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The Size of the Government and Economic Growth: An Empirical Study of Sri Lanka

SRE-Discussion 2009/08 2009

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1. Introduction

Growth models are fundamentally of two fold; the neoclassical growth model, also known as the exogenous growth model developed primarily by Solow (1956) and the new growth theory, also known as the endogenous growth model, pioneered by Romer (1986), Lucas (1988), Barro (1990) and Rebelo (1991).

The analysis of growth has long been based on the Solow's neoclassical growth theory which takes into account the linear relationship between a range of variables and economic growth in the long run. Solow's neoclassical theory predicts that economies grow with the exogenous technology change, and income per capita of countries converges over time. Based on this theory, economic growth is an effect of an external cause and therefore, government policy cannot affect growth except during the transition to steady state.

On the other hand, the new growth theory establishes that transition and steady state growth rates are endogenous, implying that long-run economic growth rates are also endogenous. The introduction of the new growth theory, which also permits non-linear relationship between government expenditure and economic growth, has therefore changed the view on the role of the government in the growth process. It maintains, contrary to the neoclassical growth theory, that endogenous factors including government can influence economic growth. As a result, government policy plays a role in navigating economic growth.

* The substance of this paper arose from conversations with Janusz Szczypula and Victor Pontines at Carnegie Mellon University. The author is thankful to their advice and criticism. The author is also thankful for feedback of Gunther Maier, Martin Zagler and Michael Hauser at the Vienna University of Economics and Business, and Thomas Url and Martin Falk at the Austrian Institute of Economic Research. Partial funding received from the Research Institute for Spatial and Real Estate Economics at the Vienna University of Economics and Business to attend the ICAS 6 convention is gratefully acknowledged. Remaining errors are authors own responsibility.

This paper looks at two main issues related to government expenditure and economic growth in Sri Lanka. First issue is, if government expenditure increases or decreases economic growth. The study attempts to address this issue by explaining the significance of total government spending and the impact that government spending has on growth of the economy. Second issue deals with the possibility of empirically verifying the existence of the Armey curve in the context of Sri Lanka. The phenomenon of the Armey curve has been empirically established for the United States and many Western countries over the last decade, but it was hardly investigated in the context of developing countries. This study provides an analytical framework based on standard time series regression methodology to analyse the relationship between government expenditure and economic growth in Sri Lanka.

It is expected that the results obtained in the context of Sri Lanka could be of relevance to other developing countries, at least to those with similar economic structures or size. Other countries in the same level of development, therefore, may infer from the results. If government spending in developing countries have a significant positive impact on the economic growth at macro level, it may explain the long, more or less steady, rise in government spending as a fraction of real gross domestic product (RGDP).

2. Theoretical background

Government spending and economic growth

The literature regarding government expenditure (or government size) and economic growth comprise of studies that assume a linear as well as a non-linear relationship between government expenditure and economic growth. Most of them are based on linear models, although Sheehey (1993), Armey (1995), Tanzi & Zee (1997), Vedder & Gallaway (1998), Giavazzi, Jappelli & Pagano (2000), among others, subscribe to forms of non-linear relationship.

A review of literature provides inconclusive evidence whether government expenditure is detrimental to economic growth. On the one hand, Landau (1983), Landau (1986), Grier & Tullock (1987), Barro (1989, 1990, 1991), Alexander (1990), Engen & Skinner (1992), Hansson & Henrekson (1994), Devarajan, Swaroop & Zou (1996), Gwartney, Holcombe & Lawson (1998), Folster & Henrekson (1999), Folster & Henrekson (2001), Dar & Amirkhalkhali (2002), and Chen & Lee (2005) support a negative relationship between government expenditure and economic growth. On the other hand, Rubinson (1977), Ram (1986), Kormendi & Meguire (1986), Grossman (1988), Diamond (1989), and Carr (1989) establish argument of a positive relationship between the two variables. The studies by Devarajan, Swaroop & Zou (1993), Sheehey (1993), Hsieh & Kon (1994), Hsieh & Lai (1994), Lin (1994), Cashin (1995), and Kneller, Bleaney & Gemmell (1998) put forward mixed results while Kormendi & Meguire (1985) disagree that there is a significant relationship between government expenditure and economic growth.

The relationship between economic growth and government size in the context of Indonesia has been reviewed by Ramayandi (2003). This paper claims that government size tends to have a negative impact on growth. In a separate study by Higgins, Young & Levy (2006), the relationship between the US economic growth and the size of government is explored at three levels: federal, state and local. They conclude that all federal, state and local governments are either negatively correlated with economic growth or are uncorrelated with economic growth. Grimes (2003) reassessed the work of Gwartney, Holcombe & Lawson (1998) with respect to 22 OECD countries and found that the size of government has only a minor effect on long-term growth outcomes. A study completed by Bagdigen & Hakan (2008) to examine the validity of Wagner’s Law using data for Turkey concluded that public expenditure has no effect on economic growth.

There are studies that test whether the evidence is consistent with the predictions of endogenous growth model that the structure of taxation and public expenditure can affect the steady-state growth rate. For instance, Kneller, Bleaney & Gemmell (1999) use data for 22 OECD countries to demonstrate that productive government expenditure enhances growth, whilst non-productive expenditure does not. The study by Miller & Russek (1997) examines the effects of fiscal structure on economic growth. They found evidence to support the view that debt-financed increases in government expenditure retard growth and tax-financed increases stimulate growth for developing countries. Debt-financed increases in government expenditure do not affect growth and tax-financed increases reduce growth for developed countries.

If governments could interfere in the economic growth process by involving in the economy, how much government involvement is needed? One could use the notion of optimal size of government to answer this question. The idea of optimal size of government was refined and popularised by Armey (1995) through his so-called 'Armey Curve' that explains the optimal government size which ensures a positive incremental economic growth for a particular country.

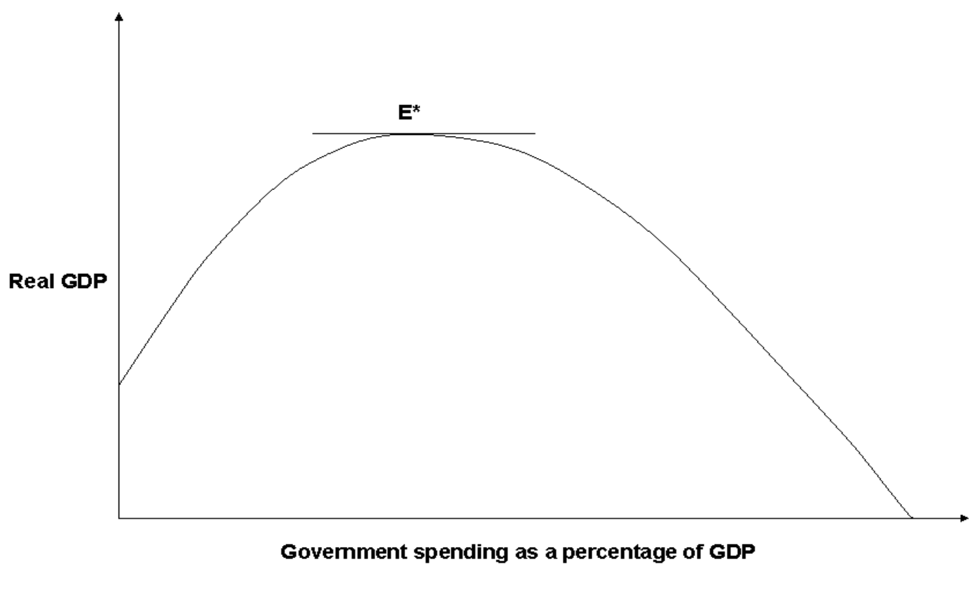
The concept of the Armey curve

Vedder & Gallaway (1998), borrowing from Armey (1995), have argued that non-existence of government causes a state of anarchy and low levels of output per capita, because there is neither rule of law nor the protection of property rights. Consequently, there is little incentive to save and invest. Only a little wealth was accumulated by productive economic activity when governments did not exist and anarchy reigned. The rule of law and the establishment of private property rights contributed significantly to economic development when a government is in place. No economy has ever obtained high levels of economic development without a government. On the contrary, there is a general consensus that excessively large governments have reduced economic growth too. Output per capita is low when all input and output decisions are made by government. However, output should be large where there is a mix of private and government decisions on the allocation of resources. In this context, government involvement in the economy is a necessary but not a sufficient condition for growth.

Armey (1995) borrows a graphical technique similar to that was popularized by Kuznets (1955, 1963)[i] and Laffer (1980s)[ii] to further explain this phenomenon. Armey (1995) maintains that low government expenditures can increase economic growth until it reaches a critical level; nevertheless excessive government expenditures could harm economic growth. He suggests a relationship similar to that of Kuznets curve between government expenditure and economic growth, and indicates that size of the government and the growth of the economy could also be modelled as a quadratic function, i.e. an inverted U-shaped curve. The expected model is a quadratic one that assumes a role for both the linear term and the squared term of government expenditure in the economic growth process.

This phenomenon could be put into a graphical perspective. The output-enhancing features of government should dominate when government is very small, and expansions in governmental size should be associated with expansions in output. The presence of a government or a collective action creates improved transportation and reliable medium of exchange which would lower the trading costs. Nevertheless, growth-enhancing features of government should diminish at some point and further expansion of government should no longer lead to output expansion. For instance, as spending rises, additional projects financed by government become increasingly less productive and the taxes and borrowing levied to finance government impose increasing burdens creating disincentives to workers. At some point, the marginal benefits from increased government spending become zero (point E* in Figure 1). The growth enhancing features of government start to diminish when the adverse effects of a big government result in a reduction of output growth. Excess infrastructure lowers benefits per dollar spent while higher tariffs de-motivate imports and exports. Further expansions of government contribute to further decline in output (Vedder & Gallaway, 1998).

Figure 1 Government spending and the economy (Armey curve)



There are relatively a few studies in the recent literature that empirically test the occurrence of the Armey curve. Vedder & Gallaway (1998) statistically test the validity of the Armey curve phenomenon in the context of United States, Canada, Denmark, Italy, Sweden and Britain. They provide empirical evidence supporting the incidence of the Armey curve for these countries. Vedder & Gallaway further provide an approximate principle that explains the validity of the Armey curve: the growth of government in emerging economies tends to increase output despite the fact that many modern Western economies are in the downward-sloping portion of the Armey Curve, where reduction in the relative size of government generates positive effects on economic opportunities for the citizens.

The study of Pevcin (2004) investigates the relationship between government spending and economic growth using a sample of European countries. Based on the panel data regression analysis using five-year arithmetic averages, Pevcin states that there is clearly observable negative relationship between the size of government and economic growth. This study empirically claims that arguments in support of the Armey curve are affirmative.

Handoussa & Reiffers (2003) study the relationship between size of the government and economic growth in the case of Tunisia. Using data for the three decades from 1968 to 1997, the authors attempt to establish the Armey curve. They not only observe the presence of the Armey curve but also empirically argue that 35 per cent of government expenditure is the ideal threshold required in the context of Tunisia. The study asserts this government size as credible taking in to account the significant role played by the Tunisian state in economic activity.

One of the difficulties that could arise in these studies is to obtain relevant data for calculating the optimum proportion of public spending. As Radwan & Reiffers (2004) demonstrate, data on different types of public spending in Israel is very difficult to obtain given military and defence spending is considerably unavailable. Radwan & Reiffers, considering only public consumption, estimate that 44 per cent of public consumption to gross domestic product (GDP) ratio as optimal. However, they maintain that this high figure is realistic in a country where the state has been all-pervading for a long time.

3. Methodology and data sources

In a previous paper, Vedder & Gallaway (1998) statistically test the concept of the Armey curve using USA data. Their results suggest occurrence of the Armey curve in USA over the time period from 1947 to 1997. In a separate section, the authors substantiate the claim that these results could be generalised into many Western economies. The present paper adopts a methodology similar to that of Vedder & Gallaway with several adjustments to examine the relationship between government expenditure and economic growth with relation to a developing country, i.e. Sri Lanka.

The approach used by Vedder and Gallaway (1998) is to relate government size (G) to economic growth (O). The government size is represented by government expenditure as a percentage of output (GDP), and the growth of the economy is represented by total output (RGDP). It provides the following quadratic function:

$$O = \beta_0 + \beta_1 G - \beta_2 G^2 + \varepsilon$$

The positive coefficient of the linear G term is related with the constructive effects of government spending on output, and the negative coefficient of the squared G term is designed to demonstrate the negative effects of increased government size. In addition to government size, human and physical capital resources of a country grow over time. This is taken into account by adding in a time variable T. The effect of business cycles on output is captured by the variable, unemployment (U). The coefficient of U is expected to be negative, because increased unemployment will result in reduced growth. The resulting expanded equation is as follows:

$$O = \beta_0 + \beta_1 G - \beta_2 G^2 + \beta_3 T - \beta_4 U + \varepsilon$$

The present study diverges from the work of Vedder & Gallaway (1998) in several ways. The dependent variable of the present study is real gross domestic product per capita (*RGDPpc*)[iii] without the government expenditure component. This data series is calculated as follows: first, only RGDP without government component is considered to avoid Wagner's Law effect[iv] and Baumol's cost disease[v]; next, *RGDPpc* is calculated to control for changes in population; then, the Hodrick & Prescott filter (1997)[vi] is used to control for business cycle effects.

This analysis, rather than relying on a simple dummy variable to enumerate human and physical capital, employs more macroeconomic variables that may have an impact on economic growth. The independent variables include the investment share of RGDP (*ki*), the consumption share of RGDP (*kc*) and openness in constant prices (*openk*) in addition to the government share of RGDP (*kg*) and the square term of government share of RGDP (kg^2). The inclusion of the variable kg^2 assists to empirically verify or invalidate the phenomenon of the Armey curve within this framework. The random error term is referred to as Є.

The resultant multiple regression equation is given as follows:

$$RGDP_{pc} = \beta_0 + \beta_1\ kg + \beta_2\ kg^2 + \beta_3\ ki + \beta_4\ kc + \beta_5\ openk + \varepsilon$$

The macroeconomic variables applicable in the analysis comprise national data series that are collected annually. This study, therefore, estimates a time series regression rather than a cross-sectional regression given that the variables in concern are data series with time dimension.

Data sources

The study is based on country-level data of Sri Lanka. Although government expenditure data is available since 1950, reliable data on national income of Sri Lanka is only available after 1959. Therefore, the study period runs from 1959 to 2003 inclusive (45 years).

All data comes from two different sources. The dependent variable is calculated from GDP at current market prices (Sri Lankan rupees million), gross domestic product deflator (GDPD) (1996=100), mid year population, and government expenditure data obtained from the annual reports of the Central Bank of Sri Lanka from 1959 to 2003.

This study also uses data from the Penn world tables available at the website of the Centre for International Comparisons at the University of Pennsylvania. Data for the following variables taken from these tables is presented as percentages: the government share of RGDP (*kg*), the investment share of RGDP (*ki*), the consumption share of RGDP (*kc*), and the openness in constant prices (*openk*).

4. Empirical results and discussion

The empirical findings are reported in this section. The descriptive statistics, the results of the stationary tests and the empirical estimation of the time series regression equation are discussed.

Descriptive statistics

Table 1 contains definitions of the variables in the dataset and descriptive statistics. The variables *RGDP* and *RGDPpc* do not include the government expenditure component given they are adjusted values in order to use appropriately in the analysis. From the two candidates for dependent variables, *RGDP* is shown only for illustrative purposes, and is not used in any further analysis. The explanatory variables that are of interest in the analysis consist of government share of RGDP (*kg*) and the square term of that variable (kg^2). Other explanatory variables are included in the model as control variables.

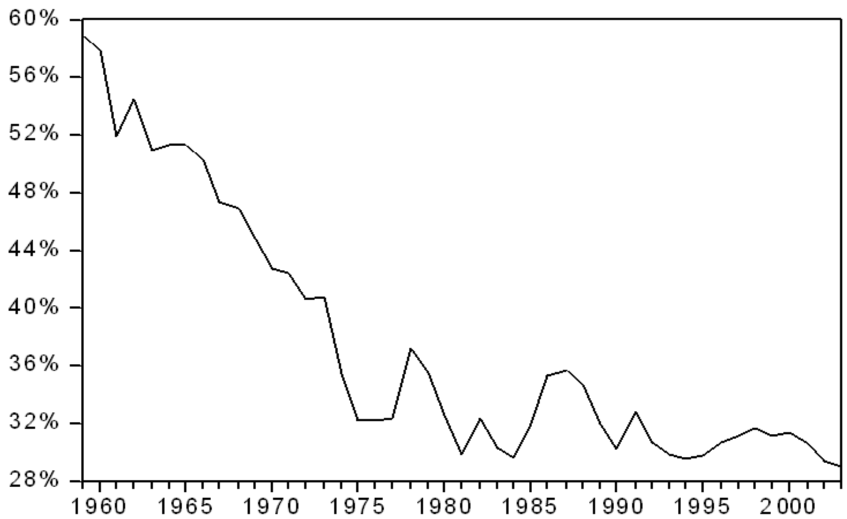
When compared with its developing counterparts and south Asian neighbours, Sri Lanka has a higher percentage of RGDP spent on government expenses with a mean of 37.56 per cent. The median spending percentage is also as high as 32.54 per cent. Sri Lanka has at least spent 29.04 per cent of their RGDP annually as government expenses. In the extreme case, the government spending was as high as almost 59 per cent. This justifies the fact that Sri Lanka is considered a welfare nation with high public spending, especially on health and education programmes. Osmani (1994) once wrote that despite the prevailing world pattern of economic liberalization in 1970s and 1980s, Sri Lanka managed to maintain high level of welfare.

Table 1 Variable definitions and descriptive statistics

Variable	Definition	N	Mean	Median	Maximum	Minimum	S.D.
Economic growth							
Real GDP (in SL Rupees Mn.)	Real gross domestic production without government expenditure	45	318.111,89	249.960,53	835.194,41	93.440,00	206.211,43
Real GDP per capita (in SL Rupees)	Per capita real gross domestic production without government expenditure	45	19.734,31	16.835,76	43.382,22	9.708,05	9.299,17
Government size							
Government share of real GDP	Government share of real GDP (base year = 1996)	45	37,56	32,54	58,91	29,04	8,90
Square term of the government share of real GDP	Square term of the government share of real GDP (base year = 1996)	45	1.488,61	1.058,85	3.470,39	843,32	749,64
Investment							
Investment share of real GDP	Investment share of real GDP (base year = 1996)	45	14,82	14,12	26,96	10,49	3,41
Consumption							
Consumption share of real GDP	Consumption share of real GDP (base year = 1996)	45	72,15	69,40	101,79	62,93	8,29
Openness							
Openness in constant prices	Total trade as a percentage of GDP	45	98,76	81,47	221,60	62,93	40,03

As depicted in Figure 2, there is a decreasing trend in government expenditure as a percentage of RGDP until Sri Lanka opened up her economy in 1977. Since 1977, the Sri Lankan economy, once dominated by agricultural, has experienced strong growth in its industrial and service sectors. In the political front, Sri Lanka began to shift away from a socialist orientation in 1977. Since then, the government has been deregulating, privatizing, and opening the economy to international competition. The share of government in RGDP starts to fluctuate afterwards, but it looks more or less stagnated ever since. High level of economic liberalization means less government involvement in the economy. Nevertheless, in Sri Lanka's case, left and right aligned political parties won general elections one after the other, and came into power interchangeably. This resulted in very frequent changes in the government policies and spending decisions.

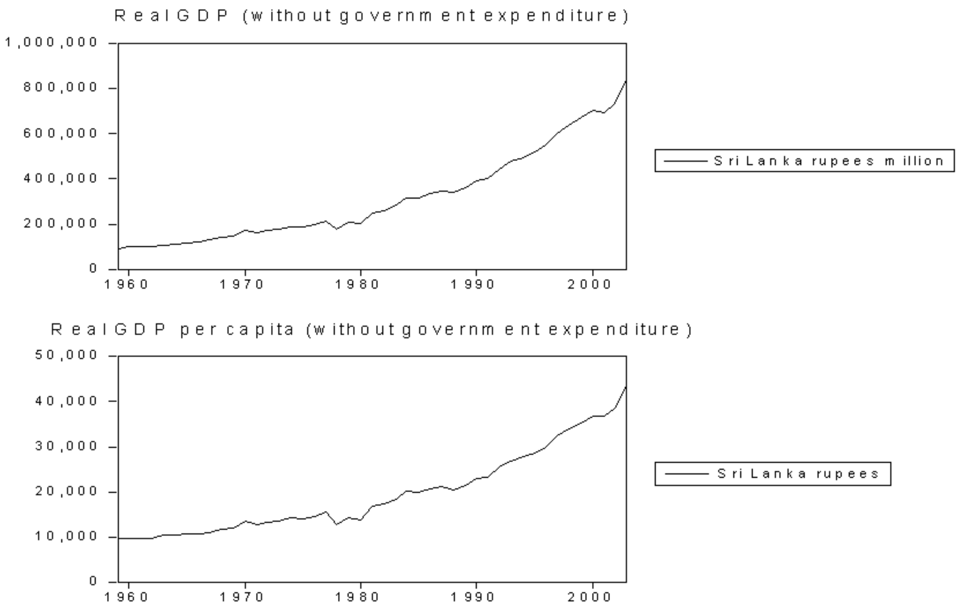
Figure 2 Government expenditure as a per cent of real GDP



Data source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006.

The trends of two selected indicators of economic growth are plotted in Figure 3. These indicators are government expenditure adjusted values. The variables show a similar movement over the 45 years with similar fluctuations and minor shocks. These minor shocks in national output and economic growth are closely related to the political developments in the country. The minor shock after 1970 is possibly associated with the Sri Lanka Freedom Party-led coalition's victory in the 1970 parliamentary election; in 1977 with the United National Party's win in the 1970 parliamentary election; in 1988-1989 with the insurrection in which around 50,000 lives were lost; and soon after 2000 with a win to the Sri Lanka Freedom Party-led coalition in the presidential election. The most significant of these shocks is the one which occurred after 1977 parliamentary election. The anti-Tamil riots and the establishment of a new government with a different political orientation in 1977 saw the Sri Lanka's economy change noticeably in its structure and dimension by means of pro-right policies.

Figure 3 Indicators of economic growth (government expenditure adjusted)



Data source: Central Bank of Sri Lanka (various years), Annual report, various issues.
Note: The graphs are based on authors own calculations.

Stationarity[vii] of the variables

Stationarity of the data series becomes important when dealing with time series data. Much past empirical work based on time series data assumes that the underlying time series are stationary. On the one hand, stationary time series avoids autocorrelation[viii] and spurious regression[ix]. It allows for forecasting and performing causality tests of Granger and Sims[x] on the other.

One way of testing for stationarity is to use the unit root test. There are several types of unit root tests. This study uses the Augmented Dickey-Fuller (ADF) test[xi] to check the stationary of data series. The results of the Augmented Dickey-Fuller unit root tests and the stationarity level of the data series based on these results are shown below:

Table 2 The results of the Augmented Dickey-Fuller unit root test

Variable		ADF test statistic	
		Constant	Constant, Linear Trend
Real GDP p.c. (without gov. component)			
Level	rgdp_pc	-0.553	-1.984
First difference	∆rgdp_pc	1.326	-2.003
Second difference	d(rgdp_pc,2)	-3.816*	
Government share of RGDP			
Level	kg	-2.499	-2.058
First difference	∆kg	-6.732*	
Square term of government share of RGDP			
Level	kg^2	-3.109*	
Investment share of RGDP			
Level	ki	-1.400	-1.916
First difference	∆ki	-12.058*	
Consumption share of RGDP			
Level	kc	-5.592*	
Openness in constant prices			
Level	openk	-4.530*	

Where "*" indicates the t-value is significant at 5% level and the series is stationary.

These findings suggest that level data series of variables square term of government share of RGDP, consumption share of RGDP and openness in constant prices, first differences of variables government share of RGDP and investment share of RGDP and the second difference of the variable *RGDPpc* (without government component) are stationary. These stationary data series of variables are employed in the time series regression estimation.

Regression results

In order to examine the effect of each factor influencing economic growth, a series of time series regression analyses using Ordinary Least Squares (OLS) estimation technique were carried out. Table 3 lists the main results of two regression analyses, which have been rectified using the residual tests. Regression (1) is an analysis using all five explained variables; regression (2) is the result acquired after taking off the weakest variable *kc* (consumption share of RGDP). All the coefficients are significant at 5 per cent level or better in regression (2).

Table 3 Economic growth and countrywide economic variables (The results of the time series regression using OLS)

Dependent variable: real GDP per capita (without government expenditure)	(1)	(2)
Government size		
Government share of real GDP	0.760** (0.347)	0.715** (0.342)
Square term of the government share of real GDP	-0.014** (0.006)	-0.013** (0.006)
Investment		
Investment share of real GDP	0.445*** (0.135)	0.409*** (0.128)
Consumption		
Consumption share of real GDP	-0.100 (0.125)	
Openness		
Openness in constant prices	0.295** (0.109)	0.253** (0.096)
R-squared	0,977	0,977
Adjusted R-squared	0,971	0,972
F-statistic	165,242	190,985
Prob(F-statistic)	0,000	0,000
Number of observations	45	45

Notes: AR (3) term introduced to control problems of serial correlation is not listed here.
Standard errors are shown in parentheses.
* Statistical significance at the 10-percent level
** Statistical significance at the 5-percent level.
*** Statistical significance at the 1-percent level.

When considering the two regression results, the equation's overall F tests are significant at a level above 1 per cent, and the coefficient of determination R^2 is above 0.97. Accordingly, more than 97% of the variation of *RGDPpc* is explained by government expenditure, investment and the openness of the economy. This means that the equation has results that fit well, and that a very strong corresponding relation exists between the explanation variables and economic growth in Sri Lanka.

The estimated model is shown below:

$$RGDP_{pc} = -3.6296 + 0.7147\,kg - 0.0133\,kg^2 + 0.4085\,ki + 0.2530\,openk$$

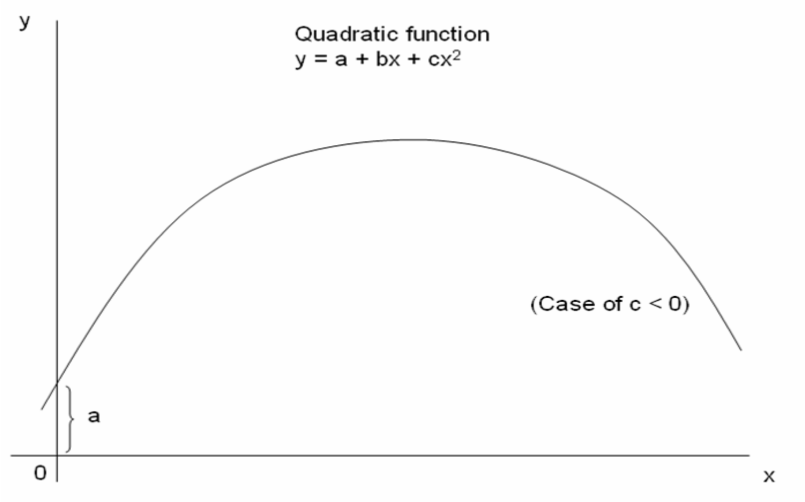
As one would expect, the coefficient of the linear term of government expenditure *kg* has a positive sign to account for the positive beneficial effects of government spending on output, while the negative sign of the coefficient of squared term kg^2 explains any adverse effects associated with increased governmental size. The positive sign of the coefficient of investment share of the RGDP is associated with the positive effects of investment on *RGDPpc* and economic growth. This model also suggests that openness is beneficial for Sri Lanka: it increases *RGDPpc* and economic growth. The estimation results also suggest that *RGDPpc* is predicted to increase by 0.715 Sri Lankan rupees when the government share of RGDP goes up by one per cent; decrease by 0.013 Sri Lankan rupees when the square term of the government share of RGDP goes up by one unit; increase by 0.408 Sri Lankan rupees when the investment share of RGDP goes up by one per cent; increase by 0.253 Sri Lankan rupees when openness in constant prices goes up by one unit and is predicted to be -3.630 Sri Lankan rupees when government share of RGDP, investment share of RGDP and openness in constant prices are zero.

5. Policy perspective

There is a policy perspective to this exercise. The properties of the estimated parameters provide extra information about the potential policy directions. The coefficients of the estimated quadratic equation provide evidence to prove or not to prove existence of the Armey curve. In order to establish this inverted U-shaped curve, the coefficient of the square term of government share of RGDP (kg^2) needs to be negative. The geometric presentation of the quadratic function and its properties are illustrated in Figure 4.

The positive sign of the linear term *kg* is designed to show the positive beneficial effects of government spending on output, while the negative sign of the squared term kg^2 means the variable measures any adverse effects associated with increased governmental size. Since the squared term increases in value faster than the linear term, the presence of negative effects from government spending eventually will outweigh the positive effect, producing a downward sloping portion. The values that were obtained in the case of Sri Lanka are consistent with this principle.

Figure 4 The properties of the quadratic function



The mechanism specified below calculates the optimal level of government expenditure using first differentiation:

$$RGDP_{pc} = -3.6296 + 0.7147\ kg - 0.0133\ kg^2 + 0.4085\ ki + 0.2530\ openk$$

Calculate the first derivative;

$$\frac{d(RGDPpc)}{d(kg)} = 0.7147 - 2(0.0133)\,kg$$

Equalise these values to zero to calculate the optimal government size;

$$0 = 0.7147 - 2(0.0133)\ kg$$
$$26.8684 = kg$$

The results support statistical estimation of the Armey curve, and it provides a framework to approximately compute the specific point where output is maximised. The curve peaks where government spending is equal to 26.87 per cent of RGDP (approximately 27 per cent). Sri Lanka has spent an average of 30 per cent of RGDP as government expenditure from 2000-2003, but the share of government spending has a reducing trend. For instance, government expenditure in Sri Lanka in 2003 was exactly 29 per cent. The average government share of RGDP continuous to drop since 1960s: from 50.74 per cent in 1960s to 37.18 per cent in 1970s to 32.43 per cent in

1080s to 30.75 per cent in 1990s. The results indicate that Sri Lanka has had excessive government expenditures, nonetheless, is reaching an ideal amount of government expenditure from the standpoint of growth optimization.

If these results are accurate, the country since 1959 has been in the negatively sloped portion of the Armey Curve. That is, higher government spending as a percentage of total output is associated with lower levels of real output. These results are consistent with the idea that welfare states do not necessarily promote economic growth.

6. Conclusions

One of the arguments put forward by the architects of the endogenous growth theory is that governments can manipulate growth. Following these foot steps, Armey (1995) argued that low levels of government expenditures can increase the economic growth until economic growth reaches a critical level, nevertheless excessive increments of government expenditures could harm economic growth. This study attempts to answer two research questions related to government expenditure and economic growth in the context of Sri Lanka: (a) can government expenditure increase or decrease economic growth? (b) is it possible to empirically verify the existence of the Armey curve in the case of Sri Lanka?

The findings of the investigation validate the non-linear relationship between government expenditures and economic growth. The results are generally consistent with the previous findings: government expenditure and economic growth are positively correlated; excessive government expenditures are negatively correlated with economic growth; there is a positive relationship between investment and economic growth; and open economy promotes growth.

Moreover, this study performs an empirical test of the popular phenomenon of the Armey curve using a data set of 45 observations (1959-2003) for Sri Lanka. The signs of the coefficients of government share of real gross domestic product and its square term confirm the possibility of constructing the inverted U-shaped Armey curve for

Sri Lanka. This paper adds to the literature that the Armey curve is a reality not only for developed economies, but also for developing economies.

The Armey curve provides the possibility of calculating optimal government expenditure percentages, therefore, could be used as a policy tool in determining the efficient levels of government expenditure. The results of the study suggest an optimal government expenditure percentage of approximately 27 per cent for Sri Lanka. In comparison to the lowest government expenditure percentage of the recent times (29 per cent in 2003), Sri Lankan government is spending at least 2 per cent more money than the required amount of spending from an optimization point of view. These findings have important implications for appraisal of government spending and policy design.

References

Alexander, W.R.J. (1990), 'Growth: some combined cross-sectional and time series evidence from OECD countries', Applied Economics 22: 1197-1204.

Armey, D., (1995), ‘The freedom revolution’, Regnery Publishing Co., Washington, D.C.

Bagdigen, M. & C. Hakan (2008), 'Causality between public expenditure and economic growth: the Turkish case', Journal of Economic and Social Research 6(1): 53-72.

Barro, R. J. (1989), 'A cross country study of growth, saving, and government', NBER Working Paper 2855.

Barro, R. J. (1990), 'Government spending in a simple model of endogeneous growth', The Journal of Political Economy 98 (5) 2: S103-S125.

Barro, R. J. (1991), 'Economic growth in a cross section of countries', Quarterly Journal of Economics 106: 407-444.

Carr, J. L. (1989), 'Government size and economic growth: a new framework and some evidence from cross-section and time-series data: comment', The American Economic Review 79 (1): 267-271.

Cashin, P. (1995), 'Government spending, taxes and economic growth', IMF Staff Papers 42 (2): 237-269.

Central Bank of Sri Lanka, (various years), Annual report, Colombo: Central Bank of Sri Lanka.

Chen, S. T. & C. C. Lee (2005), 'Government size and economic growth in Taiwan: a threshold regression approach', Journal of Policy Modelling 27: 1051-1066.

Dar, A. A. & S. Amirkhalkhali (2002), 'Government size, factor accumulation, and economic growth: evidence from OECD countries', Journal of Policy Modeling 24: 679-692.

Devarajan, S., V. Swaroop & H. Zou (1993), 'What do governments buy? The composition of public spending and economic performance', World Bank Working Paper WPS 1082.

Devarajan, S., V. Swaroop & H. Zou (1996), 'The composition of public expenditure and economic growth', Journal of Monetary Economics 37: 313-344.

Diamond, J. (1989), 'Government expenditure and economic growth: an empirical investigation', IMF Working Paper No. 89/45, Washington D.C.

Engen, E. & J. Skinner (1992), 'Fiscal Policy and Economic Growth', NBER Working Paper No. 4223. Cambridge MA: National Bureau of Economic Research.

Folster S. & M. Henrekson (1999), 'Growth and the public sector: a critique of the critics', European Journal of Political Economy 15: 337-358.

Folster, S. & M. Henrekson (2001), 'Growth effects of government expenditure and taxation in rich countries', European Economic Review 45: 1501-1520.

Giavazzi, F., T. Jappelli & M. Pagano (2000), 'Searching for non-linear effects of fiscal policy: evidence from industrial and developing countries', European Economic Review 44: 1259-1289.

Grier, K. B. & G. Tullock (1987), 'An empirical analysis of cross-national economic growth: 1950-1980', Caltech Working Paper.

Grimes, A. (2003), 'Economic growth and the size and structure of government: implications for New Zealand', Motu Working Paper #03-10.

Grossman, P. J. (1988), 'Government and economic growth: a non-linear relationship', Public Choice 56: 193-200.

Gwartney, J., R. Lawson & R. Holcombe (1998), 'The size and functions of government and economic growth', paper prepared for the Joint Economic Committee, Retrieved September 11, 2009, from http://www.house.gov/jec/growth/function/function.pdf

Handoussa, H. & J. L. Reiffers (2003), ‘Femise report on the Euro-Mediterranean partnership- analysis and proposals of the Euro-Mediterranean forum of economic institutes’, Institut de la Méditerranée, France, Retrieved September 17, 2008, from http://www.femise.net/PDF/Femise_A2003gb.pdf

Hansson, P. & M. Henrekson (1994), 'A new framework for testing the effect of government spending on growth and productivity', Public Choice 81: 381-401.

Heston, A., R. Summers & A. Bettina, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006.

Higgins, M., A. Young & D. Levy (2006), 'Federal, state, and local governments: evaluating their seperate roles in US growth', MPRA Paper No. 1014.

Hodrick, R. & E. C. Prescott (1997), ‘Postwar U.S. business cycles: an empirical investigation’, Journal of Money, Credit, and Banking 29 (1): 1-16.

Hsieh, E. & K. Lai (1994), 'Government spending and economic growth: the G7 experience', Applied Economics 26 (5): 535-542.

Hsieh, E. & S. L. Kon (1994), 'Government spending and economic growth: the G-7 experience', Applied Economics 26: 535-542.

Kneller, R., M. F. Bleaney & N. Gemmell (1998), 'Growth, public policy and the government budget constraint: evidence from OECD countries', Discussion Paper no. 98/ 14, School of Economics, University of Nottingham.

Kneller, R., M. F. Bleaney & N. Gemmell (1999), 'Fiscal policy and growth: evidence from OECD countries', Journal of Public Economics 74: 171-190.

Kormendi, R. C. & P. Meguire (1985), 'Macroeconomic determinants of growth: cross-country evidence', Journal of Monetary Economics 16: 141-164.

Kormendi, R. C. & P. Meguire (1986), 'Government debt, government spending, and private sector behavior: reply', American Economic Review 76(5): 1180-1187.

Kuznets, S. S., (1955), ‘Economic growth and income inequality’, American Economic Review 45: 1-28

Kuznets, S. S., (1963), ‘Quantitative aspects of the economic growth of nations: VIII. Distribution of income by size’, Economic Development and Cultural Change 11, pt. 2: 1-80.

Landau, D. (1983), 'Government expenditure and economic growth: a cross-country study', Southern Economic Journal 49: 783-792.

Landau, D. (1986), 'Government and economic growth in the less developed countries: an empirical study for 1960-1980', Economic Development and Cultural Change: 34-75.

Lin, S. (1994), 'Government spending and economic growth', Applied Economics 26(1): 83-94.

Lucas, R. E. (1988), 'On the mechanics of economic development', Journal of Monetary Economics 22: 3-42.

Miller S. M. & F. S. Russek (1997), 'Fiscal structures and economic growth: international evidence', Economic Inquiry 35(3): 603-613.

Osmani, S. R. (1994), 'Economic reform and social welfare: the case of nutrition in Sri Lanka', The American Economic Review 84(2): 291-296.

Pevcin, P., (2004), ‘Does optimal spending size of government exist?’, EGPA - European Group of Public Administration, Katholieke Universiteit Leuven, Belgium, Retrieved August 18, 2008, from http://soc.kuleuven.be/io/egpa/fin/paper/slov2004/pevcin.pdf

Radwan, S. & J. L. Reiffers (2004), ‘Femise report on the Euro-Mediterranean partnership- analysis and proposals of the Euro-Mediterranean forum of economic institutes’, Institut de la Méditerranée, France, Retrieved September 17, 2008, from http://www.femise.org/PDF/Femise_A2004gb.pdf

Ram, R. (1986), 'Government size and economic growth: a new framework and some evidence from cross-section and time series data', American Economic Review 76: 191-203.

Ramayandi, A. (2003), 'Economic growth and government size in Indonesia: some lessons for the local authorities', Working Papers in Economics and Development Studies (WoPEDS) 200302, Department of Economics, Padjadjaran University.

Rebelo, S. (1991), 'Long-run policy analysis and long-run growth', The Journal of Political Economy 99 (3): 500-521.

Romer, P. M. (1986), 'Increasing returns and long-run growth', The Journal of Political Economy 94 (5): 1002-1037.

Rubinson, R. (1977), 'Dependency, government revenue and economic growth: 1955-1970', Studies in Comparative International Development 12: 3-28.

Sheehey, A. J. (1993), 'The effect of government size on economic growth', Eastern Economic Journal 19(3): 321-328.

Solow, R. M. (1956), 'A contribution to the theory of economic growth', The Quarterly Journal of Economics 70 (1): 65-94.

Tanzi, V. & H. H. Zee (1997), 'Fiscal policy and long-run growth', IMF Staff Papers 44: 179-209.

Vedder, R. K. & L. E. Gallaway (1998), ‘Government size and economic growth’, paper prepared for the Joint Economic Committee, Retrieved September 11, 2008, from http://www.house.gov/jec/growth/function/function.pdf

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Notes:

[i] Kuznets hypothesis made the proposition that, during the course of secular economic growth of a country, income inequality first increases, but begins to decline after reaching a critical point. The model that demonstrates an inverted U shaped curve includes variables inequality, average income (GDP per capita) and its square term. The horizontal axis of the graph demonstrating the ‘Kuznets curve’ is a measure of increased economic development, and the vertical axis is a measure of income inequality.

[ii] Richard Armey borrows the graphical technique from Arthur Laffer to develop what he termed the Armey Curve. The Laffer curve is a concept used to illustrate that increases in the rate of taxation do not necessarily increase tax revenue. The Laffer curve is an inverted U-shaped curve in which an optimal tax rate is assumed to lie somewhere in between 0 per cent and 100 per cent tax rates.

[iii] Real GDP per capita is considered a proxy for standard of living. It is sensible to use real GDP per capita to represent economic growth, because all citizens would benefit from their country's increased economic production (economic growth). A simple way to calculate real GDP per capita is to divide real gross domestic product by the mid year population.

[iv] Wagner’s Law effect is the idea that development of economies is accompanied by increased share of government spending. With the development process, state expenditure needs to be increased in order to achieve expanded social, administrative, protective and welfare objectives. Most studies perform a Granger causality test to identify the direction of causality. Nevertheless, I remove actual government expenditure component from real GDP to eliminate causality in the direction from increased GDP to government spending.

[v] The term ‘Baumol’s cost disease’ is used to explain lack of growth in productivity in the public sector. On the one hand, public administration activities are labour-intensive and there is little growth

in productivity over time. On the other hand, public services like public hospitals and universities hardly grow in productivity. As a result, only a little more resources will be generated and be spent as public expenditure.

[vi] Our interest here is only in the trend component of the data series; thereby we eliminate the cyclical component. The Hodrick and Prescott (HP) filter (1997) is widely used among macroeconomists to obtain a smooth estimate of the long-term trend component of a series. The HP filter is a two-sided linear filter that calculates the smoothed series *s* of *y* by minimizing the variance of *y* around *s*, subject to a penalty that constrains the second difference of *s*. In other words, the HP filter chooses *s* to minimize:

$$\sum_{t=1}^{T}(y_t - s_t)^2 + \lambda \sum_{t=2}^{T-1}((s_{t+1} - s_t) - (s_t - s_{t-1}))^2,$$

Where λ is the penalty parameter that controls the smoothness of the series σ. The larger the λ, the smoother the σ. As λ=∞, s approaches a linear trend. Annual data is used in this analysis; therefore, a penalty parameter of 100 is recommended to smooth the series.

[vii] A timeseries is stationary if its mean and variance do not vary systematically over time.

[viii] Autocorrelation is the correlation between members of series of observations ordered in time. In other words, autocorrelation occurs when error terms of the observations are correlated. This could be shown as follows:

$$E(u_i u_j) \neq 0 \qquad i \neq j$$

[ix] When regressing a time series variable on another time series variable, it tends to produce very high R^2 values even though there is no meaningful relationship between two variables. This is the case especially when both time series variables subject to a deterministic trend. This situation is referred to as the spurious (nonsense) regression.

[x] Time series forecasting as well as causality tests of Granger and Sims assume that the time series involved in analyses are stationary. Therefore, usually stationary tests precede tests of causality.

[xi] The testing procedure for the ADF test is applied to the model

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + ... + \delta_p \Delta y_{t-p} + \varepsilon_t,$$

Where α is a constant, β is the coefficient on a time trend and *p* is the lag order of the autoregressive process. If the model is a random walk, both the constraints $\alpha = 0$ and $\beta = 0$ apply. When modelling a random walk with a drift, only the constraint $\beta = 0$ applies.
The test statistic of the unit root test is calculated as follows. The relevant null hypothesis is $\gamma = 0$ against the alternative hypothesis $\gamma < 0$:

$$ADF_\tau = \frac{\hat{\gamma}}{SE(\hat{\gamma})}$$

The test statistic is then compared to the relevant critical value for the ADF test. If the test statistic is greater than the critical value, the null hypothesis $\gamma = 0$ is rejected (data series is stationary).

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