



Investigating the Impact of Public Debt on Economic Growth in Jamaica

Working Paper

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Abstract

The Jamaican economy has been characterized by high levels of public debt concurrent with persistent low economic growth. As such, an understanding of the dynamics between public debt and growth is critical in addressing the obstacles to economic growth. Against this background, the paper investigates the impact of public debt on economic growth using quarterly data from 1990 to 2014. The paper employs an autoregressive distributed-lag model, which jointly captures both short-run and long-run effects. The results of the models indicate that the public debt has a non-linear impact on economic growth. Of note, the paper finds that the composition of debt matters, i.e. total public and external debts negatively affect economic growth in excess of 100 per cent and 55 per cent of GDP, respectively.

JEL Classification: H62 E62 and D50

Keywords: External Debt, Gross Domestic Product, Auto Regressive Distributive Lag Model

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

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I. Introduction

The Jamaican economy has been characterized by high levels of public debt along with persistent low economic growth. As such, an understanding of the dynamics between public debt and growth is critical in addressing the obstacles to economic growth and to improve debt sustainability in Jamaica. Traditionally, the main drivers of economic growth are the level and quality of a country's physical and human capital, technological advancement and the quality of the labour force as well as the country's level of openness to international trade. However, it is now universally accepted that a country's ability to grow also depends critically on its level of indebtedness.

Debt financing provides fiscal space to governments which can facilitate growth through higher public investment. However, debt can create higher fiscal imbalances through greater debt servicing attributed, in part, to future increases in loans to repay existing debt. In addition, increase borrowing in the domestic economy can crowd out private sector investment. Further, research has shown that public debt levels have a non-linear impact on growth. Reinhart and Rogoff (2010) find that public debt to GDP in excess of 90 per cent has a negative impact on economic growth.

There has been a limited number of studies in Jamaica that analyze the relationship between debt and economic growth. Against this background, the paper investigates the relationship between public debt and economic growth in Jamaica. In addition, the study seeks to determine whether there is evidence of a nonlinear impact of debt on growth and to identify this critical threshold beyond which debt impairs growth. Further, the paper attempts to clarify the impact of external and domestic debt on economic growth.

Section two of the paper contains a review of the literature, while section three provides an overview of the relationship between external debt and growth in Jamaica. The data and methodology are outlined in sections four and five while section six contains the results. The conclusion is presented in section seven.

II. Literature Review

According to the conventional view of public debt (Elmendorf and Mankiw, 1999), in the short-run output is demand-determined and fiscal deficits (or higher public debt) have a positive effect on disposable income, aggregate demand and hence overall output. This positive short-run effect of budget deficits (and higher debt) is likely to be large when the country's output is far from

capacity. However, in the long-run Elmendorf and Mankiw (1999) found that the reverse holds. In that if Ricardian Equivalence does not hold, the decrease in public savings brought about by a higher budget deficit will not be fully compensated for by an increase in private savings.¹ As a consequence, national savings will decrease, resulting in lower total investment. This will have a negative effect on GDP, as it leads to a smaller capital stock, higher interest rate, lower labour productivity and wages (Presbitero and Panizza, 2013). Presbitero and Panizza (2013) showed that this negative effect can be amplified by the presence of distortionary taxes.

Greiner (2011) argued that the effect of debt on growth depends on the presence of rigidities in the economy. In particular, Greiner (2011) showed that, in a model with no rigidities and elastic labour supply, public debt has a negative effect on labor supply, investment, and economic growth. In the presence of wage rigidities and unemployment, public debt has no effect on the allocation of resources and can have a positive effect on growth if it is used to finance productive investment.

Other researchers have also sought to explain theoretically the relationship between debt and economic growth. Presbitero (2010) stated that industrialized countries are better able than developing states to borrow and use domestic and foreign financing in a productive way, without bearing the costs of the disincentive to investment, capital flight, policy volatility and crowding out that generally go hand in hand with large debts. Continuing, the author noted that in developing countries the negative consequences of debt overhang are likely to offset the possible benefits derived from the availability of additional resources. This occurrence results from poor economic management and bad institutions within developing countries. Thus, irrespective of the income level, poor institutions and policies are likely to be the first-order constraints to growth.

One of the most prominent paper on debt is Reinhart and Rogoff (2010) where the authors studied the relationship between high public debt levels, growth and inflation in 44 countries using a panel framework. The paper finds that a ratio of public debt to GDP in excess of 90 per cent has a negative impact on economic growth. Using a dynamic panel based on an endogenous growth model Rother and Checherita (2010) in their study of 12 Euro area countries also found that debt in the range of 90 per cent to 100 per cent of GDP has a negative non-linear impact on growth.

¹ Ricardian Equivalence suggests that as governments try to stimulate demand by increasing debt-financed government spending, demand remains unchanged as the public will save excess money to pay for future tax increases that will be initiated to pay off the debt.

The authors showed that debt affects economic growth via its impact on private saving, public investment, total factor productivity as well as sovereign long-term nominal and real interest rates. Presbitero (2010) studied the relationship between external debt and economic growth in 114 developing countries over the period 1980 to 2004 using an ordinary least square and generalized method of moments techniques. He found that public debt has a negative impact on output growth in excess of 90 per cent of GDP in low and middle-income countries.²

In contrast to the findings of Rother and Checherita (2010), Presbitero (2010) and Reinhart and Rogoff (2010), Simon et al (2014), in their study of the relationship between public debt levels and economic growth in advanced countries, did not find any threshold for debt ratios above which medium-term economic growth are significantly negatively affected. Notwithstanding, the authors did find evidence that higher debt levels are associated with a higher degree of output volatility.

Calderón and Fuentes (2013) using a panel framework investigated the relationship between debt and growth in Latin America countries over the period 1970 to 2010. The study revealed that debt has a negative impact on economic growth. Notably, they show that strong institutions, high quality domestic policies, and outward-oriented policies partly mitigate the adverse effect of debt on economic growth. In addition, the paper shows that a simultaneous sharp reduction in public debt and an improvement in the policy environment induce an increase in the growth rate per capita of 1.7 percentage points for the Caribbean and 2 percentage points for South America.

A number of studies has found that the composition or the type of debt matters. Using an auto regressive distributed lag (ARDL) approach, AKram (2011) examined the impact of public debt on economic growth and investment in Pakistan for the period 1972-2009. He finds that the public external debt has a negative relationship with per capita GDP and investment in Pakistan, confirming the existence of a debt overhang effect. Musa et al (2013) examined the relationship between economic growth, external debt and domestic debt in Nigeria over the period 1970 to 2011. They found that external debt has a negative impact on the economic performance of Nigeria. In contrast, they also show that domestic debt had a positive impact on economic growth through encouraging productivity and hence output growth. Omet et al (2002) studied the impact

² Minea and Parent (2012) study the relationship between debt and growth by using the Panel Smooth Threshold Regressions model. They find that public debt is negatively associated with growth when the debt-to-GDP ratio is above 90 per cent and below 115 per cent.

of external debt on the performance of the Jordan economy during the period 1970 to 2000. Using an endogenous growth model, the authors found that the positive effect of external debt on growth rapidly changes as external debt levels increase above the optimal level of 53 per cent of GDP. The authors noted that high debt levels are associated with low growth since a higher distortionary tax burden on capital is required to service debt, leading to a lower rate of return on capital, hence lower investment and growth. Using a dynamic panel data model on 93 developing countries, Ricci et al (2002) examined the impact of external debt on developing countries during the period 1969 to 1998. The findings showed that the average impact of debt on per capita growth becomes negative for debt levels above 160 per cent to 170 per cent of exports and 35 per cent to 40 per cent of GDP. Hassan and Mamman (2013) examined the contribution of external debt to the economic growth in Nigeria over the period 1970 to 2010, through the use of an ordinary least square model. The authors result showed an inverse relationship between external debt and economic growth in Nigeria. However, Hassan and Mamman (2013) showed that debt service payments have a positive impact on economic growth in Nigeria. The authors explained that as the country pays its debts, it avoids the accumulation of interests and penalties thereby attracting foreign aid, foreign direct investments and other international opportunities that boost the economy in the long-run.

With regard to Jamaica, Blavy (2006) in his study on productivity in Jamaica found that debt service crowded out investment in Jamaica, and as a result adversely affects productivity growth. He also showed that low levels of debt in Jamaica are associated with positive growth in productivity.

III. Overview of Public Debt and Economic Growth in Jamaica

Economic growth in Jamaica has been very low and volatile over the period 1990 to 2014, reflecting the vulnerability of the country to frequent natural disasters, adverse external and internal shocks and social conflicts. On average, Jamaica's real GDP grew by 0.5 per cent between 1990 and 2014. Jamaica's low economic growth over the period can be partly explained by the financial crisis that the country experienced during the late 1990's and the impact of the international financial crisis in 2008, which contributed to the persistent contraction in economic growth throughout 2008 to 2013. These factors combined with a large public debt-to-GDP ratio,

often created macroeconomic uncertainty, high unemployment, emigration, declining external competitiveness, limited access to finance by the private sector given the narrow scope of the financial sector, as well as rising crime rates, which dampened output growth in Jamaica over the period (Blavy, 2006).

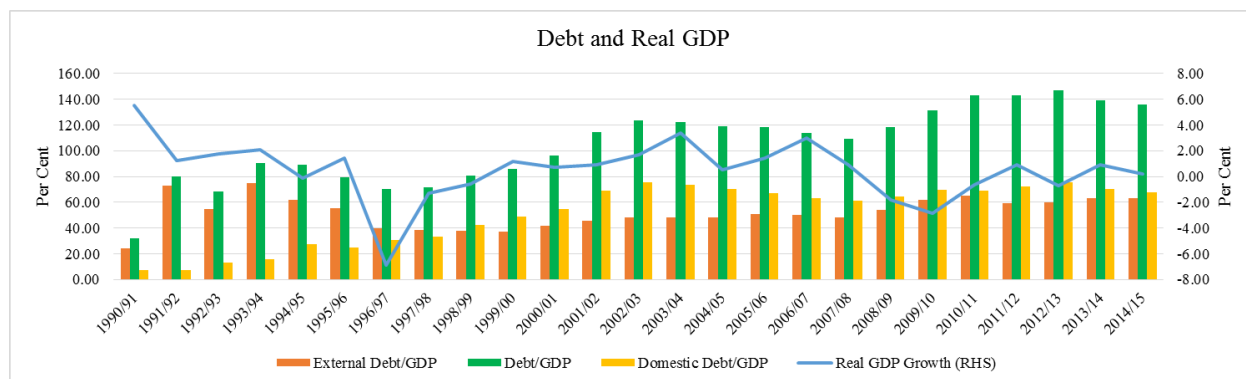
Jamaica is regarded as one of the most highly indebted countries in the world. The country's debt to GDP ratio increased from 31.7 per cent in FY1990/91 to 135.7 per cent in FY2014/15, while the domestic and external debt to GDP ratio grew from 7.3 per cent and 24.4 per cent in FY1990/91, respectively, to 67.5 per cent and 63.1 per cent in FY2014/15.³ One of the primary factors which contributed to the increase in debt was the Government's bailout of the financial sector in the 1990s, which added approximately 40 per cent of GDP to the public debt (Government of Jamaica, 2011). In addition, persistent fiscal deficits, due in part to low economic growth, as well as the absorption of debt from loss making public entities by the Central Government and the exposure of the debt to exchange rate depreciation contributed to Jamaica's high debt over the period (CaPRI, 2008).

Figure 1 (below) shows that there tends to be a faster build-up in debt at lower levels of GDP growth. In addition, when GDP growth declines, there is a larger increase in total debt. Notably, there is a stronger negative relationship between Jamaica's economic growth and the external debt.

Against the background of the economic and fiscal challenges faced by the Government, Jamaica entered a Stand-by Agreement in 2010 with the International Monetary Fund and subsequently an Extended Fund Facility (EFF) in 2013. To date, the EFF programme has resulted in significant improvement in Jamaica's macro economy. This improvement has generated, in part, confidence in the domestic economy, both from the domestic and international markets. In this context, Jamaica's real GDP expanded on average by 0.6 per cent during FY2013/14 to FY2014/15, relative to an average contraction of 0.8 per cent over FY2009/10 to FY2012/13. Similarly, Jamaica's debt to GDP ratio fell from 142.8 per cent in FY2010/11 to 135.7 in FY2014/15 (see **Figure 1**).

³ Debt calculation includes central government direct and guaranteed, including PetroCaribe debt and BOJ debt.

Figure 1: Public Debt and Economic Growth in Jamaica



IV. Data

The study utilizes quarterly data from 1990 to 2014⁴. The change in real GDP is used as a measure of economic growth while investment is measured by the change in gross fixed capital formation. The paper measures debt burden by the ratio of debt to nominal GDP, the ratio of external debt to nominal GDP and the ratio of domestic debt to nominal GDP. Openness to trade is measured by the total of imports and exports divided by nominal GDP. The openness indicator is included to capture the impact of globalization and free trade on economic growth. Notably, the long-run coefficient on openness is expected to be positive. The short-run estimate is expected to be negative. This is in a context where Jamaica is highly dependent on imports. Given that the country has consistently recorded trade deficits, the increasing levels of trade in the absence of significant rise in exports should have a negative impact on GDP. The other independent variable is labour, measured as Jamaica employed labour force. The long-run coefficient on labour is expected to be positive based on economic growth theory. However, the short-run coefficient on labour could be negative due to the findings of Blavy (2006) that labour productivity in Jamaica is generally low, which could have a negative impact on economic growth. The final independent variable is inflation, which captures uncertainty in the economy.

The model includes a dummy variable to capture the structural breaks in the economy due mainly to the local financial crisis. All variables are logged and first differenced. The Phillips Perron-Test

⁴ Data obtained from the Ministry of Finance, the Statistical Institute of Jamaica and the Bank of Jamaica.

for unit root revealed that most of the variables in the model are I (0) while the others were stationary after taking the first difference (see **Table 1**, Appendix). In addition, the first difference of all variables were normally distributed based on the Jarque-Bera test.

V. Methodology

To gauge the relationship between public debt and economic growth, an ARDL approach was used. The ARDL approach allows the inclusion of dynamic variables to mitigate the impact of the endogeneity of the explanatory variables (Ekanayake (2012)). Furthermore, the general to specific modeling procedure provides consistent estimators when the variables of concern are of different orders of integration. This feature minimized the possibility of estimating spurious relations, while retaining long-run information (Ekanayake (2012)). Additionally, for a finite sample, the ARDL methodology provides precise estimators and valid t-statistics (Pesaran, et al. 2001). Another advantage of working with ARDL specification is that all of the independent variables enter the equation with a lag, which mitigates any contemporaneous causation from the dependent variable to the independent variables, which could bias the estimates (Catao and Terrones 2003). In addition, the ARDL model is selected on the basis that the model specification has no bias to the order of integration of the variables when assessing a long-run relationship compared to other error correction models, such as the vector error correction model, which requires all variables to be integrated of the same order (Scarlett, 2011). The ARDL model has the advantage of yielding consistent estimates of the long-run coefficients that are asymptotically normal. Furthermore, the estimation of the model can be carried out using ordinary least squares (OLS) from which the long-run relationships can be ascertained. However, the ARDL approach employs only a single reduced form equation and therefore it is necessary to avoid bi-directional causality between the main variables of concern (Ekanayake, 2012). In this regard, this study carries out Granger causality tests to determine the causality between variables.

The ARDL framework implemented in its log format is outlined below:

$$\Delta y_t = \beta_0 + \phi y_{t-1} + \lambda j_{t-1} + \theta X_{j,t-1} + \sum_{k=1}^p \Omega_k \Delta y_{t-k} + \sum_{k=1}^p \Gamma_k \Delta j_{t-k} + \sum_{l=0}^q \alpha_l \Delta X_{j,t-l} + \varepsilon_t \dots \dots \dots (E1)$$

In the model, the dependent variable Y_t (which is measured by the change in real GDP), j the main explanatory variable (measure by ratio of debt to GDP) and explanatory variables X_j (which include, investments, inflation, labour, and openness) enter the ARDL regression with lag of order p and q , respectively.

The coefficients on the level effects are ϕ and θ with the long-run effects estimated as $-\frac{\theta}{\phi}$ and $-\frac{\lambda}{\phi}$, with ϕ representing the convergence parameter (speed of adjustment to the long run relationship). Additionally, the short run coefficients are Ω , Γ and α .

Given that the research is interested in assessing whether there exists a non-linear impact of government debt on growth, a quadratic equation in debt is included in the model. The latter is used to capture the impact of increasing levels of debt on economic growth. This is outline in the model below:

$$\Delta y_t = \beta_0 + \phi y_{t-1} + \lambda j_{t-1} + \lambda j_{t-1}^2 + \theta X_{j,t-1} + \sum_{k=1}^p \Omega_k \Delta y_{t-k} + \sum_{k=1}^p \Gamma_k \Delta j_{t-k} + \sum_{k=1}^p \Gamma_k \Delta j_{t-k}^2 + \sum_{l=0}^q \alpha_l \Delta X_{j,t-1} + \varepsilon_t \dots \dots \dots \quad (E2)$$

Where: j^2 is the non-linear variable, which is derive by squaring the ratio of debt to GDP. If the coefficients on the linear and quadratic debt terms are significantly deferent from zero then the hypothesis of a non-linear effect of debt on economic growth would be confirmed in Jamaica. Given the existence of a non-linear relationship between debt and economic growth, equation 3 attempts to identify the level of debt at which the non-linear relationship holds by including dummy variables to capture specific debt levels. In this regard, the ARDL model employed is as follows:

$$\Delta y_t = \beta_0 + \phi y_{t-1} + \lambda j_{t-1} + \theta X_{j,t-1} + \sum_{k=1}^p \Omega_k \Delta y_{t-k} + \sum_{k=1}^p \Gamma_k \Delta j_{t-k} + \sum_{l=0}^q \alpha_l \Delta X_{j,t-1} + D_{i,t} + \varepsilon_t \dots \dots \dots \quad (E3)$$

Where $D_{i,t}$ captures respective debt levels of interest.

To investigate the relationship between the debt public (and the composition of debt) and economic growth in Jamaica the study estimates several models. The first model (Model 1), which is derived from equation 2, has real GDP as the dependent variable, the main independent variable as the ratio of debt to GDP along with the quadratic term in debt and the vector X consisting of the other independent variables. These are investment, lag real GDP, the ratio of openness to GDP, labour, and a dummy variable to capture the impact of structural changes in the economy. The second model (M2) seeks to determine the level at which debt negatively affect economic growth. Model 2 consist of M1 (excluding the quadratic debt terms) along with a dummy variable to capture the threshold that debt negatively affect economic growth. The third model (M3) seeks to capture the impact of domestic and external debt on economic growth. M3 replicates M1 by replacing the main independent variable, ratio of debt to GDP, with the ratios of domestic and external debt to GDP along with their quadratic terms. The model also includes the CPI variable. The final model (M4), seeks to determine the level at which domestic and external debt negatively affect growth. This model is built from M3 by replacing the quadratic terms with two dummy variables that capture the threshold that domestic and external debt negatively affect economic growth.

To test the existence of a long-run relationship between the variables under investigation a Wald test was employed (i.e. $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$). The Wald test statistic is compared with the bound test critical values tabulated by Pesaran, et al. (2001). If the Wald test statistics were greater than the upper bound of the critical value, the null hypothesis can be rejected to conclude that there exists a long-run relation between the variables of concern. If it were smaller than the lower bound critical value, the null hypothesis cannot be rejected. Finally, if it falls within the lower and upper bound, the results become inconclusive (Pesaran, et al., 2001). The Wald F test statistics for all models exceeded the upper bound critical value and therefore, the null hypothesis is rejected, confirming a long-run relationship among the variables of interest (see **Table 2**).

The ARDL models employed in the paper are normal distributed based on the Jarque-Bera test. Similarly, none of the ARDL models are found to have serial correlation based on the Breusch-Godfrey Serial Correlation LM test or heteroskedasticity based on the Harvey test (see **Table 3**). In addition, the Granger causality tests indicate that there is no bi-directional causality between the main variables (see **Table 5**).

VI. Results and Discussion

Model 1 estimates the relationship between the public debt and economic growth in Jamaica. The results suggest that public debt has a non-linear impact on economic growth both in the long and short runs as indicated by the statistical significance of the non-linear variable (see **Tables 3 & 4** in the appendix). Furthermore, both in the long and short runs, public debt at low levels has a positive impact on economic growth, while public debt at high levels has a negative impact on economic growth. More specifically, in the long-run, at low levels of debt, economic growth increases by 0.06 per cent after a one percentage point increase in the ratio of debt to GDP, while at high levels of debt, a one percentage point increase in the ratio of debt-to-GDP reduces economic growth by 0.02 per cent. Similarly, in the short-run, at high levels of debt, economic growth is reduced by 0.04 per cent after a one percentage point increase in the ratio of debt-to-GDP, while at low levels of debt, a one percentage point in ratio of debt to GDP increases GDP by 0.19 per cent. To gauge the level at which debt negatively affect economic growth in Jamaica the results from Model 2 indicate that ratios of debt to GDP in excess of 100 per cent have a negative and statistical significant impact on economic growth in Jamaica (see **Tables 3 & 4** in the appendix) .

The above results, imply that debt has a statistical and significant inverse relationship with economic growth at high levels in Jamaica. That is, the greater the level of debt, the more the economy growth decreases. This results may partly reflect the use of loan receipts (outside of capital linked loans) on non-productive activities / sectors. Notably, a significant portion of debt proceeds in Jamaica is used to repay other debts rather than to boost capital investment. For example, US\$1.5 billion of the recent debt raising of US\$2.0 billion on the ICM was used to repay debt to Venezuela. In addition, Jamaica's high debt level is largely attributed to the Government's bailout of the financial sector in the 1990s, which added approximately 40 per cent of GDP to the public debt (Government of Jamaica, 2011). Further, the Government's absorption of losses and debt from loss making public entities such as Air Jamaica, Clarendon Alumna Partners and Sugar Company of Jamaica and the exposure of Jamaica debt to exchange rate depreciation also contributed significantly to its high debt levels. The crowding out of the private sector by Government as it seeks to finance its debt payments could also explain the negative relationship. That is, the Jamaican Government borrowed extensively in the domestic bond market, which would have diverted funds away for private sector investment and would have also facilitated an increase in interest rates, which had a further damping impact on economic growth.

Notably, the results of the paper is consistent with the findings of Rother and Checherita (2010), Reinhart and Rogoff (2010) and Presbitero (2010) who found that debt has a negative effect on economic growth at certain levels of debt. The signs of the coefficients on the key indicators of growth in Model 1 is generally in line with expectations for the long and short runs. That is the coefficients on investments and labour are positive and statistically significant in the short and long runs, with the exception of labour in the short-run. However, the openness to trade variable was not statistical significant both in the long and short runs. Further, the model is robust based on the standard normality, heteroskedasticity and serial correlation tests.

The results from Model 3 which estimates the impact of external and domestic debt on economic growth in Jamaica show that external debt has a non-linear impact on economic growth both in the short and long run as indicated by the statistical significance of the non-linear variable. In addition, both in the long and short runs, external debt at low levels has a positive impact on economic growth, while external debt at high levels has a negative impact on economic growth. With regards to the domestic debt, the results show that in the short-run high levels of domestic debt has a statistical negative impact on economic growth, however, lower levels of debt while having a negative impact on GDP, the relation was not statistically significant. Further in the long-run, while the results show that domestic debt does not have a non-linear relationship with economic growth, domestic debt has an overall positive impact on economic growth. Against this background, external debt has a greater statistical negative impact on economic growth in Jamaica. It is possible that domestic debt create additional spending in the economy which is used, in part, to generate additional activity. The signs of the coefficients on the other indicators of growth in Model 3 is generally in line with expectations. The coefficients on investments, openness and labour in the long-run are positive and statistically significant, while in the short-run the coefficient on investment remains the same, however, the impact from labour and openness while remaining statistically significance are negative. The negative openness coefficient in the short-run may arise from the large import content in production, however, as businesses grow efficiencies improve in the long-run. Similarly, in the short-run the low quality of the Jamaican labour force could have a negative impact on growth as indicated by Blavy (2006) due to low labour productivity. However, as training is received on the job, the contribution of labour to economic growth increases in the long-run. Notably, the model is robust based on the standard normality, heteroskedasticity and serial correlation tests.

The results from Model 4 reveal that that ratio of external debt-to-GDP in excess of 55 per cent has a negative and significant impact on economic growth in Jamaica.⁵ The results are consistent with the findings of Ricci et al (2002), AKram (2011) and Musa et al (2013) who show that high external debt has a negative impact on economic growth. The results also support Omet et al (2002) findings that high external debt levels are associated with low growth as a higher distortionary tax burden on capital is required to service debt, leading to a lower rate of return on capital, and hence lower investment and economic growth.

VII. Conclusion

The study explores the relationship between public debt and economic growth in Jamaica from 1990 to 2014 using an ARDL approach. Specifically, the paper investigated the existence of a non-linear relationship between public debt and economic growth. The results indicate that public debt has a non-linear impact on economic growth. Of note, the paper finds that public and external debt negatively affect economic growth in excess of 100 per cent and 55 per cent of GDP, respectively. Furthermore, the results indicate that external debt has a greater statistical negative impact on economic growth in Jamaica. The findings are consistent with the results from other studies, specifically those related to developing countries.

Given the potential impact of public debt on economic growth in Jamaica, it is imperative that the Government of Jamaica seek to reduce debt levels by implementing sound fiscal and debt management policies. Specifically the Government's debt strategy should be geared towards reducing the country's exposure to external debt given the overwhelming negative impact on growth and to increase financing from the domestic market. Notwithstanding, the Government should expeditiously seek to implement structural reforms geared towards fiscal consolidation, debt management, public sector reform and tax reform, which are necessary for economic expansion as well as for fiscal and debt sustainability. In addition, the strict implementation of

⁵ The threshold impact for domestic debt was not access given that the non-linear impact in the long-run was not confirmed.

fiscal rules, as outlined in the Government's medium-term macroeconomic programme, will be critical for achieving debt and fiscal sustainability.⁶

Due to the limited scope of the study, there are some areas that warrant further investigation. A much larger data set and the employment of different methodologies, which capture the impact of maturity structure, interest rate and currency composition of debt, could facilitate further research on the subject area.

⁶ The fiscal rules put a limits on the Government's ability to incur huge fiscal deficits.

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Appendix

Table 1: Unit Root Test

Variables	Phillips-Perron Test									
	Level				1st Difference					
	Test Statistic		Critical Values		Test Statistic		Critical Values			
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept		
Log Public Debt/GDP	-3.696	-4.520	-3.500	-4.056	***	-8.127	-8.329	-3.501	-4.058	***
(Log Public Debt/GDP)^2	-3.696	-4.520	-3.500	-4.056	***	-8.127	-8.329	-3.501	-4.058	***
Log External Debt/GDP	-3.282	-3.219	-3.500	-4.056	***	-7.864	-7.901	-3.501	-4.058	***
(Log External Debt/GDP)^2	-3.282	-3.219	-3.500	-4.056	**	-7.864	-7.901	-3.501	-4.058	***
Log Domestic Debt/GDP	-4.409	-1.408	-3.500	-4.056	**	-9.118	-10.782	-3.501	-4.058	***
(Log Domestic Debt/GDP)^2	-4.409	-1.408	-3.500	-4.056	***	-9.118	-10.782	-3.501	-4.058	***
Log CPI	-4.823	-6.436	-3.500	-4.056	***	-4.188	-5.230	-3.501	-4.058	***
Log Real GDP	-3.762	-4.219	-3.500	-4.056	***	-13.553	-13.432	-3.501	-4.058	***
Log Labour	-1.199	-2.286	-3.500	-4.056		-12.926	-12.861	-3.501	-4.058	***
Log Openness	-4.523	-4.544	-3.500	-4.056	***	-8.600	-8.628	-3.501	-4.058	***
Log Investment	-8.031	-8.355	-3.500	-4.056	***	-27.082	-26.608	-3.501	-4.058	***

Notes: *, **, *** are Mackinnon critical values for the rejection of the null hypothesis of a unit root at the 10%, 5% and 1% levels respectively.

Table 2: Bound Test Results

Model	Wald test F statistic	
Model 1	10.30533	***
Model 2	9.455928	***
Model 3	14.88941	***
Model 4	10.57509	***

Notes: Critical Value for Bound Test (Pesaran et, al 2001, p 300)

intercept and trend(k=4) :[4.617, 5.786] at 1% and [3.539, 4.667] at 5%

intercept and trend(k=5) :[4.011, 5.331] at 1% and [3.189, 4.329] at 5%

intercept and trend(k=8) :[3.220, 4.411] at 1% and [2.604, 3.46] at 5%

*** and ** indicate significance at 1% and 5%, respectively

Table 3: Model 1 to Model 4 Short-run Results

Results of the General to Specific ARDL Models												
Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient	Std. Error		Coefficient	Std. Error		Coefficient	Std. Error		Coefficient	Std. Error	
L GDP (-1)	-0.366	0.084	***	-0.387	0.076	***	-0.905	0.115	***	-0.636	0.098	***
L Public Debt/GDP (-3)	0.201	0.037	***	0.147	0.032	***						
(L Public Debt/GDP)^2 (-1)	-0.061	0.021	***	-0.033								
L External Debt/GDP (-3)							0.156	0.023	***	0.108	0.019	***
(L External Debt/GDP)^2 (-1)							-0.032	0.016	**			
L Domestic Debt/GDP (-3)							0.049	0.024	**			
(L Domestic Debt/GDP)^2 (-1)							0.004	0.012				
L Investment (-3)	0.049	0.016	***	0.058	0.017	***	0.031	0.014	**	0.040	0.016	**
L Openess (-3)	-0.028	0.019		0.009	0.019							
L Openess (-2)							0.045	0.017	**	-0.020	0.019	
L Labour (-3)	0.146	0.071	**	0.118	0.073							
L Labour (-1)							0.329	0.067	***	0.132	0.065	**
L CPI(-1)							-0.148	0.026	***	-0.031	0.024	
DL GDP (-3)	0.016	0.097		-0.058	0.099	***						
DL GDP (-1)							0.294	0.091	***	0.325	0.101	***
DL Public Debt/GDP (-1)	0.187	0.053	***	0.127	0.046							
(DL Public Debt/GDP)^2 (-3)	-0.044	0.019	**									
DL External Debt/GDP (-1)							0.127	0.036	***	0.091	0.037	**
(DL External Debt/GDP)^2 (-3)							-0.029	0.012	**			
DL Domestic Debt/GDP (-1)							-0.017	0.030				
(L Domestic Debt/GDP)^2 (-3)							-0.034	0.011	***			
DL Investment (-8)	0.024	0.013	*	0.020	0.013							
DL Investment (-4)							0.033	0.012	***	0.020	0.014	
DL Openness (-1)	0.000	0.021		-0.031	0.021		-0.036	0.017	**	0.019	0.020	
DL labour(-1)	0.031	0.089		0.075	0.093		-0.163	0.077	**	-0.045	0.088	
DL CPI(-1)							0.295	0.087	***	0.203	0.091	**
Local Financial Crisis Dummy	-0.033	0.012	***	-0.034	0.013	***	-0.024	0.011	**	-0.026	0.013	**
Public Debt 100 Threshold Dummy				-0.027	0.011	**						
External Debt 55 Threshold Dummy										-0.032	0.008	***
Trend	-0.001	0.000	*	-0.001	0.000	*	0.003	0.001	***	0.001	0.001	*
constant	3.883	1.064	***	4.127	0.949	***	11.299	1.464	***	7.384	1.202	***
R-Square	0.62610			0.57771			0.77007			0.63121		
Jargue-Bera Prob Value	0.14674			0.56797			0.98818			0.44466		
Breusch-Godfrey Serial Correlation Test	0.13560			0.14800			0.76730			0.59070		
Harvey Test Heteroskedasticity Test	0.60450			0.16210			0.88170			0.02430		

White-Heteroscedasticity Robust Standard Errors are included

Note: Level of Significance: *---10% Level of Significance: **---5% Level of Significance: ***---1%

Dependent Variable: DL GDP

Table 4: Model 1 to Model 4 Long-run Results

Results of the Long Run Coefficients ARDL Models				
Variables	Model 1	Model 2	Model 3	Model 4
L Public Debt/GDP (-3)	0.55	0.38		
(L Public Debt/GDP)^2 (-1)	-0.17			
L External Debt/GDP (-3)			0.173	0.169
(L External Debt/GDP)^2 (-1)			-0.04	
L Domestic Debt/GDP (-3)			0.05	
(L Domestic Debt/GDP)^2 (-1)			0.00	
L Investment (-3)	0.13	0.15	0.03	0.06
L Investment (-1)				
L Openness (-3)	-0.08	0.02		
L Openness (-2)			0.05	-0.03
L labour (-3)	0.40	0.31		
L labour (-1)			0.36	0.21
L CPI (-1)			-0.16	-0.05

Table 5: Granger Causality Tests

	Prob. Value
Growth rate of real GDP does not Granger Cause Growth in ratio of Debt to GDP	0.4250
Growth in ratio of Debt to GDP does not Granger Cause Growth rate of real GDP	0.0486
Growth rate of real GDP does not Granger Cause Growth in ratio of External Debt to GDP	0.3790
Growth in ratio of External Debt to GDP does not Granger Cause Growth rate of real GDP	0.0812
Growth rate of real GDP does not Granger Cause Growth in ratio of Domestic Debt to GDP	0.0041
Growth in ratio of Domestic Debt to GDP does not Granger Cause Growth rate of real GDP	0.4754