Investigating the Optimal Level of Government Spending to Maximize Economic Growth in Jamaica

Working Paper

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Abstract

The low economic growth experienced by Jamaica over the past twenty years has ignited the debate about the appropriate level of the Government's involvement in the economy. In this regard, the paper uses a non-linear regression model as well as an error correction model to determine the optimal level of Government's spending that maximizes economic growth for the country. The study utilizes quarterly data from 1993 to 2016. Based on the results, the paper finds that the optimal level of Government expenditure that maximizes economic growth for Jamaica is 33.2 per cent of total output. This result is 4.6 per cent of GDP greater than the average level of Government expenditure in Jamaica. Accordingly, the findings supports the proposition that a less austere level of Government spending in Jamaica can result in an improvement in economic growth.

JEL Classification: E62 and F63
Keywords: Government Spending, Economic Growth, Robust Least Squares Model

*The views expressed in this paper are not necessarily those of the Bank of Jamaica.

Table of Contents

I Introduction

During the onset of the international economic recession in 2008, the Government of Jamaica (Government) faced a dire global economic climate and very limited opportunities for counter-cyclical economic policy due to its low growth and high debt level. The global recession came after thirteen years of economic growth averaging 0.5 per cent, considerably below the level of growth experienced in numerous Caribbean countries as well as the average growth rate of the developed economies (see Figure 1). In 2013, the Government entered into a 4-year Extended Fund Facility programme (EFF) with the International Monetary Fund, predicated on fiscal consolidation, to effect economic growth. At the end of the EFF, macroeconomic fundamentals have improved in Jamaica but achieving consistent, sustainable growth has been elusive. In this context, there has been significant debate regarding the impact of the Government's policy, and in particular the role that the Government should play in engendering economic growth. Specifically, is there an optimal level of government spending that maximizes economic growth? Against this background, the study aims to uncover the effect of various forms of government expenditure on economic growth and to determine the level of government expenditure that maximizes economic activity.

To determine the growth maximizing level of government spending the paper employs econometric analysis in the form of a robust least squares model similar to that Alimi (2014) as well as an error correction model. The overview below provides a brief background on Jamaica's economic position over the past two decades. Section 2 reviews previous literature on the optimal levels of government spending to drive economic growth while section 3 explains the methodology utilized in the paper. The results of the regression analysis are shown in section 4 and section 5 elaborates on the relevant policy implications of the results. The conclusions and limitations of the study are contained in section 6.

Overview

During the period 1994-2016, real GDP growth in Jamaica was anemic, averaging 0.2 per cent. Notably, total real output in 2016 was higher by a mere 3.8 per cent relative to its level in 1994, when it stood at $725.6 billion. In addition, real per capita income declined over the period by 75.2

per cent to US$2 205.0 relative to the level of US$8 878.6 in 1994, (see Figure 2). Jamaica's performance compares unfavorably to most Caribbean and developed countries. Notably, the causes for Jamaica's poor performance are multi-faceted and cannot be reduced to a single economic indicator. Guseh (1997) explained that additional government expenditure above (below) a certain threshold level may have a negative (marginal positive) effect on output. If this explains Jamaica's lackluster performance, it implies that government expenditure over the past 20 years may have been consistently above (below) its optimal levels. In that regard a case can be made for a reduction (an expansion) in government spending to improve the country's growth prospects.

How large is the Jamaican government relative to its counterpart in the Caribbean and the industrialized countries? Measured as a share of GDP, during 1994-2016, Jamaica's average total government expenditure was 29.0 per cent, 2.0 per cent higher than the average for selected Caribbean countries.[1] Notably, the average government expenditure, as a share of GDP, for Jamaica and the selected Caribbean countries were below the average for 39 developed countries, which stood at 39.7 per cent of GDP (see Figure 3)[2]. This result validates Wagner's law, which purports that as countries experience economic development and increasing incomes, government expenditure as a share of total output increases. Similarly, the result supports Wagner (1892), which indicated that as nations developed, there is increasing demands on governments for social services. In addition, there is additional rent seeking opportunities on the part of businesses and groups within the economy, which provide a strong incentive for governments to increase expenditure.

Historically, in Jamaica, the majority of Government's spending has been directed towards debt (interest expenses) and salaries payments. Over the period FY1993/94 to FY2016/17, interest cost and salaries comprised, on average, 69.9 per cent of the total expenditure budget or 20.1 per cent of GDP. On the other hand, pubic investment for infrastructure, research and development (i.e. capital expenditure), which is critical for economic growth, on average, accounted for 9.9 per cent

[1] Caribbean countries are defined according to the IMF standard and include: Antigua and Barbuda, The Bahamas, Barbados, Dominica, Dominican Republic, Grenada, Guyana, Haiti, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago.

[2] Developed country is defined according to the IMF standard as shown in the World Economic Outlook (WEO)

of the total expenditure budget or 2.8 per cent of GDP. Of note, programme spending over the review period averaged 20.2 per cent of the total expenditure budget and 5.9 per cent of GDP.

Interest payments averaged 10.5 per cent of GDP and represented 41.5 per cent of government revenue over the review period. This compares to average interest cost of 11.6 per cent of government revenue for other Caribbean countries. In addition, Jamaica has recorded, on average, a primary surplus of 7.1 per cent of GDP over the period.[3] Against this background, the Government's ability to spend on critical economic growth inducing capital projects was limited.

Given the above, the fiscal environment in Jamaica induced limited capital spending, which contributed to the relatively low investment in physical infrastructure by the Government. This may have had an adverse effect on economic growth in Jamaica over the review period.

II Review of Literature

There are numerous studies which attempt to quantify the relationship between government spending and economic growth, however, consensus has not been reached on the precise nature of the relationship. While authors such as Scully (1994) claim that government spending above a certain threshold has a negative effect on economic growth, others such as Ram (1986) find that government spending has a positive impact on growth. This study adds to the international literature as well as creates domestic research on the topic for Jamaica. Given Jamaica's lackluster economic growth in the past twenty years, it is important that government spending is tailored to optimize economic growth and economic welfare. Table 1 below summarizes selected research conducted that estimate the optimal level of government spending for chosen countries.

As shown in table 1, estimates for the economic growth maximizing level of government spending vary widely, for example, as low as 17.5 per cent for the United States to a high of 41.2 per cent for the European Union.

[3] According to data from the World Development Indicators

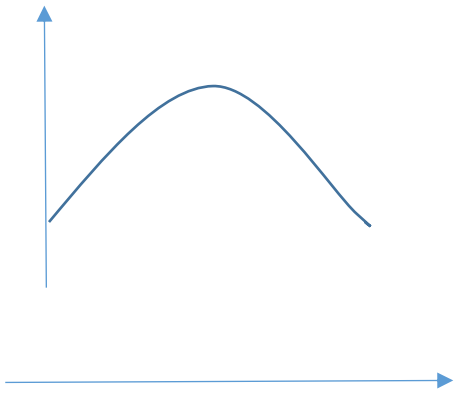
Table 1: Estimates of Optimal Level for Government Expenditure by Authors

Author	Period	Country/Panel	Optimal Size (%) of GDP
Alimi (2014)	1970-2012	Nigeria	19.8
Vedder & Gallaway (1998)	1791-1998	United States	17.45
Heath (2012)	1959-2009	Sri Lanka	27.0
Scully (1994)	1929-1989	United States	21.5-22.9
Ferris (2014)	1890-2012	New Zealand	33.0
Choblanov and Mladenova (2009)	1970-2007	28 EU Countries	25.0
Lewis-Bonoe et al	1975-2002	Caribbean	26.0
De Witte and Moesen (2009)		23 OECD Countries	41.2
Asimakopoulos and Karavias (2014)	1980-2008	Panel Dataset	19.1 (Di) 18.0 (D)
Mavrov (2002)	1990-2004	Bulgaria	28.0

Di = Developing Countries
D= Developed Countries

Herath (2012) performed a non-linear analysis of the impact of the size of government on economic growth in Sri Lanka. The analysis was provoked by the concept of the Armey curve. The latter concept states that up to a certain level, government spending has a positive impact on GDP which emanates from the provision of basic social services, law & order enforcement and effective capital expenditure. However, above a certain threshold, government spending begins to have a negative impact on economic growth. This occurs through inefficient regulations as well as social welfare programmes that incentivize against effort, among other factors.

The Armey Curve



The data used by Herath (2012) were real output (dependent variable), government spending as a share of total output and the square of government spending as a share of total output along with a vector of control variables. In a modification unique to the paper, the dependent variable captured private sector output, in an attempt to determine the effect of government spending on economic activity within the private sector. Ordinary least squares methodology was utilized using annual data from 1959 to 2009. The output maximizing level of government expenditure as a share of GDP for Sri Lanka was found to be 27.0 per cent. Alimi (2014) estimated the growth maximizing level of government expenditure for Nigeria also using the concept of the Armey curve. The author established a standard growth model with the dependent variable being the change in total non-government output. This was regressed against government expenditure as a share of total output, the square of total government expenditure as a share of total output, openness and consumption as well as investment and population. Due to the negative coefficient on the squared term, Alimi (2014) found evidence of the existence of the Armey curve for Nigeria. He found that for every 1 percentage point increase in government spending as a share of output, real GDP increases by 10.4 units. In addition, the optimal level of government spending for Nigeria was found to be 19.81 per cent of GDP.

Vedder and Gallaway (1998) estimated the level of government spending that maximizes economic growth in the United States. The authors utilized annual data from 1947-1997 and estimated a least squares model which regressed real total output against government spending as a percentage of GDP, the square of government spending as a share of GDP, and a time trend variable to control for the increase in total output over time. The authors found that government spending as a share of GDP that maximized economic growth was 17.5 per cent, considerably below the reported level of government spending as a share of GDP in the United States of 40.0 per cent. The coefficient for government spending as a share of GDP was -3.4. As such, for every 1 per cent increase in government spending as a portion of GDP, total output falls by 3.4 per cent. The square of government spending also had a negative coefficient, indicating the presence of an Armey curve relationship. Vedder and Gallaway (1998) also tested the model using long-run data, acknowledging that annual changes in output were highly affected by business cycle fluctuations. In that regard, the authors used 5-year averages for output and government spending over the period 1791 to 1998 and controlled for structural breaks. The results showed that the growth maximizing level of government spending was 11.1 per cent of total output. Vedder and Gallaway

(1998) conducted similar analysis on various forms of government spending and found that for income security[4], health, defense and other federal spending, there were no persistent negative relationships with output growth. However, the authors found that for net interest payments and entitlement expenditures, such as medicare and social security, there were persistent negative relationships with output growth.

Scully (1994) analyzed the impact of the size of government on economic growth in the United States utilizing annual data from 1929 to 1989 using time series ordinary least squared analysis. Government size was measured as total taxes as a percentage of GDP. The research assumed that on average, budgets were balanced, that is, government spending was equal to tax revenues as a share of total output. The author contended that the effect of an increase in taxes as a share of GDP on output was negative at an increasing rate after reaching its optimum level. The results indicated that the level of government taxes as a share of GDP which maximizes US economic growth was between 21.5 and 22.9 per cent of GDP. Taxes below this level implied that the government could improve economic growth by increasing taxes, and consequently spending as a share of GDP, since the marginal effect of government spending/taxes on economic growth was positive. However, spending above this level implied that the marginal effect of government spending on GDP was negative, hence the reduction of taxes as a share of GDP would improve economic growth. Scully (1994) explained these results by citing public choice theory, that government spending above a certain level could encourage rent seeking behaviour by various agents in the economy, which could harm economic growth. He also noted that government taxes, particularly progressive taxation, discouraged effort.

Asimakopoulos and Karavias (2015) used a generalized method of moments technique to estimate a dynamic panel threshold model to determine the optimal level of government spending across 129 countries for the period 1980 to 2009. The authors found that the optimal level of government spending as a share of GDP was 18.4 per cent. For developed and developing countries they found the optimal level of government spending to be 18.0 per cent and 19.1 per cent, respectively. However, within sub groups countries were highly heterogeneous and as such it may be more instructive to study the issue on a country specific basis.

[4] Income security refers to the provisions of the Employee Retirement Income Security Act (ERISA) in the United States, whereby minimum standards are established for pension plans in private industry.

Ferris (2013) utilized an engle granger co-integration model with data from 1890 to 2012 to determine the maximizing level of government expenditure for New Zealand. The author acknowledged the potential problems that structural change may create for long-run data, however, contended that New Zealand was one of few countries where the fundamental legal, political and economic institutions have remained largely unchanged over the time period, which validated the use of long-run data. The author found that the growth maximizing level of government expenditure for New Zealand was approximately 30.0 per cent of GDP, slightly below the New Zealand Central Government spending of 33.0 per cent of GDP for 2012.

Choblanov and Mladenova (2009) used a panel dataset with 81 countries to estimate the optimum size of government spending that maximizes economic growth and social welfare over the period 1970 to 2007. Government consumption expenditure was used to indicate the size of government. The panel was estimated using generalized least squares methodology with period fixed effects. The results showed that the square of government consumption as a share of GDP had a negative relationship with economic growth. This is consistent with the view that above a certain threshold level, government spending has a negative marginal effect on output growth. The authors found that the optimal level of government consumption as a share of GDP was 10.7 per cent. Notably, most developed countries optimal government spending were considerably above this threshold. In addition, Choblanov and Mladenova (2009) estimated a generalized least squares method with fixed effects on 28 OECD countries for the period 1970-2007. From this analysis, they found that the growth maximizing level of total government expenditures as a share of GDP was 25.0 per cent.

Guseh (1997) used a conventional neoclassical production function to evaluate the impact of government spending on output for fifty-nine (59) middle income developing countries for the period 1960 to 1985. Acknowledging that differences in endowments could explain variations in economic performance, the author used a fixed effects model to control for both the inter-temporal dynamics and country heterogeneity. Guseh (1997) found that government spending as a share of total output had a coefficient of -0.14, implying that a one per cent increase in government expenditure as a share of GDP would result in a decrease of 0.14 per cent in GDP growth rate. This suggested that for middle income developing countries, the growth maximizing level of government expenditure was, on average, below the current levels of government expenditure.

Hok et. al. (2014) used an autoregressive distributed lag model to evaluate the relationship between government size and economic growth for eight ASEAN countries from 1995 to 2011.The results supported the U-shaped relationship and found that the optimal size of government expenditure as a share of GDP was 28.5 per cent for the eight ASEAN nations.

On the other hand, research has also shown that the relationship between government spending and economic growth can be ambiguous, particularly over the long-run. Yuk (2005) analyzed data for the United Kingdom from 1830 to 1993 with the aim of identifying the relationship between government spending and economic growth. The author acknowledged the possibility of reverse causality, citing the ideas of Wagner (1892) that as an economy grows and becomes more prosperous, the public sector will also expand as a share of output. In this context, the author used a tri-variate VAR model to measure the relationship among output growth, government expenditures and exports, and made no assumptions regarding the dependent variable. A co-integration test was used to determine the existence of a long-run relationship between the variables. The results were mixed and inconsistent, with no evidence of a long-run relationship for the sample period. Nevertheless, Yuk (2005) found evidence of a relationship between the three variables in the short-run. That is, in the short-run double causation exits between government spending and growth.

III Data and Methodology

This study employs a robust least squares and an error correction models (ECM) to investigate the relationship between government spending (g_t) and economic growth $(y_t - y_{t-1})$ in Jamaica. The variables employed are government spending (g_t) measured as total government expenditure divided by total GDP, square of government spending as a share of GDP $({g_t}^2)$ to account for the non-linearity between government spending and economic growth, total investment, measured as a share of GDP (i_t) , openness (o_t), which is measured as exports plus imports divided by total output, inflation (Inf_t), measured as percentage change in CPI, the 6-month indicative Treasury bill yield (tb_t) and total population (p_t). In addition, dummy variables were added to control for the effects of the Jamaican financial sector crisis $(crisis_t)$, as well as structural breaks around the

global financial crisis($global_t$), ($global2_t$). The error term is represented by (e_t). The robust least squares model takes the form of a second degree polynomial function as shown below in equation (1).

$$y_t - y_{t-1} = b_o + b_1 g_t - b_2 {g_t}^2 + b_3 i_t + b_4 o_t + b_5 p_t + b_6 tb_t + b_7 crisis_t + b_8 global1_t + b_9 global2_t + e_t \quad (1)$$

A positive coefficient for b_1 indicates that government expenditure has a growth inducing impact. For b_2, a negative coefficient signals a diminishing impact of government expenditure on economic growth after a threshold level of spending. This idea is informed by public choice theory, which states that excessive government spending, while intended to have a positive social impact, may actually encourage rent seeking behaviour by individuals and firms. As a consequence, public spending may hinder economic growth, as explained by Gwartney & Wagner (1988). The diminishing return of government spending may be attributed to unproductive capital investment along with the crowding out of the productive sector. While the model uses a polynomial function to capture nonlinearity in the relationship, the coefficients pose no major estimation problems and were estimated using robust least squares.

In addition to equation (1) the study employs two additional equations to uncover whether or not the Armey curve phenomena exist for government wages & salaries and capital spending. These categories of government spending are important as the former accounts for a large share of overall spending while the latter is critical for sustainable economic growth.

$$y_t - y_{t-1} = b_o + b_1 wag_t - b_2 {wag_t}^2 + b_3 i_t + b_4 o_t + b_5 p_t + b_6 tb_t + b_7 crisis_t + b_8 global1_t + b_9 global2_t + AR\,(1) + e_t \quad (2)$$

$$y_t - y_{t-1} = b_o + b_1 cap_t - b_2 {cap_t}^2 + b_3 i_t + b_4 o_t + b_5 p_t + b_6 tb_t + b_7 crisis_t + b_8 global1_t + b_9 global2_t + AR\,(1) + AR\,(2)\, e_t \quad (3)$$

According, equations (2) and (3) investigate the existence of an Armey curve phenomenon for government expenditure on wages & salaries (wag_t) and capital spending (cap_t) respectively. In each equation a squared term is utilized to capture nonlinearity in the relationship between the form of government spending in question and total output. An autoregressive term was added to both equations to account for autocorrelation.

A Johansen cointegration test was performed to establish whether or not cointegrating relationships exist among the variables in the different models (see Table 2). The tests revealed the existence of at least one cointegrating relationship among the variables in model (1), however, not for the other two models. In this context, the paper utilizes an error correction model (ECM) to estimate the optimal level of total government expenditure that maximizes economic growth, similar to that conducted by Alshahrani et. al. (2014). The ECM equation is contained below in model (4) and utilizes the variables from model 1. As such the variables are government expenditure as a share of GDP (g_t), the square of government expenditure as a share of GDP ($g_t{}^2$), investment (i_t), openness (o_t), inflation(Inf_t), the 6-month Treasury bill indicative yield (tb_t), population (p_t) as well as the lagged residuals (r_{t-1}). The coefficient of the lagged residuals (b_{10}) measures the speed of adjustment in the model. The coefficient of the lagged residuals is expected to be negative, indicating model convergence and the existence of a long-run relationship among the variables.

$$y_t - y_{t-1} = b_o + b_1 g_t - b_2 g_t{}^2 + b_3 i_t + b_4 o_t + b_5 p_t + b_6 tb_t + b_7 crisis_t + b_8 global1_t + b_9 global2_t + b_{10} r_{t-1} \quad (4)$$

A granger causality test was conducted to evaluate the direction of the relationship between government expenditure and economic growth. If there exist dual causality, it will indicate the existence of Wagner's law within the Jamaican economy.

To calculate the optimal levels for general government spending, wages & salaries and capital expenditure, the paper uses partial differentiation, by taking the maxima of the results from the various quadratic equations. For example, the optimal level of government spending (g_t) is captured in the maxima as set out in Model 1.

$$y_t - y_{t-1} = b_o + b_1 g_t - b_2 g_t{}^2 + b_3 i_t + b_4 o_t + b_5 p_t + b_6 tb_t + b_7 crisis_t + b_8 global1_t + b_9 global2_t + e_t \quad \text{(Model 1)}$$

$$\frac{\partial y_t - \partial y_{t-1}}{\partial g_t} = b_1 - 2(b_2) g_t$$

$$0 = b_1 - 2(b_2) g_t$$

$$g_t = \frac{b_1}{-2b_2 g_t}$$

The paper utilizes quarterly time series data received from the Statistical Institute of Jamaica, the Ministry of Finance and the Bank of Jamaica, spanning the period June 1993 to June 2016. The data was seasonally adjusted using the Census X-13 method so as to disentangle seasonality effects. Augmented Dickey Fuller tests demonstrated that all variables were integrated of order (1) with the exception of investment, which was stationary (see Table 3).

IV Estimation Results

General Government Expenditure

For general government expenditure as captured in model 1, the results imply that a one percentage increase in government expenditure as a share of total output, ceteres paribus, results in an increase of 0.02 per cent in GDP growth (see Table 4). With the exceptions of investment and inflation, all variables are statistically significant at the five per cent level. Investment has a positive coefficient, as expected, while inflation has a negative coefficient. The latter is due to uncertainties associated with higher degrees of price changes that adversely affect decisions among businesses, which can lower economic growth. Although statistically significant, the coefficient for the Treasury bill rate, while positive was small, hence having a limited impact on economic growth. The squared government variable has a negative coefficient, implying that the Armey curve phenomenon is significant for Jamaica. The dummy variables, which indicate structural breaks for the financial sector crisis and the global financial crisis all have negative coefficients and are statistically significant at the 1 per cent level.

The result from the partial differentiation, shows that the optimal level of government spending is approximately 33.2 per cent of total output for Jamaica. Notably, the average level of government expenditure over the last 5 fiscal years (FY2012/13- FY2016/17) was 27.9 per cent. Accordingly, the results indicate that the Government of Jamaica is on the positively sloped side of the Armey curve, implying that there is room of approximately 5.3 per cent of GDP, to instigate economic expansion from added government spending. Of note, the country is currently under a 3-year IMF

Stand-By Arrangement which ends in FY2019/20. In this regard, the Government would be challenged to increase its spending given the strict fiscal prudence that is embedded with the arrangement. Nonetheless, one of the main objectives of the IMF programme is to engender greater economic growth. The findings of this paper indicate that the Government can play a bigger role in facilitating economic growth in Jamaica by increasing expenditure by approximately 5.3 per cent of GDP. While the latter may be large, consideration can be given to a smaller expenditure increase to facilitate economic growth, although not optimal.

Public Sector Wages

The results of model 2, indicate that for every 1 per cent increase in public sector wages, economic growth increases by 0.03 per cent, ceteres paribus. The squared term is negative, implying a non-linear, Armey curve relationship. All variables were statistically significant, at least at the 5 per cent level, with the exceptions of openness, inflation and investment. Utilizing partial differentiation, the finding shows that the public sector wage bill as a share of total output that optimizes economic growth is 10.9 per cent. Notably, this ratio is higher by 1.9 percentage points than the country's fiscal responsibility target as contain in the Fiscal Responsibility Legislation and the IMF Stand-By arrangement target, both of 9.0 per cent of GDP.

Capital Expenditure

From model (3), the results show that a 1 per cent change in capital expenditure as a share of GDP results in a 0.004 per cent increase in economic growth. This result is statistically significant at the 10 per cent level. Within the model, capital expenditure, the dummy variables representing the Jamaican financial sector crisis and the global economic crisis are statistically significant at the 5 per cent level. Population growth and the Treasury bill rate are statistically significant at the 1 per cent level. Investment, openness and inflation were not statistically significant. The estimate for the maxima of capital spending shows that the optimum level of capital expenditure that maximizes economic growth, as a share of total output is 4.9 per cent. This estimate is considerably greater than the average capital expenditure level of 2.2 per cent of GDP over the past five years. Accordingly, the result shows that the Government has been under investing in effective capital

expenditure that is vital for economic development and long-term economic growth sustainability. Notably, the IMF Stand-by Arrangement facilitates greater capital spending to instigate economic growth. In that regard, the Government should aim to achieve the optimal capital spend, that is an additional spending of approximately 2.5 per cent of GDP. To achieve the optimal capital spend in conjecture with the primary balance target under the IMF programme, the Government would need to either reduce programme expenditure, which is not recommended given the need for preservation of the social safety net, or reduce the primary balance target of 7.0 per cent of GDP.

The results from models 2 and 3, indicate that the Government's capital spending has a significantly lower impact on economic growth than wages & salaries. This finding may be explained by two factors. First, capital projects that were selected by the Government may have had a low productive impact on investment in Jamaica due to the nature of the spending. A second factor that may explain the lower coefficient for capital expenditure is the higher import content for capital goods than for other elements of government expenditure. For example, the higher import content arises as infrastructure development typically requires significant imports as the country does not produce/manufacture most of the items required.

Error Correction Model

The results from the error correction model is shown in Table 5. The findings indicate that the speed of adjustment, which is represented by the coefficient of the lagged residual term (r_{t-1}) is -0.15, which implies that the error correction term is correcting the disequilibrium of the system by 15 per cent quarterly, representing a very low speed of adjustment. The negative coefficient on the error term implies that there is a long-run relationship between government expenditure and economic growth. The results imply that a one percentage increase in government expenditure as a share of total output, ceteres paribus, results in an increase of 0.02 per cent in GDP growth. With the exceptions of investment and inflation, all variables are statistically significant either at the five per cent or 10 per cent level. Investment has a positive coefficient, as expected, while inflation has a negative coefficient. The latter is due to uncertainties associated with higher degrees of price changes that adversely affect decisions among businesses, which can lower economic growth. Although statistically significant, the coefficient for the Treasury bill rate, while positive was small, hence having a limited impact on economic growth. The squared government variable has

a negative coefficient, implying that the Armey curve phenomenon is significant for Jamaica. The dummy variables, which indicate structural breaks for the financial sector crisis and the global financial crisis all have negative coefficients.

The result from the partial differentiation, shows that the optimal level of government spending is approximately 33.2 per cent of total output for Jamaica. Notably, the average level of government expenditure over the last 5 fiscal years (FY2012/13- FY2016/17) was 27.9 per cent. Accordingly, the results indicate that the Government of Jamaica is on the positively sloped side of the Armey curve, implying that there is room of approximately 5.3 per cent of GDP, to instigate economic expansion from added government spending. Of note, the country is currently under a 3-year IMF Stand-By Arrangement which ends in FY2019/20. In this regard, the Government would be challenged to increase its spending given the strict fiscal prudence that is embedded with the arrangement. Nonetheless, one of the main objectives of the IMF programme is to engender greater economic growth. The findings of this paper indicate that the Government can play a bigger role in facilitating economic growth in Jamaica by increasing expenditure by approximately 5.3 per cent of GDP. While the latter may be large, consideration can be given to a smaller expenditure increase to facilitate economic growth, although not optimal.

Granger Causality Test

Further to the aforementioned analysis, a granger causality test was performed to evaluate the direction of the influence in total government spending and economic growth (see Table 6). The results indicate that government expenditure granger causes growth. However, economic growth does not granger causes government expenditure. In this context, the relationship is one directional from government spending to economic growth. In this regard, the data for Jamaica, suggests that there is no support for Wagner's law, which states that as countries develop, there will be more pressure for government to increase its expenditure.

Models Robustness Checks

The Breusch-Godfrey Serial Correlation LM test indicate that the models have no serial correlation while the Harvey test for heteroskedasticity show its absence (see Table 4 and 5).

V Policy Discussion

The main purpose of this study is to investigate the optimal level of government expenditure in Jamaica that maximizes economic growth. The paper findings show that government expenditure over the review period, on average, has been below the optimal level by 4.5 percentage points. In particular, for wages & salaries and capital spending, government average expenditure over the period was 1.7 percentage points and 1.9 percentage points, respectively, below the optimal level. The paper's results, however, should be considered within some context. For example, the provision of government services is, not solely, to engender economic growth. Government spending is influenced by several political factors, such as the need to support the poor, to facilitate industrial development and to contribute to social and cultural activities, which may not have a significant positive impact on economic growth, but are needed for the maintenance of social cohesion.

Nevertheless, Jamaica has maintained a relatively tight fiscal policy stance over the past two decades. Jamaica's average annual primary surplus over the said period is rated among the top ten in the world according to data from the World Economic Outlook. With this considered, economic growth led by state expenditure was severely constrained. Currently, Jamaica's high public debt limits its ability to undertake expansionary fiscal policy. The study results, however, show that a cautionary case can be made for more government spending, including additional capital spending, which could help to stimulate greater economic growth and hence improve the social welfare of the population as desired under the country's Economic Reform Programme. It is critical that the added spending be geared towards productive expenditure, for example spending towards improving labour productivity and general efficiencies through technologies.

VII Conclusion and Limitations of Study

The study utilizes quarterly data from 1993 to 2016 to determine the optimal level of government spending to maximize Jamaica's rate of economic growth. The results show that government expenditure in Jamaica follows an Armey curve path and that the optimal level of government expenditure as a share of GDP that maximizes economic growth is 33.2 per cent of GDP. Over the period under review, on average, the Government spent less than the optimal level. In this regard, there is room for expansionary fiscal policy. However, the country is currently under a 3-year IMF Stand-By Arrangement which outlines expenditure targets to FY2019/20. In this regard, the Government would be challenged to increase its spending given the strict fiscal prudence that is embedded with the arrangement. Nonetheless, one of the main objectives of the IMF programme is to engender greater economic growth, which may facilitate dialogue on further spending. In addition, the results from the study indicate that the optimal levels for wages & salaries and capital expenditure that maximizes economic growth are 10.9 per cent of GDP and 4.9 per cent of GDP, respectively.

The study uses data over a fixed time period and during that time structural changes may have impact the way government spending interacts with economic growth, for example the two IMF programmes, hereby representing a limitation of the research. Notwithstanding, as data becomes available, which is sufficient to analyze the impact in the new dispensation, it may be useful to investigate the question further. In addition, further investigation may be conducted to see how the government spending interacts with other measures of social welfare besides economic growth. By focusing on economic growth, this paper presents a limited view of the optimal level of government spending for improvements to social welfare.

VIII References

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Appendices

Table 2: Johansen Cointegration tests

Johansen Cointegration tests					
	Hypothesized Number of CE's	P-Value	EigenValue	Trace Statistic	5% Critical Value
Model 1	1	0.0034	0.404607	141.9644	125.6154
Model 2	1	0.3811	0.285924	107.0638	125.6154
Model 3	1	0.4633	0.27334	104.3662	125.6154

Table 3: Unit Root Test

Augmented Dickey Fuller Test (test statistics)		
	Level	First Difference
GDP Growth	-1.4848	-8.9634 ***
Government Expenditure as a share of GDP	-2.3576	-19.008 ***
The Square of Government Expenditure as a share of GDP	-2.1485	-19.749 ***
Public Sector Wages as a share of GDP	-2.5747	-14.439 ***
The Square of Public Sector Wages as a share of GDP	-2.5456	-14.564 ***
Openness	-2.6113	-11.526 ***
Investment as a share of GDP	-3.3155 ***	-
Inflation	-1.8294	-4.8839 ***
Capital Expenditure as a Share of GDP	-1.4511	-9.5345 ***
The Square of Capital Expenditure as a Share of GDP	-1.7615	-10.498 ***
Treasury Bill Rate	-2.0722	-8.7873 ***
Population	-2.0911	-9.8349 ***

*** significant at the 1 per cent level

Table 4: Estimation Results

Dependent Variable: GDP Growth									
Explanatory Variables	Model 1			Model 2			Model 3		
	Coefficient	Standard Error		Coefficient	Standard Error		Coefficient	Standard Error	
Constant	-1.954541	0.661143	***	-1.507597	0.699903	**	-1.227889	0.792031	
Government Expenditure as a share of GDP (-4)	0.017392	0.002372	***						
The Square of Government Expenditure as a share of GDP (-4)	-0.000264	3.87E-05	***						
Public Sector Wages as a share of GDP (-4)				0.032517	0.006916	***			
The Square of Public Sector Wages as a share of GDP (-4)				-0.001486	0.000358	***			
Capital Expenditure as a share of GDP (-4)							0.004876	0.002754	*
the Square of Capital Expenditure as a share of GDP (-4)							-0.000495	0.000307	
Population (-4)	-0.468270	0.158783	***	-0.381396	0.171778	**	-0.300392	0.196465	
Treasury bill rate	0.000546	0.000211	**	0.000431	0.000233	*	0.000857	0.000249	***
Investment as a share of GDP (-4)	0.000368	0.000269		0.000358	0.000268		0.000498	0.000251	
Openness (-4)	0.000343	0.000159	**	0.000239	0.000191		0.000387	0.000195	
Inflation (-4)	-0.037627	0.048222		-0.026368	0.050354		-0.010623	0.046433	
Financial Sector Crisis (Dummy) (-1)	-0.055507	0.006468	***	-0.059534	0.006524	***	-0.048255	0.006408	***
Global Financial Crisis (Dummy) (-1)	-0.014912	0.006690	***	-0.010991	0.006625		-0.010431	0.006932	
Financial Crisis Dummy (-1)	-0.016980	0.006412	***	-0.020408	0.006219	***	-0.022972	0.006087	***
AR(1)				-0.284540	0.109698	**	-0.343786	0.110060	***
AR(2)							-0.303052	0.111808	***
R-Squared	0.651756			0.578642			0.509517		
Adjusted R-Squared	0.607675			0.518447			0.43104		
F Statistic	14.78526			9.612932			5.571588		
ρ (F Statistic)	0.000000			0.000000			0.000003		
DW Statistic	2.267038			1.870227			2.467879		
Breusch Godfrey Serial Correlation Test	0.448			0.167			0.2416		
Harvey Heteroskedasticity Test	0.8915			0.3295			0.2727		
Number of observations	90			90			90		

Coefficient Standard errors given in parenthesis

*, **, and *** denote significance of result to the 10, 5, and 1 per cent level of significance respectively

Table 5: Error Correction Model Results

Dependent Variable: GDP Growth			
Explanatory Variables	**ECM model**		
	Coefficient	**Standard Error**	
Constant	-1.94581	0.66610	***
Government Expenditure as a share of GDP (-4)	0.01754	0.00237	***
The Square of Government Expenditure as a share of GDP (-4)	-0.000267	0.00004	***
Investment (-4)	0.00038	0.00027	
Inflation (-4)	-0.05260	0.05293	
Openness (-4)	0.00038	0.00016	**
Population (-4)	-0.451344	0.15876	***
Treasury bill rate (-4)	0.000572	0.00021	***
Financial Sector Crisis (Dummy) (-1)	-0.05481	0.00650	***
Global Financial Crisis (Dummy) (-1)	-0.01578	0.00677	**
Financial Crisis Dummy (-1)	-0.01782	0.00642	***
Lagged residual	-0.15419	0.11874	*
R-Squared	0.6608		
Adjusted R-Squared	0.6123		
Log Likelihood	303.0274		
DW Statistic	1.9770		
Breusch Godfrey Serial Correlation Test	0.2516		
Harvey Heteroskedasticity Test	0.4311		
Number of observations	89		

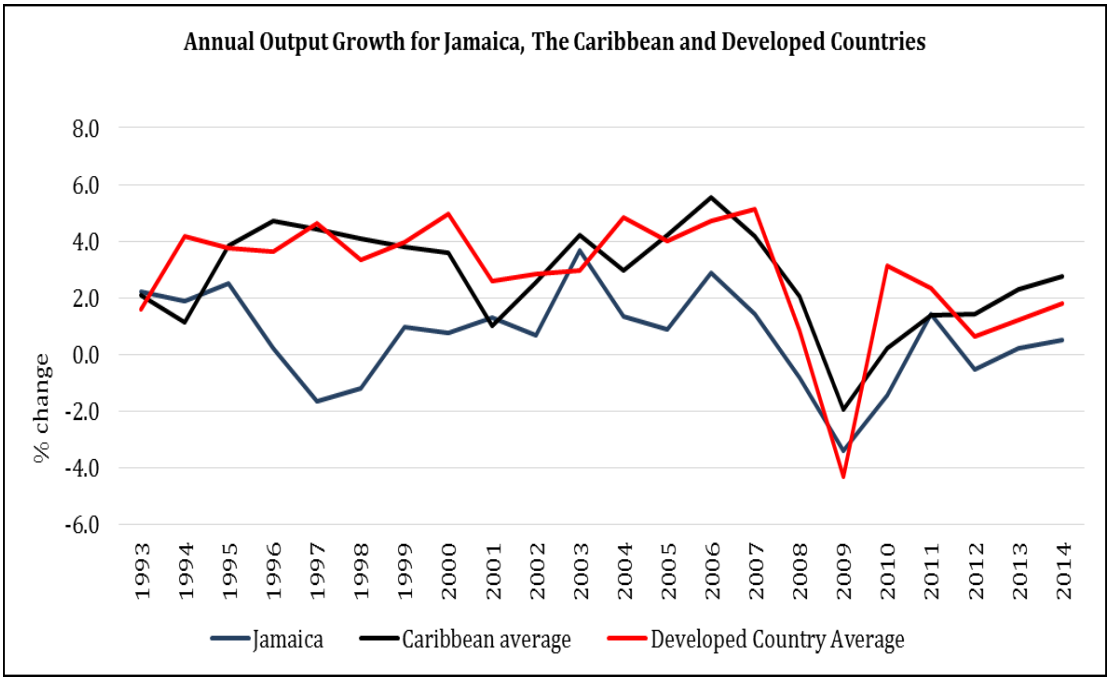
Coefficient Standard errors given in parenthesis

*, **, and *** denote significance of result to the 10, 5, and 1 per cent level of significance respectiv

Table 6: Granger Causality Test

Granger Causality Test (test statistics)		
Null Hypothesis	**F-Statistics**	**Prob.**
Government Expenditure does not Granger Cause Economic Growth	6.85822	0.0017
Economic Growth does not Granger Cause Government Expenditure	0.81103	0.4478

Figure 1: Average Annual Output Growth for Jamaica, the Caribbean and the Developed Countries



Source: World Economic Outlook

Figure 2: Jamaica's GDP Per Capita (1993-2015)

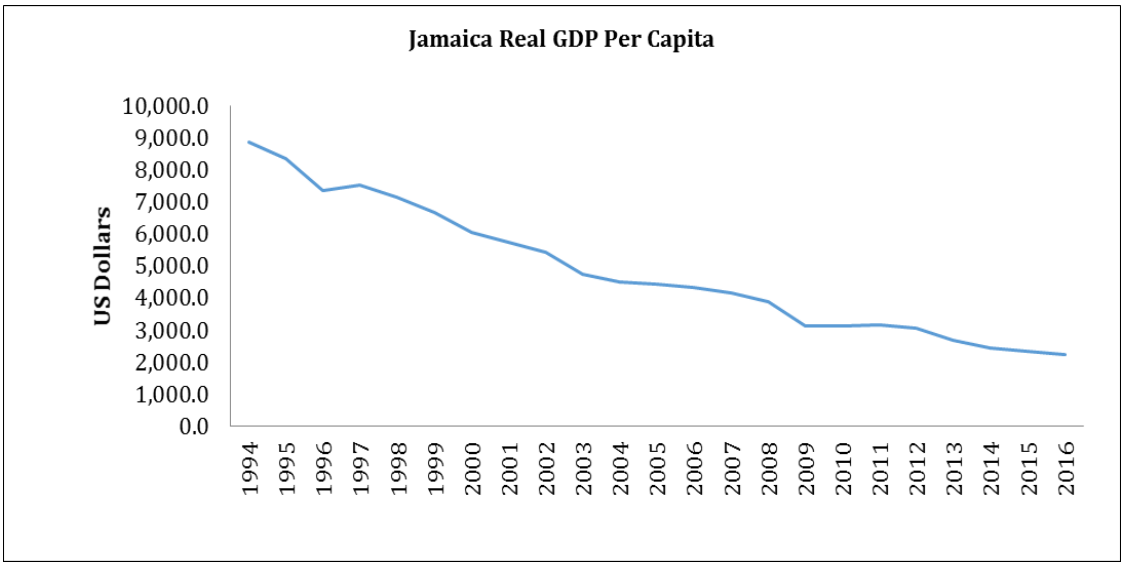
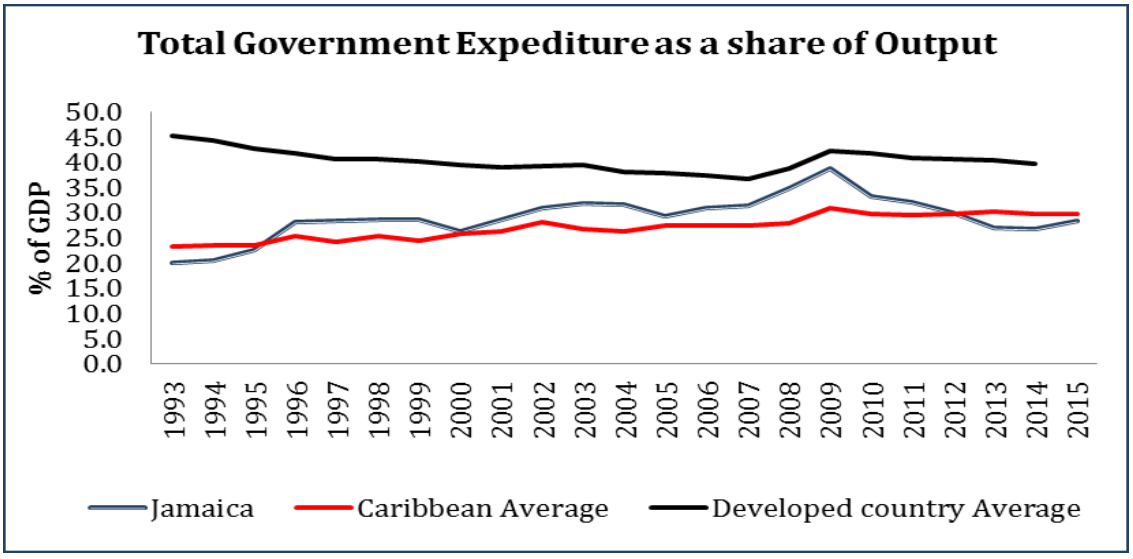


Figure 3: Total Government Expenditure as a share of output for Jamaica, the Caribbean and the Developed Countries (1993-2016)



Source: World Economic Outlook

Figure 4: Government spending by category and economic growth