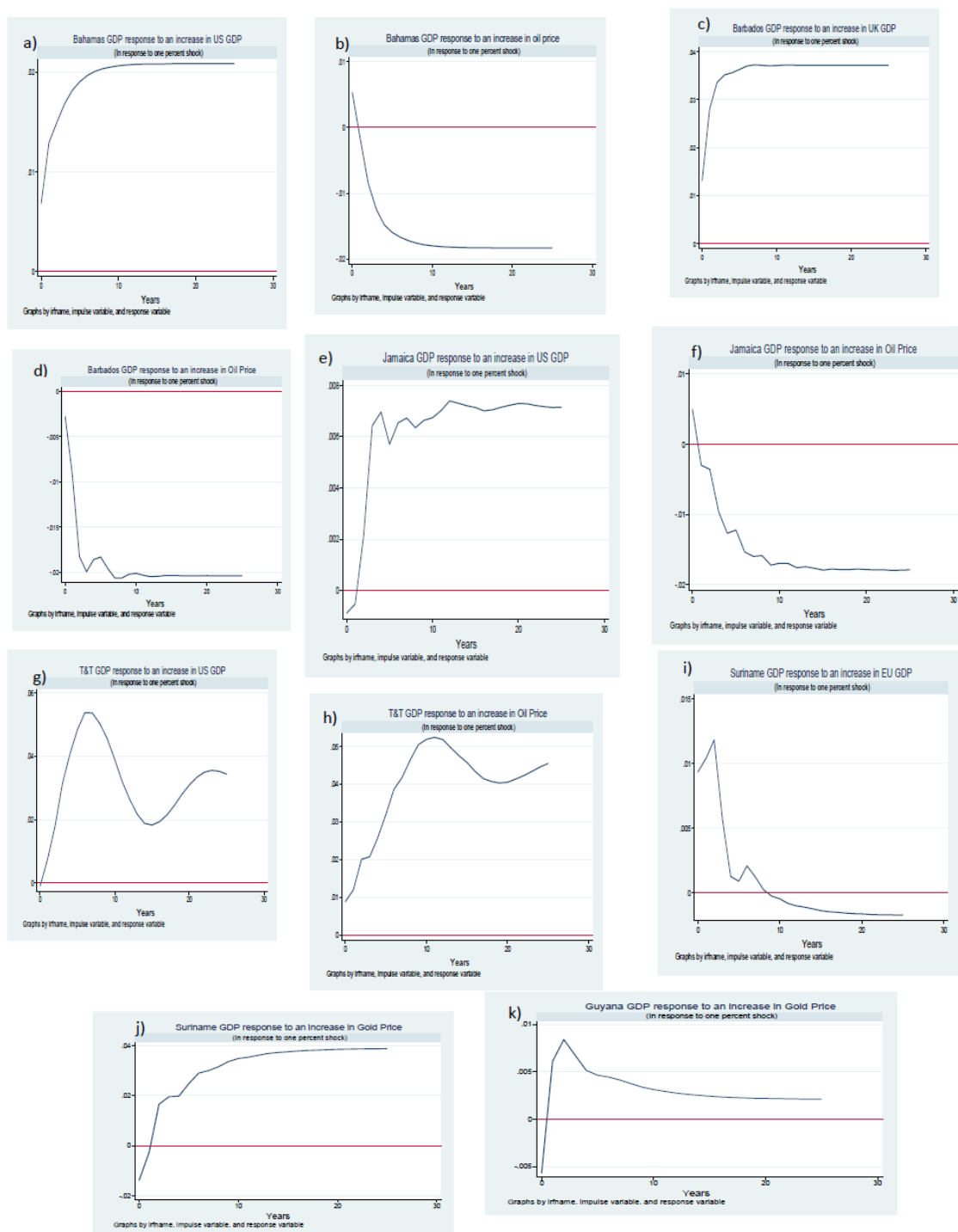
Source: Authors' calculations using STATA. The figures show the response of the respective country's GDP to a 1 percent change in the independent variable. These are, by panel: a) The Bahamas: U.S. GDP; b) The Bahamas, oil price; c) Barbados: U.K. GDP d) Barbados: oil price; e) Jamaica: U.S. GDP; f) Jamaica: oil price; g)

Trinidad and Tobago: U.S. GDP; h) Trinidad and Tobago: oil price; i) Suriname: E.U. GDP; j) Suriname: gold price; k) Guyana: gold price.

For **The Bahamas**, we found one cointegrating vector with an optimal order of two lags. The tests for serial correlation and normality were passed, namely, we could not reject the hypothesis that the errors are not serially correlated. The impulse-response exercises showed that an increase in the U.S. real GDP led to a significant and permanent increase in the GDP of The Bahamas over 4 years (Figure 4, panel a).[22] Likewise, a 1 percent increase in the price of oil reduced The Bahamas' real GDP permanently after 4 years, by 0.2 percentage points (Figure 4, panel b). Therefore, both have a very solid permanent effect.

For **Barbados**, we found that the best long-run cointegrating relationship was with the United Kingdom's real GDP, consistent with the high proportion of tourism originating there, and not from the United States. The coefficient on the United States in the structural equation is not statistically significant. Nonetheless, a 1 percent increase in U.S. GDP prices also has a positive permanent effect for the case of Barbados (Figure 4, panel c). In terms of commodity prices, we looked at some of their small but relatively significant export commodities (sugar and fish) but did not find them to be strong determinants of the real GDP of Barbados: The impulse response function analysis suggests only a small and temporary effect. However, as with The Bahamas, oil prices are important and have a permanent negative effect: A 1 percent increase in oil prices also reduces real GDP by 0.02 percentage points (Figure 4, panel d).

For **Jamaica**, as expected, the U.S. GDP is also an important determinant: an increase in the U.S. GDP has a minor immediate negative effect, but within 4 years it increases Jamaica's real GDP by 0.08 percentage points. Likewise, a 1 percent increase in oil prices reduces Jamaica's real GDP permanently (over the long run) by –0.015 percentage points, with the full effect coming through in 4 years. We also looked at other possible variables that could influence Jamaica's

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[22] In The Bahamas and Barbados, it seems that a noticeable dip in the real GDP around 1990 was attributed to the hike in oil prices before the first Iraq war, coupled with the property bust in the United States, which also affected tourism markedly in 1990 and 1991.

real GDP, such as aluminum prices[23] and sugar prices. These do not fare as well in the cointegrating relationship.

For **Trinidad and Tobago**, the cointegrating long-run equation included the real GDP of the United States, the European Union's real GDP, and oil prices (Figure 4, panels g and h). As expected the oil price has a positive and significant effect on long-run real GDP: A one percent increase in oil prices leads to an increase of 0.04 percentage points in Trinidad and Tobago's real GDP. Moreover, the U.S. real GDP has a short-term effect up to approximately 8 years, but then this effect diminishes substantially thereafter (although it does not completely disappear). Other variables were also important (e.g., natural gas) but did not have a straightforward cointegrating relationship with GDP.[24] Trinidad and Tobago also manufactures iron and cement, but metal prices were not significant on their own.[25]

The long-run growth of **Guyana** and **Suriname** were more difficult to describe in a simple cointegration relationship model for various reasons. First, they have various external influences, and it is not always clear which way they work: Suriname produces energy, but it is also an energy importer, so it is not clear ex-ante which way the relationship of the oil price with GDP works. Both countries export gold, and Guyana exports bauxite; however, metal prices tend to be highly correlated with oil prices, which they import (as stated)[26]. Third, the ties to the European ex-colonists, in particular, were phased out during the period studied but not in a straightforward way: In Guyana, preferential export prices for sugar with the European Union were phased out starting in 2005, but the phase-out period also included some financing. In Suriname, there were substantial public transfers from The Netherlands and strong trade ties. These

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[23] We do not have prices for bauxite (produced by Guyana and Jamaica); however, aluminum prices tend to be highly correlated with energy prices because of their intensive use in the transformation of bauxite into aluminum.

[24] The relation here is not straightforward, for various reasons. First, natural gas prices vary by market, and liquefied natural gas prices would only be relevant for Trinidad and Tobago starting around 2000 when the liquefied natural gas terminal was operational (even though exports were at first very small). Second, natural gas is also used as an input in fertilizers, which are then exported, so it could also be considered a cost in the GDP structure.

[25] This is probably because metal prices and oil prices are highly correlated.

[26] The geographic separation between bauxite extraction and aluminum production globally leads to a situation in which bauxite demand is driven by the energy-intensive global aluminum industry: energy comprises almost half of the cost of aluminum and bauxite about 8 percent (see Khan, 2015).

trading ties have been changing and are being replaced by more trade and investment from China (also through their demand for commodities). Ties with Europe were most likely stronger before 2000 but have dwindled; however, this is difficult to test given the limited number of observations in our sample after 2000. In Guyana, trade is mostly with the European Union and CARICOM (less so with the United States); however, Guyana also benefits from significant remittances from its diaspora in the United States. Both countries have suffered some bouts of macroeconomic instability followed by strong reforms (see Byron and Kamau, 2012). Guyana's growth before the 1990 reforms suffered from large fiscal problems but later received substantial Heavily Indebted Poor Countries relief. Moreover, Suriname had episodes of hyperinflation in the late 1990s and recently changed its exchange rate system from fixed to floating, all of which affect the macroeconomic environment and conditions for growth. The quality of the data before 2000 is not as strong as in other countries because not all activities (sometimes informal) are being captured. Although this can be an issue for many countries, given the small size of Guyana and Suriname measurement errors may stand out more and affect the data. Given high inflation, it is also more difficult to determine the measurement of real variables.

The results of the cointegration exercise for Suriname show that real GDP is influenced by the real GDP of the European Union, as well as gold prices (see Figure 4, panels i and j). Gold prices have had a significant effect on the terms of trade of Guyana and Suriname. A one percent increase in the European Union's GDP raises Suriname's GDP initially by 0.011 percentage points (all else being equal), but the effect is only temporary and has had hardly any effect after 8 years.[27] A one percent increase in gold prices raises Suriname's real GDP by almost 0.04 percentage points; although the effect is gradual (after 8–10 years), it is permanent.

The results for Guyana were not as strong as for the other countries—we did not find a strong cointegrating relationship with any other real exogenous variables. This is likely because of the aforementioned issues, and is clear in all

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[27] We also looked at whether aid from The Netherlands entered into the cointegration relationship, as well as China's real GDP, but neither performed as well as the European Union GDP, which likely already captures these effects (and China's GDP is correlated most likely to commodity prices).

the methods used in this paper. However, gold prices turn out to be significant: A one percent increase in gold prices raises Guyana's real GDP by less than 0.01 percentage points; most of the effect dissipates and it is temporary (Figure 4, panel k). As a producer of gold, it is possible that part of this relation in Guyana is capturing bauxite prices and oil prices, which are somewhat correlated with gold.

This makes the three tourism-dependent economies more vulnerable to the U.S. cycle, which is the theme of the next section.

6.2   Business Cycle Synchronization With the United States

Cross-country studies and time-series analysis have verified the negative correlation between growth and volatility (Ramey and Ramey, 1995; Fatas, 2000; Hnatkovska and Loayza, 2004). This implies that economies that have a concentrated matrix of exports to a few countries are more exposed to the business cycle of those countries. More specifically, the recent financial crisis in the United States may have affected the cycle in the Caribbean economies and thus long-run growth. However, how synchronized are the cycles of the Caribbean region with those of the U.S. economy?

The first approach would be to compare the cyclical component of GDP between the United States and these economies over time. Figure 5 displays the cyclical component estimated by a Hodrick-Prescott Filter on log of GDP. The first observation is that the cycles in the Caribbean region have a larger amplitude than in the United States. Second, a visual inspection confirms the close relationship of cycle in The Bahamas and Barbados with the United States. This is especially true for Barbados in the past three decades, while the other economies do not have such a high correlation with the United States (the correlation between both cycles is around zero).

Figure 5. Cyclical Component of Caribbean Economies and the United States
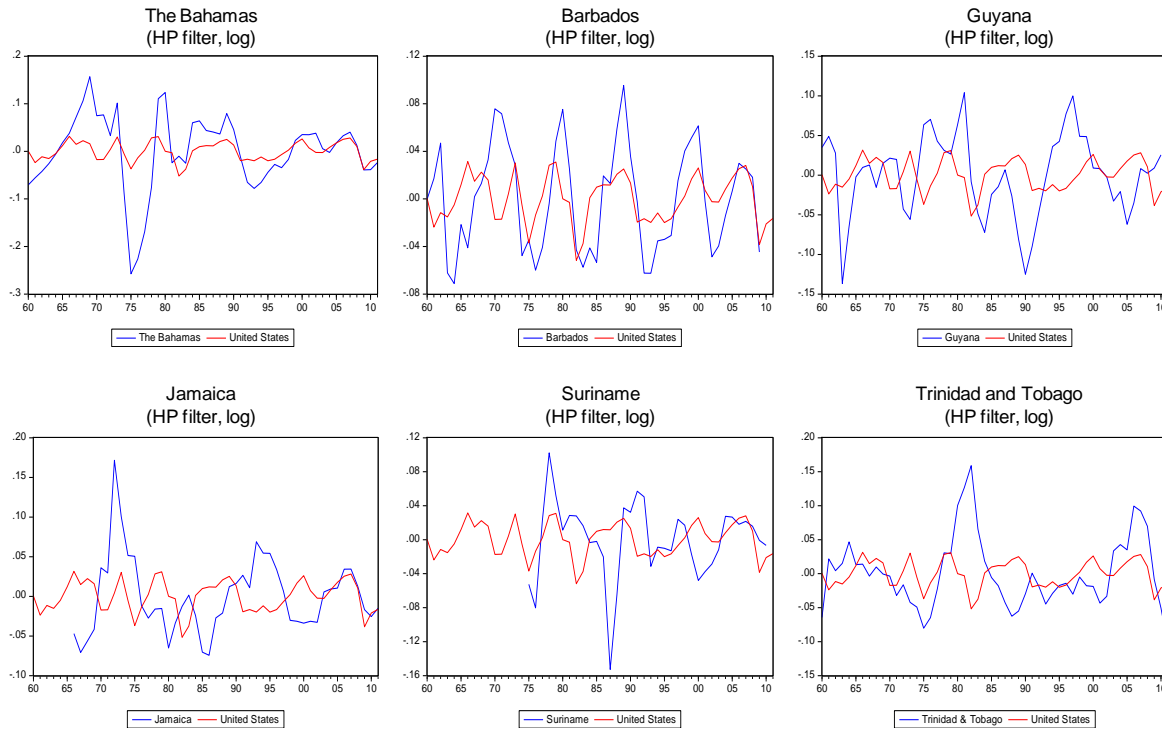
Source: Author's estimation using Hodrick and Prescott filter and World Bank data.

A similar conclusion emerges from an examination of the comovements of GDP of the U.S. and the Caribbean, as measured by the degree of concordance. Following Harding and Pagan (2002), each economy faces two states: contraction (negative growth rate with respect to the previous year) and expansion (positive growth rate with respect to the previous year). The index quantifies the portion of the time that two economies are in the same state. We define $S_t=1$ when the economy is in phase of expansion and $S_t=0$, otherwise. The difference between our approach and Harding and Pagan (2002) is that the definition of contraction corresponds to a state where the GDP trend—as estimated by the Hodrick-Prescott filter—is above the current value of GDP. The opposite is defined as an expansion. The indicator is constructed for a pair of countries {j,c} over T years as follows:

$$I_{jc} = T^{-1} \left[Count\{S_{jt} = 1, S_{ct} = 1\} + Count\{S_{jt} = 0, S_{ct} = 0\} \right]$$

$$I_{jc} = T^{-1} \sum S_{jt} S_{ct} + (1 - S_{jt})(1 - S_{ct})$$

The advantage of this index is its independence in relation to the filter used to measure the cyclical position and the stochastic process of GDP.

Table 6 shows the index of concordance between the economies in the Caribbean region and the United States, although the exercise was conducted for all possible pairs. The concordance index of 4 of the 21 cases is greater than 70 percent, which is still only moderately high: Barbados/The Bahamas, Barbados/United States, The Bahamas/United States, and Suriname/Trinidad and Tobago. The first three reflect the high dependence of these economies on tourism exports, not only over the long run (as already shown in the previous exercises) but also over the cycle.

Table 6. Index of Concordance

	1	2	3	4	5	6	7
1. The Bahamas	1.00	0.76	0.43	0.43	0.44	0.50	0.83
2. Barbados		1.00	0.60	0.48	0.66	0.48	0.70
3. Guyana			1.00	0.36	0.44	0.39	0.49
4. Jamaica				1.00	0.64	0.52	0.35
5. Suriname					1.00	0.78	0.61
6. Trinidad and Tobago						1.00	0.52
7. United States							1.00

Note: The number of observation used to construct the index of concordance is limited by the available observations for each country.

The low concordance indices of the Caribbean countries with each other is noteworthy, despite the fact that they are in the same region and share a common free-trade area: CARICOM.

6.3   Does Being a Small State Matter for Growth?

The literature on whether being small matters for growth has been inconclusive, as discussed previously in the literature survey. Alesina, Spolaore, and Wacziarg (2005) identified several advantages and disadvantages of being a large

country. In their model, the steady-state per capita output is increasing in openness and size, but the effect of size is smaller when the degree of openness is higher. There is a tradeoff; the lower the dependence on trade, the larger the countries will be (as discussed earlier). It is possible that the optimal size is endogenous and it depends on the degree of openness. Alesina and colleagues complemented the theoretical model with empirical evidence using a short panel data of countries and obtained a positive coefficient for size and a negative coefficient for the interaction between size and openness, which supports their hypothesis.

Smaller countries seem to have less detailed trade and national accounts data available, so we propose a slightly different method to study the effect of size on growth for the Caribbean. Following Calderon and Fuentes (2013), we construct a large panel data of countries and add a dummy variable that takes the value of 1 if the country is small (total population less than 3 million people, which corresponds to 19 out of 115 countries in the sample). As in Calderon and Fuentes (2013), we use system General Method of Moments to estimate a growth equation on initial per capita GDP, human capital, quality of governance, financial market development, domestic policy index (which comprises inflation and fiscal surplus), the outward-oriented policy index (which includes trade and financial openness), public debt, and the interaction of these two indexes with public debt. The first column of Table 8 shows the estimated coefficient of the canonical regression, with similar results found in the literature. The second column includes the size dummy, which is not statistically significant on its own. The third column shows the result when the interactions of the dummy for small size and the policy indexes are included. Now, the coefficient of the small size becomes large but not statistically significant, whereas the coefficients for the interactions are positive and statistically significant.

In sum, being large matters for growth, but the negative effect is offset by good domestic policies (low inflation and fiscal surplus) and greater openness (either trade or financial). We interpret this as saying that small countries have to be even more disciplined in their policies because their small size makes them much more susceptible to negative shocks to the growth process.

Table 8. Growth, Public Debt, and Country Size

	[1]		[2]		[3]	
Transitional convergence						
Initial real per capita GDP	−1.6435	**	−1.7326	**	−1.6712	**
(in logs)	(0.397)		(0.419)		(0.440)	
Structural factor						
Human capital	1.7226	**	1.8111	**	1.8856	**
(in logs)	(0.461)		(0.483)		(0.536)	
Private credit	0.5577	*	0.6253	*	0.5283	
(% of GDP, logs)	(0.318)		(0.338)		(0.337)	
Institutions	2.8809	**	3.1274	**	2.8630	**
(in logs)	(1.039)		(1.080)		(1.191)	
Policy environment index						
Domestic policy environment	−1.0107		−0.9590		−1.3944	
	(0.849)		(0.846)		(0.993)	
Outward policy environment	0.2228		0.2249		0.0008	
	(0.176)		(0.205)		(0.239)	
Government burden						
Public debt	−0.8784		−0.7802		−0.6471	
(% of GDP, logs)	(1.413)		(1.429)		(1.597)	
Domestic Policy Environment ×	0.344	*	0.3338	*	0.4198	*
Public Debt	(0.214)		(0.212)		(0.244)	
Outward Policy Environment ×	0.069	**	0.0635	*	0.0916	**
Public Debt	(0.032)		(0.035)		(0.040)	
Country size						
Dummy small country			−0.4815		−11.4622	
(1 if population <3 million)			(0.644)		(7.401)	
Domestic Policy Environment ×					0.6407	*
Dummy Small Country					(0.329)	
Outward Policy Environment ×					0.8595	**
Dummy Small Country					(0.434)	
No. of observations	693		693		693	
No. of countries	115		115		115	
No. of instruments	118		119		119	

Serial correlation tests (*p* value)

AR(1)	(0.000)	(0.000)	(0.000)
AR(2)	(0.728)	(0.747)	(0.726)
Overidentifying restrictions (*p* value)			
Hansen Test	(0.399)	(0.348)	(0.357)

Note: The overall policy environment index is a weighted average of the four policy indicators in regression [1]: CPI inflation rate, fiscal overall balance as a percentage of GDP, exports and imports as a percentage of GDP, and amount of equity liabilities as a percentage of GDP. The first two capture domestic policy indicators while the latter two proxy outward policies. Weights are provided by the coefficient estimates of the corresponding variables reported in Calderon and Fuentes (2013). Hence, the overall policy index is computed as follows: PE = –1.1299 * Inflation + 0.2489 * Fiscal Balance + 3.1238 * Trade Openness + 0.9869 * Financial Openness. In addition, the domestic policy index is calculated as DPE = –1.1299 * Inflation + 0.2489 * Fiscal Balance, while the outward policy index is computed as OPE = 3.1238 * Trade Openness + 0.9869 * Financial Openness. All estimations include time dummies. Standard deviations appear in parentheses. *p = .10. **p = .05*) implies statistical significance at the 10 (5) percent level. All estimations include time dummies. Standard deviation is in parentheses.

7. Conclusions

This paper aims to explain the generally slow growth of the Caribbean economies (The Bahamas, Barbados, Guyana, Jamaica, Suriname, and Trinidad and Tobago) since 1980 using a variety of methodological approaches. Some of these economies were not poor compared with the United States, but the gap in per capita income between these countries and the United States has increased. The review of the literature concluded that several factors should be included when analyzing performance of these economies: their small size and their high public debt, their dependence on tourism or natural resources, and their dependence on the business cycle of large trading partners.

This paper proposed two basic approaches to analyze all these issues: a time-series analysis for the individual economies and a multicounty cross-country estimation. The second method takes advantage of the large literature of panel data estimation of growth and confirms that sound economic policies can help ameliorate the negative effect of public debt and small size of these economies. However, their susceptibility to shocks from large neighbors and commodity prices makes it harder for policies to be as effective as in large economies. We also confirm the strong influence of the United States' business cycles on these Caribbean countries, which trumps any effect that the countries

could exert on each other, and underscores the importance of size in the movement of their GDP.[28]

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[28] The only meaningful concordance pair was that of Trinidad and Tobago with Suriname, and we surmise that this is because Trinidad and Tobago is very large and comparatively wealthier than Suriname and invests heavily in Suriname's oil sector.

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Appendix A. Literature Summary

Table A1. Literature Review: Studies With Large Sample of Countries (including the Caribbean)			
Authors	Objectives	Data and Method	Results
Loayza, Fajnzylber, and Calderón, 2005	Describe, explain, and forecast economic growth for Latin America and the Caribbean.	Solow's decomposition for 20 countries in Latin America and the Caribbean. Regression model estimated with panel data from 78 countries for the period 1961–99 with technique of Arellano and Bond (1991).	Variations of growth are explained mainly by variations in total factor productivity and not by accumulation factors. Convergence and cyclical reversion have a negative effect on growth, while a positive effect is estimated for improvement of structural policies, stabilization policies, and external conditions. The stabilization and structural policies are projected as engines of growth in Latin America and the Caribbean for the period 2000–10.
Calderón and Fuentes, 2012	Study the relation between public debt level and growth and the factors that determine it.	Regression model with data panel estimated by Arellano and Bond (1991). The data are from 136 economies (5 from Caribbean) for the period 1970–2010. Policies environment and structural factors variables are included with interactions with the public debt level to analyze the role played in the effect of debt level on growth.	Negative and nonlinear relation between public debt level and growth is founded, which is mitigated by good quality of domestic policies, greater financial development, but mainly by stronger institutions and policy development outward. It is projected that a fall in the level of public debt and an improvement in the policy environment at the country level in the top 10 percent of the distribution would induce an increase of 2.0 percentage points in the growth rate of South America and of 1.7 percentage points in the Caribbean for the period 2000–10.
Eugenio-Martín, Martín, and Scarpa, 2004	Analyze the relationship between tourism and growth in both directions.	Regression model with data panel estimated by Arellano and Bond (1991). The data are from 21 countries in Latin America and the Caribbean (including Guyana, Jamaica, and Trinidad and Tobago).	There are positive effects of tourism on economic growth for countries of low and middle income, which does not necessarily occur in high-income countries. Analyzing opposite causality is estimated that low-income countries should adjust levels of infrastructure, education, and development to attract tourism.
Sequeira and	Analyze the effects	Regression model with data panel	It is found that there is a positive effect of

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Table A1. Literature Review: Studies With Large Sample of Countries (including the Caribbean)			
Authors	Objectives	Data and Method	Results
Nunes, 2008	of tourism on economic growth and study any differences for small countries and poor countries with the rest of the sample.	estimated by the Blundell and Bond (1998) method and by fixed effects. Data are from 94 countries for the period 1980–2002, with 47 small countries and 59 poor countries.	tourism on growth rate, and there is no evidence that this effect is of a different magnitude for small countries and poor countries with respect to the rest of the sample.
Easterly and Kraay, 2000	Find empirical evidence of differences in income, growth, and volatility for being a small country.	Using as dependent variable the average between 1960–95 of per capita GDP (PPP) (level, growth rate or standard deviation, according to the model) is estimated a cross-section regression model. The data are from 154 economies, of which 33 are small size (from the Caribbean: The Bahamas, Barbados, Guyana, and Suriname).	No effect is found to be small country on the income level, nor on the growth rate, but is positively related to volatility of growth due in part to the increased volatility of terms of trade shocks. This increased volatility of terms of trade is a result of greater openness that small countries have.
Armstrong and Read, 2002	Analyze the effect of vulnerability of small countries on growth.	Using as dependent variable the average of per capita GNP between 1980 and 1993, two cross-section regression models are estimated for 105 small territories, with 64 sovereign countries and 41 subnational regions with high autonomy. As a measure of vulnerability the Vulnerability Index of Briguglio is used.	No effect for the vulnerability index is founded, and so that the author argue specification problems in its construction. It is also estimated that the production structure of economies (agriculture, industry, and services) is important to explain the differences in growth rates between small countries. However, no relevant conclusions are found in this work.
Read, 2004	Describe the implications of globalization and regionalism for the growth of small island	Review of the determinants of growth that are established in the literature and description of implications of globalization and regionalism given the growth determinants. This is a	Globalization poses the challenge of increased vulnerability of small island countries by greater exposure to economic shocks because their specialized production structure.

Table A1. Literature Review: Studies With Large Sample of Countries (including the Caribbean)			
Authors	Objectives	Data and Method	Results
	countries, given their structural determinants.	theoretical—and not empirical— work.	
Alesina, Spolaore, and Wacziarg, 2005	Develop a theoretical framework for growth of small countries and estimate it with panel data.	Using a neoclassical theory, the authors develop a model where the size and trade openness of a country are determinants for per capita GDP of steady state. This model is estimated by SUR and 3SLS using data panel from 104 countries for 1960–2000.	The theoretical model shows that per capita GDP of steady state is increasing in openness and size, but the effect of size is smaller when the degree of openness is higher. In the extreme case, a small country is not affected by its size if is completely open to international trade. The empirical results identified a positive coefficient for size and a negative coefficient for the interaction between size and openness.
Charveriart, 2000	Analyze the effect, dynamics, and distribution of natural disasters in Latin America and the Caribbean, along with vulnerabilities and options to mitigate risks.	Descriptive statistics is used to analyze natural disaster events in the countries of Latin America and the Caribbean for a wide range of time.	High degree of susceptibility of Latin America and the Caribbean to natural disasters. It is postulate the need to generate public policies to mitigate the effects of these events, and the adoption of mechanism to diversify risk in the international financial market.
Thacker and Acevedo, 2010	Analyze the role of tourism and debt economic growth.	Solow decomposition for Caribbean countries for period 1971–2009. Regression models with data from 154 countries for the period 1979–2007.	Growth and factors contributions differ between Caribbean countries. Tourism is positively related to growth and negatively with volatility, while public debt is negatively associated with growth and increases volatility.
Thacker, Acevedo, and Pirrelli, 2012	Analyze the role of tourism, country size, and condition of island in economic growth.	Solow decomposition for Caribbean countries for period 1971–2009. Regression models with data from 154 countries for a period of 29 years. It is estimated with the instrumental variable method of Hausmann and Taylor (1981).	Growth and factors contributions differ between Caribbean countries. Tourism is positively related to growth and negatively with volatility. Country size is positively associated with growth. The condition of the island is negatively related to growth. However, tourism contribution more

Table A1. Literature Review: Studies With Large Sample of Countries (including the Caribbean)			
Authors	Objectives	Data and Method	Results
			than offset the lower growth because of the small island condition.

Table A2. Literature Review: Studies With Data Exclusively From Caribbean Countries			
Authors	Objectives	Data and Method	Results
Peters, 2001	Investigate determinants of growth in CARICOM countries	Data are from 12 CARICOM countries for the period 1977–96. Regression model derived from the Solow model with human capital and endogenous growth based model (no theoretical derivation), estimated by generalized least squares and fixed effects.	In the first model, it is found that investment and human capital are the main contributors to growth. The Solow model has high explanatory power for Caribbean countries. In the second model, it is estimated that there is a negative effect on growth for inflation, population growth rate, and government spending, while a positive effect is found for investment, education, life expectancy, trade liberalization, financial development, and information technology. This last variable reinforces increases the effect of human capital.
Kida, 2005	Reviewing the sources of growth for the CARICOM countries between 1978–2004	Data are from Caribbean countries for the period 1978–2004.	Total factor productivity is the main contributor to economic growth. The growth trajectory of Caribbean countries is marked by the development of tourism, export of commodities and debt. It also establishes that low total factor productivity growth in the 1990s is due to poor macroeconomic environment, low quality of institutions and high level of microeconomic inefficiency.
Economic Commission for Latin America and the Caribbean, 2009	Analyze the growth of the countries of the Caribbean and its determinants	Data are from Caribbean countries between 1971 and 2007. Growth accounting and regression models.	Important contribution of capital and total factor productivity to the high growth rate in 1970s and 1980s, while in the 1990s the labor was the major contributor to the low growth rate. In the regression model, it is found that there is a negative effect of inflation, fiscal spending, and real interest rate, and a positive effect of trade openness and education. No significant effect was estimated for investment and convergence.
Greenidge, Craigwell, Thomas,	Find threshold for debt-to-GDP ratio of Caribbean	Regression model estimated by fixed effects with data from 12 Caribbean countries between 1980 and 2010.	There is a threshold of 55–56 percent of the debt-to-GDP ratio for Caribbean countries on which the effect of debt on growth becomes negative. The relation is not linear, for ratio less

Authors	Objectives	Data and Method	Results
and Drakes, 2012	countries on which the effect of debt on growth becomes negative		than 30 percent, the effect is positive.
Hausmann and Klinger, 2009	Analyze why CARICOM countries would be behind in the process of structural transformation and explore policies to reverse this trend	Indicators are constructed to analyze the possibility of transforming the current productive structure of Caribbean countries, concentrates on products unsophisticated. It also makes the exercise of CARICOM as one country to study the effects of integration. Service sector is not included in the analysis because of missing data.	The structural change is a determinant for the productivity and therefore for growth. It is found that the current production matrix of Caribbean countries is backward in relation to their level of income per capita and that the actual products are unlikely to change to others more sophisticated. It is also estimated that the integration would allow a more diversified export matrix at the level of developed countries, and more sophisticated products.
Crowards, 2000	Analyze possible measures of vulnerability to natural disasters and applies them to the Caribbean	Possible indicators: number of event given period, macroeconomic impact, volatility of agricultural production, quantification of the cost of damage, number of victims, and number of deaths.	High difficulty to develop an aggregate indicator of vulnerability to natural disasters, but with a range of possible instruments to use. Analyzing macroeconomic impact of natural disasters in the Caribbean is estimated a negative effect on economic growth in the second and third years, negative effect on trade balance, increased government spending, and immediate drop in tourism.
Kouame and Reyes, 2011	Analyze the effect of the financial crisis on the economic performance of the countries of the Caribbean	It focuses on the effect of external shock on the economic performance of Caribbean's countries. It uses descriptive and comparative analysis of data on macroeconomic variables to study the vulnerability of the region to other countries' economic cycle.	Caribbean countries tend to magnify the effects of the crisis, and specifically amplifying the business cycle of the United States because its high trade dependence, financial flows, and tourism.

Table A2. Literature Review: Studies With Data Exclusively From Caribbean Countries			
Authors	Objectives	Data and Method	Results
Sosa and Cashin, 2009	Analyze the effect of natural disasters and external shocks on economic performance of the countries of the Eastern Caribbean (countries with monetary union).	Vector autoregression model is used with two exogenous components: natural disasters and international economic variables. For the analysis is used the variance decomposition method and impulse response function.	It is found that natural disasters, external demand shocks (tourism), and oil prices are the main determinants of GDP fluctuations. While the effect of the first two factors disappears in the short term (2 years), an oil price shock has greater persistence.

Appendix B. Theoretical Model for Time-Series Analysis

Consider a representative, infinitely lived household that maximizes

$$U_0 = E_0 \sum_{t=0}^{\infty} \beta^t L_t \ln c_t$$

where $0 < \beta < 1$ is the subjective discount factor, L_t is the size of the population (or labor force) at time t, $c = C/L$ is per capita consumption in t,[29] and E_t is the expectation operator depending on information available at period t. The household supplies inelastically L_t units of labor. Utility is maximized with respect to per capita consumption, subject to the following budget constraint:

$$K_{t+1} + C_t = e^{z_t} K_t^{\alpha} [(1+\gamma)^t L_t]^{1-\alpha} + (1-\delta) K_t$$

where K_t is the capital stock at time t, δ is the depreciation rate, and α is the compensation for capital as a share of GDP. In this economy, technological progress is labor-augmenting and occurs at the constant rate γ. Production is affected by a stationary productivity shock z_t. It is possible to rewrite the model in terms of effective unit of labor, $\tilde{k}_t = k_t (1+\gamma)^t$ and $\tilde{c}_t = c_t (1+\gamma)^t$, which makes $\tilde{k}_t$ and $\tilde{c}_t$ stationary. The solution of the stationary economy is the same as the above economy. This economy is characterized by the following problem:

$$\max_{\{\tilde{k}_{t+1}, \tilde{c}_t\}} E_0 \sum_{t=0}^{\infty} L_t \ln(1+\gamma)^t \tilde{c}_t \qquad (1)$$

subject to

$$(1+n)(1+\gamma)\tilde{k}_{t+1} + \tilde{c}_t = e^{z_t} \tilde{k}_t^{\alpha} + (1-\delta)\tilde{k}_t \qquad (2)$$

where n is the rate of population growth, which is assumed constant. The stochastic process for the technology shock is given by the following:

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[29] Lowercase letters denote per capita; uppercase letters denote total; and a tilde above a variable denotes per unit of effective labor.

$$Z_t = \rho Z_{t-1} + \varepsilon_t, \varepsilon_t \sim N(0, \sigma_\varepsilon^2) \qquad (3)$$

Assuming $\delta = 1$, the analytical solution of this problem is the policy function for the capital per effective unit of labor expressed as follows:

$$\ln \tilde{k}_{t+1} = \ln(\alpha\beta) - \ln(1 + \gamma) - \ln(1 + n) + \ln \tilde{y}_t, \qquad (4)$$

where $\tilde{y}_t = e_t^{Z_t} k_t^\alpha$ is the GDP per unit of effective labor.

Given that $\ln \tilde{y}_t$ can be expressed as follows:

$$\ln \tilde{y}_t = z_t + \alpha \ln \tilde{k}_t \qquad (5)$$

replacing (3) and (4) in (5) to obtain the following:

$$\ln \tilde{y}_t = A + (\alpha + \rho) \ln \tilde{y}_{t-1} - \alpha\rho \ln \tilde{y}_{t-2} + \varepsilon_t \qquad (6)$$

where $A \equiv \alpha(1 - \rho)[\ln(\alpha\beta) - \ln(1 + \gamma)]$. Recalling that $\tilde{y}_t(1 + \lambda)^t = y_t$ I can use (6) to obtain a compact representation of the data-generating process of per capita GDP:

$$\ln y_t = \phi_0 + \phi_1 t + \phi_2 \ln y_{t-1} + \phi_3 \ln y_{t-2} + \varepsilon_t \qquad (7)$$

where $\phi_0 \equiv A$; $\phi_1 \equiv (1 + \gamma)$; $\phi_2 \equiv \alpha + \rho$; $\phi_3 \equiv -\alpha\rho$. Equation (7) is consistent with a series of per capita GDP that is trend stationary as found in the data. Moreover, it shows that per capita GDP follows an AR(2) process if the technology shock follows an AR(1) process. This equation includes as a special case the traditional AK model ($\alpha = 1$) and the unit root in the technology process ($\rho = 1$), but it is impossible to identify the value of any of these parameters.

Appendix C. Explaining Change in Economic Growth for the Caribbean Countries, by Component Over Time: 2001–05 and 1991–95

Country	Period	Debt	Consumer Price Index	Fiscal Balance*	Trade	eq_fly**	Foreign Direct Investment	Domestic Policy Environment	Outward Policy Environment
The Bahamas	1991–95	30.4	3.8	–0.4	104.0	2.6	0.8	–5.3	17.1
	2001–05	31.2	2.0	–2.6	91.3	3.2	3.5	–5.9	17.2
Barbados	1991–95	65.4	3.1	0.5	106.8	2.5	0.5	–5.1	17.1
	2001–05	48.0	2.4	–2.2	113.4	2.7	1.1	–5.8	17.4
Guyana	1991–95	619.1	32.6	–2.3	241.0	4.6	10.8	-6.1	21.6
	2001–05	122.9	5.1	–5.0	199.9	3.2	3.8	-6.5	19.7
Jamaica	1991–95	87.4	41.1	–3.8	110.0	27.5	2.1	-6.5	17.9
	2001–05	104.1	10.7	–2.9	89.0	57.7	5.4	-6.0	18.0
Suriname	1991–95	63.6	163.4	–10.8	63.2	1.4	–5.2	-8.8	14.3
	2001–05	34.8	19.4	0.9	70.3	1.9	–2.7	–5.2	15.2
Trinidad and Tobago	1991–95	57.8	7.0	0.2	80.6	76.3	6.2	–5.2	18.0
	2001–05	48.7	4.8	2.5	97.3	88.5	6.3	-4.6	18.7

* Fiscal balance at beginning of period.

**Predicted value with foreign direct investment as proxy.