Government Expenditure and Economic Growth in a Small Open Economy: A Disaggregated Approach

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Abstract

This paper provides empirical evidence on the relationship between the components of government expenditure and economic growth in Barbados. Both the Dynamic Ordinary Least Squares and the Unrestricted Error Correction Model were employed to analyse time series data spanning from 1976-2011. Generally the findings suggest that total government spending produces a drag on economic growth, particularly in the short-run, with a much smaller impact over time. More specifically the results indicate that while outlays on health and social security have little influences on per capita economic growth; government expenditure on education typically has a significant and negative impact on growth, both in the long and short runs. In addition, reallocations of government spending from one component to another may have growth-enhancing effects without having to change the level of government spending.

Keywords: *government expenditure, growth, small open economy*
JEL Classification No: E62, E210, H50

1. Introduction

As with most of the developing world, Barbados has been plagued with budget deficits for three decades, with a rapid increase seen over the last five years. Larger budget deficits can often coincide with less efficient government spending, growth in government personnel and other government expanding policies which are thought to place a drag on economic growth. The continued widening of the Barbadian budget deficit has started to adversely impact the international reserves of the monetary authority and as Barbados aims to maintain its pegged exchange rate[1], the government has decided to undertake a self-imposed fiscal adjustment. With stagnant growth and a continued loss in revenue, the fiscal adjustment is tied heavily to a reduction in government's expenditure. Given the dominant role of government in the Barbadian economy any decrease in government spending may have serious implications for economic activity. This fiscal adjustment includes a contraction in both outlay on health care and education as these are two of the largest components of government's expenditure. It leaves the question of how the different categories of government spending affect economic growth and if greater efficiency can be obtained by rebalancing these components.

A widely accepted school of thought suggests that growth in government is almost always associated with a negative impact on economic activity, however not all components of expenditure are expected to influence the economy equally (for example see Wu et al, 2010). Theoretical work done by Barro (1990) and Aschauer (1988) indicate that public expenditure on investment and other productive activities should have a positive link with economic growth, while government consumption is anticipated to show growth-inhibiting effects. Empirical research on the impact of fiscal components on long-run economic growth have been undertaken by such authors as Feder (1983), Landau (1983), Derajavan et al. (1996), and more recently Afonso and Jalles (2013) for both developed and developing countries with mixed results. Little work has been undertaken for the Caribbean in general and Barbados specifically. The two studies that are available (Belgrave and Craigwell, 1995; Belgrave et al, 1996) were conducted on Barbados and the Organisation of Eastern Caribbean States (OECS) respectively and ambiguous findings were also derived. However these articles were done nearly 20 years ago and can be considered out of date. Thus another look at the components of

[1] Barbados' exchange rate is pegged to the US dollar at US$1 to BDS$2.

government expenditure and their relationship to economic growth appear to be warranted, especially in these times of a burgeoning fiscal burden.

This paper adds to the scant Barbadian and Caribbean literature by using more robust econometric methodologies and employing a more up to date data set. In terms of the methodology the Dynamic Ordinary Least Squares (DOLS) and Unrestricted Error Correction Model (UECM) frameworks are applied to Barbados over the period 1975-2010. These techniques address the issues of endogeneity, serial correlation, and non-stationarity by among other things creating the option of utilising variables of different degrees of integration (I_1 and I_0).

The article continues as follows. After a brief look at the empirical literature on government spending and economic growth, the data and methodology are described. In the next section a presentation and discussion of the empirical results are given. Then robustness checks are performed. Finally, some conclusions are made.

2. Literature Review

Economic theory suggests that high levels of government spending can spur economic growth; however over consumption by government can crowd out private investment and hence place a drag on economic output (for examples see Monadjemi (1993) and Buiter (1977)). The empirical evidence discussed below also shows mixed results. Many cross sectional studies have concluded that there is a negative link between economic growth and government spending. Barro (1991) using a sample of 98 countries between 1960 and 1985 obtained results that suggest the association between economic growth and government consumption is both negative and significant. Ghura (1995) investigated 33 Sub-Saharan African economies and the findings revealed that there is also a negative relationship between government consumption and economic growth. Lee (1995) utilised an endogenous growth model of an open economy and his results show that government consumption was linked with slower economic growth for a cross section of 89 developed and developing countries for the period 1960-1985. In addition Ram (1986) employing production functions found that for 115 nations that total government spending had a negative effect on economic growth.

Contrary to the above negative association between government expenditure and economic growth, some authors have also provided evidence of a positive relationship.

For example, Harko (2009) supported a positive linkage between government outlay and gross domestic product (GDP) per capita growth for 21 Asian countries. Slemrod et al (1995) reported a positive correlation between the ratio of government expenditure to GDP and the level of real GDP per capita across 13 of the 24 economies in their sample. However when the authors tested the Organisation for Economic Co-operation and Development (OECD) nations on their own, a negative relationship was revealed. Alexiou (2007), using an ordinary least squares approach for the period spanning 1970-2001 concluded that in Greece there is a positive association between government spending and GDP growth.

Surprisingly research has also revealed that there is no significant relationship between government expenditure and economic growth. For example Bairam (1990) employing a sample of 20 African territories for the era 1960-1985, reported that the effects of government outlay couldn't be generalized. Kormendi and Meguire (1985) also observed no significant relationship between economic growth and government consumption. In Levine and Renelt (1992) there were also no evidence to support a robust linkage between economic growth and government expenditure. Conte and Darrat (1988) utilizing the majority of the OECD countries showed no significant impact of government growth on real economic activity. Nelson and Singh (1994) findings were also inconclusive as a significant relationship between government expenditure and economic growth could not be established.

Studies have also tested the decomposition of government spending and its link to economic growth, categorizing government expenditure into groups such as; investment, health care, social contributions, education and defense. The findings as with the aggregated approach are mixed.

Kelly (1997) for example, used a sample of 73 countries and the results supported the hypothesis that public investment is likely to positively influence economic growth. Belgrave and Craigwell 1995 for the period of 1969-1993 also showed that in Barbados an increase in government investment has a positive relation to growth. On the other hand evidence from Afonso and Furceri (2010) supported the proposition that government investment has a sizeable negative and statistically significant impact on growth, concluding that public investment can have a crowding out effect. Similarly Devarajan et

al (1996) for a sample of 43 developing countries reported that a rise in the share of public investment expenditure has a significantly negative influence on economic growth.

Belgrave and Craigwell's (1995) results suggest that government spending on health has a positive relation to growth. Alfonso and Alegre (2011) also supported this finding using Euro area data between 1970 and 2006. Likewise Khan and Ahmed (1999) showed that improved health conditions via government spending on health care can contribute to more productive labour markets and hence expand economic activity. On the other hand, the results of Devarajan et al (1996) supported the claim that public spending in health had a negative relation to growth however it was statistically insignificant.

Social spending has often been assumed to be unproductive (Kneller et al, 1999). Afonso and Furceri (2010) results also imply that social contributions have a statistically significant negative effect on economic growth. However, Bellentini and Ceroni (2000), using a sample of 61 countries found that there was a statistically significant, positive association between social security expenditure and economic growth. Bellentini and Ceroni (2000) concluded that their findings supported the view that social security expenditure stimulates investment in human capital and this translates to economic growth.

Authors have also examined how spending on education affects long–term growth generally finding a positive, significant relationship. Jung and Thorbecke (2003) found that their simulation results imply that education outlay can raise economic growth. Belgrave and Craigwell (1995) also concluded that government spending on education has a positive effect on economic output in Barbados. Many other studies have reported that because of its effects on human capital expenditure education has a significantly positive correlation with growth (see Barro, 1991; Roubini and Sala-IMartin, 1991; Birdsall et al, 1995). In direct contrast, Landau (1986) findings supported the hypothesis that government spending on education has an apparent drag on economic growth. Landau (1986) continued by stating that government expenditure on education seemed to be inefficient at generating actual education, as actual education is strongly correlated with growth rates, but levels of government educational spending are not. Using a data set containing 19 Caribbean countries over the period 1995 to 2007 Bynoe et al (2012)

also affirms Landau's (1986) findings and suggests that spending on education has little influence on either primary or secondary school enrolment.

Government outlay on defense is largely seen as unproductive; however research has shown that its effects on economic growth can vary. Benoit (1973) highlighted that military expenditure increases economic growth in developing countries. His results however were later questioned and disregarded by many (for example see Lim, 1983). Others have argued that the military can be seen as a place of training and therefore can act as a driver of human capital accumulation (see Weede, 1992). For the most part however research has revealed that this type of expenditure has a negative or insignificant impact on economic growth (see Ram 1995; Knight et al, 1996).

3. Econometric Methodology and Data

3.1.1. Methodology

In order to assess the relationship between government expenditure and economic growth, this study utilizes the DOLS and UECM techniques which support variables of differing degrees of integration, while also permitting the estimation of both long-run multipliers and short-run dynamics via cointegrating relationships amongst the variables under investigation.

The DOLS approach applies leads and lags of the first differences of the non-stationary variables in the long-run regression, with the intention of correcting for possible endogeneity between the regressors and the dependent variable, and long-run serial correlation respectively. This is expressed as such:

$$y_t = \beta' x_t + \sum_{j=-k_1}^{+k_2} \gamma_j \Delta x_{t-j} + u_t \quad (1)$$

$$\Delta y_t = \alpha_0 + \sum_{j=1}^{k_2} \alpha_j \Delta y_{t-j} + \sum_{j=0}^{k_2} \delta_j \Delta x_{t-j} + \rho u_{t-1} + v_t \quad (2)$$

where Equations (1) and (2) are the long- and short-run specifications, respectively. y_t is the dependent variable in levels, x_t is a matrix of regressors which may be integrated of either order 0 or 1 and $k_1$and k_2 are the lead and lag lengths chosen. The β vector (which also includes the intercept) captures the long-run multiplier effects of the regressors on the regressand, γ_j are the coefficients on the leads and lags of the first

differenced non-stationary variables, Δ is the first difference operator, while u_t is the random error term in the long-run equation which follows all the classical least squares assumptions. This random error, if stationary suggests a cointegrating relationship between the regressors and the dependent variable, and becomes the error correction model (ECM) term (u_{t-1}) in the short-run Equation (2), where δ denotes the short-run dynamics between the regressors and the regressand, α_0 is the intercept, α is the coefficient on the lagged dependent variable and v_t is the random error term in the short-run equation. The coefficient ρ on the ECM term u_{t-1} represents the speed of adjustment back to long-run equilibrium, and lies between 0 and -1 for a stable model. A statistically significant ECM term supports the finding of cointegration and the validity of the long-term model specification.

The UECM methodology in contrast requires a single equation to capture long- and short-run dynamics and the ECM term is now included as the lag of the dependent variable in levels such as:

$$\Delta y_t = \alpha_0 + \sum_{j=1}^{p} \alpha_j \Delta y_{t-j} + \sum_{j=0}^{q} \delta_j \Delta x_{t-j} + \rho\, y_{t-1} + \varphi' x_{t-1} + v_t \qquad (3)$$

In this case, the long-run coefficients are calculated as (φ/ρ) and p and q are the maximum lag lengths for the lagged dependent variables and first differenced regressors respectively. For the purpose of this study, standard errors are corrected for serial correlation using the Newey-West Heteroskedasticity and Autocorrelation Consistent Covariance (HAC) procedure, while the maximum lag and lead lengths are set to 1, due to the relatively small sample size, and potential large loss of degrees of freedom if greater lags or leads are included.

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3.2.Data

The sample for this study uses annual observations covering the period 1975 – 2010, and comprises data on central government's total government expenditure, spending on education, health and social security, real per capita GDP and a selection of control variables - openness to international trade, population and investment - indicated in the literature (see for instance Craigwell et al, 2012).. Other variables such as prices and fiscal policy measures have also been suggested but, due to the relatively small sample

size, the need to include leads and lags, as well as the high correlation between some of these variables (see Tables 1 and 2), these controls had to be excluded from the regressions[2].

Real per capita GDP is used to capture economic growth (y_t) and the degree of central government expenditure is represented initially by nominal total government spending and spending on education, health and social security all as a percentage of nominal GDP. Growth in population is expected to have a positive impact on economic growth, particularly in the long-run, as the labour force increases over time, while investment enhances the country's productive capacity and real output. Finally, a more open economy may lead to greater access to international export markets, but in a small, net importing country such as Barbados, a higher degree of openness could alternatively result in heightened vulnerability to external shocks. In later sections, as a part of the checks for robustness, real government expenditures (nominal spending deflated by prices proxied by the retail price index) and the components of government expenditure measured as percentages of total government spending are included as alternative measures of government spending. Real per capita GDP, population, real government expenditures and its components all entered the regressions in logged form. In addition, real per capita GDP, the degree of openness to international trade, investment per real per capita GDP and prices were all obtained from the Penn World Tables, while government's expenditure and its components were retrieved from the Central Bank of Barbados' Online Statistics database.

Table 1: Correlation of Main Regressors and Real Government Expenditure

	Openness	Population	Prices	Total Real Government Expenditure	Investment/Real GDP per capita

[2] Note that prices were included as a regressor in the initial regressions and the results found were qualitatively similar.

Openness	1.000	0.653	0.686	0.582	-0.032
Population	0.653	1.000	0.943	0.974	-0.251
Prices	0.686	0.943	1.000	0.880	-0.266
Total Real Government Expenditure	0.582	0.974	0.880	1.000	-0.164
Investment/Real GDP per capita	-0.032	-0.251	-0.266	-0.164	1.000

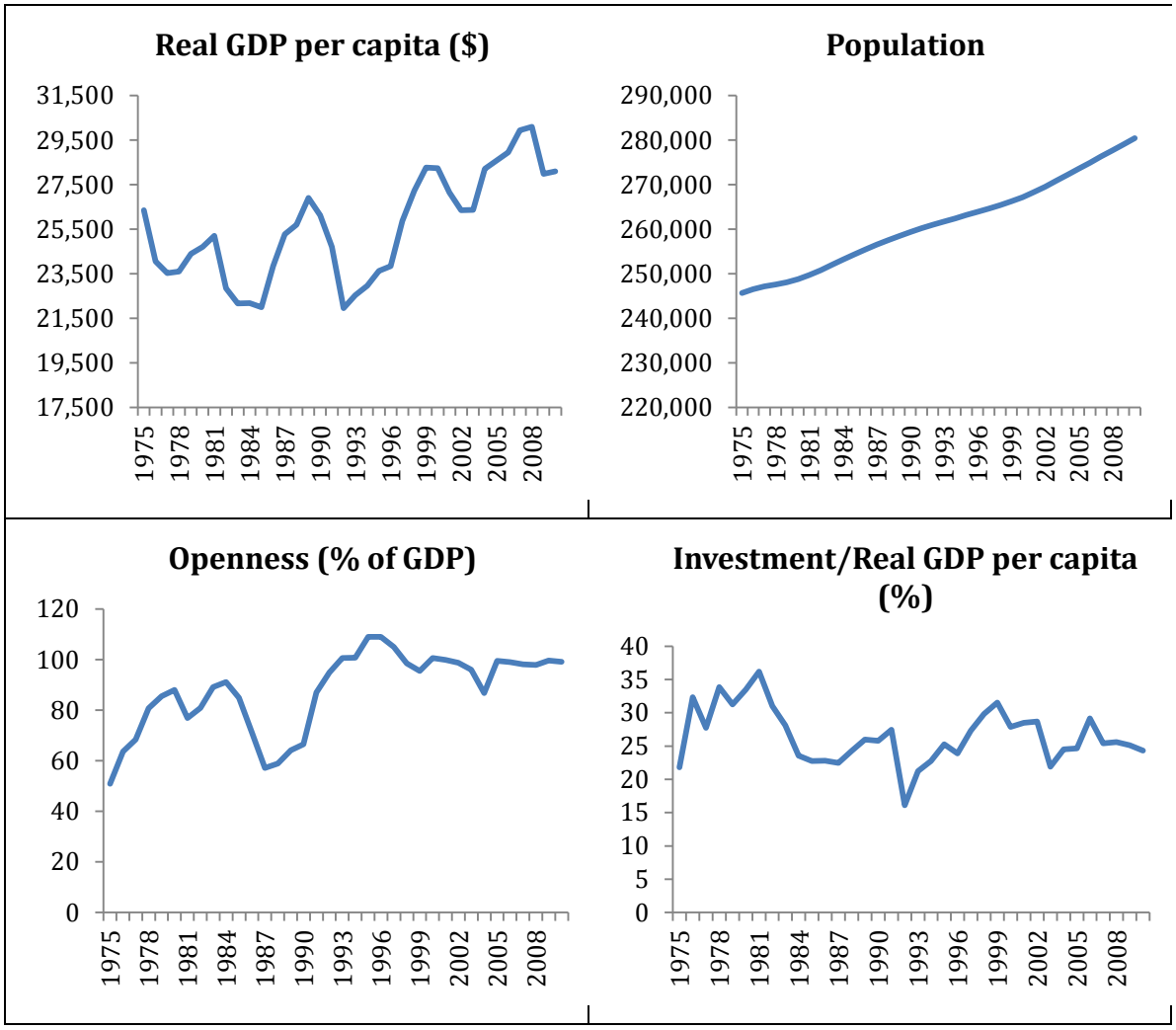
Table 2: Correlation of Main Regressors and Components of Real Government Expenditure

	Openness	Population	Prices	Real Expenditure on Education	Real Expenditure on Health	Real Expenditure on Social Security	Investment/Real GDP per capita
Openness	1.000	0.640	0.683	0.622	0.529	0.569	-0.051
Population	0.640	1.000	0.945	0.973	0.930	0.959	-0.292
Prices	0.683	0.945	1.000	0.899	0.830	0.859	-0.335
Real Expenditure on Education	0.622	0.973	0.899	1.000	0.921	0.968	-0.193
Real Expenditure on Health	0.529	0.930	0.830	0.921	1.000	0.905	-0.214
Real Expenditure on Social Security	0.569	0.959	0.859	0.968	0.905	1.000	-0.168
Investment/Real GDP per capita	-0.051	-0.292	-0.335	-0.193	-0.214	-0.168	1.000

Augmented Dickey Fuller unit root tests (not reported but available) confirmed that only investment as a percentage of real per capita GDP, spending on education as a ratio of GDP and as a proportion of total government expenditure were found to be integrated

of order 0. All other variables were non-stationary: integrated of order 1. Figures 1 and 2 show plots of the dependent and control variables and expenditure items used in the regressions, and confirm the unit root test results that most variables appear to have an upward trend. In particular, real expenditure by government has generally increased over the 36 years in question, both on an aggregate and disaggregated level. Interestingly though, while outlay on education and health both as a percentage of GDP and total expenditure have remained relatively constant and even declined slightly respectively, social security spending seems to have marginally expanded relative to GDP, and maintained its share of total expenditure over time.

Figure 1: Plots of Control Variables and Aggregate Expenditure (1975 - 2010)



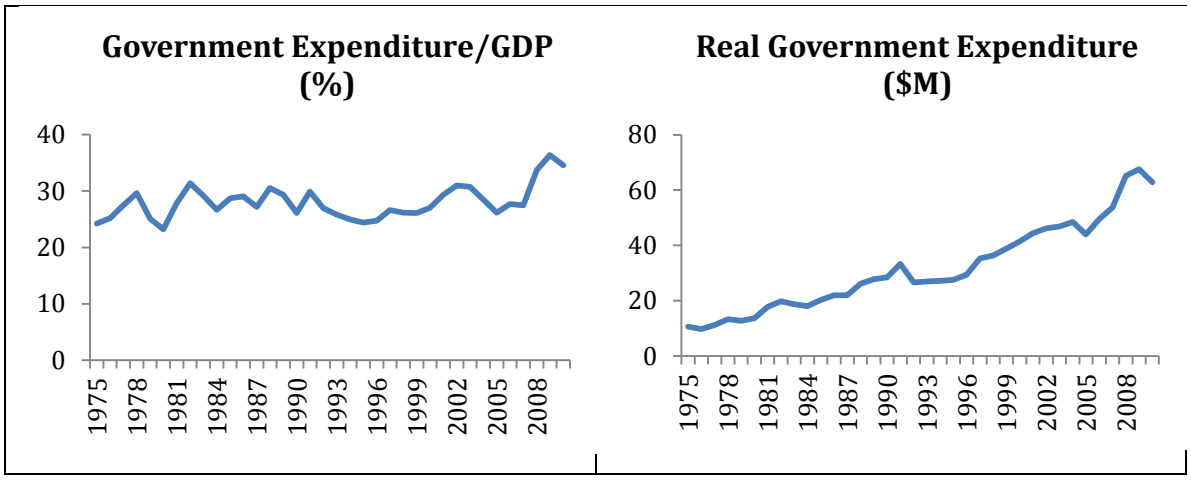
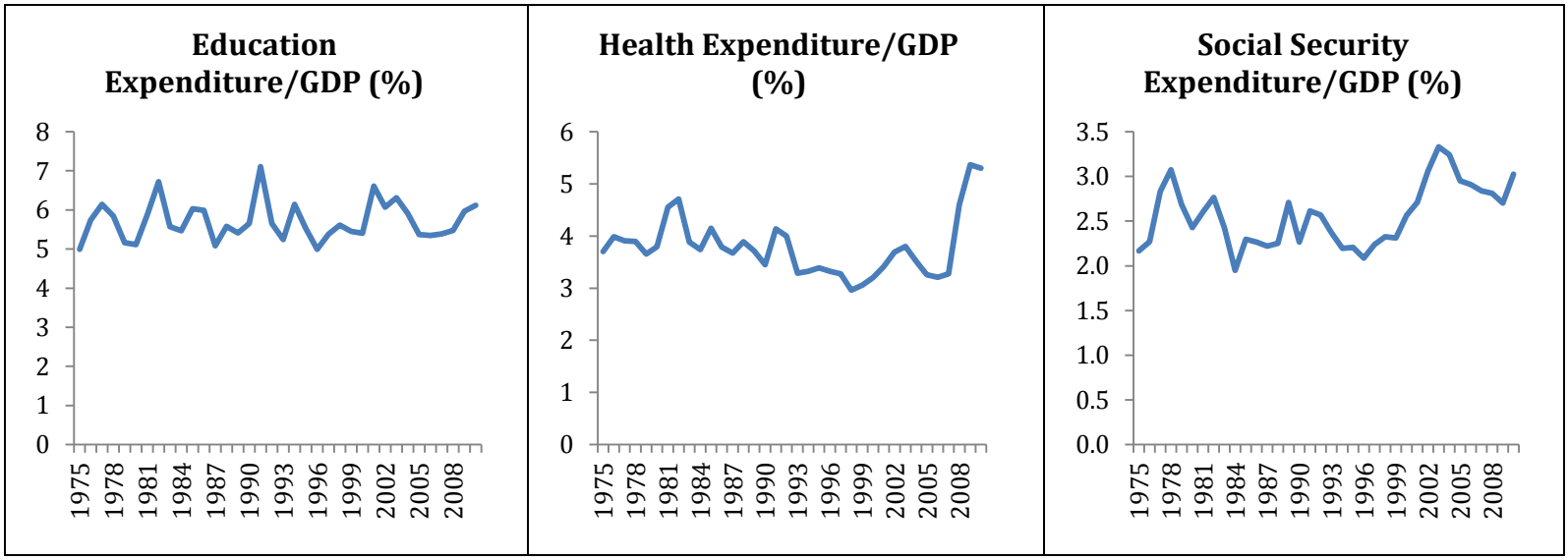
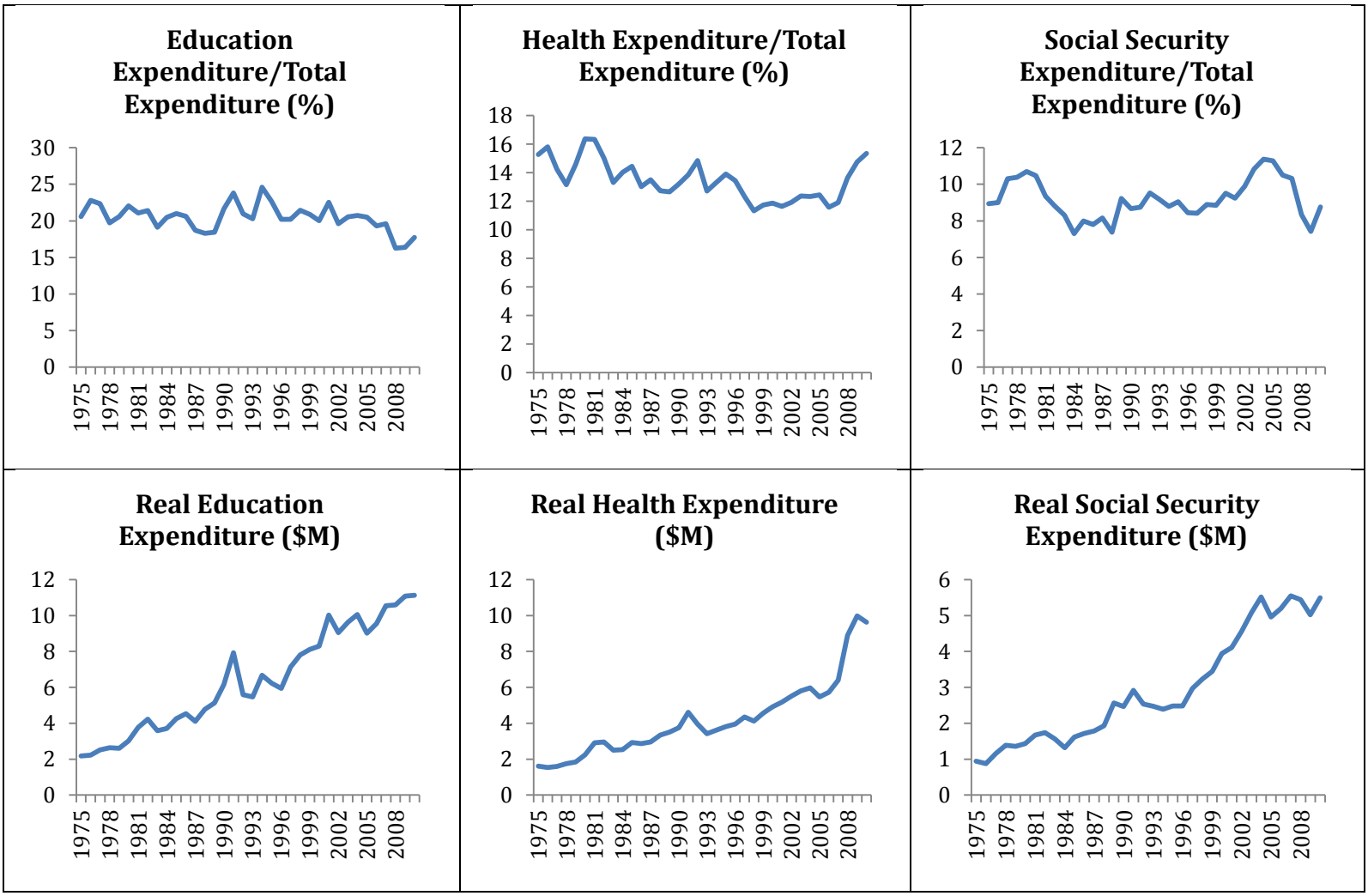


Figure 2: Plots of Selected Components of Total Government Expenditure (1975 - 2010)





Finally, even though real aggregate and disaggregated government expenditures appear to rise with real per capita GDP over time, these factors are by nature highly correlated with one of the controls: population (see Tables 1 and 2). As a result, some care should be taken when interpreting the results from those regressions that include both determinants, as this correlation is sure to have led to a very high degree of multicollinearity, and as such, estimates of the coefficients on the real expenditure variables and/or population may be highly imprecise and can in fact change signs.

4. Results

Table 3 presents the findings of the baseline regressions, both long- and short-run, for the DOLS and UECM specifications. A cursory check of the three control variables shows that they generally conform to a priori expectations. A more open economy

produces lower GDP growth both in the short- and long-runs, as Barbados, being a small economy highly dependent on imports, is affected by external price and output shocks from the global economy. Similarly, increases in per capita investment build extra capacity for growth in both the short and long run. In the long-run, a rise in Barbados' population has a statistically, positive impact on real GDP per capita, with a 1% increase in the population producing a direct change in per capita income within the range of 3.5% - 3.6%. In the short run, an expansion in population growth leads to statistically lower per capita GDP increases (at least in the DOLS instance), as capital remains fixed in the short-run, causing diminishing returns to production. Turning to total expenditure to GDP, the results suggest that expansions in this ratio generally lead to reductions in per capita GDP and growth rates respectively, with the effect being statistically significant only in the short-run. Nevertheless, the size of these coefficients appear to be relatively small, with the impact ranging from a 0.0055 to 0.0074 percentage point decline in growth, attributed to a 1% rise in the ratio of total expenditure to GDP. In addition, the statistically significant error correcting terms ranging from -0.8959 to -0.9124 imply that a cointegrating relationship exists among the variables, and deviations away from that long-run equilibrium dampen out very quickly over time, with almost a full return to equilibrium one year later.

Table 3 Long-run and Short-run DOLS and UECM Model Results: Baseline

	Long-run Impact Multipliers		Short-run Dynamics	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	3.5194***	3.6149***	-33.4419***	-18.8420
	(0.2998)	(0.5065)	(9.2240)	(18.4545)
Openness	-0.0045***	-0.0037***	-0.0029***	-0.0040***
	(0.0008)	(0.0008)	(0.0005)	(0.0005)
Investment	0.0094***	0.0048***	0.0078***	0.0094***
	(0.0022)	(0.0014)	(0.0016)	(0.0023)
Total Expenditure/GDP	-0.0080	-0.0043	-0.0074***	-0.0055***
	(0.0059)	(0.0044)	(0.0019)	(0.0020)

ECM			-0.8959*** (0.1961)	-0.9124*** (0.1808)
Summary Statistics				
Adjusted R-squared	0.9414	0.6917	0.7031	0.6917
Jarque-Bera Statistic	1.0438	0.8485	0.1071	0.8485
Q-Statistic	0.5416	0.2046	0.0152	0.2046

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively.

Digging deeper into the composition of government expenditure, Tables 4, 5 and 6 provide estimates of the relative impacts of expenditure on education, health and social security respectively, all as a percentage of nominal GDP, on real per capita GDP in the short- and long-run. Again, the control variables generally carry the expected signs as in the baseline equations, but individual components provide differing results.

Increased spending on education by the central government appears to have an unintuitive negative effect on per capita output in both the long and short-run, and this result is generally robust and statistically significant across both model specifications in the short-run, but only significant in the DOLS instance over a longer period. Again, the models exhibit a stable long-run equilibrium, with the majority of the influences of any short-term shocks being erased after one year.

Public spending on healthcare also carries a negative sign across model specifications and time horizons, but this finding seems to be less than robust in terms of level of significance and the validity of the short-run error correction model in the DOLS specification. That specification suggests an error correction term greater than 1 in absolute value, and it is this specification which implies that increased spending on health reduces per capita GDP both in the long- and short- runs. The more econometrically plausible ECM term in the UECM specification also indicates a rapid speed of adjustment but suggests that the impact of public sector health spending on growth may not be statistically different from zero.

Finally, social security outlays by the Barbadian government seem to follow the typical trend of public expenditures on education and health in the short-run and imply a negative, though in this case statistically insignificant, effect of spending on economic activity. However, in the long-run the story becomes quite different, as, while the impacts are still insignificant, there appears to be some positive influence on real output from increases in government's social security spending relative to nominal GDP.

Table 4 Long-run and Short-run DOLS and UECM Model Results: Education

	Long-run Impact Multipliers		Short-run Dynamics	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	2.9648***	3.2695***	8.8246	-13.8511
	(0.4701)	(0.4226)	(9.8348)	(10.1248)
Openness	-0.0034***	-0.2628***	-0.0033***	-0.0040***
	(0.0008)	(0.0430)	(0.0008)	(0.0010)
Investment	0.0132***	0.0028	0.0058**	0.0058**
	(0.0031)	(0.0013)	(0.0024)	(0.0023)
Education Expenditure/GDP	-0.0391***	-0.0208	-0.0384***	-0.0398***
	(0.0130)	(0.0121)	(0.0102)	(0.0122)
ECM			-0.5958***	-0.5530***
			(0.1733)	(0.1465)
Summary Statistics				
Adjusted R-squared	0.8040	0.5935	0.6141	0.5935
Jarque-Bera Statistic	0.9911	0.5488	1.6624	0.5488
Q-Statistic	0.6050	0.7164	0.1639	0.7164

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively

Table 5 Long-run and Short-run DOLS and UECM Model Results: Health

	Long-run Impact Multipliers		Short-run Dynamics	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	2.7474***	3.4387***	-22.5767***	-10.5039
	(0.2909)	(0.3937)	(7.8941)	(9.1448)
Openness	-0.0037***	-0.0037***	-0.0027***	-0.0037***
	(0.0005)	(0.0005)	(0.0006)	(0.0006)
Investment	0.0083***	0.0037*	0.0081***	0.0086***
	(0.0019)	(0.0016)	(0.0017)	(0.0022)
Health Expenditure/GDP	-0.0534**	-0.0248	-0.0387***	-0.0204
	(0.0212)	(0.0169)	(0.0010)	(0.0140)
ECM			-1.0079***	-0.83345***
			(0.2174)	(0.0169)
Summary Statistics				
Adjusted R-squared	0.9340	0.6914	0.7134	0.6914
Jarque-Bera Statistic	0.9139	0.5958	0.8133	0.5958
Q-Statistic	0.0170	0.1592	0.0036	0.1592

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively

Table 6 Long-run and Short-run DOLS and UECM Model Results: Social Security

	Long-run Impact Multipliers		Short-run Dynamics	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	3.4389***	3.2294***	-33.5997**	-28.4493
	(0.2660)	(0.4958)	(14.4551)	(18.2038)
Openness	-0.0041***	-0.0032***	-0.0030***	-0.0040***
	(0.00056)	(0.0010)	(0.0006)	(0.0008)
Investment	0.0105***	0.0035*	0.0078***	0.0082***
	(0.0023)	(0.0017)	(0.0020)	(0.0023)
Social Security	0.0056	0.0371	-0.0272	-0.0059
Expenditure/GDP	(0.03770)	(0.0241)	(0.0254)	(0.0325)
ECM			-0.7607***	-0.9110***
			(0.0020)	(0.1864)
Summary Statistics				
Adjusted R-squared	0.8937	0.6161	0.5685	0.6161
Jarque-Bera Statistic	0.5758	0.2714	0.7435	0.2714
Q-Statistic	0.5228	0.0896	0.2190	0.0896

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively

5. Robustness Checks

Given the results of the preceding subsection, robustness checks are carried out for the baseline and disaggregated models, by substituting different measures of government expenditure.

First, in the baseline case, total government expenditure as a percentage of nominal GDP is replaced with total real expenditure (total government expenditure

divided by the price level), in order to ascertain whether changes in the real value of government's annual outlay significantly impact total per capita output (see Table 7). However, it must be noted that with the very high correlation between population and real expenditures (ranging from 0.930 in the case of real public spending on health to 0.974 for total real government expenditure; see Tables 1 and 2), some models may suffer from high degrees of multicollinearity, characterised by large standard errors, insignificant variables and changes in signs of coefficients.

By and large the findings confirm those of the previous subsection, as the UECM model suggests that both the long- and short-run impacts of expenditure are negative, with both being insignificantly different from zero. The DOLS specification indicates an insignificant positive relationship between total expenditure and real per capita GDP, but the relatively large standard error and the error correcting term of greater than 1 in absolute value brings into question the validity of this specification's estimates.

Table 7 Long-run and Short-run DOLS and UECM Model Results: Baseline (Total Real Expenditure)

	Long-run Impact Multipliers		**Short-run Dynamics**	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	2.5886	4.3085***	-37.4083***	-1.1031
	(1.6596)	(1.3285)	(6.9213)	(19.8190)
Openness	-0.0035***	-0.0036***	-0.0031***	-0.0035***
	(0.0009)	(0.0008)	(0.0006)	(0.0007)
Investment	0.0100***	0.0040**	0.0082***	0.0083***
	(0.0024)	(0.0013)	(0.0023)	(0.0029)
Total Real Expenditure	0.0545	-0.0747	-0.1579*	-0.0407
	(0.1130)	(0.0788)	(0.0833)	(0.0795)
ECM			-1.0283***	-0.9323***
			(0.2118)	(0.1700)
Summary Statistics				
Adjusted R-squared	0.9238	0.6271	0.6402	0.6271
Jarque-Bera Statistic	0.3388	1.2219	1.9472	1.2219

Q-Statistic	1.7275	0.2168	0.1737	0.2168

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively

Next, Tables 8, 9 and 10 present alternative measures of public spending on education, health and social security by measuring each classification as first, a percentage of total government expenditure, and secondly, as total real expenditure, again deflated by prices.

Generally, the results suggest that short-run increases in both the proportion of education in total spending and the real value of public spending on education again reduce GDP growth, but the direction of this relationship appears reversed in the long-run. Higher concentrations of educational spending in government's total spending have insignificant, yet positive, impacts on real output, while the findings are mixed with regards to real expenditures, with the large standard errors again suggesting highly imprecise estimates.

Table 8 Long-run and Short-run DOLS and UECM Model Results: Education Expenditure/Total Expenditure and Real Education Expenditure

	Long-run Impact Multipliers (Education Exp/Total Exp)		Short-run Dynamics (Education Exp/Total Exp)		Long-run Impact Multipliers (Real Education Exp)		Short-run Dynamics (Real Education Exp)	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	3.0846*** (0.4889)	2.9945** (0.6605)	2.1928 (11.2033)	-17.7806 (13.6027)	3.0615** (1.3184)	3.4098*** (0.9114)	-34.2063*** (6.7498)	-13.1682 (15.9231)
Openness	-0.0036*** (0.0008)	-0.2236 (0.0758)	-0.0038*** (0.0010)	-0.0043*** (0.0012)	-0.0031*** (0.0008)	-0.0034*** (0.0005)	-0.0029*** (0.0004)	-0.0035*** (0.0007)
Investment	0.0131*** (0.0034)	-0.0013 (0.0021)	0.0060* (0.0033)	0.0059* (0.0034)	0.0085*** (0.0025)	0.0041** (0.0018)	0.0084*** (0.0018)	0.0100*** (0.0025)
Education Expenditure	0.0021 (0.0034)	0.0041 (0.0049)	-0.0034 (0.0026)	-0.0029 (0.0029)	0.0059 (0.0945)	-0.0099 (0.0737)	-0.1046*** (0.0324)	-0.0410 (0.0386)
ECM			-0.5145** (0.2044)	-0.4808** (0.2029)			-0.8861*** (0.1576)	-0.9998*** (0.1281)
Summary Statistics								
Adjusted R-squared	0.7541	0.4139	0.4646	0.4139	0.9090	0.6308	0.6204	0.6308
Jarque-Bera Statistic	2.1936	0.4946	0.6039	0.4946	4.1652	1.0303	0.3496	1.0303

Q-Statistic	1.4307	0.6861	0.4423	0.6861	0.9422	0.6617	0.5284	0.6617

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively

With regards to health expenditures (Table 9), again it displays contracting effects on real output, both in the short- and long-run, across both specifications and variable choices. Once more, if those equations with the ECM terms greater than 1 in absolute value are excluded, then real expenditures on health have statistically significant, negative impacts on GDP, over both horizons, a result more emphatic than in the previous subsection.

Table 9 Long-run and Short-run DOLS and UECM Model Results: Health Expenditure/Total Expenditure and Real Health Expenditure

	Long-run Impact Multipliers (Health Exp/Total Exp)		Short-run Dynamics (Health Exp/Total Exp)		Long-run Impact Multipliers (Real Health Exp)		Short-run Dynamics (Real Health Exp)	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	2.9349*** (0.4002)	2.6963*** (0.4834)	-19.7205* (10.0745)	-20.1323** (8.6669)	5.8507*** (1.1349)	6.7523*** (0.6406)	-21.6392*** (5.8170)	40.8764** (16.9806)
Openness	-0.0036*** (0.0005)	-0.0028*** (0.0005)	-0.0027*** (0.0007)	-0.0032*** (0.0008)	-0.0041*** (0.0006)	-0.0042*** (0.0005)	-0.0029*** (0.0005)	-0.0033*** (0.0006)
Investment	0.0110*** (0.0018)	0.0030 (0.0020)	0.0091*** (0.0016)	0.0104*** (0.0015)	0.0083*** (0.0026)	0.0017 (0.0013)	0.0070*** (0.0017)	0.0060*** (0.0018)
Health Expenditure	-0.0136 (0.0080)	-0.0165*** (0.0057)	-0.0018 (0.0060)	-0.0025 (0.0066)	-0.2256* (0.1101)	-0.2971*** (0.0519)	-0.0825** (0.0376)	-0.0887** (0.0351)
ECM			-1.1204*** (0.1383)	-1.0023*** (0.1538)			-0.9779*** (0.2193)	-0.8385*** (0.1483)
Summary Statistics								
Adjusted R-squared	0.9072	0.6676	0.6776	0.6676	0.9248	0.7513	0.6980	0.7513
Jarque-Bera Statistic	1.2852	0.9417	0.9916	0.9417	0.4093	0.6438	0.4216	0.6438
Q-Statistic	0.5940	0.3309	0.2654	0.3309	0.1543	0.1793	0.3054	0.1793

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively

Once more, spending on social security by government is the only segment of public expenditure investigated which appears to have a consistent positive, though largely insignificant impact on real GDP both in the long- and short-run (Table 10). In one instance however (DOLS estimate of social security expenditure to total expenditure), the influence of increasing the concentration of government spending in social security is statistically significant and positive in the short-run, but this result lacks any degree of robustness across specifications.

Table 10 Long-run and Short-run DOLS and UECM Model Results: Social Security Expenditure/Total Expenditure and Real Social Security Expenditure

	Long-run Impact Multipliers (Social Security Exp/Total Exp)		Short-run Dynamics (Social Security Exp/Total Exp)		Long-run Impact Multipliers (Real Social Security Exp)		Short-run Dynamics (Real Social Security Exp)	
Regressors	**DOLS**	**UECM**	**DOLS**	**UECM**	**DOLS**	**UECM**	**DOLS**	**UECM**
Population	3.4250*** (0.1884)	3.0606*** (0.4098)	-14.1328 (8.9271)	-11.3458 (13.1975)	2.4952 (1.4629)	1.7971* (0.9329)	-29.9174** (12.2707)	-33.5933 (19.8467)
Openness	-0.0039*** (0.0006)	-0.0029*** (0.0006)	-0.0027*** (0.0006)	-0.0033*** (0.0007)	-0.0037*** (0.0008)	-0.0029*** (0.0007)	-0.0028*** (0.0007)	-0.0036*** (0.0009)
Investment	0.0113*** (0.0014)	0.0027 (0.0022)	0.0081*** (0.0018)	0.0089*** (0.0025)	0.0103*** (0.0019)	0.0031 (0.0022)	0.0082*** (0.0021)	0.0092*** (0.0024)
Social Security Expenditure	0.0006 (0.0094)	0.0087 (0.0070)	0.0149** (0.0061)	0.0089 (0.0081)	0.0614 (0.1034)	0.0979 (0.0618)	-0.0137 (0.0700)	0.0631 (0.0738)
ECM				-0.8641*** (0.1434)			-0.9689*** (0.2078)	-0.9663*** (0.1848)
Summary Statistics								

Adjusted R-squared	0.9150	0.6517	0.6044	0.6517	0.8912	0.6038	0.6134	0.6038
Jarque-Bera Statistic	0.1474	0.7019	1.3545	0.7019	0.5980	0.9220	1.1957	0.9220
Q-Statistic	0.7728	0.6004	0.0019	0.6004	0.4260	0.4151	0.0050	0.4151

***, ** and * represent statistical significance at the 1%, 5% and 10% levels of significance respectively

6. Conclusions

The results presented above provide key and interesting insights into the impact of the Barbadian government's fiscal policy decisions on economic prosperity via its spending decisions.

Generally the findings suggest that total government spending by the Barbadian fiscal authorities produces a drag on economic growth, particularly in the short-run, with a much smaller impact over time. These results support the theory that governments can indeed over-consume and crowd out private sector involvement in economic activity, while also corroborating the earlier empirical findings of authors such as Ram (1986), Barro (1991), Ghura (1995) and Lee (1995). Though not empirically tested within this study, the relatively small proportion of growth-enhancing capital expenditure (see Belgrave and Craigwell, 1995 in the case of Barbados) which makes up total government spending may be a contributing factor in this case, as only a small portion of the government's budget is allocated and spent on longer-term investment projects.

Results in the literature have also largely confirmed the theory that increasing public spending on education boosts a country's economic performance via the accumulation of human capital (see for example Barro, 1991; Roubini and Sala-IMartin, 1991; Birdsall et al, 1995). However, the findings, while mixed, partially corroborate the earlier conclusions of Belgrave and Craigwell (1995), who found a positive, yet insignificant effect of spending on education on real GDP growth for Barbados. The estimates of the impact of an increase in the ratio of spending on education to total public spending on real GDP per capita also suggest an insignificant, yet positive relationship between the two in the long-run. On the contrary, an expansion in spending on education relative to nominal GDP have a statistically significant negative influence on growth,

both in the short- and long-run, while any short-run rise in real educational spending, reduces per capita GDP growth rates. This negative association has been previously discovered by Landau (1986), who suggested that while improvements in educational attainment are positively correlated with GDP growth, public expenditure on education may not be efficient in achieving the necessary levels of educational enrolment and attainment necessary to boost growth. This reasoning seems to also be the case for the Caribbean as Bynoe et al. (2012) results also revealed that the level of expenditure on education in 19 Caribbean countries had no effect on primary or secondary school enrolment. Perhaps, Barbados, while being able to boast literacy and secondary school enrolment rates of almost 100% over the past two decades at least, has reached a point where increases in the levels of public spending in education may no longer significantly add to human capital accumulation, and the island may thus be experiencing reducing returns to scale, and in some cases growth-reducing wastage, particularly in the short-run.

The negative impact of public health expenditure on growth contradicts the findings by Belgrave and Craigwell (1995) that government's outlay in this area boosts economic prosperity within the island. Like education, this follows the general result with regards to total government spending, implying that more recent inefficiencies in the health service may be contributing to decreasing returns to scale from real spending on health care by government.

Government's spending on social security produces a largely insignificant impact on real per capita output and its growth rate but interestingly enough, this effect is more often than not deemed to be positive. In fact, on the sole occasion where any change in social security spending (in the proportion of total government spending which is allocated to social security) suggests a significant, albeit not robust, impact of spending on GDP growth in the short-run, the direction of the relationship is a positive one. It may be that during times of economic downturns, increased spending on social security and safety nets relative to other components of expenditure, act as automatic stabilisers, contracting the negative effects of expanding unemployment, and partially mitigating the fall in aggregate demand within the economy.

Overall, the results imply that increasing government's involvement in economic activity within the Barbadian economy via further spending may actually inhibit or in fact reduce economic prosperity both in the short- and long-run. However, weak evidence

does exist to indicate that, rather than raise total expenditure, reallocations of expenditure from one component to the next, may have some marginal success to augmenting per capita output.

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