



## **Impact of public education expenditure on economic growth in Sri Lanka: Evidence from econometrics analysis**

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### ***Abstract***

*This study examined the effect of government spending for education on economic growth in Sri Lanka for the period spanning from 1974 to 2018. The econometrics analysis includes Unit root, bound test of cointegration analysis and error correction. Unlike other previous studies, this study used basic disaggregate form of government expenditure on education; government expenditure on general education and government expenditure on higher education as major explanatory variables together with other macro-economic variables. The study findings include that government spending on higher education and economic growth in Sri Lanka is positively and significantly related while public expenditure on general education has a negative impact on economic growth. Short term causality test exits, there is evidence of short-run granger causality from government educational expenditure on higher education and general education to economic growth. Findings of the study reveal that in the long run, government educational expenditure on higher education, through its impact on human capital, significantly and positively influence economic growth. Thus, such spending on education should be encouraged in the public sector. Since the study identified different results from its disaggregated analysis of education on economic growth, government should pay more attention on the improvement of the productivity of the education sector to have greater impact on economic growth.*

**Keywords:** *Bound testing, economic growth, human capital, public expenditure on education.*

### **1. Introduction**

It is widely accepted that education is an important source of human capital formation of a country. In most of the studies expenditure on education was used as a proxy for human capital formation (Barro, 2001; Temple, 1999; Mankiw, 1992; Nonneman & Vandhoul, 1996). The

importance of education can be further explored as it is often called as a merit good. This is due to the fact that through education worth providing to society is greater than worth providing to the individuals for a longer term. Expenditure on education is a long-term investment that could bring a high level of productivity of labour which in turn contributes positively to the growth of Gross Domestic Product (GDP). Not only the physical development, there are huge indirect benefits passed to the society in improving the level of education. This improves the various other aspects such as health, nutrition, sanitation and also discipline of the society. Therefore, expenditure on education produced externalities into the economy which could speed the development process of the nation (Sunde, 2017). As such, literature supports the hypothesis of this study between education expenditure and economic growth nexus as education is an important determinant of economic growth of a country and plays a vital role in promoting economic growth and development (Barro, 2001). Moreover, the benefits of education will not pass to the economy and society instantaneously and it requires going through a few education cycles and also the most adverse situation is the existence of educated unemployment which restricted the contribution of education to the growth of output in the economy.

Most of the countries in the world have recognized the importance of promoting education as a means of improving productivity and invest heavily in the education sector (Chandra, 2010). Therefore, countries in the world pay much attention to the education sector in their national policy development (Victor, 2015). In Sri Lanka government budget proposals have recognized education as the main expenditure category and allocate 9.75 percent from its total expenditure for the education sector during the period 2012-2018. This study aims to find out whether education expenditure has any significant impact on national output with the given prominence of the national budget over the last period under the government policy of free education.

There is a plethora of studies conducted on whether the investment of education can contribute significantly to the economic growth of a country. Most of the empirical studies identified a positive relationship between the education expenditure and economic growth (Ali, Abdul-Hakim & Abdullah, 2016; Sunde, 2017; Tomic, 2015; Mallick, Das, & Pradhan, 2016; Kakar, Khilji, & Khan 2011), but some other studies confirmed a negative association too (Baldwin & Borrelli, 2008; Bolkol, 2016; Devarajan, Swaroop, & Zou, 1996) and few studies questioned about the education growth nexus (Levine & Renault, 1992; Blis & Klenow, 2000; Ansari & Singh, 1997). It seems country specific studies are limited in this nature. Further, time series country specific studies are potentially more important as such studies capture country specific factors, although the findings cannot be generalized to other countries (Dilrukshini, 2009). In this context, it's vital to examine using the time series data, the contribution of the education sector to promote economic growth in Sri Lanka as the education provides by the government equally to all the children in the country. Even though government invests annually a sizable portion from the total budget on education the returns to investment in education significantly lower than those found for other developing economies (Ganegodage & Rambaldi, 2011). This urges a deeper analysis on education growth nexus in Sri Lanka.

The empirical evidence suggested by a large body of literature provides mixed and inconsistent results on education growth nexus. Therefore, this study aims to investigate the

impact of public education expenditure on economic growth on empirical ground as a case study of Sri Lanka for the period 1974 to 2018. The paper argues that provision of more funds available for general and university education as a source of human capital development lead to the development of the growth of the economy and this study makes two main contributions to the empirical literature on education-growth nexus. Firstly, it examines the joint effect of expenditure on general education and university education on growth performance in Sri Lanka. Secondly, it applies the standard bound testing approach of cointegration methodology to investigate the human capital development on economic growth in Sri Lanka. As such, this paper provides new evidence by examining the influence of education expenditure as a main determinant of economic growth in Sri Lanka based on a large range of data set spanning from 1974 to 2018.

The paper is structured as follows. Section two briefly reviews the theoretical and empirical literature on nexus between education and economic growth. Section three provides a brief overview of the government expenditure on education during the study period; section four brings out the sources of data and methodology and model specification of the study, while section five presents the empirical evidences and discussion of results with respect to the impact of government expenditure on education and economic growth in Sri Lanka. The final section presents the conclusion and policy implications of the study.

The dialogue between economic growth and its determinants in particular its macroeconomic factors have paid much attention in the literature with the development of economic theory (Tilak, 2011). The next section deals with the extensive review of literature on dialogue between education expenditure and economic growth.

## **2. Review of literature**

### **2.1 Theoretical literature**

In the history of economic thought, since the era of Adams Smith different ideas were developed on economic growth and its determinants. According to the Keynes (1936), economic growth mainly depends on the government expenditure. According to this theory, government expenditure is an independent exogenous variable which affects to economic growth through a multiplier effect. Thus, economic growth occurred due to increasing government expenditure. Solow (1957) growth model provides the necessary foundation for the growth accounting but that model totally ignored the human capital as the most important factor in the determination of economic growth. This was highlighted with the development of the endogenous growth models pioneered by Romer (1990) and Lucas (1988). The growth literature turns to a new aspect with the pioneered work of Barro (1991). The new growth approach highlighted the social benefit of education which explains the long-term benefits of developing human capital of the nation (Sianesi & Reenen, 2003). Thus, in the modern economics, education as a primary component of human capital has been identified as the key determinants of economic growth.

## 2.2 Empirical literature

In the broad literature there are extensive studies that explored the impact of public investment on economic growth. These studies were cross sectional and country specific macro level studies produced inconsistent and controversial outcomes (Hussin, Muhamm, & Razik, 2012). However, in the case of Asian countries, there are limited studies carried out of this nature (Mallick et al., 2016). Further, most of the studies focused on the impact of human capital on economic growth. However, there are limited studies that focused on the relationship between public spending on education and economic growth. Among that most of the literature confirmed the positive association between public expenditure on education and economic growth.

Sunde (2017) examines the association between education expenditure and economic growth in Mauritius using ARDL bound testing approach and granger causality test for the period 1976-2016 to find out long run and short run relationship between the variables. This study found that there is a positive relationship between education expenditure and economic growth in the long run. Further, the study confirmed the short run unidirectional causality from education expenditure to economic growth. Similar result has been obtained by Ali et al. (2016) in their study on education expenditure and economic growth in Pakistan for the period 1980-2014 using cointegration approach. Further, similar results obtained by the study done by Mekdad, Dahmani and Louaj (2014) with the use of endogenous growth model for the period 1974-2012 for Algeria. In this model GDP per capita regressed against the set of explanatory variables namely public spending on education, gross domestic capital formation and labour force participation rate to form the Cobb Douglas production function.

A study by Mallick et al. (2016) analyzed the dynamics of expenditure on education and economic growth in selected 14 major Asian Countries including Sri Lanka by using balanced panel data from 1973-2012. The results of the cointegration confirmed the positive and significant long run relationship between education and growth in all the 14 Asian countries. The panel VECM presents unidirectional granger causality running from growth to expenditure on education both in the short run as well as long run. But, expenditure on education granger causes economic growth in the long run in all the countries. Hussin et al. (2012) investigated the education-growth nexus in Malaysian economy using time series data for the period 1970-2010 based on the estimation of the vector autoregression model. Findings revealed that economic growth positively cointegrated with fixed capital formation, labour force participation rate, and government expenditure on education. In addition, Kakar et al. (2011) also found that human capital plays a vital role in explaining economic growth in China.

Wang and Liu (2016) developed a panel data model to investigate the impact of education on economic growth, using time series secondary data covering 55 countries for the period 1960-2009. This study examines different educational levels such as primary, secondary and higher education on economic growth. The findings of the study concluded that the positive impact of higher education is significant but primary and secondary education does not have a significant impact on economic growth.

Khattak and Khan (2012) investigated primary and secondary education to economic growth in Pakistan during 1971-2008. The findings showed that only secondary education has a

significant positive impact on economic growth in Pakistan. But, theoretical literature confirmed that investment in education has a long term impact on the accumulation of human capital and has a positive impact on long term growth. In line with this argument some studies confirmed the importance of the composition of education which forms the human capital to confirm the link between education and growth (Mekdad et al., 2014; Miller & Russek, 1997). Another similar study done in the USA by Baldwin and Borrelli (2008), examined the direct and indirect relationship between education spending and economic growth during 1988-2005. The results of the study confirmed the expenditure on primary and secondary education has a negative relationship with per capita income while expenditure on higher education has a significant positive relationship with per capita income in the USA. Similar results obtained by a research done in Turkish economy for the period 1970-2012 by Mercan and Sezer (2013). A research by Lin (2004) concluded that the higher education sector is vital and investment in the higher education sector promotes economic growth. This is supported by some other prior scholars (Liu, 2006; Huang, Jin, & Sun, 2009). Moreover, Pradhan (2009) examined the relationship between higher education and gross output by incorporating error correction models in India for the period 1951-2002 and found unidirectional causality between education and economic growth.

As mentioned above in the introduction, education is a merit good which provides more benefits to society in the longer term. However, some economists argued that expenditure on education is not an investment but just merely consumption. In line with that proposition, Devarajan et al. (1996), a study on 43 developing countries over 20 years concluded that excessive expenditure on education has a negative impact on countries' economic growth. There are other studies that reported no relationship between expenditure on education and economic growth. Levine and Renault (1992) reported that government expenditure on education is not robustly correlated with economic growth. Similar argument brought forward recently by Blis and Klenow (2000) about the link between investment in education and economic growth based on study among 52 countries for the period 1960-1990. He argued that it was too weak to conclude that education significantly contributed to economic growth. Further, studies pay attention to the short run and long run effects of expenditure on education on economic growth. Accordingly, a study done by Kakar et al. (2011) in the case of Pakistan, concluded that there is no significant relationship between education and short run economic growth but its impact in the long run is significant and positive.

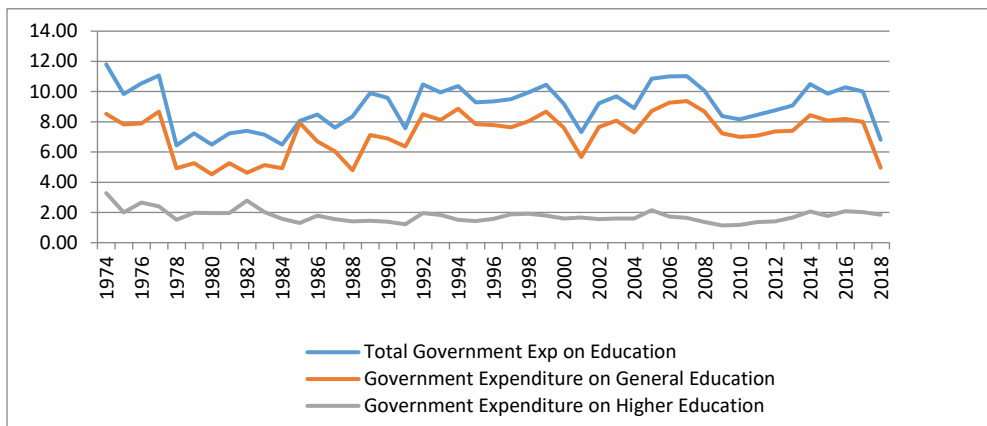
There are limited studies conducted to analyze the impact of public expenditure for education on economic growth in Sri Lanka. Kesavarajah (2012) examined the validity of Wagner's law in Sri Lanka by using cointegration and error correction modeling technique covering the period from 1960 – 2010 based on time series data. The findings of the study confirmed the existence of a long run relationship between public expenditure and economic growth. This result is consistent with the findings of Dilrukshini (2009) and concluded the existence of long-term relationship between public expenditure and economic growth in Sri Lanka. Moreover, both studies rejected the validity of Wagner's Law, and found that there is no empirical support either for the Wagner's Law or Keynesian hypothesis, in the case of Sri Lanka.

Ganegodage and Rambaldi (2011) investigated education growth nexus for the period 1959-2008 using standard classical and endogenous growth model. Further, model framework enriched by adding physical capital, economic policy changes and the ethnic war due to their substantial importance. The impact of education is assessed through a quality-adjusted human capital stock live. The returns to investment in education are positive however, considerably below those found for different developing economies. In addition, Dilanee (2019) and Shaista, Abida and Butt (2010) confirmed the positive association between public expenditure on education and economic growth in Sri Lanka in the long run.

### 2.3 Trends in public expenditure on education in Sri Lanka

Education in Sri Lanka is state funded and offered free of charge at all levels: general and university level. Sri Lanka provides general education for 13 years under three cycles' namely primary, junior secondary and senior secondary level. Government has taken steps to promote the education sector after 1977 with economic reforms in Sri Lanka.

Figure 1 shows the trends in government expenditure on general education and higher education as a percentage of total government expenditure for the period 1974-2018. According to Figure 1, noticed slight fluctuations of total government expenditure on education in nominal terms throughout the period. The relevant figure has decreased from 11.8 percent in 1974 to 6.8 percent in 2018 and the period average was 9.1 percent of total government expenditure. The fluctuation in the total government expenditure on Education is mainly explained by the variations in the allocation of general education.

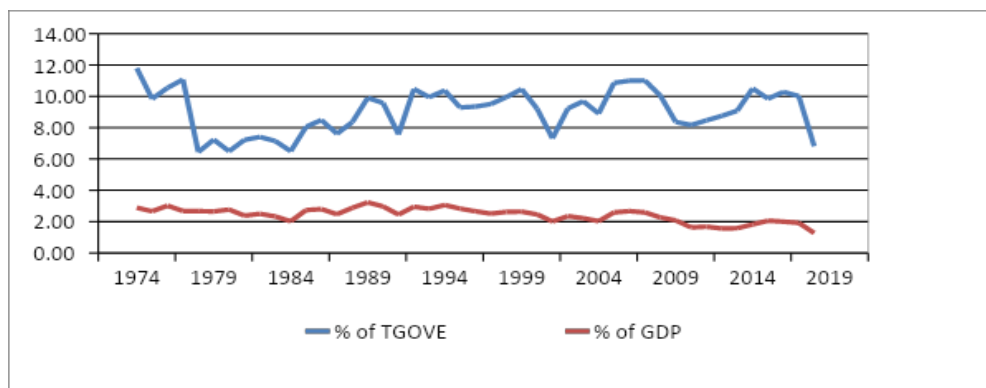


**Figure 1** Government expenditure on education (as a % of total govt. expenditure)

Source: Central Bank annual report 2019.

The provision for the general education is significant in the total government expenditure and the reported average for the period was 7.2 percent of total government expenditure. It has been reported that the decrease in the allocation for higher education from the total government expenditure throughout the period. The relevant figure has been declined from 3.2 percent in 1974 to 1.8 percent in 2018 and the period average was 1.8 percent as a

percentage of total government expenditure. Figure 2 below reflects Government education expenditure as a percentage of GDP for the period 1974-2018.



**Figure 2** Government education expenditure as a % of GDP -1974-2018

Source: Central Bank annual report 2019.

The rate of total government expenditure as a percentage of GDP has declined during the period 1974-2018. The public spending on education was relatively high during the period 1977-1995 comparison with other periods. For instance, the average public spending on education during the period 1977-1987 was 2.5 percent of GDP whereas the reported figure further increased on average during the period 1988-1995 up to 2.9 percent of GDP. But there after the successive governments came into office unable to upsurge the trend but the figure has declined continuously. The period 1996-2004, it was 2.4 percent of GDP, from 2005-2010, it was 2.3 percent and finally from 2011-2018 period, it was 1.7 percent. The reported average figure for the period 1974-2018 was 2.4 percent of GDP.

### 3. Methodology

#### 3.1 Sample and data source

The broad theoretical and empirical literature proclaims that the enhancement of human capital through education is an important determinant of economic growth (Pelinescu, 2014; Funke & Strulik, 2000; Bundell et al., 1999; Lucas, 1988). As such, in the present study identified public investment in education as an important determinant of economic growth when designing growth models.

The study mainly used secondary data as the study incorporated a macro approach. The annual time series data used for the analysis covers the period 1974 to 2018. The relevant data will be collected from Central Bank Reports. Different variables have been used in the literature to analyze the impact of public expenditure on education on economic growth. Further, the model is enriched by adding another two control variables namely, inflation rate and trade openness. The variables under consideration are GDP, gross domestic capital formation, labour force participation rate and public expenditure on education, inflation rate and trade openness variable. A brief description of the variables and justification of selecting such variables are summarized in Table 1.

### 3.2 Model specification

The analysis of this study was broadly carried out on the basis of deductive research methodology. The investigation was started with formulation of the relevant theoretical statement and tries to find out if the theory is falsified by the available information. Therefore, the progression of the analysis is based on the confrontation of theory with the empirical findings. Initially, the research explains the theoretical background and empirical studies on human capital and economic growth. Then, researchers looked at the pattern of government expenditure on education in Sri Lanka during the study period. This will be able to identify trends in the education system in Sri Lanka. Moreover, it will be helpful to identify public expenditure on education as a main explanatory variable of that model.

The model framework of this study is based on the augmented Cobb Douglas production function which explains the determinants of economic growth. Initial classical production function is given as (1).

$$Y = A.K^\alpha. L^\beta \rightarrow (1)$$

The development of endogenous growth literature added human capital the equation 1 is given as,

$$Y = A.K^\alpha. L^\beta. H^\gamma \rightarrow (2)$$

Where Y is output, A is Technological progress, K is capital, L is labour and H is human capital. In the present study human capital is measured by public expenditure on education which includes expenditure on general education and expenditure on University education. The log linear form of function which explains the growth determinants can be as follows (3) and the extensive model is reported in equation 4.

$$\text{Ln}Y = \alpha\text{Ln}K + \beta\text{Ln}L + \gamma\text{Ln}H \rightarrow (3)$$

The updated empirical log linear function which explains the impact of expenditure on public education on economic growth is given by equation 4.

$$\text{LnRGDP}_t = \alpha_1\text{LnGDCF}_t + \alpha_2\text{LnLFPR}_t + \alpha_3\text{LnGEGE}_t + \alpha_4\text{LnGEHE}_t + \alpha_5\text{INFR}_t + \alpha_6\text{LnFT}_t + U_t \rightarrow (4)$$

Where Y is Gross Domestic Product (RGDP), K is the capital which is measured by gross domestic capital formation (RGDCF), L is the labour whose proxy is Labour Force Participation Rate (LFPR) and H is human capital whose proxies are formed based on major disaggregated form, Public Expenditure on General Education (GEGE) and Public Expenditure on Higher Education (GEHE). The present study rather than just relies on major growth variables including the human capital proxies, employs more macroeconomic variables that may have an impact on economic growth. Accordingly, study employs INFR is the inflation rate and FT represents trade openness variables. And finally,  $U_t$  is the random error term. All the figures are measured in real terms deflated using the implicit price index (base year 1996). They are all expressed in logarithm except inflation rate.



Table 1  
Description of variable selection

Name of the variable	Abbreviation	Data source	Definition	Justification
Real GDP	RGDP	Central Bank Annual report	Annual average real GDP growth rate using GDP Deflator (1996=100)	Different measures of economic growth have been used in the literature (Victor, 2015). This study uses real GDP as a measure of economic growth
Public Expenditure on General education	GEGE	Central Bank Annual report	Total real government expenditure on general education which includes primary and secondary education as % of GDP	As a proxy for human capital (Khattak & Khan, 2012)
Public Expenditure on Higher education	GEHE	Central Bank Annual report	Total real government expenditure on Higher Education as % of GDP	As a proxy for human capital (Baldwin & Borrelli, 2008; Lin 2004; Pradhan, 2009)
Gross Domestic Capital Formation (investment)	GDCF	Central Bank Annual report	Gross Domestic Fixed capital formation as a % of GDP	As a proxy for physical capital (Mekdad et al., 2014)
Labour	LFPR	Central Bank Annual report	Economically active population as a % of Labour-force	As a proxy for labour (Hussin et al., 2012; Mekdad et al., 2014)
Foreign Trade	TFT	Central Bank Annual report	Total exports and Imports as a % of GDP	As a proxy for openness variables (Devarajan et al., 1996)
Inflation	INFR	Central Bank Annual report	Annual average % change in GDP Deflator	As a stability variable (Barro, 1997)

*Source: Survey data.*

### 3.3 Analytical tools and techniques

Since the study deals with time series data, a test for stationary is a very important precondition before proceeding to deeper analysis. In general, various macro-economic theories assumed a long run stable relationship between certain economic variables. This means that a set of macroeconomic variables cannot move away too far from each other, if there is a long run relationship among them (Rathnasiri, 2011). Therefore, prior to the estimation of the dynamic model, it is essential to determine the variable's stationary properties or order of integration using unit root test. The unit root test is generally based on either using Dickey- Fuller (DF) tests or Augmented Dicky Fuller (ADF) tests or the Phillips-Perron (PP) unit root tests test. In this study, ADF unit root test is used to check the stationary of the data. It uses a bound testing cointegration approach to find the long run infection of the public expenditure on education and economic growth and uses error correction techniques to verify the short run dynamics of the long run model.

## 4. Results and discussion

### 4.1 Descriptive statistics

Table 2 reports the descriptive statistics of the variables selected for the model. According to Table 2, Sri Lanka has maintained Rs. 10,524 average income at constant prices throughout the period. Moreover, minimum real income was Rs. 2,502 while the maximum real income was Rs. 28,462. Further, Table 2 shows that on average, the mean government expenditure on general education and higher education was 2.4 percent and 0.48 percent per annum respectively. It is also evident that attention given to the education sector is not impressive throughout the period. Further, the country is able to maintain 25.7 percent of investment rate, 55 percent of trade dependency ratio, and 45 percent of labour force participation rate and 9 percent inflation rate on average during the period 1974-2018. The time series standard deviation of gross domestic capital formation, foreign trade ratio, inflation rate and labour force participation rate are substantial for the period of 1974-2018. Also there is an asymmetry, Skewness values were mostly negative or close to zero and lower Jarqua-bera test indicates the normality of the distribution.

Table 2  
Descriptive statistics

Variable	RGDP	GEGE	GEHE	GDCF	FT	INFR	LFPR
Mean	10523.77	2.422000	0.480453	25.76640	55.19059	9.927239	45.72444
Median	7681.280	2.510000	0.448467	25.73109	57.29371	8.799049	48.60000
Maximum	28461.55	3.230000	0.939156	39.05554	80.47409	26.66667	54.10000
Minimum	2502.211	1.270000	0.234156	14.44502	31.32139	0.656814	33.80000
Std. Dev.	7788.936	0.457104	0.156787	4.996689	13.68350	5.436360	6.682717
Skewness	1.040188	-0.601827	0.957258	-0.067174	-0.257322	0.871418	-0.576355
Kurtosis	2.825194	2.638200	3.737102	3.500305	1.844777	3.745820	1.774435
Jarque-Bera	8.172221	2.961907	7.891295	0.503165	2.998873	6.738228	5.307656
Probability	0.016804	0.227421	0.019339	0.777569	0.223256	0.034420	0.070381
Observations	45	45	45	45	45	45	45

Source: Based on survey data.

## 4.2 Unit root tests

The purpose of this study is to investigate the impact of public education expenditure on economic growth of Sri Lanka. As a first step in our data analysis is to see whether the series are stationary or non-stationary; thus, to ensure properties of data, unit root tests are used. The results of the ADF test are reported in Table 3. Accordingly, the test results are going to be summarized with an intercept, without intercept, with intercept and trend at their levels and first difference. The null hypothesis ( $H_0$ ) is that the series  $Y_t$  is I (1). If the calculated t-value (ADF test value) is less than the critical value given in the table, then we cannot reject the null hypothesis that  $Y_t$  has a unit root. That means  $Y_t$  is a non-stationary time series.

According to the ADF test results in Table 3, the null hypothesis of a unit root at levels of all the variables cannot be rejected at 5 percent level. In other words, results clearly show that most of the variables such as LRGDP, LGDCF, LFT are non-stationary at levels except LGEGE, INFR and LGEHE.

Table 3  
ADF unit root test results

Variable	Model	Level (t-stat)	First Difference (t-stat)	Decision
LRGDP	Intercept	0.447881	-6.036763***	I(1)
	Intercept and Trend	-1.431601	-5.981789***	
LGEGE	Intercept	-1.326150	-6.700361***	I(0)
	Intercept and Trend	-3.596102*	-6.661418***	
LGEHE	Intercept	-0.778451	-9.431010***	I(0)
	Intercept and Trend	-3.589056*	-9.587895***	
LGDCF	Intercept	-1.089739	-5.737264***	I(1)
	Intercept and Trend	-2.402293	-5.715070***	
LLFPR	Intercept	-1.398228	-5.859215***	I(1)
	Intercept and Trend	-1.739079	-5.821052***	
LFT	Intercept	-1.788263	-5.359684***	I(1)
	Intercept and Trend	-2.178712	-5.651380***	
INFR	Intercept	-5.802942***	-10.04564***	I(0)
	Intercept and Trend	-6.658765***	-10.04564***	

Note: \*, \*\*\* denotes significance at 5% and 1% level respectively.

But, all the variables are stationary at first difference (see for more details, Appendix 1). That means there exists a mixture of I (1) and I (0) variables in the model. Thus, the most suitable method for estimation in these circumstances is the Autoregressive Distributed Lag Model (ARDL) cointegration technique proposed by Peseran et al. (2001).

## 4.3 Cointegration analysis

Given the results of the unit root test, then the study put forward a step to use the Cointegration procedure in order to test for the existence of a long run stable relationship between the dependent and independent variables. Unit root test shows that the order of variables are I (0)

and I (1). Regardless of the order of integration a bound testing can be applied to find out the long run model. First, the study examined the maximum lag length based on lag length selection criteria and established 4 lag lengths as reported in Table 4. Further, inverse polynomial function of AR form depicts that the variables are stationary as the all variables are lying within the circle (see Figure 3).

Table 4  
VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-8.757516	NA	5.09e-09	0.768659	1.061220	0.875194
1	211.2269	354.1213	1.26e-12	-7.572044	-5.231556*	-6.719767
2	265.1176	68.34922	1.23e-12	-7.810617	-3.422200	-6.212597
3	345.2198	74.24105*	5.05e-13	-9.327796	-2.891452	-6.984035
4	455.6921	64.66672	1.20e-13*	-12.32645*	-3.842174	-9.236942*

\* indicates lag order selected by the criterion.

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

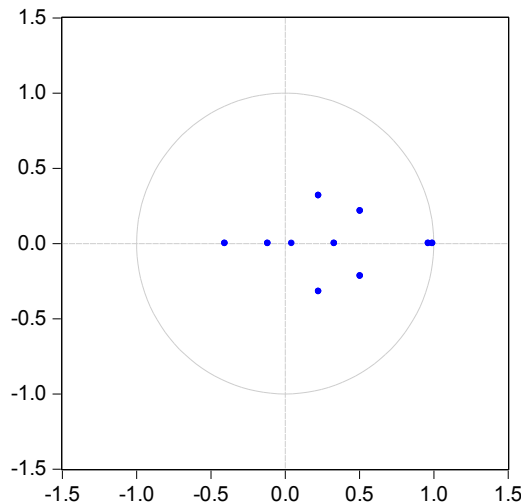


Figure 3 Inverse polynomial function

#### 4.4 ARDL bound test

Table 5 summarizes the estimated results of F tests for the level of significance. The results revealed that F statistics is greater than the upper bound critical values. It reflects that there exists a long run relationship among the variables. Once the model confirms the long term

relationship between education and growth, the next step in the ARDL approach is to determine the long run coefficients in the education-growth model.

The estimated results of the long term ARDL model and long term coefficients calculated by long run results based on the constant model are summarized in Table 6.

Table 5  
Bound test results

Test statistic	Value	Significance level	Bound critical values			
			I(0)	I(1)	I(0)	I(1)
F-Statistic	25.39114					
Lag	4	10%		2.12		3.23
		5%		2.45		3.61
		2.5%		2.75		3.99
		1%		3.15		4.43

As shown in Table 6, all the explanatory variables have significant relationship with the real GDP except foreign trade to GDP. Government expenditure on general education as a percentage of GDP has a significant negative relationship with the real GDP in Sri Lanka. But, government higher education expenditure as a percentage of GDP has a significant positive relationship with the real GDP.

Table 6  
ARDL long run results (selected model: ARDL (1, 5, 5, 5, 5, 5))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGEGE	-1.100741	0.118882	-9.259089	0.0115
LGEHE	0.314833	0.079784	3.946080	0.0586
LGDCF	2.383534	0.084030	28.36516	0.0012
LLFPR	2.821005	0.140294	20.10780	0.0025
INFR	-0.051353	0.002455	-20.91876	0.0023
LFT	-0.136937	0.087851	-1.558751	0.2594
R-squared				0.999998
Adjusted R-squared				0.99965
S.E. of regression				0.003857
F-statistic				30114.01
Prob (F-statistic)				0.000033

Source: Based on survey data.

A 1 percent increase in public expenditure on general education reduces the economic growth in 1.1 percent whereas a 1 percent increase in public expenditure on higher education increases the economic growth by 0.31 percent rates. This implies that more investment in the higher education sector is more beneficial than the investment in general education in Sri Lanka. These findings are consistent with the results of some prior studies (Wang & Liu, 2016; Mekdad et al., 2014; Lee & Kim, 2009; Baldwin & Borrelli, 2008). One may say that the

higher education sector is the main provider of the human capital in a country. Human capital is identified as the most important factor of economic growth (Riley, 2012). The growth effect of the development of human capital can be explained basically in two strands; influence on production through the labour productivity, so called level effect and the rate effect by contributing to competitive advantage through the innovation and diffusion of technology (Pelinescu, 2014; Romer, 1990). There is no doubt as confirmed in this study physical investment contributes greatly to economic growth but accumulation of knowledge through the investment in human capital particularly in the higher education sector moves the economy to a higher stage of growth in the long run.

The long term model shows that gross domestic capital formation is positively correlated and significant with real GDP confirming the theory. A 1% increases in investment increases the economic growth by 2.4 percent annually. This finding is consistent with Victor (2015) and Hussin et al. (2012) which found that capital investment has a positive relationship with economic growth. This is because private investment is recognized as the major source of promoting growth as suggested in the growth theories. Investment in physical assets promotes capital stock which increases the resource base of the country.

In the long run growth model, the proxy for the labour represented by labor force participation rate (LFPR) has a significant positive relationship with the growth in Sri Lanka. This is consistent with the previous findings Victor (2015) and Hussin et al. (2012). In the current study, as a proxy for labour, LFPR contribute well in the growth of the country. Higher LFPR promotes labour productivity in the long run and that will enhance profits of the organizations in which such firms can be reinvested in physical capital. Thus an increase in labour force participation rate will stimulate growth of a country.

The coefficient for the foreign trade as a percentage of GDP is insignificant and this indicates that this variable is not important for explaining the variation in the real GDP in the long run model. But, as a stability variable, inflation rate negatively related with the growth in the long run. High and persistent Inflation increases risk and uncertainty in business decisions and reduces investment in the long run. This finding is in line with the previous literature (Aslam & Lebbe, 2016; Mallik & Chowdhury 2001; Barro, 1997).

#### **4.5 Short run dynamics of the model**

Having identified the cointegration relationship between the variables in the model, the study performed the Vector Error Correction modeling (VECM). System model identified the error correction term as a value which corrects the disequilibrium of the system. It should have a negative sign and should also be significant. If the error correction term/speed of adjustment is a negative sign and significant it confirms the existence of a long term relationship between the variables in the growth model. In addition to the confirmation of the long run relationship, the short run dynamics of the model has been examined by estimating ECM as reported in Table 6. The log changes in the relevant variables represent short run elasticities while ECM term represents the speed of adjustment back to the long run relationship among the variables.

Table 6 indicates that the error correction term is negative and statistically significant. Thus, the results indicate the cointegration among the variables. The absolute value of the coefficient

of the error correction term (i.e. is 0.61) implies that 61 percent of the disequilibrium in the real GDP is adjusted towards the equilibrium annually.

Table 7 denotes the short run dynamics of the error correction mechanism based on the long run model. The short run coefficients of the model indicate that immediate impact of the log difference variables and the subsequent year's impact are highly significant in all cases. The results show that there is a short run relationship among the variables, implying that highly significant short run reaction in real GDP to the variation of public expenditure of general education, public expenditure on higher education, gross domestic capital formation, inflation rate, labour force participation rate and foreign trade.

Table 7  
Error correction results

Variable	Variable ID	Coefficient	Standard error	t-statistics	p-value
C	C1	4.527587	0.168136	26.92814	0.0014
D(LGEGE)	C2	-0.116067	0.005108	-22.72467	0.0019
D(LGEGE(-1))	C3	-0.471984	0.025354	-18.61581	0.0029
D(LGEGE(-2))	C4	-1.296238	0.041776	-31.02816	0.0010
D(LGEGE(-3))	C5	-0.718839	0.023869	-30.11622	0.0011
D(LGEGE(-4))	C6	0.131728	0.008323	15.82749	0.0040
D(LGEHE)	C7	0.351793	0.013171	26.71068	0.0014
D(LGEHE(-1))	C8	0.405440	0.023175	17.49500	0.0033
D(LGEHE(-2))	C9	0.798305	0.030274	26.36906	0.0014
D(LGEHE(-3))	C10	0.579698	0.019098	30.35353	0.0011
D(LGEHE(-4))	C11	0.026686	0.006124	4.357649	0.0488
D(LGDCF)	C12	-0.371442	0.029664	-12.52176	0.0063
D(LGDCF(-1))	C13	0.002818	0.006803	0.414248	0.7189
D(LGDCF(-2))	C14	0.084938	0.008488	10.00712	0.0098
D(LGDCF(-3))	C15	0.592805	0.015277	38.80329	0.0007
D(LGDCF(-4))	C16	-0.045331	0.008642	-5.245178	0.0345
D(LLFPR)	C17	-1.511408	0.050416	-29.97857	0.0011
D(LLFPR(-1))	C18	1.647162	0.067338	24.46107	0.0017
D(LLFPR(-2))	C19	1.464579	0.051769	28.29076	0.0012
D(LLFPR(-3))	C20	1.598867	0.050347	31.75666	0.0010
D(LLFPR(-4))	C21	-1.604984	0.061269	-26.19580	0.0015
D(INFR)	C22	0.015767	0.000406	38.82213	0.0007
D(INFR(-1))	C23	-0.029509	0.001276	-23.12532	0.0019
D(INFR(-2))	C24	-0.031300	0.001094	-28.60429	0.0012
D(INFR(-3))	C25	-0.033954	0.001150	-29.51605	0.0011
D(INFR(-4))	C26	-0.000661	0.000164	-4.042786	0.0561
D(LFT)	C27	0.510347	0.020868	24.45628	0.0017
D(LFT(-1))	C28	-0.674722	0.018410	-36.65038	0.0007
D(LFT(-2))	C29	0.618547	0.024106	25.65893	0.0015
D(LFT(-3))	C30	-0.156446	0.008196	-19.08883	0.0027
D(LFT(-4))	C31	0.173070	0.008565	20.20628	0.0024
CointEq(-1)*		-0.618603	0.023200	-26.66368	0.0014

R<sup>2</sup> 0.999271; Adj. R<sup>2</sup> 0.996446; Std. Err 0.001928; F-stat 353.7541(0.00); AIC -9.673783  
Source: Based on authors calculations.

The short run dynamics of the error correction model reveals that government expenditure on general education has a negative impact on real GDP. This finding is confirmed by Baldwin and Borrelli (2008) which identified a negative association between government expenditure on primary and secondary education expenditure on economic growth. However, the association between government expenditure on higher education and real GDP is positive in the short run. This finding is also in line with the previous literature where most of the studies confirmed the positive association between government expenditure on higher education and economic growth (Lin, 2004; Liu, 2006; Baldwin & Borrelli; 2008; Pradhan, 2009). Moreover, the gross domestic capital formation, labour force participation rate and Foreign trade as a percentage of GDP (in most cases) have positive impact on Real GDP in the short run but inflation has negative impact on real GDP in the short run.

#### 4.6 Diagnostic tests

To test the robustness of the results obtained, the study used tests for autocorrelation, normality, heteroscedasticity, misspecification and stability test. The diagnostic test of the error correction model indicates that there is no evidence of serial correlation and heteroscedasticity. Further Jarque-Bera normality test indicates that the residuals are normally distributed. Ramsey Reset Test indicates an absence of general specification errors. The results of the CUSUM test for parameter stability indicate that the parameter instability is not found because the cumulative sum does not go outside the area between the two critical lines (see Table 8 and Figure.4).

Table 8  
Diagnostic tests

Test Criteria	F- Statistics	Prob.
Breusch-Godfrey LM Test	2.368586	0.3668
Heteroskedasticity Test: ARCH	4.303145	0.0451
Jarque-Bera Test	3.812297	0.1435
Ramsey Reset Test	0.452169	0.6231

Source: Authors calculations.

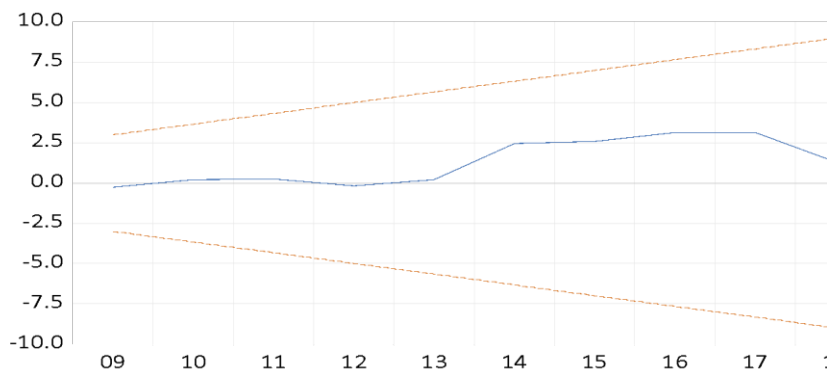


Figure 4 CUSUM test result



## 5. Conclusion and recommendations

This study has used a large data set spanning from 1974 to 2018, in order to assess the potential impact of government expenditure on education on economic growth of Sri Lanka. Moreover, study also investigated the impact of certain other macro variables on economic growth. The novelty of this paper is that instead of general form of government expenditure used in many studies previously, the current study incorporates main disaggregated form of government expenditure: government expenditure on general education and government expenditure on higher education as main explanatory variables to achieve intended objective of the study with other explanatory variables. As such, current study used a comprehensive model of economic growth. The bound testing ARDL model with ECM techniques has been used for the data analysis to find out the long run and short run relationship between education expenditure and economic growth in Sri Lanka. The ARDL Bound Tests has identified long-run relations among the variables. ECM is found that in the variation of economic growth both the human capital variables and other explanatory variables have significant causal effect.

This study revealed that a large body of literature has focused on the relationship between education expenditure and economic growth. These studies were cross sectional and country specific macro level studies produced inconsistent and controversial outcomes. Most of the previous empirical studies identified a positive relationship between government expenditure on education and economic growth in the long run but fewer studies identified negative associations on it. Moreover, the studies done on this nature were limited in the Sri Lankan context.

The findings of the study confirmed that public expenditure on higher education has a positive and significant relationship with economic growth, both in the short run and long run. But, the study revealed that public expenditure on general education has a negative relationship with economic growth, both in the short run and long run. Thus, current study identified different impacts of general education and higher education on economic growth through the main disaggregates form analysis. This means that the performance of a country in the development process is closely related with the effectiveness of the education system. Further, study confirmed that other macro variables such as private investment, labour have a positive impact on economic growth whereas inflation has a negative impact on economic growth.

The study would like to make the following recommendations based on the findings of the study. The findings of the study confirmed that the higher education sector in Sri Lanka is a very important source of promoting economic growth through producing human capital for the nation. So that the study highlights investment in the higher education sector is an essential determinant of economic growth in the long term. Government spending on higher education is one of the investments which could generate skilled labour and their productivity would again result in economic growth. So that government expenditure on education would create human capital which in turns make innovations and enhance technological development in the longer term. Thus, the government upsurge the expenditure on higher education in order to get more benefits to the nation in the long term but at the same time monitoring mechanisms should be established to ensure effective utilization of such funds for the intended projects.

The results of the bound testing and error correction analysis reflect that government expenditure on general education has a negative impact on economic growth in Sri Lanka both in the short run and long run. The analysis of data revealed that the government has spent 7.2 percent on average on general education as a percentage of total government expenditure during the period of study. The one side of this picture reflects mismatch between general education system and the real sector in the economy. Thus, this mismatch should be addressed by the policy makers by introducing appropriate education reforms to improve the relevance of the general education sector with more growth orientation. The other side of the negative impact on economic growth may be due to the excessive investment in general education and associated lower productivity. Therefore, it is required to improve the productivity of general education to have a great impact on economic growth in the longer term. According to the study done by Ranasinghe, Arunathilake, and Dunusinghe (2016) on the investment in general education in Sri Lanka, has focused on the fund allocation, fund utilization and human resource competencies in the general education sector. According to them “human resources are the most important element in schools; hence, necessary steps should be taken to improve the quality of human resources not only for the teaching purpose but also for the implementation of development plans”.

This study emphasized the quantity side of education rather than quality of education. By considering the importance of education in the economic growth of Sri Lanka, other factors such as quality of education should be given prompt attention by the government.

## 6. Future line of research

For future research, examining the transmission mechanism of how government current and capital spending on education translate to higher productivity and economic growth can be further explored. In this context, identifying more disaggregated forms of current and capital expenditure is vital for a fruitful research.

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