The Nexus Between External Public Debt and Economic Growth of Sri Lanka

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The external public debt-led growth hypothesis suggests that external public debt is one of the key determinants of economic growth. This hypothesis is more applicable to developing countries including Sri Lanka. The theoretical and empirical studies have examined the relationship between external public debt and economic growth and found that this relationship is ambiguous. The objective of the paper is to investigate the nexus between the external public debt and the economic growth of Sri Lanka. This empirical research study utilised annual time series data from 1990 to 2019. The long-run equilibrium equation was obtained by applying the Auto Regressive Distributed Lag (ARDL)bounds cointegration test while the short-run results were received through Error Correction Modeling (ECM). The study's findings conclude by proving the existence of a negative weak significant effect of external public debt over economic growth. The control variables, capital stock and human capital displayed a positive relationship and labor showed a negative relationship in the long run. In the short run, only labour has been identified to have a negative significant impact on economic growth. In contrast, other variables, external public debt, capital stock and human capital, had no relationship with the dependent variable. This study can assist policymakers in obtaining a holistic understanding of the realities associated with external public debt and helps them identify steps that need to be taken if the effects produce a negative result.

Keywords: *External Public Debt, Economic Growth, Sri Lanka*

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1.   Introduction

In the post-1980s, among developing countries, the rate of debt accumulation and increase in debt servicing were major factors that influenced economic growth. However, the influence of imperfect exchange rate adjustments made some of these countries lose their international competitiveness. Furthermore, declining terms of trade, economic mismanagement, and problems in governance reduced the growth rates of such economies. This decline was greater in the countries that faced higher debt burdens because higher debt burdens resulted in higher interest payments, reduced foreign inflows, lower export earnings and lower domestic output (Siddiqui & Malik, 2001). Hence, policymakers in developing countries were required to pay more attention to debt when formulating economic policies. This provides a basis for studying the relationship between debt and economic growth.

Moreover, a country's default rate probably would increase with a high level of external debt. The unfavorable influences of external borrowing borne by a country due to debt not being efficiently utilized regarding investment or economic growth, shall negatively influence investor confidence (Clements, Bhattacharya, & Nguyen, 2003; Bakar & Hassan, 2008; Makin, Zhang, & Scobie, 2009; Akram, 2011; Ali & Mustafa, 2012; Daud & Podivinsky, 2012; Kharusi & Ada, 2018) and consequently, countries shall become unable to foster economic growth and thus fail on debt repayments owing to the high level of indebtedness. However, debt repayments have also been an effective signal that provides discretion over the government's capabilities and indications of the fundamentals of a country's economy (Sandleris, 2008). Additionally, the repayment ability of any country is closely associated with its sovereign debt rating (probability of default), thereby, influencing its future borrowing opportunities. Risk of default, rescheduling and arrears shall certainly impact the volatility of future inflows and additional lending while access to capital markets mainly depends on perceived sustainability (Gunning & Mash, 1999). Accordingly, any undesirable or uncertain elements relating to Sri Lanka's external position may result in delays in generating foreign investment inflows.

Most of developing countries worked so hard not to default even with a high level of indebtedness where debt service could "crowd out" investment or, to a lesser extent, cause stagnant or declining economic growth. Being either in default or a debt-overhang situation is not suitable for a country to maintain a sustainable position (Daud & Podivinsky, 2012). The paper makes a significant contribution to the knowledge in this area as Sri Lanka is currently experiencing a very devastating economic and political climate, an analysis of the relationship between external public debt and economic growth could give some insight as to whether Sri Lanka has been benefiting from external borrowing. According to Krugman (1988), the prevalence of high incidence of default highlights the importance of research on the role of external debt concerning economic growth, however, most research studies that have considered such dimensions have focused on affluent countries rather than on developing countries and therefore have limited relevance to the Sri Lankan context. A few research studies have been conducted on the Sri Lankan economy in this regard (Fonseka & Ranasinghe, 2007; Ekanayake, 2011; Kumara & Cooray, 2013), but none of such research has exclusively focused on external public debt. Thus, the objective of the paper is to examine the relationship existing between external public debt and the economic growth of Sri Lanka. The paper exhibits the effectiveness of debt management policies in developing countries including Sri Lanka.

The remainder of this paper is structured as follows. The second section reviews the theoretical and empirical literature on external public debt and economic growth. The third section presents the performance of public debt in Sri Lanka. While the fourth section summarizes the analytical framework, the fifth section explains the data sources and describes the variables. The sixth section discusses the econometrics methodology and empirical results followed by a conclusion and policy implications in the last section.

2. Review of literature

There are ample studies that have been conducted previously to examine the relationship between external public debt and economic growth. This paper exclusively focuses on investigating the relationship that exists between the external public debt and the economic growth of Sri Lanka. This section critically reviews the theoretical and empirical studies.

2.1 Theories

An extension of Myer's (1977) work on debt overhang is used to explain the negative effect of debt. Myer's work focuses on the debt overhang of a firm, while Krugman's focuses on the same problem experienced by an economy. Accordingly, in Krugman's (1988) words '*A country has a debt overhang problem when the expected present value of potential future resource transfers is less than its debt*' (1988, p.255). Krugman's paper makes an important deduction: if a debt overhang situation were to rise, a country could still be able to attract foreign creditors by offering a high interest rate premium and issuing bonds at a discounted rate. Although many authors argue that it is highly unprofitable, Krugman's view, when considered in isolation becomes mandatory for the repayment of existing debt. Krugman calls the new debt accumulated as the 'insurance' for existing creditors. While Krugman's work focuses on debt overhang and its implications on current creditors of an economy, however, fails to address the relationship between debt and economic growth. Sachs (1989), extending on Krugman's work, argues that the returns from investing in the country are subject to high marginal tax by external creditors and hence new domestic and foreign investments are discouraged. Moreover, the outflow by way of taxation disincentivizes the government in making difficult reforms, trade liberalization and other forms of progressive reforms. The debt overhang problem not only affects the sheer volume of investment but also creates a poor macroeconomic policy environment, thereby degrading the efficiency of the investment, which in turn becomes detrimental to achieving economic growth (Pattillo et al., 2002).

Any analysis of debt and its negative impact on economic growth would be incomplete without discussing the crowding-out effect. The effectiveness of fiscal stabilization in the Keynesian model is dependent on the magnitude of the fiscal multipliers. The effect of an increase in debt-induced government spending does not directly translate into an increase in the national output through the multiplier effect alone. There would be a certain amount of reduction in the expected level of output because of the crowding-out effect (Balcerzak & Rogalsa, 2014).

The Laffer curve shows the relationship between the nominal value of debt and the market value of debt. It invokes the Laffer curve as an inverted 'U' shape curve where the relationship is initially positive and following the optimal point, a negative relationship (formally known as the declining side of the Laffer curve) is created (Claessens, 1990). The Laffer curve and Krugman's theory have certain similarities: if the economy is on the declining side of the Laffer curve, a reduction in the nominal claims outstanding (debt forgiveness) would be beneficial for the existing creditors. Any rational creditor would not invest when the economy is on the declining side, and this would adversely impact economic growth. On the other hand, when the market value of debt is higher than the nominal value, new creditors would willingly invest, and this would have a positive impact on the economic growth of the country.

Ricardo suggests that there is no significant relationship between external debt and economic growth. Ricardo's main argument was that the public debt issue is equivalent to taxation (Buchanan, 1976). Barro's finding as quoted in Buchanan (1976), is also consistent with the initial findings by Ricardo. In his paper it is argued that a taxpayer would 'capitalize' the future debt obligation to the level at which the debt does and will not have a significant impact on the spending of the taxpayers, thereby, the external debt burden would neither have a positive nor a negative effect (Seater, 1993).

2.2 Empirical studies

The concept of debt gained significance among developing countries, especially in the post 1980's and thereafter immense research efforts have been devoted towards assessing the impact of debt on various aspects of an economy (i.e., inflation rate, interest rate, money supply, trade, and economic growth etc.) (Siddiqui & Malik, 2001). Growing contemporary empirical literature emphasizes that there is a relationship between external debt and economic growth. However, there is a disagreement about the direction of causality and signs of the effect. Most of the empirical research has concluded that debt influences economic growth (Clements, Bhattacharya, & Nguyen, 2003; Bakar & Hassan, 2008; Makin, Zhang, & Scobie, 2009; Akram, 2011; Ali & Mustafa, 2012; Daud & Podivinsky, 2012; Kharusi & Ada, 2018) while the others have endorsed the economic growth to debt relationship (Lof & Malinen, 2014).

Debt to economic growth

A significant number of studies on debt to economic growth causality rendered a negative relationship between the two (Akram, 2011; Ali & Mustafa, 2012; Kharusi & Ada, 2018; Daud & Podivinsky, 2012; Guei, 2019). These studies were conducted on specific countries (Akram, 2011; Ali & Mustafa, 2012; Kharusi & Ada, 2018) and in some cases as a cross-country analysis (Guei, 2019; Daud & Podivinsky, 2012). The studies by Akram (2011) and Ali and Mustafa (2012) were country-specific based on Pakistan in which they were able to identify that the inability of successive governments to considerably reduce the fiscal deficit, the inefficient use of debt and the stagnant economic growth in real revenues had fueled the prolonged debt problem in the country while several other factors such as stagnant government revenues and the high real cost of borrowing had contributed towards the rise of public debt and created a change in the country's economic growth dynamics while Kharusi and Ada's (2018) were based on Oman. Akram's (2011) ARDL model included investment, external debt, domestic debt, debt servicing, trade openness, and inflation as explanatory variables. The Vector Autoregressive (VAR) model applied by Ali and Mustafa (2012) used human capital, capital, labour force and external debt as a percentage of Gross Domestic Product (GDP) as its explanatory variables. The exclusion of variable debt servicing in Ali and Mustafa (2012) meant that the empirical evidence pertained to only the theory of debt overhang while on the other hand, Akram's (2011) use of debt servicing as a model variable enabled him to test the crowding out effect as well. However, the crowding-out effect was insignificant in the short run and weakly significant in the long run. In the cross-country analysis of emerging economies, a negative effect of debt on economic growth was seen (Daud & Podivinsky, 2012; Guei, 2019). Duad and Podivinsky's (2012) cross-country analysis using the Generalized Method of Moments (GMM) system revealed that debt accumulation slows the economies of developing countries but Guei (2019) found an insignificant negative effect in the long run. Further, Duad and Podivisnsky (2012) found there to be an insignificant effect of debt servicing payment, this meant that the crowding out effect is void.

The aforementioned arguments have been rebuffed since a significant proportion of research has observed and determined a positive casual direction from the external debt to economic growth (Bakar & Hassan, 2008; Makin et al., 2009). Bakar and Hassan (2008) through their investigations on the Malaysian economy, were able to demonstrate that a debt overhang problem influences both, investments in physical capital and activities involving costs borne up-front (e.g., investments in human capital and technology) to produce increased output in the future. However, their research findings indicated that the country did not face such a problem, thus eliminating the influences of adverse incentives on economic growth and advocating a positive relationship between external debt and economic growth. Another research conducted in New Zealand also presented similar views, however, justified the positive influence through its acclamations on capital accumulation by considering variables such as the capital stock, domestic labour force, total

labour productivity and foreign borrowing (Makin et al., 2009) Further on, research done involving a group of 10 emerging economies using data from 2005 to 2015 revealed a threshold for government's external debt at 33.17 per cent of GDP, a lower value than most other developed countries. External debt exhibited positive outcomes on economic growth while within this threshold and created detrimental effects when it was exceeded (Vu et al., 2019).

Economic growth to debt

In addition to the above arguments that proclaim debt influences economic growth, it is also equally important to extend consideration towards research studies that claim the contrary, economic growth impacts debt. In the discussion relating to sovereign debt and economic growth by Lof and Malinen (2014), it was proved that, although higher levels of sovereign debt do pose a severe burden on a country, the effects of debt on economic growth are quite not clear since no statistically significant long-run effect could be found. This result can be interpreted concerning several VAR specifications and samples. Economic growth, however, has been statistically proven to have a significant negative effect on sovereign debt. This scenario is driven primarily by the negative effect of economic growth on sovereign debt.

In his research on the effects of public debt on economic growth based on the Israeli economy, Shahor (2018), commented that, although it is quite common to analyze the effects of external debt on economic growth, it is also equally possible to assess the impact of economic growth on public debt. He also suggested that two distinct explanations can be sought to comprehend the effects of debt due to economic growth. The first is to seek for explanation when the economy grows. In such an instance, tax receipts shall increase thereby resulting in the reduction in debt. The second is to consider a period without any economic growth. During such a period, the government shall intervene and take action to increase debt. In the paper on short-term external debt and economic growth, Butts (2009) empirically tests the nature of the causality relationship between short-term external debt and economic growth in 28 Latin American and Caribbean countries. The results reveal that Granger causality between economic growth and short-term external debt occurred in 13 countries such as Belize, Dominican Republic, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Paraguay, Peru, St. Vincent, Uruguay and Venezuela.

While most literature advocates the existence of a relationship between economic growth and debt, Panizza and Presbitero (2014) concluded that there was no evidence that public debt had a causal effect on economic growth. It was further stated that the relationship should not be taken into consideration while making fiscal consolidation.

The Sri Lankan context

While there are ample studies that have done in developing countries on the topic of the relationship between public debt and economic growth, the discourse on it in the Sri Lankan context is scarce. Fonseka and Ranasinghe (2008) conducted a study to identify the sustainability of Sri Lanka's public debt over the years where it was found that public debt in Sri Lanka has increased, resulting in high debt servicing obligations. The debt servicing and debt levels were seen to hurt Sri Lanka's economic growth in this study. Ekanayake (2011) also contributed to the study on debt and economic growth in Sri Lanka by investigating the debt sustainability of Sri Lanka for the period of 1997 to 2010 using the quarterly data and found that a reduction in debt to GDP ratio by 2.4 per cent could be seen for a unit standard deviation positive economic growth shock. A study conducted by Kumar and Cooray (2013) deviated from the above studies where the subject of interest was the threshold level of debt which would optimize economic growth. Wherein, it was found above the threshold level of 59.42 public debt to GDP percentage, would result in the reduction of economic growth.

Debt situation in Sri Lanka

Since independence, Sri Lanka's external public debt has been constantly increasing, contributing to the growth of the government debt stock. Debt service payments increase as debt stock rises, thus reducing the fiscal space available for other necessary or productive activities. Furthermore, greater deficits resulting from high debt service expenditures eventually lead to the government borrowing more, exposing it to a "debt trap" or "vicious cycle," as well as a foreign resource crisis. This could be attributed to the low revenue collection of the government which has been low for the last two decades even though the per capita income has been increasing. The tax system is plagued by certain inefficiencies; tax exemptions, tax holidays, avoidance of tax, and complexities of the tax system which has caused a decline in the revenue elasticity (The government revenue to GDP ratio dropping to a level as low as 11.5 per cent in 2014 from over 20 per cent in the 1990s). As a result, the government has to rely on debt financing to support recurrent expenditures (Central Bank of Sri Lanka (CBSL) Annual Report, 2016). Further, due to the country's movement to lower-middle-income status in 1997 (CBSL Annual Report, 1997), the country started to experience a huge decrease in foreign grants and concessional financing, while it was being subjected to non-concessional and commercial borrowings. This has changed the structure of the debt stock, with an increase in the share of external debt. Within the external debt, the portion of more expensive commercial debt and the stock of short-term debt has grown (as a percentage of total external debt, concessional debt declined to 46.9 per cent in 2016, from over 90 per cent before 2007). This change has forced the country to access international capital markets through the issuance of International Sovereign bonds at commercial interest rates, further accumulating the debt stock at same time increasing the foreign currency exposure risk (CBSL Annual Report, 2016).

Figure 1 shows the total public debt as a percentage of GDP, external public debt as a percentage of GDP and external public debt in Sri Lanka from 1990 to 2019. Public debt as a percentage of GDP in Sri Lanka has remained high over the last few decades. It increased above 100 per cent during the period 2001-2004. In 2019, this was reported as 86.8 per cent.

Figure 1: External public debt as a percentage of GDP and external public debt in Sri Lanka from 1990 to 2019
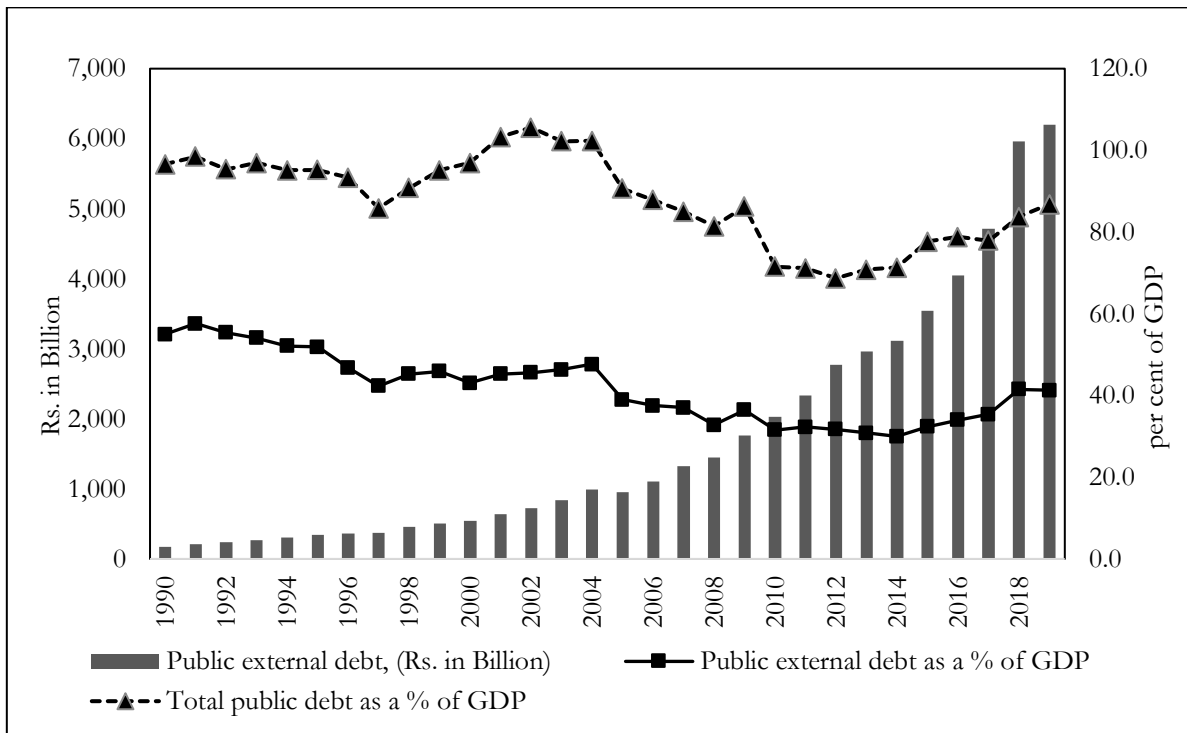
Source: CBSL Annual Report (2019)

Sri Lanka's external public debt has shown an increasing and upward pattern since the year 1990. The data from CBSL indicates that the past three decades have seen a substantial increase in the dependence on external debt. As of the end of 2019, Sri Lanka's external public debt was recorded at Rs. 6,201 billion which is equivalent to 41.3 per cent of GDP (CBSL Annual Report, 2019). Which highlighted the issue of the usability of external debt to boost the domestic economy.

3. Methodology

3.1 Analytical framework

Having examined the theoretical and empirical research, the production function framework is used to develop the model that will be used to evaluate how external public debt affects economic growth. The general operation of the production function is as follows:

$$y = f(A, L, K) \tag{1}$$

Where Y is the GDP per capita, L is the labour force, K is the capital stock, and A is the total productivity factor. The impact of external public debt on economic growth is assumed to operate through A (Cunningham, 1993).

$$A = g(PED) \tag{2}$$

Substituting Equation (2) in Equation (1)

$$y = f(L, K, PED) \tag{3}$$

The empirical models for estimations can be illustrated as follows:

$$GDPPC = \beta_0 + \beta_1 LFPR + \beta_2 GCF + \beta_3 PED + \varepsilon_t \tag{4}$$

Where ε_t is the error term, GDPPC is the GDP per capita, LFPR is the labour force participation ratio, GCF is the gross capital formation, and PED represents the external public debt.

Equation (4) may, of course, leave out factors essential to explaining growth. Human capital is one of the most significant factors that can influence many other macroeconomic indicators including economic growth. Therefore, we included human capital as an additional variable to the model to account for its effect on economic growth.

$$GDPPC = \beta_0 + \beta_1 LFPR + \beta_2 GCF + \beta_3 PED + \beta_4 HC + \varepsilon_t \tag{5}$$

3.2 Data source and description of variables

Annual time series data on GDP per capita, external public debt, labour force participation rate, gross capital formation, and government expenditure on education, which cover the 1990 – 2019 period, have been used in this study. The proxy for the dependent variable has been selected by analyzing several previous papers that have been conducted with similar ideologies in order to investigate the impact of external public debt on economic growth. In this paper, the GDP per capita has been used as a proxy for economic growth (see, Daud & Podivinsky, 2012; Kumara & Cooray, 2013; Ravinthirakumaran, 2014; Shahor, 2018; Ravinthirakumaran et al., 2019). Different measures of external public debt have been proposed and used in empirical analyses of the relationship between external public debt and economic growth. Some authors constructed different proxies to measure the external public debt such as stock of external debt by Clements et.al., (2003), and external debt as a percentage of GDP by Kharusi and Ada (2018). However, Vu et al. (2019) argue that, regardless of the many external public debt measures that exist in the literature, the simplest ones are those based on actual external public debt as a per cent of GDP, therefore this study has been used it. Labour force participation rate (Odhiambo, 2010; Shahid,

2014), gross capital formation (Akram, 2011; Kumara & Cooray, 2013) and government expenditure on education (Wijeweera et al., 2005; Ali & Mustafa, 2012) have been used as a proxy for labour, capital stock and human capital respectively. The expected signs for labour, capital stock and human capital are positive while the sign of external public debt is to be determined. Reviewing the existing literature on external public debt and economic growth shows that there is not a clear definition of external public debt.

3.3 Method of analysis

The ARDL bound testing (Pesaran, 1997; Pesaran, Shin, & Smith, 2001) has been adopted by this paper to estimate the long-run equilibrium relationship among the variables while short-run results were obtained by using the Error Correction Mechanism. It should be noted that this ARDL cointegration test is done when the variables are integrated of both order zero I(0) and order one I(1). However, the ARDL bound text procedure can't be used for I(2) variables. The advantage of using the ARDL model is that the model uses a single reduced-form equation. In addition to this the ARDL model does not require decisions on the specifications that should be included like in the case of a standard cointegration test. These decisions include the number of endogenous and exogenous variables to be included. In addition to this the ARDL model allows the use of different optimal lags for different variables unlike the standard cointegration approach (Kharusi & Ada, 2018).

Unit root test

The authors initially tested whether the series is time stationary. Most of the modelling techniques applied in time series analysis are primarily concerned with the stationarity of the data. Unit root tests provide statistical evidence on the stationarity of a given series. If there is a unit root, then the particular series is considered to be non-stationary. Moreover, estimation based on non-stationary variables may lead to spurious results which produce high R^2 and t-statistics, but without any coherent economic meaning (Granger & Newbold, 1974).

In this study Augmented Dicky Fuller (ADF) test and Phillips-Perron (PP) test were carried out for checking unit roots and the results are presented in Table 1. The results indicate that all variables are non-stationary in their levels except labour force participation rate, but stationary in their first difference at the 1 per cent level of significance. Since the stationarity property of the variables under consideration is a mixture of I (1) and I(0) and there are no I(2) or higher order integrated variables, the ARDL bound testing technique was deemed appropriate for estimation.

Table 1: Unit root tests

Variables	Augmented Dickey-Fuller (ADF) Test			Phillips-Perron (PP) Test		
	Level	First Difference	I (d)	Level	First Difference	I (d)
GDPPC	-3.29 (0.09)	-7.69 (0.00)	I (1)	-3.27 (0.09)	-16.90 (0.00)	I (1)
LFPR	-3.64 (0.04)	--	I (0)	-3.64 (0.04)	--	I (0)
GCF	-3.17 (0.11)	-5.68 (0.00)	I (1)	-2.90 (0.17)	-11.73 (0.00)	I (1)
PED	-0.89 (0.94)	-6.33 (0.00)	I (1)	-0.96 (0.93)	-6.35 (0.00)	I (1)
HC	-2.86 (0.19)	-6.39 (0.00)	I (1)	-2.91 (0.17)	-6.31 (0.00)	I (1)

Source: E-Views Data analytical results.

Bounds test

Following the unit root tests, the next step is to apply the ARDL bound test approach to analyse the long-term relationship that exists between the variables. The presence of a long-run relationship between the variables and hence the test was based on the following model constructed.

The unrestricted model of the series is as follows,

$$\Delta GDPPC_t = \beta_0 + \theta_1 GDPPC_{t-1} + \theta_2 PED_{t-1} + \theta_3 GCF_{t-1} + \theta_4 LFPR_{t-1} + \theta_5 HC_{t-1}$$
$$+ \sum_{i=1}^{p} \beta_{1i} \Delta GDPPC_{t-i} + \sum_{j=0}^{q_1} \beta_{2j} \Delta PED_{t-j} + \sum_{j=0}^{q_2} \beta_{3j} \Delta GCF_{t-j}$$
$$= \sum_{j=0}^{q_3} \beta_{4j} \Delta LFPR_{t-j} + \sum_{j=0}^{q_4} \beta_{5j} \Delta HC_{t-j}$$
$$+ \varepsilon_t \qquad (6)$$

Where Δ is the first difference operator, p is the lag order of the dependent variable, q_s are the lag orders of the regressors. The coefficients of θ_s show the long-run, whereas the β_s are the parameters that show the short-run dynamics of the model and ε_t is the white-noise disturbance term.

To test the long-term linkage among the variables an F- test is conducted. The null hypothesis of no long-term association existing among the variables $H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = 0$ is tested (Pesaran, Shin, & Smith, 2001). The decision criteria is as follows, if the value of the *F-test* > upper critical bound (UCB), then H_0 would be rejected and the variables of the study are co-integrated, if the value of the *F-test* < lower critical bound (LCB), then H_0 would be accepted and the variables of the present study, would take to be not co-integrated; however, if value of *F-test* ⩾ LCB and ⩽UCB, then the decision would be inconclusive (Chandio, Jiang, & Rehman, 2019). When it is established that variables are co-integrated (i.e., There is a long-run or equilibrium

relationship between them), in the short-run there may be disequilibrium. The results of the bounds test are reported in Table 2.

Table 2: Bound F- Test Results

Country	F- Statistic value	Lag Length	Significance Level	Bound Critical Values	
				I(0)	I(1)
			1 per cent	3.74	5.06
Sri Lanka	17.11	2	5 per cent	2.86	4.01
			10 per cent	2.45	3.52

Source: E-Views Data analytical results.

The test conclusion is that at 1 per cent, 5 per cent and 10 per cent, the calculated F-statistic which is 17.11 lies outside the bound range thereby giving enough evidence to reject the null hypothesis (there is no long-run relationship) and conclude that the variables are cointegrated in the long run.

After determination of the existence of cointegration among the variables, the next step in the ARDL approach is to determine the long-run coefficient. The estimates of the ARDL long-run coefficient for the estimated model are presented in Table 3.

Table 3: Long Run Estimation Results (2,0,0,0,2)

Independent variable	Coefficient	Std- Error	t- statistics	Prob
PED	-0.07	0.03	-2.08	0.05***
GCF	0.37	0.06	6.12	0.00*
LFPR	-0.60	0.11	-5.13	0.00*
HC	1.29	0.54	2.38	0.02**

ECT = GDPPC – (- 0.07*PED + 0.37*GCF – 0.60*LFPR + 1.29*HC)

Note. *, ** and *** denote the statistical significance at 1 per cent, 5 per cent and 10 per cent levels respectively.

Source: E-Views Data analytical results.

As illustrated in Table 3, the empirical evidence from this study highlights the existence of a negative and weakly significant relationship between external public debt and economic growth in the long run. The rationale for this is the higher level of external public debt resulting in lower rates of economic growth where a one per cent increase in external public debt leads to a decrease in GDPPC by 0.07 per cent. The empirical findings of the above results line with the ideas presented by Krugman (1988), where he suggested that high debts have adverse effects on economic growth using the debt-overhang theory and it also conforms with previous studies done by Akram (2011), Ali and Mustafa (2012), Kharusia and Ada (2018), Daud and Podivinsky (2012), and Guei (2019).

Further, the results show a positive relationship between gross capital formation and economic growth. Where a one per cent increase in gross capital formation increases GDPPC by 0.37 per cent at 5 per cent level of significance. The existence of a positive relationship between gross capital formation and economic growth is much by the general assumptions that capital is a crucial element that contributes to economic growth similar to the ideas of classical economists. Who proclaimed that capital is one of the major determinants of economic growth (King & Levine, 1994). Furthermore, an increase in the labour force participation rate leads to a reduction in the GDP per capita by 0.6. Which is claiming the existence of a negative relationship. Clark et al. (1999), disclose a negative association between labour force participation rates and GDP per

capita. Also, Table 4 illustrates that human capital has a positive impact on economic growth and has the most substantial effect on GDPPC. This shows that a one per cent increase in government expenditure on education will increase GDPPC by 1.29 per cent which is significant at a 5 per cent level. These findings underline the thoughts associated with the economic theory which suggests that human capital is a crucial element contributing to economic growth with specific regard to Less Developed Countries (LDCs). Similarly, it also corroborates with the findings of Lucas (1993) who stated that the accumulation of human capital shall result in positive economic growth, Mankiw (1992) who made extensions to the theory by identifying human capital as an additional accumulable factor and the notions suggested by Ali and Mustafa (2012).

Error correction mechanism

Following the estimation of long-run coefficients, the final step in the ARDL approach is to conduct an analysis of error correction and estimate the short-run coefficients. The short-run dynamics can be derived by estimating the Error Correlation Term (ECT) with the specified lags as shown in Equation (7).

$$\Delta GDPPC_t = \beta_0 + \rho u_{t-1} + \sum_{i=1}^{p} \beta_{1i} \Delta GDPPC_{t-i} + \sum_{j=0}^{q_1} \beta_{2j} \Delta PED_{t-j} + \sum_{j=0}^{q_2} \beta_{3j} \Delta GCF_{t-j}$$

$$+ \sum_{j=0}^{q_3} \beta_{4j} \Delta LFPR_{t-j} + \sum_{j=0}^{q_4} \beta_{5j} \Delta HC_{t-j}$$

$$+ \varepsilon_t \tag{7}$$

Where $\mathcal{U}_{t-1}$ is the Error Correction Term.

The statistically significant and negative sign of $\mathcal{U}_{t-1}$ coefficient ρ implies that any long-run disequilibrium among dependent variables and several independent variables will converge back to the long-term equilibrium association.

The short-run error correction is resultant of the cointegration among the variables and thus the results of the error correction model in this study are summarized in Table 4.

Table 4: Error Correction Model Representation of The Selected ARDL Model (2,0,0,0,2)

Variable	Coefficient	Std. Error	t- Statistic	Prob.
C	40.78	3.98	10.22	0.00*
D(GDPPC (-1))	0.38	0.11	3.30	0.00*
D(LFPR)	-0.36	0.16	-2.13	0.04**
D(LFPR (-1))	0.36	0.14	2.52	0.02**
ECM (-1)	-1.67	0.16	-10.28	0.00*
R²	0.84			
$\overline{R}^2$	0.87			
F- statistic	17.11			0.00
DW - statistics	1.89			

Note. *, **, and *** denote the statistical significance at 1 per cent, 5 per cent, and 10 per cent levels respectively

Source: World Bank

As per the above-mentioned Table, results indicate the existence of a stable long-run relationship among the variables, further confirmed by the significant error correction term (Banerjee, Dolado, & Mestre, 1998). Speed of adjustment is represented by the coefficient of the error correction term (ECT) which means following a disturbance in the unrestricted model and shows how quickly the variables returned to their long-run values. These results suggest that after a shock, approximately 167 per cent, adjustment towards the long-run equilibrium is completed after one year.

Change in labour force participation rate is the only variable that has an impact on GDPPC because the short-run coefficients of the other variables PED, GCF and HC all have taken the value 0. An increase in the change in labour force participation rate had led to a reduction in GDPPC growth rate by 0.36 which is claiming the existence of a positive relationship in the short run.

Results of short-run Granger causality tests are shown in Table 5. As can be seen in the table, in the short run, the F-statistics on the explanatory variables suggest that at a 5 per cent level or better there is bidirectional Granger causality between external public debt and economic growth, gross capital formation and economic growth, labour force participation rate and economic growth, and labour force participation rate and external public debt. Further, at the 5 per cent level there is also a unidirectional Granger causality running from human capital to gross capital formation, external public debt to human capital, gross capital formation to labour force participation rate, and human capital to labour force participation rate. The findings of this study suggest that high debts have adverse effects on economic growth and confirm the validity of the external public debt-led growth hypothesis for Sri Lanka. That is, a lower level of external public debt results in higher rates of economic growth.

Table 5. Results of Short-run Granger Causality

Dependent Variable	F-Statistics					Direction of Causality
	$\Delta ln GDPPC$	$\Delta ln PED$	$\Delta ln GFC$	ΔHC	$\Delta ln LFPR$	
$\Delta ln GDPPC$	--	6.45** (0.01)	4.92** (0.04)	0.12 (0.98)	7.22** (0.01)	PED → GDPPC GFC → GDPPC LFPR → GDPPC
$\Delta ln PED$	5.24** (0.03)	--	0.25 (0.62)	0.29 (0.59)	4.44** (0.04)	GDPPC → PED LFPR → PED
$\Delta ln GFC$	5.63** (0.02)	2.49 (0.13)	--	3.06*** (0.07)	1.29 (0.27)	GDPPC → GFC HC → GFC
ΔHC	1.03 (0.32)	6.29** (0.02)	1.79 (0.19)	--	0.71 (0.41)	PED → HC
$\Delta ln LFPR$	3.57** (0.04)	12.58* (0.00)	9.29* (0.01)	9.44* (0.00)	--	GDPPC → LFPR PED → LFPR GFC → LFPR HC → LFPR

Notes: *, **, *** indicates significance at the 1 per cent, 5 per cent and 10 per cent respectively.
Source: World Bank

Diagnostic tests

The diagnostic tests are used to ensure the suitability and the validity of the regression models that have been employed in the study. These include tests for serial correlation (Breusch-Godfrey Serial correlation LM test), heteroscedasticity (Breusch-Pagan-Godfrey test and Glejser test and white

test), normality (Jarque-Bera), stability (CUSUM Test and CUSUM of Squares Test) and the white noise (Q-test) (Gujarati & Porter, 2013; Greene, 2018).

Serial Correlation LM Test: Table 6 below shows the summary of results for the Breusch Godfrey serial correlation LM Test. F test and Chi-squared test suggested that there was no autocorrelation because the p-value was greater than 5 per cent.

Table 2: Summary of Results for Breusch Godfrey (Serial correlation LM Test)

Teats	Test Statistic	P values
F test	1.46	0.26
Chi squared test	4.25	0.11

Source: EViews data analytical results.

Heteroscedasticity test

Table 7 below shows the summary of results for the Breusch-Pagan-Godfrey, Glejser and White test. All test results revealed that there was no heteroscedasticity because the p-value was greater than 5 per cent.

Table 7: Summary of Results for Heteroscedasticity Test (Breusch-Pagan-Godfrey, Glejser and White Test)

Heteroscedasticity Test					
	Breusch Pagan Godfrey Heteroscedasticity Test	F-statistic	1.32	Pro. F (8,17)	0.29
		Obs*R-squared	9.99	Prob.Chi-Square (8)	0.26
		Scaled explained SS	4.41	Prob.Chi-Square (8)	0.81
	Glejser test	F-statistic	1.42	Prob. F (8,17)	0.25
		Obs*R-squared	10.42	Prob.Chi-Square (8)	0.23
		Scaled explained SS	6.78	Prob.Chi-Square (8)	0.55
	White test	F-statistic	1.59	Prob. F (8,17)	0.19
		Obs*R-squared	11.16	Prob.Chi-Square (8)	0.19
		Scaled explained SS	4.93	Prob.Chi-Square (8)	0.76

Source: EViews data analytical results.

Normality test

If the residuals are normality distributed, the histogram should be bell-shaped and the Jarque-Bera statistic should not be significant. The Jarque-Bera statistic has a χ^2 distribution with two degrees of freedom under the null hypothesis of normally distributed errors (Gujarati & Porter, 2008). The Jarque-Bera test indicates that the residuals are normal because the Jarque-Bera statistic is 2.26 and the p-value is greater than 0.05.

White noise test

The Q test calculated with 12 lags were tested and at all 12 lag levels the Q statistic was less than the chi-squared critical value for the respective lags. This means that there is no autocorrelation among the error terms. Additionally, it could also be concluded that the series is white noise because Q statistic is also a test for white noise (Gujarati & Porter, 2013).

CUSUM test and CUSUM of squares test

Both these tests are based on the cumulative sum of recursive residuals. The diagram would indicate the residual performance and the pattern of its stability. The residuals will be considered to be unstable if the line exceeds the extreme lines and appears in the critical region (Brown,

Durbin, & Evans, 1975). The diagrams below show that at a 5 per cent level, the CUSUM test and CUSUM of Squares Test indicate that the parameters are stable as the critical lines have not been crossed (See Figure 2).

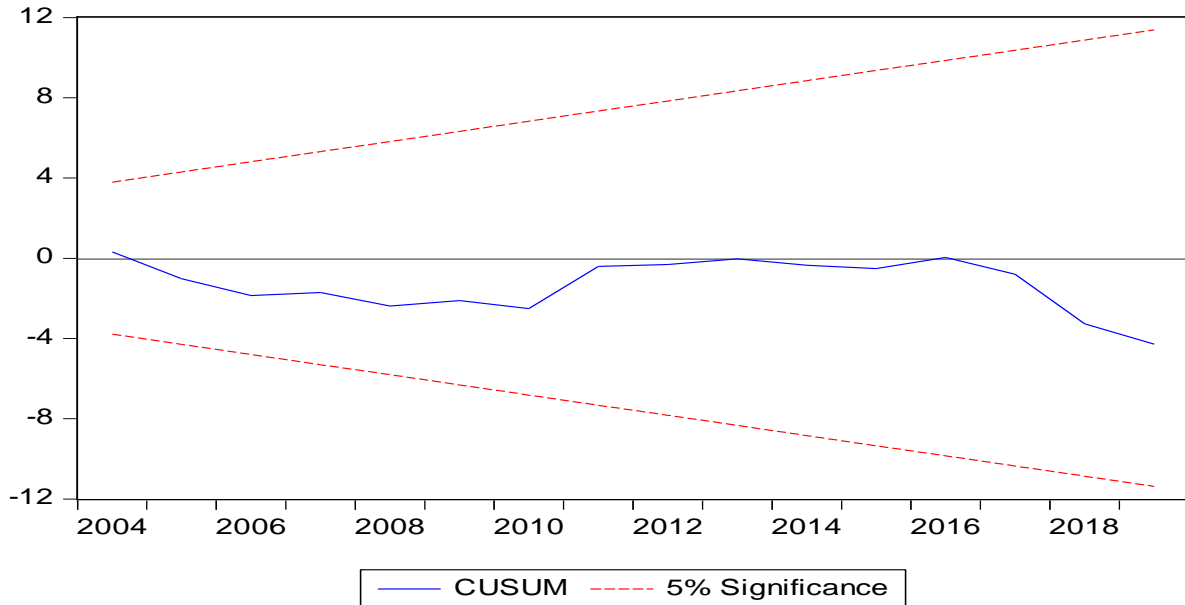**Figure 2: Cumulative Sum of Recursive Residual Test Results from *Eviews***
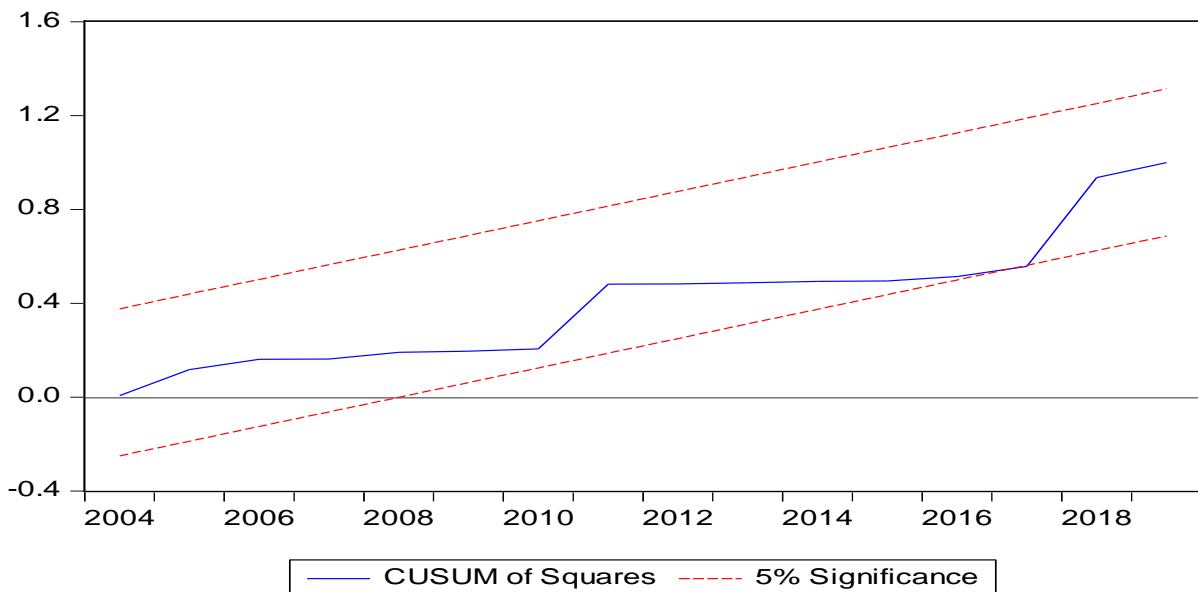

Figure 3: Cumulative Sum of Recursive Residual Squares Test Results from *EViews*

4. Conclusion

The study attempted to identify and assess the nature of the relationship that existed between external public debt and the economic growth of Sri Lanka, both, in the long run and short run throughout 1990 – 2019, by focusing on GDPPC as a function of external public debt, gross capital formation, labour force participation rate, government expenditure on education. The long-run equilibrium equation was obtained by applying the bounds cointegration test while short-run results were obtained through Error Correction Modeling. The results confirmed the existence of a negative relationship between external public debt and economic growth in the long run. Further, the significant adjustment parameter received from the cointegration equation also confirmed the

existence of a negative relationship in the long run. Therefore, this study indicates that external public debt is one of the drastic influence factors on the economic growth of Sri Lanka. The drastic influence of external public debt on the economic growth of Sri Lanka may have been the contributing factor to the persistent low rate of revenue collection despite the steady increase in per capita income, over the last two years in the country. Hence, it was required for the policymakers to pay more attention to debt when formulating economic policies in Sri Lanka.

In terms of appropriate policy implementation, it is highly recommended to obtain increased domestic savings and export earnings so as to raise the estimated growth rate and lessen the reliance of the government on external debt. Additionally, a broadened tax base and a suitable tax compliance methodology need to be put into practice as an endeavour to eliminate evasion. Furthermore, it is also highly crucial to create a conducive environment that encourages investment and foreplays with much focus on policies that relate to the inflow of Foreign Direct Investment (FDI), reducing the inflow of debts. In respect to this matter at hand, there is a severe need for close monitoring and consistent debt management strategies to avoid the mis-utilization of external debt.

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