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ABSTRACT

Although the countries of the Organization of the Eastern Caribbean States (OECS) have registered some appreciable degrees of success concerning poverty reduction, education or schooling achievement, and economic growth, in many instances, much needs to be done in terms of poverty reduction, high external debt and overall development. The present paper re-examines the issue of the determinants of economic growth in the countries of the OECS in the period 1980-2011. Specifically, the paper answers two questions. What are the determinants of economic growth in the countries of the OECS? What are their short-run and long-run impacts? To this end, the paper uses the cointegration autoregressive distributed lag (ARDL) approach at the country level to draw conclusions concerning each country individually and the region as a whole. Overall, it is found that external debt, natural increase rate, and private consumption are the main drags to economic growth in the region in the short and long runs, and trade openness positively impacts economic growth. For any significant determinant, the long-run impact is in general far bigger than the short-run impact. Of note, natural disasters have negative impacts on economic growth, but only in a handful of countries. The negative impact of budget deficit shows up in one country with a complete data set. These results have policy implications.

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1. **Introduction**[1]

The countries of the Organization of the Eastern Caribbean States (OECS) are island countries located in the Caribbean Sea. The independent countries of the OECS include Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines. These countries share many common features such as common British legacies, common currency (the EC dollar), small economic size, small land size, small population, high degree of vulnerability, and low degree of economic diversification. At the same time, they also differ from one another in more than one aspect including degree of social partnership, level of crimes, and frequency of natural disasters.

Remarkably, against the odds, at least up to now, all the countries of interest as well as territories in the sphere, have recorded a noticeable degree of success regarding poverty reduction, education or schooling achievement, and economic growth or perhaps development as the levels of their respective human development index (HDI) rankings indicate. This does not mean that these countries should rest on their laurels. Indeed, in many instances, much needs to be done concerning poverty reduction[2], high external debt[3], and high exposure to external shocks. These issues and others, of course, ultimately affect their economic growth prospects or the quality of their economic growth. In fact, it can be observed that the high economic growth, in the order of 5.9% per year, that characterized the region in the 1980's, has been eroded in

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[1] An earlier version of this paper was presented at the 34th Annual Review Seminar of the Central Bank of Barbados. We thank Dr. Delisle Worell, the discussant of the paper, and other participants for their useful comments. We acknowledge Dr. Ankie Scott-Joseph and Moses Davis for helping us with data collection. We are also grateful to Benjamin Burghardt for editing the paper. Naturally, all remaining errors are our own.

[2] "Despite their middle upper income country status, however, between 18% and 30% of the population live in poverty." http://www.worldbank.org/en/country/oecs/ov retrieved on 18/3/2013.

[3] Most of these countries are per GDP among the most indebted countries in the world.

recent times such that only an economic growth of 0.6% was registered in 2011. Of course, although there is variability among the countries, the downward economic growth trend has been generally experienced by all, with some countries registering even negative economic growth (Antigua and Barbuda with -5.5% in 2011 and likewise St. Kitts and Nevis with -2%).

The present paper deals with the economics of the six independent countries of the OECS alluded to above. It reexamines the issue of the determinants of economic growth in the countries of the OECS in the period 1980-2011. Specifically, the paper answers two questions. What are the determinants of economic growth in the countries of the OECS? What are their short-run and long-run impacts? Naturally, the objective can be approached from at least two perspectives. Indeed, the analysis can target the causal factors of economic growth in the six countries taken as a whole. In the same token, the focus may be on individual countries. The paper exploits a single country approach to deal with the two perspectives.

It is imperative, singularly at a time of economic crisis, to shed light on some key determinants of growth/development of the region and individual countries since such an endeavour can help the region as well as individual countries build a platform for growth resumption that can further be conducive to sustainable development.

The literature indicates that many models --neo-classical, endogenous growth, dependence theory, plantations model, etc. -- can explain, with some degree of success, a country or region's economic growth. This paper adopts a variant of endogenous growth model to explore the determinants of economic growth in the OECS countries.[4] Basically, models are formulated based on quantitative data capturing, among others, information on human resources,

[4] Another valuable or rather complementary approach is the growth diagnostics approach initiated by Hausmann *et al.* (2005) and applied, among others, by Grenade (2012) for Grenada.

physical capital, structural policies and institutions, financial depth, the availability of public services and infrastructure, external conditions, natural disasters, good governance, and stabilization policies. Time series data covering the period 1980-2011 and 6 independent countries are of interest.

The paper exploits the autoregressive distributed lag (ARDL) bounds testing procedure initiated by Pesaran *et al.* (2001) to estimate and test the relationship between economic growth and a host of variables. Compared to other cointegration methods or distributed lag methods, this methodology has three advantages. First, contrary to other cointegration techniques which are based on variables with the same level of integration, the ARDL methodology allows a mixture of I(0) and I(1) variables. Second, and more significantly the ARDL methodology can be conducted even if the sample size is small. Third, it provides valid test statistics even when some of the regressors are endogenous (see Pesaran *et al*. 2001). Overall, it leads to more accurate parameter estimates compared to other cointegration techniques.

The paper makes three empirical contributions to the literature. First, it is among the very few empirical studies which squarely deal with the countries of the OECS[5]. Indeed, as far as the Caribbean is concerned, although there exist some reports from the World Bank and the Inter-American Development Bank (IADB) as well as working papers from the IMF, most of these studies deal with either Jamaica, Barbados or Trinidad and Tobago. In addition, in quite a number of studies dealing with Latin America and the Caribbean, the focus is heavily on Latin America (see, for example, Loayza *et al.* 2005). Second, this is also a rare study which uses the ARDL approach in the context of economic growth. By doing so, more reliable estimates are

[5] Others include Roache (2007), Sosa and Cashin (2009), Grenade (2012) for Grenada and Acevedo (2014).

obtained, particularly in the context of small sample sizes. Third, unlike many authors, a clear distinction is made here between short-run and long-run impacts.

The paper is organized as follows. Section 2 provides the background of the countries of interest. Section 3 deals with the literature review. Section 4 develops the methodology. Section 5 provides the results. Section 6 concludes.

2. **The OECS Countries: A Background**[6]

The Organization of the Eastern Caribbean States (OECS) consists of six independent Member States –Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines--- as well as 3 associated Members which happen to be British dependent territories --- Anguilla, the British Virgin Islands, and Montserrat. This paper only deals with the independent states.

The OECS was officially launched in June 1981 with the signing of the treaty of Basseterre by the individual Heads of Government. The two major objectives of the Organization are to promote economic integration as well as to issue and manage a common currency (Eastern Caribbean dollar) through the Eastern Caribbean Central Bank (see Mamingi 1999 or other documents).

The OECS countries were all colonized by Great Britain. Grenada became independent on February 7, 1974, Dominica on November 3, 1978, St. Lucia on February 22, 1979 , St. Vincent and the Grenadines on October 27, 1979, Antigua and Barbuda on November 1, 1981 and St. Kitts and Nevis on September 19, 1983. It is worth noting that these islands changed colonial tutelages (French to English) once or several times before the British had the upper hand.

[6] This section is somewhat an up-to date of section 2 in Mamingi (1999,17).

Perhaps the most remarkable cases are Dominica, Grenada and St. Kitts and Nevis where the French fought the British several times.

The countries of interest possess the following other salient characteristics. They are all small in population, land area and economic endeavours. Indeed, their populations range from 51,134 inhabitants in St. Kitts and Nevis to 175,365 inhabitants in St. Lucia. Precisely, their total population is just about 600,000 inhabitants. Their land areas range from 261 square kilometres in St. Kitts and Nevis to 750 square kilometres in Dominica. They are also characterized by small economic sizes. The latter, in terms of GDP (PPP), are in 2011 US$billion: 0.918 for St. Kitts and Nevis, 1.020 for Dominica, 1.224 for St. Vincent and the Grenadines, 1.428 for Grenada, 1.743 for Antigua and Barbuda, and 2.142 for St. Lucia . As a consequence of their small economic sizes, these countries are highly opened. The countries are highly vulnerable to external shocks and natural disasters (environmental shocks), particularly hurricanes (e.g., Luis and Marylin (1995) in Dominica, Georges (1999) in St. Kitts and Nevis and Ivan (2004) in Grenada). The impact of natural disasters has somehow decreased since resilience mechanisms have been put in place in many countries. Natural resources in the sense of minerals and fuel are rather scarce. However, the story changes if one considers beaches with white sand and coral reefs as natural resources. In any event, these countries depend on a limited range of items. The share of agriculture to GDP is dwindling as time passes. Indeed, agriculture, which occupied a great deal of good position at the independences, has been progressively replaced by industry and services. To corroborate, the share of agriculture to GDP in percentage passes from 7.10 in 1980 to 2.28 in 2011 in Antigua and Barbuda, from 30.60 in 1980 to 13.54 in 2011 in Dominica, from 24.71 in 1980 to 5.31 in 2011 in Grenada, from 15.94 in 1980 to 1.77 in 2011 in St. Kitts and Nevis, from 14.39 in 1980 to 3.26 in 2011 in St. Lucia, and from 14.28

in 1980 to 5.4 in 2011 in St. Vincent and the Grenadines. The literature underlines the negative role played by globalisation and trade liberalisation on major commodity exports, sugar and banana, in addition to environmental catastrophes or disasters such as hurricanes, floods and volcanic eruptions.

Remarkably, despite their small sizes and other impediments, the economies of the region have performed well compared to many large middle income countries. To substantiate the records, the 2011 per capita GDP (PPP) ranges from US$11,700 in St. Vincent and the Grenadines to US$17,300 in Antigua and Barbuda. The countries also rank high in the Human Development Index (HDI). In fact, all the six countries are in the category of "higher human development" in 2011. According to 2011 HDI, out of 187 countries, Antigua and Barbuda occupied the 60th position, Grenada the 67th position, St. Kitts and Nevis the 72nd position, Dominica the 81st position, St. Lucia the 82nd position, and St. Vincent and the Grenadines the 85th position. For sure, the economic growth /development of the region is attributed to the importance attached to the development of human capital, physical capital, and societal capital.

The recent economic crisis has, however, shaken the region, which has to revamp itself to stay afloat, particularly from rising unemployment, pockets of poverty (1/3 to 1/5 of population), high level of indebtedness (from 90% to 170% of GDP), and high sensitivity to environmental quality.

3. Literature Review.

The literature review concentrates on empirical work dealing with the determinants of economic growth with emphasis on the Caribbean, particularly the OECS countries.

The literature on the determinants of economic growth or development is quite vaste and covers a number of schools of thought or models (Latin America Structuralist School, Dependency Theory, Swan-Solow's Growth Model, Endogenous Growth Model à la Romer and others, Plantation Model,…). Nowadays there seems to be a consensus on the dependence of a country's economic growth on a wide range of factors and not only capital and labor. Sala-i-Martin *et al.* (2004) acknowledged this fact and explored the robustness of explanatory variables in cross-country regressions of 88 countries[7] in the period 1960-1996 by using Bayesian averaging of classical estimates. Among 67 explanatory variables, they found 18 to be significantly and robustly partially correlated with long-term growth. Relative price of investment, primary school enrollment, and the initial level of real GDP per capita are the strongest predictors of growth.

McCarthy and Zanalda (1995) attempted to explain why although facing the same external shocks six small Caribbean Islands (the six countries of the OECS) economically perform better than four larger Islands (Barbados, Jamaica, Trinidad and Tobago, and Dominican Republic) in the period 1980-1992. Using descriptive statistics and regression analysis, they found that higher investment rate and the presence of the currency board were two key elements that made the difference.

Lewis and Craigwell (1998) examined the determinants of growth for Barbados in the period 1960-1991 using an endogenous growth model which includes human capital, domestic policy and sectoral policy. They exploited a cointegration/error correction model to capture the pattern of Barbados economic growth in the period of interest. The results indicate a strong

[7] The sample does not cover the countries that we are dealing with.

role for domestic policy and a less significant role for external forces in the country's economic growth/development.

Downes (2002) looked, among others, into the key driving factors of Barbados' economic growth /development in the period 1960-2000. He clearly distinguished six factors: (i) the international environment context favorable to migrant labor and a large inflow of foreign investment; (ii) the important role of physical capital; (iii) the enhancement of human capital through "investment in health and education"; (iv) the big role of "government consumption relative to total output"; (v) the "good macroeconomic management"; (vi) the good quality of institutions.

Ramkissoon (2002) dealt with small states and attempted to explain their superior performance compared to others. He particularly focused on the differing performance amongst a group of small Caribbean economies. Using basically descriptive statistics, he concluded that even in the context of small states, the smaller the state, the better is the performance. According to him, high degree of openness, high contribution of services and offshore finance sectors, greater political stability, and strong societal cohesion justify the finding.

Loayza *et al*. (2005) studied thoroughly growth phenomenon in Latin America and the Caribbean in the 1960-2000 period with focus on stylized facts, explanations, and forecasts of economic growth. Concerning stylized facts, they concluded that after a solid growth in the 1960s and the 1970s, most Latin American and Caribbean countries saw a sharp drop in output per capita in the 1980s. The region recovered in the 1990s. Using a Generalized Method of Moments (GMM) in the context of panel data and exploiting an endogenous growth type of model which links economic growth rate to economic, political and social variables, they

uncovered 5 key explanatory factors of economic growth in the region: transitional convergence (due to diminishing returns), cyclical reversion, structural policies (education, financial depth, government burden, and public infrastructure), stabilization policies (policies to control inflation, cyclical volatility, real exchange overvaluation and banking crises), and external conditions (terms of trade shock, and prevailing conditions in the world). Naturally, these underlying factors while being more prominent in some countries than in others, are the starting point for planning a strategy for further growth.

Banik and Bhaumik (2006) studied the impacts of demographic changes (aging population), the structure of labour market, and youth emigration in the context of declining fertility rate on the Barbadian economic growth and development. This paper pointed out important issues that need further attention. The latter include sizeable capital outflows from the economy, shortage of skilled workers as well as noticeable unemployment.

Using a Panel Vector Autoregression (PVAR) model, Roache (2007) examined the quantitative effect of public investment on economic growth in the Eastern Caribbean Currency Union (ECCU). Like other studies, this one too includes control variables such as OECD growth rate, aid flows, dummy variables for natural disasters, and elections. Endogenous variables are real GDP, real public investment, and the bilateral exchange rate with the United States. The results indicate a negative impact of public investment on growth. Moreover, public investment shock "also appear to appreciate the real exchange rate, suggesting that the short-run demand impact is larger than the long-run supply response" (p. 6).

Kida (2005) used a growth diagnostics approach to review the growth performance of the Caribbean Small States in the period 1978-2004 and pointed out the constraining factors to improve their productivity and competitiveness. The following was noticed: (1) the long-run

economic growth of the countries of interest has been strong (3% per year) compared to other regions; (2) the volatility of growth was high but declining from 5.8% points in the 1970s to 2.8% points in the 1990s; (3) growth has been uneven with some countries—Antigua and Barbuda, St. Kitts and Nevis and Grenada-- growing faster than others (the Bahamas, Guyana and Suriname); (4) "growth has slowed in the 1990s" with the sharpest decline registered by Antigua and Barbuda, Dominica, St. Lucia, and St. Vincent and the Grenadines. The growth slowdown can be explained by the evolution of tourism and banana production. Overall, the study found that countries' own policies in the 1980s were the culprit. Precisely, productivity growth and competitiveness were impeded by "lack of fiscal discipline, large external public debts, and inappropriate environment for private sector led growth."

Thomas and Serju (2009) attempted to explain the economic "growth puzzle" of Jamaica which manifests itself in the form of low growth rate (0.7 % over the last 10 years) accompanied by a high investment/GDP ratio (28.8%) over the same period, at least in comparison with other Caribbean countries. Using growth accounting and regression analysis, they found that the quality of political and institutional climates are important factors explaining economic growth within the Caribbean region. In addition, capital investment and FDI contribute positively to economic growth.

Using country-specific VAR models with block exogeneity restrictions, Sosa and Cashin (2009) attempted to explain the drivers of economic fluctuations in the Eastern Caribbean . External shocks including foreign and climatic (natural disasters) account for more than half of fluctuations. The impact of natural disasters is particularly visible in the two first years of the shock.

Grenade (2012) used a growth diagnostics framework or methodology to pinpoint the binding constraints to economic growth in Grenada in order to devise policy priorities. The study concludes that " poor human capital, high cost of business operations, weak regulatory, and institutional support for business activity, and low self discovery"(p.46) as the most important binding constraints to economic growth. The recommendations include: (i) development of a comprehensive human resource strategy, high cooperation between the Government and the private sector in many aspects (educational, training programs, etc.), creation of a favourable climate for doing business activity, and boosting of underexploited opportunities.

Mamingi and Perch (2013) examined the nature of the relationship between population growth and economic growth/development in a small developing country, Barbados, in the period 1980-2010. Using an autoregressive distributed lag approach to cointegration, the paper yields the following main results: (i) population growth and population density each positively and significantly affects economic growth; (ii) economic growth negatively and significantly affects population growth; (iii) natural increase rate positively and significantly impacts population growth; (iv) net international migration negatively and significantly affects population growth. The other results are: (i) government consumption expenditure negatively and significantly influences economic growth; (ii) personal consumption negatively and significantly impacts economic growth; (iii) domestic investment positively and significantly affects economic; (iv) the less risky the country is, the larger the economic growth. These results have policy implications.

Using a Panel-VAR framework, Acevedo (2014) studied the impacts of natural disasters (hurricanes and storms) on 12 Caribbean countries during the last forty years. Not surprisingly,

the author uncovers negative effects of natural disasters on the economic growth as well as debts of the concerned countries.

At least four remarks can be made from these studies and others not presented here. First, there are a great deal of factors affecting economic growth with some being more prominent than others. Second, the study outcomes most often depend on the methodology used to conduct the investigation. Third, the distinction between short-run impact and long-run impact is not forcefully emphasized in empirical work. Fourth, some studies are more analytical than others.

4. Methodology and data

As pointed out above in the introductory part, several models can potentially explain the economic performance of a given entity (country, region). Among them, two are particularly prominent: the neoclassical growth theory and the endogenous growth theory (model). Of note, the Swan-Solow's neoclassical model uses a neoclassical form of production (for example, Cobb-Douglas) with the assumptions that there are "constant return to scale, diminishing returns to each input, some smooth and positive elasticity of substitution between inputs. The production function is combined with a constant-saving –rate" (Barro and Sala-i-Martin 1995, 10). The model and its extensions predict the dependence of long-run growth on conditional convergence (catch-up hypothesis), the annihilation of per capita growth in the absence of sustained improvements in technology, the exogeneity of the rate of technological progress, and the exogeneity of population growth. Difficulties associated with explaining long-run growth with the above model have given rise to the endogenous growth model with the following features. There are no diminishing return to each input, technological progress is endogenous and so is population growth, the returns to scale are increasing and there is an important role for human

capital as well as for technology diffusion. An offshoot of the endogenous growth methodology is the growth diagnostics approach (see Hausmann *et al.* 2005). While this paper acknowledges the usefulness of the growth diagnostics approach in dealing with the binding constraints to economic growth, the latter approach is not pursued here. The paper is based on the endogenous growth theory.

4.1 Determinants of Economic Growth

As pointed above, many factors affect economic growth. Here, we develop a few important ones that also serve our paper (see also Loayza *et al*. 2005).

Economic growth Variable

Several measures can in principle capture the economic performance of a country or a region. In the first instance, the economic performance has to do with some income measurement which is generally captured by some GDP or GDP per capita in level or growth terms. These two measures have been criticized to the extent that, among others, they ignore quite a number of items, particularly the environmental endeavours. In other words, they, in general, overestimate the extent of wealth. It is also possible to take the antipode of wealth, that is, a measure of deprivation as a scale of measurement of economic performance. Concretely, the percentage or the evolution of the percentage of people below the poverty line is a candidate. The issue is that such a measure is not often produced. Alternatively, one can target a measure that encompasses economic, educational, and health aspects. This is the essence of the Human Development Index (HDI) (see also Ramkisson 2002). It seems that continuous series are hard to find for some countries and also the development of the HDI is quite recent. Despite its flaws, we use the growth of real GDP per capita as the measurement of economic performance.

Human Capital: Education

One of the key distinctions between the neoclassical growth model and the endogenous one is the emphasis of the latter on the role of human capital in economic growth. Human capital is understood as "knowledge and skills embodied in the labor force" (Easterly and Wetzel 1989, 4). Much of human capital is captured by the level of education of the population. The assumption is that the level of education captures the level of know how, and hence leads to a positive effect of education or human capital on economic growth. Which level of education captures the best the phenomenon of education is not clear-cut. Here, as in Loayza *et al.* (2005), education is captured by the rate of gross secondary-school enrolment. It is, however, worth noting that the level of education does not necessarily fully reflect the quality of human capital.

Fertility Rate / Population Growth

This demographic variable (fertility rate) can to a large extent be associated with structural policies and institutions, particularly through family planning. The variable affects economic growth through population growth, precisely through the age structure effect, the youth effect, the female availability, and the retirement effect (see also Tietenberg 2010). Although there is no consensus on the effects of fertility rate on economic growth, the belief that in the long run a high rate of fertility probably brings about a decrease in economic growth seems to have an edge over other views. In reality, whether population growth negatively affects economic growth depends on the behaviour of its two components: fertility rate/net increase rate and net migration rate (immigration – emigration). In many Caribbean countries the latter factor is extremely important since it is linked to the phenomenon of remittances. We mainly use net increase rate in this paper. It is expected to negatively affect economic growth.

International Trade Openness

There seems to be a consensus in the literature that trade openness brings about economic growth. Indeed, trade leads to the expansion of economies of scale, boosts specialization, and hence offers the possibility of exploiting comparative advantage, can enable countries to take advantage of technological innovation through diffusion and pushes firms to behave competitively (see Loayza *et al.* 2005, Yanikkaya 2003). There are several measures that capture trade openness. These include the trade intensity as the share of exports and imports to GDP, the share of exports to GDP, population density, and volume of trade. Here the share of exports plus imports to GDP is of interest. It is expected to have a positive impact on economic growth.

Government Burden

Government burden refers to Government expenditures. The impact of government burden on economic growth depends on which components dominate overall. For recall, one can decompose the Government burden into consumption and investment. Either component can target a particular sector and generate various results. It is generally agreed that expenditures on education, health, and infrastructure have positive impact on economic growth; otherwise, the impact of consumption on economic growth is rather negative. Here, government burden is captured by the ratio of government consumption to GDP. It is expected to negatively impact economic growth.

Fiscal Deficits

For recall, fiscal deficits arise when expenditures are greater than revenues (tax proceeds). It is generally accepted that fiscal deficits negatively affect economic growth. The way fiscal deficits

are financed explains the negative outcome. Indeed, borrowing domestically or externally or even printing money ultimately create macroeconomic imbalance which soon or later will negatively affect economic growth (see Easterly and Wetzel 1989, 9). Like elsewhere, we expect fiscal deficits to have a negative impact on economic growth.

External Debt

External debt is, in the long run, a drag to economic growth. The OECS countries are among the most indebted countries in the World. Thus, we expect external debt be a major determinant of economic growth in the region. Note, however, that in many countries data on this sensitive variable are missing.

Natural Disasters

The Caribbean is prone to natural disasters (hurricanes, storms, etc.). Overall, we expect that the latter will negatively affect economic growth via their often negative effects on people, infrastructure and the economy at large. We use a dummy variable to capture the phenomenon in our model.

Social Partnership Cohesion

The emergence of social partnership cohesion is a bonus for any country to solve the development issues and others. Indeed, it had been noticed that strong social partnership induces economic growth. It is possible that social cohesion is the key factor which explains why small states in general escape the Dutch disease. The stronger the society's social cohesion, the larger is the economic growth. Since social cohesion has become to a greater extent a component of societal structure of the Caribbean, the impact of social cohesion on economic growth is difficult

to show in the context of a time series study unless we assume that the constant term in a growth time series regression captures the average effect of this variable.

Good Governance

Without any doubt, "Good Governance" is the key variable that differentiates the economic growth paths of many countries. To recall, good governance basically encompasses bureaucratic efficiency, absence of corruption or rather very low level of corruption, enforcement of contractual agreements, the respect of civil and political rights, and prevalence of law and order (see Loayza *et al.* 2005 23-24). As can be seen, governance basically dictates the framework in which the society must evolve. That is, it is expected that good governance positively affect economic growth. Of course, there is the issue of its measurement since it includes many elements each being able to justify an index. Further comments will be made on this variable in the discussions part.

Macroeconomic Stabilization Policies

Price stability generates an environment for economic growth through the confidence of business, particularly investment. Inflation captures such an endeavour. As many authors acknowledge, inflation rate is the indicator par excellence of macroeconomic stability. Indeed, it is generally accepted that inflation (and its variability) negatively affects economic growth. In addition, another important measure is the cyclical volatility of GDP (lack of output stability). In brief, three measures can be used to capture macroeconomic stability policies: inflation rate, inflation variability, and GDP volatility. Here we use both inflation and inflation variability and expect them to negatively affect economic growth.

Crime Rate

Criminal activities negatively affect economic growth through their effect on investment, and firms competitiveness. World Bank (1997) writes, for example, the following: " Crime and violence have emerged in recent years as major obstacles to the realization of development objectives in the countries of Latin America and the Caribbean". The statistics are not often there. The variable is not used in our paper.

Remittances

Remittances defined as money and other goods remitted to families in the home country from abroad, are believed more and more to positively affect economic growth. In fact, in some countries they compete with private inflows. Such is the case for Jamaica. There is an issue of data quality to the extent that in most cases the reported figures underestimate the true values. The variable is not used here.

Other Determinants

Non economic aspects can also explain growth trajectory. These non economic elements can be epitomized by culture (religious affiliations, colonial legacies, etc.) (see also Grier 1999). This aspect is however not pursued here.

4.2 Estimation Methods

Time series data are of interest here. In this context, the autoregressive distributed lag approach (ARDL) to cointegration initiated by Pesaran *et al.*(2001) is used to fulfill the major goal of the study. As underlined above, this methodology presents three major advantages compared to its competitors. Indeed, the ARDL bounds testing procedure assumes that all variables are endogenous. In addition, unlike most cointegration techniques, the ARDL can be applied to

regressors which are purely I(0), purely I(1), or mutually cointegrated. Finally, it is also suitable for cointegration analysis even if the sample size is small.

Consider the following function

$$y_t = f(V_t) \qquad (1)$$

where *t* stands for time index, y is the dependent variable and V is the matrix of explanatory variables. The relationship (1) can be expressed in linear form as follows:

$$y_t = V_t\ B + e_t \qquad (2)$$

where V, the matrix of explanatory variables, is of dimension $n\ x\ k$, B is the vector of parameters of dimension $k\ x\ 1$, and e is a random variable which represents the error term.

In the first instance, the bounds approach requires estimating an unrestricted error correction model version of equation (2) by OLS. The unrestricted error correction model (ECM) proposed by Pesaran *et al*. (2001) follows the fundamental principles of the Johansen five error correction multi-variance VAR (see Pesaran *et al.* 2001; Boamah *et al*. 2011, 28-30):

Case 1: no intercepts and no trend

$$\Delta y_t = \pi_{yy} y_{t-1} + \pi_{yVV} V_{t-1} + \sum_{i=1}^{p-1} \beta' \Delta z_{t-1} + \delta' \Delta V_t + u_t \qquad (3)$$

Case 2: Restricted intercepts and no trend

$$\Delta y_t = \pi_{yy}(y_{t-1} - \mu_y) + \pi_{yVV}(V_{t-1} - \mu_V) + \sum_{i=1}^{p-1} \beta' \Delta z_{t-1} + \delta' \Delta V_t + u_t \qquad (4)$$

Case 3: Unrestricted intercepts and no trend

$$\Delta y_t = c + \pi_{yy} y_{t-1} + \pi_{yVV} V_{t-1} + \sum_{i=1}^{p-1} \beta' \Delta z_{t-1} + \delta' \Delta V_t + u_t \quad (5)$$

Case 4: Unrestricted intercepts and restricted trends

$$\Delta y_t = c + \pi_{yy}(y_{t-1} - \alpha_y t) + \pi_{yVV}(V_{t-1} - \alpha_V t) + \sum_{i=1}^{p-1} \beta' \Delta z_{t-1} + \delta' \Delta V_t + u_t \quad (6)$$

Case 5: Unrestricted intercepts and unrestricted trends

$$\Delta y_t = c + a t + \pi_{yy} y_{t-1} + \pi_{yVV} V_{t-1} + \sum_{i=1}^{p-1} \beta' \Delta z_{t-1} + \delta' \Delta V_t + u_t \quad (7)$$

where y_t is defined as above, V_t is the matrix of explanatory variables, z_t is (y_t V_t,), Δ represents the first difference operator, t captures the deterministic trend, and u_t is the error term.

To test for the existence of a level relationship between y_t and V_t, in equations (3) – (7), the bounds procedure recourses to an *F*-test (or *Wald* test) on the joint null hypothesis that the coefficients of the level variables are jointly zero. Concretely, the null hypotheses are defined as $\pi_{yy} = 0$ and $\pi_{yVV} = 0$ and the alternatives as $\pi_{yy} \neq 0$ or $\pi_{yVV} \neq 0$. Here, these *F*-statistics follow a non-standard distribution. This means that the critical values of the regular *F* distribution are no longer valid. Instead, use can be made of two asymptotic critical bounds derived by Pesaran *et al*. 2001, covering three possible classifications of the variables (all are I(0), all are I(1), or variables are mutually cointegrated). While the lower value bounds concern the case of the variables being purely I(0), the upper value bounds assume that they are purely I(1). A computed *F*-statistic that is greater than its respective upper value bound indicates the existence of a long-run relationship between or among variables, that is, cointegration; on the contrary, if smaller than the lower value bound, then the null of no-cointegration is not rejected;

and finally, if the value lies within the bounds, inference is inconclusive. In fact, for cointegration to really hold the *F* test needs to be supplemented by a *t* test on the adjustment coefficient. The latter *t* statistic does not follow a *t* distribution. Concretely, if $\pi_{yy} = 0$ and $\pi_{yVV} = 0$ are rejected then test $\pi_{yy} = 0$ against $\pi_{yy} < 0$. If the *t* statistic to test for the latter null hypothesis is negative and greater, in absolute value, than the upper value bound of the *t* (see for example table 1), then cointegration is confirmed. Naturally, the existence of cointegration implies that the long-run relationship among variables and corresponding error correction models can be estimated. As a footnote, error correction models can also arise from purely level stationary variables.

A close look at equation (5) reveals that π_{yy} is exactly the adjustment coefficient and π_{yVV} contains the long-run impact, precisely it is the long-run (LR_{yVV}) impact multiplied by negative adjustment coefficient. Algebraically, we can write $\pi_{yVV} = LR_{yVV} * (-\pi_{yy})$. In other words, $LR_{yVV} = \frac{\pi_{yVV}}{-\pi_{yy}}$. The above can be understood in the context of equation (5'):

$$\Delta y_t = c + \pi_{yy}(y_{t-1} - LR_{yVV} V_{t-1}) + \sum_{i=1}^{p-1} \beta' \Delta z_{t-1} + \delta' \Delta V_t + u_t \qquad (5')$$

where the first relationship in parentheses represents the long-run relationship between y_t and V_t.

4.3 Data

The data were obtained from the following sources: Eastern Caribbean Central Bank; World Bank: World Tables (various issues), International Monetary Fund, World Economic Outlook

Database, October 2013, World Development Indicators and EM-Dat (for natural disasters). Appendix provides a brief description of the data. The time series dimension covers the period 1980-2011. The study is limited by data availability. Indeed, in quite a number of situations some key data are missing for some countries. As a general rule, we avoid generating missing data .

5. Results

The results are based on the error correction models derived from the ARDL methodology developed above. As it is well known, in theory there is no need for pre-testing for unit root in the variables although this was done here (results are available upon request). Most variables are integrated of order one with a clear exception of economic growth rates which are stationary. To repeat, the retained ECM must in the first instance pass the autocorrelation test and a model selection criterion, here the Schwarz Bayesian Criterion (SBC). In addition, the model must also pass the heteroscedasticity, functional misspecification, and normality tests. In the final analysis, the principle of model parsimony is firmly applied here, particularly as the sample size is small.

Table 1 presents the critical values of the bounded *F* tests and *t* tests advocated in the previous section. These values concern equation (5) and are useful to draw conclusions about the existence of the level relationship or cointegration among level variables.

We report the testing results of individual country regressions using case (3) or equation (5). The latter was deemed adequate in the present situation after some preliminary testing. To not burden the paper with tables, we do not present the long-run estimates, whose derivation has been suggested above. The corresponding elasticities are obtained by multiplying

the long-run estimates by the means of the variables of interest. Similarly, the short-run elasticities are obtained by multiplying the short-run multipliers in the ECM by the means of the variables of interest.

Table 1: *F* – and *t* statistics value bounds for testing the existence of a level growth equation

	10%				5%			
K	F(l)	F(u)	t(l)	t(u)	F(l)	F(u)	t(l)	t(u)
3	2.72	3.77	-2.57	-3.46	3.23	4.35	-2.86	-3.87
4	2.45	3.52	-2.57	-3.66	2.86	4.01	-2.86	-3.99
5	2.26	3.35	-2.57	-3.86	2.62	3.79	-2.86	-4.19
6	2.12	3.23	-2.57	-4.04	2.45	3.61	-2.86	-4.38
7	2.03	3.13	-2.57	-4.23	2.32	3.50	-2.86	-4.57
8	1.95	3.06	-2.52	-4.40	2.22	3.39	-2.86	-4.72
9	1.88	2.99	-2.57	-4.56	2.14	3.30	-2.86	-4.88

Source: Pesaran *et al*. (2001), Table CI(iii) case III and Table CII(ii)

Note: k is defined as above. F is the F test statistic for testing $\pi_{yy} = 0$ and $\pi_{yVV} = 0$ and t is the t statistic for testing $\pi_{yy} = 0$ in equation (5). (l) stands for lower limit and (u) for upper limit.

Concerning Antigua and Barbuda, Table 2 indicates that the retained version of model (5) passes the basic tests for autocorrelation, heteroscedasticity, functional misspecification, and normality as the associate *p*-values of the respective tests indicate. The key question of whether there is a level relationship or cointegration between growth or log of real per capita GDP and

Table 2: Error correction model of the growth equation for Antigua and Barbuda, 1980-2011

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.038521	0.472695	4.312556	0.0005
LOG(RPCAN(-1))	-0.180167	0.038963	-4.624052	0.0003
NRIAN(-1)	-0.004156	0.002362	-1.759629	0.0976
INFAN(-1)	-0.009445	0.003090	-3.056644	0.0075
FDIAN(-1	0.324851	0.138523	2.345100	0.0322
GCAN(-1)	-0.493383	0.643810	-0.766350	0.4546
PCAN(-1)	-0.157096	0.073243	-2.144859	0.0477
DAN1(-1)	0.016772	0.225765	0.074291	0.9417
D(NRIAN)	-0.002209	0.001375	-1.606990	0.1276
D(FDIAN)	0.229011	0.133326	1.717677	0.1051
D(GCAN)	-1.041248	0.536614	-1.940404	0.0702
D(PCAN)	-0.266925	0.099450	-2.684026	0.0163
Adjusted R-squared	0.603023	S.E. of regression		0.032605
AIC	-3.711189	SBC		-3.140245
SCF(2,14)=0.020	P=0.9743	HF(11,16)=1.2329		P=0.3418
MF(2,14)=0.9765	P=0.4008	JB=0.2570		P=0.8794
CF(6,16)=3.878	K=5			

Note: Dependent variable is economic growth (DAN) and other variables are defined in Appendix. D(…)=1st difference. Equation (5) is adapted here. *SCF* is the Breusch-Godfrey test for autocorrelation using the *F* form.; *HF* is the Breusch-Pagan-Godfrey test for heteroscedasticity using the *F* version; *MF* is the Ramsey Reset test for error specification including linearity error; JB is Jarque Bera test for normality; *CF* is the cointegration *F* test such as proposed by Pesaran *et al*. (2001); *K* is the number of retained level variables in the final model; *P* stands for probability value; *AIC* is Akaike Information Criterion and *SBC* is Schwarz Information Criterion. The p-values provided for the *t* statistics are meant for a two-sided test. If one-sided, the given value must be divided into two.

other level variables is answered by *F* and *t* tests. With k=5, we realize the cointegration *F* value, F(6,16)=3.878, is greater than the upper value bounds corresponding to the 10% and 5% levels of significance (see Table 1 with k=5). The statistic *t* = - 4.624 has the correct sign and is in absolute value greater than the upper value bounds of the distribution (see Table 1). The two above facts confirm the existence of a cointegration relationship between economic growth, or precisely log real GDP per capita and the level variables. The equilibrium correction coefficient, that is, the adjustment coefficient, is - 0.18 and is statistically negative and significant. As can be noticed, the adjustment toward equilibrium is indeed very slow at 18% per year. The natural increase rate negatively affects economic growth in Antigua and Barbuda in the short run and long run. Indeed a 1% increase in the natural increase rate decreases economic growth by 0.01% in the short run and 0.11% in the long run. Inflation has a negative effect on economic growth in the long run. Indeed, a 1% increase in inflation decreases economic growth by 0.19% in the long run. Government consumption, precisely the ratio of government consumption to GDP, is a drag to economic growth in the short run and long run. To corroborate, a 1% increase in government consumption leads to a decrease in economic growth of 0.005% and 0.52% in the short run and long run, respectively. A 1% increase in private consumption to GDP ratio negatively affects economic growth by 0.15% in the short run and 0.52 % in the long run. Foreign direct investment is good for economic growth. Indeed, a 1% increase in foreign direct investment to GDP ratio brings about an increase in economic growth in the order of 0.025% in the short run and 0.19% in the long run. Natural disasters impacts do not materialize here.

Similarly to Antigua and Barbuda, the retained model for St. Lucia (see equation (5) and Table 3) passes all the basic tests advocated above. The value of the *F* test for cointegration is 6.977, which is larger than the upper value bounds (2.99 and 3.30 at the 10% and 5% levels of significance, respectively, for k=9). However, the *t* test has a value of -3.93 which is in the indeterminacy region. Nevertheless, further investigation reveals that cointegration holds. The adjustment coefficient (-0.37) indicates that 37% of disequilibrium is eliminated per year. Using the formulas of interest to derive the long-run and short-run elasticities, we note the following.

Table 3: Error correction model of the growth equation for St.Lucia, 1980-2011.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.135043	1.023452	3.063205	0.0091
LOG(RPCLU(-1))	-0.370410	0.094219	-3.931386	0.0017
TRLU(-1)	0.372913	0.075619	4.931494	0.0003
NRILU(-1)	-0.025999	0.007281	-3.570603	0.0034
INFLU(-1)	0.034938	0.016101	2.169904	0.0491
INFLU(-1)^2	-0.004874	0.002072	-2.353021	0.0350
FDILU(-1)	-0.497171	0.234006	-2.124609	0.0534
GCLU(-1)	-0.416951	0.478593	-0.871201	0.3994
PCLU(-1)	0.796618	0.255316	3.120123	0.0081
EDLU(-1)	-0.388349	0.228537	-1.699282	0.1131
NDSL(-1)	-0.026848	0.018004	-1.491246	0.1598
DLU1(-1)	-0.379294	0.160438	-2.364114	0.0343
D(TRLU)	0.182563	0.061843	2.952056	0.0112
D(NRILU)	-0.019278	0.006472	-2.978642	0.0107
D(EDLU)	-0.197050	0.136502	-1.443566	0.1725
D(INFLU)	0.026251	0.013109	2.002459	0.0665
D(INFLU^2)	-0.003516	0.001921	-1.830257	0.0902

Adjusted R-squared	0.68438	S.E. of regression	0.02454
Schwarz B. criterion	-3.48545	Akaike info criterion	-4.27946
SCF(2,11)=0.031	P=0.970	HF(16,13)=0.804	P=0.615
MF(2,11)=1.122	P=0.360	JB=0.925	P=0.630
CF(10,13)=6.977	K=9		

Note: see note to Table 2.

In St. Lucia, a 1 % increase in trade openness increases economic growth by 0.24% in the short run and 1.33% in the long-run. A 1% increase in the natural increase rate negatively impacts economic growth by 0.30% in the short run and 1.09% in the long run. A 1% increase in inflation rate increases economic growth by 0.10% in the short-run and 0.36% in long run. On

the contrary, inflation volatility depresses economic growth by 0.11% in the short run and 0.40% in the long run. Foreign direct investment (foreign direct investment to GDP ratio) decreases economic growth by 0.15% in the long-run. Private consumption (private consumption to GDP ratio) seems to have a positive impact on economic growth in the long run (1.48%). External debt negatively affects economic growth. A 1% increase in external debt decreases economic growth by 0.06% in the short run and 0.29% in the long run. Natural disasters negatively affect growth. A 1% increase in natural disasters decreases economic growth by 0.27%. As can be noticed, the following variables are correctly signed: trade openness, natural increase rate, inflation volatility, external debt, and natural disasters.

Table 4 indicates the following for Grenada. The model passes the tests of autocorrelation, heteroscedasticity, functional misspecification, and normality as the sizes of the associated p-values indicate. The value of the *F*-statistic is 13.413, which is greater than the upper value bounds (3.06 at the 10% and 3.39 at the 5% levels of significance for k=8). The *t* – value for the adjustment coefficient is -4.875, which, in absolute value, is greater than the upper value bounds (-4.40 at the 10% level and -4.72 at the 5% level for k=8). We thus accept cointegration. The adjustment coefficient is -0.968 and means that 97% of disequilibrium is adjusted per year. In any event, the natural increase rate negatively affects economic growth. Indeed, a 1% increase in the natural increase rate decreases economic growth by 4.025% in the

Table 4: Error Correction Model of the growth equation for Grenada, 1980-2011

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.548816	2.140752	4.460496	0.0066
LOG(RPCGR(-1))	-0.968298	0.198637	-4.874703	0.0046
NRIGR(-1)	-0.239105	0.035060	-6.819961	0.0010
TRGR(-1)	0.582264	0.166489	3.497310	0.0173
ESGR(-1)	0.005170	0.002527	2.046114	0.0961
FEGR(-1)	0.689108	0.164867	4.179789	0.0087
EDGR(-1)	0.896524	0.255587	3.507703	0.0171
PCGR(-1)	-0.046604	0.270185	-0.172487	0.8698
GCGR(-1)	0.603849	0.417419	1.446627	0.2076
INFGR(-1)	0.012886	0.003665	3.516160	0.0170
DGR(-1)	-0.323639	0.111123	-2.912443	0.0333
DGR(-3)	0.194841	0.121270	1.606674	0.1690
D(NRIGR)	-0.240767	1.031782	-0.233350	0.8247
D(NRIGR(-1))	-1.331220	1.542983	-0.862757	0.4277
D(NRIGR(-2))	1.088247	0.816803	1.332324	0.2402
D(TRGR)	0.317568	0.101616	3.125182	0.0261
D(TRGR(-1))	-0.075987	0.074577	-1.018910	0.3550
D(ESGR)	0.005249	0.002175	2.413580	0.0606
D(EDGR)	0.132796	0.141295	0.939847	0.3904
D(EDGR(-1))	-0.238398	0.099856	-2.387409	0.0626
D(FEGR)	-5.278309	6.329764	-0.833887	0.4423
D(FEGR(-1))	11.95506	4.974456	2.403289	0.0614
D(PCGR)	0.375435	0.185510	2.023803	0.0989

Adjusted R-squared	0.928800	S.E. of regression	0.013002
Schwarz criterion	-4.833067	Akaike info criterion	-5.927377
SCF(2,3)=4.8523	P=0.1147	HF(22,5)=0.3669	P=0.9539
MF(2,3)=3.452	P=0.7677	JB=1.8708	P=0.3924
CF(9,8)=13.413	K=8		

Note: see note to Table 2.

long run. Trade openness boosts economic growth. A 1% increase in trade openness increases economic growth by 0.32% in the short run and 0.60% in the long run. Human capital in the form of secondary school achievement or enrollment increases economic growth. A 1% increase in secondary school enrollment boosts economic growth by 0.52%. External debt has mixed effects on economic growth: a positive effect in the long run and a negative effect in the short run. Indeed, its impact in the long run is in the order of 0.49% for each percent increase in external debt (external debt/Gdp) and -0.13% in the short run for each percent increase in external debt. Fertility rate is a bonus for economic growth in the context of Grenada. It positively affects economic growth in the short run (38.21%) and the long run (2.28%). Another perverse effect is recorded by inflation, which positively affects economic growth in the long run (0.053%). Private consumption too positively affects economic growth in the short run (0.28%) and possibly negatively affects economic growth in the long run. Natural disasters do not significantly impact economic growth over the period of interest.

Regarding St. Vincent and the Grenadines, the basic results (see Table 5) show the following. The model passes the basic tests of autocorrelation, heteroscedasticity, functional misspecification, and normality as the sizes of the associated *p*-values reveal. Cointegration holds since the value of the *F*-statistic is 5.0939, which is greater than the upper value bounds

(3.23 at the 10% level and 3.61 at the 5% level for k=6) and the *t* –value for the adjustment coefficient is -4. 077, which, in absolute value, is greater than the upper value bound (-4.04 at the 10% level for k=6). The size of the adjustment coefficient implies that 52% of disequilibrium is adjusted per year. The natural increase rate has a mixed effect on economic growth. Indeed, a 1% increase in the former variable augments economic growth in the short run by 2.199% and decreases it by 1.078% in the long run. A 1% increase in trade openness brings about a 0.16% increase in economic growth in the long-run. The negative impact of private consumption is confirmed here as a 1% increase in private consumption (private consumption /Gdp) depresses economic growth by 0.27% in the short run and 0.68% in the long run. Budget deficit negatively affects economic growth in the short run with an impact of 0.012% and the long run with an impact of 0.04%. External debt is a drag to the economy. Indeed, a 1% increase in external debt decreases economic growth by 0.05% and 0.10% in the short run and long run, respectively. Foreign direct investment is a bonus for economic growth with an elasticity of 0.046% in the long run. Natural Disasters effects are not present in this model. In any case, all significant variables are in general rightly signed.

Table 5: Error correction model of the growth model for St. Vincent and the Grenadines, 1980-2011.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.656809	1.268210	4.460469	0.0004
LOG(RPCVI(-1))	-0.519299	0.127345	-4.077898	0.0009
TRVI(-1)	0.073113	0.084489	0.865355	0.3996
PCVI(-1)	-0.492485	0.132703	-3.711192	0.0019
DEFVI(-1)	-0.013077	0.004765	-2.744623	0.0144
EDVI(-1)	-0.154020	0.116461	-1.322506	0.2046
FDIVI(-1)	0.225544	0.148798	1.515769	0.1491
NRIVI(-1)	-0.038349	0.010677	-3.591721	0.0024
DVI1(-1)	-0.151622	0.173672	-0.873038	0.3956
D(NRIVI)	0.150590	0.069019	2.181859	0.0444
D(PCVI)	-0.377285	0.074602	-5.057324	0.0001
D(EDV)	-0.149393	0.095001	-1.572544	0.1354
D(DEFVI)	-0.007193	0.002750	-2.615510	0.0187
D(FDIVI)	0.169252	0.089334	1.894595	0.0764

Adjusted R-squared	0.688086	S.E. of regression	0.018668
Schwarz criterion	-4.165371	Akaike info criterion	-4.819263
SCF(2,14)=0.855	P=0.5862	HF(13,16)=0.8597	P=0.6034
MF(2,14)=1.7123	P=0.2161	JB=2.3137	P=0.3137
CF(7,16)=5.0939	K=6		

Note: see note to Table 2.

The ARDL fails to deliver valid ECM results for St. Kitts and Nevis. We derive a valid parsimonious model for which all variables are stationary. Table 6 contains the results of such a model. Basically, economic growth is regressed on its past, the change in private consumption,

external debt, and population. The model passes the basic tests of autocorrelation, heteroscedasticity, misspecification, and normality tests as the sizes of the corresponding *p*-values indicate. External debt has a negative impact on economic growth. Indeed, a 1% increase in external debt leads to a decrease in economic growth of approximately 0.06%. Likewise private consumption depresses economic growth. Indeed, a 1% increase in private consumption reduces economic growth by 0.17%. An increase in population size has a detrimental effect on economic growth in St. Kitts and Nevis. A 1% increase in population size decreases economic growth by 0.94%.

Table 6: Growth model for St. Kitts and Nevis, 198-2011

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026309	0.009104	2.889680	0.0079
DKN1(-1)	0.405349	0.158058	2.564562	0.0167
D(EDKN)	-0.178381	0.099040	-1.801100	0.0838
D(PCKN)	-0.266685	0.082454	-3.234339	0.0034
D(PSKN)	-19.58645	7.555798	-2.592242	0.0157
Adj. R-squared	0.573258	S.E. of regression		0.029471
Schwarz criterion	-3.826256	Akaike info criterion		-4.059789
SCF(2,23)=1.393	P=0.2385	Schwarz criterion		-3.826256
HF(4,25)=0.1443	P=0.9638	MF(2,23)=0.1733.		P=0.8491
JB=4.234	P=0.1203			

Note: see note to Table2

Table 7: Error correction model of the growth equation for Dominica, 1980-2011.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.831793	0.332797	5.504243	0.0004
LOG(RPCDO(-1))	-0.166208	0.027944	-5.947921	0.0002
NRIDO(-1)	0.006427	0.001281	5.018389	0.0007
TRDO(-1)	0.091419	0.052518	1.740732	0.1157
EDDO(-1)	-0.241069	0.050098	-4.811949	0.0010
PCDO(-1)	0.347074	0.075679	4.586112	0.0013
GCDO(-1)	-2.348964	0.412368	-5.696286	0.0003
NDSDO	-0.017459	0.007927	-2.202492	0.0551
DDO1(-1)	-0.545069	0.139175	-3.916430	0.0035
DDO1(-2)	-0.674259	0.144114	-4.678658	0.0012
DDO1(-3)	-0.151419	0.164539	-0.920259	0.3814
D(NRIDO(-1))	-0.004249	0.000973	-4.365420	0.0018
D(NRIDO(-2))	-0.001506	0.000470	-3.204333	0.0108
D(TRDO)	0.071561	0.043742	1.635981	0.1363
D(TRDO(-1))	0.040896	0.038228	1.069787	0.3126
D(TRDO(-2))	0.126116	0.034661	3.638605	0.0054
D(PCDO)	0.184242	0.063085	2.920532	0.0170
D(PCDO(-1))	-0.167424	0.054352	-3.080360	0.0131
D(GCDO)	-1.621541	0.258679	-6.268542	0.0001

Adjusted R-squared	0.819834	S.E. of regression	0.009056
Schwarz criterion	-5.444656	Akaike info criterion	6.348652
SCF(2,7)=0.382	P=0.6960	HF(18,9)=2.832	P=0.0569
MSF(2,7)=0.666	P=0.5440	JB=0.468	P=0.7910
CF(7,9)=8.740	K=6		

Note: see note to Table 2.

Table 7 contains the results for Dominica. The model passes all the basic tests, at least according to the *p*-values which are all greater than the regular levels of significance (1%, 5% and 10%). The cointegration *F*-value (8.740) is greater than the upper value bounds, that is, 3.23 at the 10% level and 3.61 at the 5% level of significance for k=6. The *t* value (-5.940) is in

absolute value greater than the upper value bounds in Table 1, that is, -4.04 and -4.38 at the 10% and 5% levels of significance, respectively, for k=6. The two facts allow us to conclude that cointegration exits among the variables. The adjustment coefficient is in the order of -0.17. This means that only 17% of disequilibrium is adjusted per year. As far as the elasticities in the short and long runs are concerned, we can observe the following. A 1% permanent increase in the natural increase rate negatively impacts economic growth in the short run by 0.042% and positively affects economic growth by 0.24% in the long run. Trade openness has the effect of augmenting economic growth in the short run (0.21%) and the long run (0.58%). External debt is a drag to the economy. Indeed, a 1% shock to external debt brings about a 0.82% decrease in economic growth in the long run. While private consumption is a bonus to economic growth in the long run (1.52%), it is a nuisance to economic growth in the short run (0.12%). Government consumption negatively affects economic growth in the short and long runs. Indeed, a 1% increase in government expenditure leads to a 0.32% decrease in the short run and a noticeable negative impact of 2.79% in the long run. It seems that natural disasters negatively affect economic growth. A 1% increase in natural disasters brings about a 0.02% decrease in economic growth.

6. Conclusion

Although the countries of the Organization of the Eastern Caribbean States (OECS) have registered some appreciable degrees of success concerning poverty reduction, education or schooling achievement, and economic growth, in many instances, much needs to be done in terms of poverty reduction, high external debt, and overall development. The present paper re-examines the issue of the determinants of economic growth in the countries of the OECS in the

period 1980-2011. The paper answers two questions. What are the determinants of economic growth in the countries of the OECS? What are their short-run and long-run impacts? To this end, it uses the cointegration autoregressive distributed lag (ARDL) approach at the country level to draw conclusions concerning each country individually and the region as a whole.

In the realm of limited data availability, these regressions results allow us to make the following observations particularly at the regional level. First, all major determinants of economic growth find their ways in the OECS countries. These include trade openness, foreign direct investment, external debt, budget deficit, government consumption, private consumption, inflation, inflation variability, human capital, natural increase rate, fertility rate, and population growth. Second, while in general there are no major surprises concerning the determinants of economic growth in the OECS countries, there are a few cases for which the direction of the impacts is rather surprising (for example, positive impact of inflation in St. Lucia). Third, natural disasters assumed to be important for these vulnerable countries have an impact on economic growth on only a handful of countries. Fourth, long-run impacts are overwhelmingly bigger than short-run impacts. This speaks to the persistence effects that policy makers should pay attention to as a short-run shortfall might get amplified in the long run if necessary measures are not taken. Fifth, natural increase rate, external debt and private consumption are among the determinants the most damaging to economic growth in the countries examined. On average, a 1% increase in natural increase rate depresses economic growth by 1.2% in the long run. Clearly, it means that an acceleration of natural increase rate might jeopardize the standard of living reached in these countries. External debt evolution needs to be monitored as this variable negatively impacts economic growth in the majority of the countries studied. Note that in Grenada the variable has a mixed impact: negative in the short run and positive in the long run.

Sixth, trade openness is friendly to economic growth in the OECS countries. A 1% increase in trade openness boosts, on average, economic growth by 0.25% and 0.67% in the short run and long run, respectively. Seventh, beyond commonalities each country has its singularities: budget deficit in St. Vincent and the Grenadines, inflation and inflation variability in St. Lucia, inflation in Antigua and Barbuda, fertility rate and secondary school enrollment in Grenada, and government consumption in Dominica. Eighth, if we interpret the constant term in all the regressions presented above as the average effect of the factors considered almost constant, then good governance, as a structure largely affected by social cohesion, is the candidate by excellence of those factors. In this case the positivity of constant terms means that good governance is conducive to economic growth. Eighth, nothing special could be said about budget deficit since, in the majority of cases, we did not have enough data to justify its inclusion in the regressions.

There is a need to repeat that the conclusions drawn here are in the realm of data used. Indeed, many missing or incomplete data did not allow us to exploit some variables in some country regressions. Such were the cases of secondary school enrollment and budget deficit in some countries. It is useful that the statistical bodies or others in the countries concerned namely generate the relevant statistics to enable researchers to fully undertake their studies.

On another note, it is also important that a panel data study be conducted to see how the results compare with the ones obtained here. The authors are doing just that.

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Appendix

Definition of Variables and Sources of Data.

Key to understanding variables used in different tables.

Suffix= country name.

an=Antigua and Barbuda; do=Dominica; gr=Grenada; kn=St. Kitts and Nevis;

lu=St. Lucia; vi=St. Vincent and the Grenadines.

Prefix: Meaning of the variable

RPC: real per capita GDP in US dollar;

D: real per capita GDP growth computed as Log(rpc/rpc(-1)). Computed by us;

DEF: budget deficit/GDP computed as (revenue-expenditure)/GDP denominated here budget deficit;

ED = external debt as a % of GDP denominated here external debt;

ES: gross-secondary school enrolment (% gross) denominated as gross secondary school enrollment;

FE: fertility rate (live births per 1,000 women);

FDI: Foreign direct investment/GDP ratio denominated here foreign direct investment;

GC: government consumption/GDP ratio denominated here government consumption.

INF: inflation rate (%);

NRI: natural increase rate (birth rate –death rate);

NDS: natural disasters: 1 if occurred in a given year and 0 otherwise;.

PC: private consumption/GDP ratio denominated here private consumption;

PS= population size in millions;

TR: Trade (Export+import)/GDP ratio denominated here trade openness;

D(…)=first difference

Putting Prefix and Suffix together

Examples:

RPCAN=real per capita GDP for Antigua and Barbuda;

DLU= real per capita growth for St.Lucia; DDO=real per capita growth for Dominica

DEFKN=budget deficit for St. Kitts and Nevis;

EDGR=external debt for Grenada; EDLU=external debt for St. Lucia;

ESAN=secondary school enrollment in Antigua and Barbuda;

FDIVI=foreign direct investment for St. Vincent and the Grenadines;

FEDO: fertility rate in Dominica; FELU=fertility rate in St. Lucia;

GCVI=government consumption for St. Vincent and the Grenadines;

INFDO=inflation rate for Dominica;

NRIDO=natural increase rate for Dominica; NRILU=natural increase rate for St. Lucia;

NDSki=natural disasters for St. Kitts and Nevis;

PCKN=private consumption for St. Kitts and Nevis;

PSGR=population size in Grenada;

TRAN=trade openness for Antigua and Barbuda; TRGR=Trade openness for Grenada;

D(PSAN)=first difference of population size for Antigua and Barbuda.

Sources:

Eastern Caribbean Central Bank; World Bank: World Tables (various issues), International Monetary Fund, World Economic Outlook Database, October 2013, World Development Indicators, and EM-Dat.