ECONOMIC GROWTH AND THE SIZE AND QUALITY OF THE GOVERNMENT

Arusha Cooray*

Abstract: This study investigates the role of the government in economic growth by extending the neo classical production function to incorporate two dimensions of the government – a *size* dimension and a *quality* dimension. A composite governance index is constructed and used to measure the quality of the government. The government quantity and quality augmented model is then tested on 51 developing and transition economies. The estimation is also carried out on the countries by income distribution. There is strong support for convergence among the economies. The empirical results indicate that the size of the government has a positive but insignificant impact on growth, while the quality of the government has a significant and positive impact on economic growth. Hence, investing in the capacity for enhanced governance is a priority for the improved growth performance of the countries examined.

* Corresponding author: Arusha Cooray, School of Economics and Finance, University of Tasmania, Hobart 7001, Australia, Tel: 61-3-6226-2821; Fax: 61-3-6226-7587; E-mail: arusha.cooray@utas.edu.au.
I wish to thank Glenn Otto, Bhaskara Rao, Ranjan Ray, Hugh Sibly and Graeme Wells for valuable comments.

Introduction

There is no government in the standard neo classical production function. While this might well be suited to a developed economy, for a developing economy, a government plays an important role in the distribution and allocation of resources. Certain goods such as education, health, defense that the private sector finds difficult to provide, are made available by the government. Therefore this study investigates the role of the government in economic growth by extending the neo classical production function to incorporate two dimensions of the government – a *size* dimension and *quality* dimension. The size dimension as measured by public investment, has been incorporated in the work of Barro (1991), Barro and Sala-i-Martin (1992), Easterly and Rebelo (1993), Devarajan, Swaroop and Zou (1996), Hulton (1996), Pritchett (1996), Aschauer (2000). However, much less attention has been paid to the quality dimension which underpins the efficient provision of public goods. Hulton (1996), Pritchett (1996) and Aschauer (2000) have examined the effectiveness of public capital in the growth process. This study differs from the studies of Hulton, Pritchett and Aschauer in that government quality is measured by a composite governance index that is constructed by aggregating the governance indicators complied by Kaufmann, Kraay and Mastruzzi (2006).

The empirical evidence on the relation between economic growth and government investment has been mixed. Barro (1991) in a study of 98 developed and developing economies finds a positive but insignificant relation between public investment and economic growth over the 1960-1985 period. Devarajan *et al.* (1996) find a negative relation between the capital component of public investment and economic growth for a group of developing economies. They attribute this to the misallocation of public

capital expenditure by developing countries which causes them to be unproductive at the margin. Pritchett (1996) who incorporates an investment efficiency coefficient in his model, argues that public investment may not create productive capital in developing countries due to inappropriate use. Hulton who also includes an infrastructure effectiveness variable in his model, argues that infrastructure effectiveness is the single most important variable explaining growth differentials between countries. Aschauer (2000) examining both the effects of quantity and efficiency of public capital on economic growth concludes that both these factors lead to increases in output per head. Similarly Easterly and Rebelo (1993) find a positive association between public investment and economic growth in particular, transport and communication.

While public investment can lead to enhanced growth, a question that arises is, in developing countries that already allocate a large proportion of public resources to the provision of social services will further increases in government spending improve growth outcomes? Does governance contribute to growth? Therefore, this study attempts to address the question of how governance underpins the growth process. Poor governance can be regressive to sustained growth while good governance acts to improve the efficiency of the stock of public capital.

The rest of the paper is structured as follows. Section 2 presents the model. Section 3 describes the data. Section 4 evaluates the empirical results and Section 5 summarizes the conclusions.

2 The Cobb-Douglas Specification

The Solow augmented Mankiw-Romer-Weil (MRW) model is used as a basis for this study. The production function incorporating the size and quality of the government is of the Cobb-Douglas form such that:

$$y(t) = Ak(t)^{\alpha} h(t)^{\beta} (g(t)e^{\mu\theta})^{\gamma} \qquad (1)$$

where $y(t)$ is output per worker; $k(t)$ is the stock of private capital per worker; $h(t)$ is the stock of human capital per worker. The size dimension of the government is measured by $g(t)$, which is represented by the stock of government capital per head, and θ measures the quality dimension of the government. More specifically, it is a measure of the average level of governance. The exponential form is assumed for the quality variable as good governance is not a direct factor input but serves to improve the efficiency of the stock of government capital. In steady state equilibrium, there is an exogenous rate of technological progress ϖ, and growth rate of the labour force n. The stock of capital depreciates at a rate δ. If, the fraction of income devoted to private capital is s_K, the fraction of income devoted to human capital is s_H and the fraction of income devoted to public capital is s_G, the steady state level of per capita output, $[Y(t)/L(t)]^*$, is reached when the addition to the stock of each type of capital is just sufficient to meet the needs of the labour force which grows at a rate of $g+n$ and to replace capital which depreciates at a rate of δ. The steady state level of output per capita in log linear form can be expressed:

$$\ln\left[\frac{Y(t)}{L(t)}\right]^* = a_0 + a_1 \ln\left[\frac{s_K}{n+\varpi+\delta}\right] + a_2 \ln\left[\frac{s_H}{n+\varpi+\delta}\right] + a_3 \ln\left[\frac{s_G}{n+\varpi+\delta}\right] + a_4\theta \qquad (2)$$

Where $a_4 = \mu\gamma$. On the steady state growth path, countries with different levels of governance will have different levels of per capita income but the same rate of steady state growth. Economies with poor governance will have a lower level of per capita income in the long run.

Relaxing the assumption of steady state growth, the growth rate of output per worker in the transition to steady state can be expressed:

$$\ln y(t) - \ln y(0) = (1 - e^{-\lambda t})\left[\ln(y^*) - \ln y(0)\right] \qquad (3)$$

where $y(0)$ is the initial level of output per worker and y^* is the steady state level of income per worker towards which the economy is moving. λ is the speed of convergence and $\lambda = (1-\alpha-\beta-\gamma)(n+\varpi+\delta)$ (see Barrro and Sala-i-Martin 1992). Subtracting $y(0)$ from both sides and substituting for y^* yields the transitional model that can be estimated:

$$\ln y(t) - \ln y(0) = a_0 + a_1 \ln\left[\frac{s_K}{n+\varpi+\delta}\right] + a_2 \ln\left[\frac{s_H}{n+\varpi+\delta}\right] + a_3 \ln\left[\frac{s_G}{n+\varpi+\delta}\right] + a_4\theta +$$

$$a_5 \ln y(0) + \varepsilon \qquad (4)$$

According to equation (4), the growth rate of income per capita depends on the accumulation of private capital, human capital, public capital and good governance. Applying the same reasoning as Hulton (1996), a country with better governance will converge to a higher level of steady state income per capita than a country with poor governance. If they both start at the same level of income per capita, the country with better governance will experience a faster rate of growth. Equation (4), which is the transition to steady state model, is estimated in Section 4 for the full sample and by income distribution.

3 Data

The study comprises 51 developing countries (see Appendix). As the earliest for which the governance indicators are available is 1996, the data used for the empirical estimation covers the period 1996-2003 and are annual. The data are averaged over this seven year period. The data used in this study have been obtained from the following sources:

GDP Per Capita (Y/L): World Development Reports and Human Development Reports.

Share of Public Investment to GDP (s_G), *Share of Government Consumption Expenditure to GDP*: World Development Indicators

Share of Private Investment to GDP (s_K): The private investment series is constructed as in Easterly and Rebelo (1996) by subtracting the public investment series from total investment.

Net Secondary Enrolment Ratio (s_H): is used as proxy for human capital (s_H) as in MRW. The data are obtained from the Human Development Reports.

Government Education Expenditure as percentage of GDP, Government Health Expenditure as percentage of GDP, Government Military Expenditure as percentage of GDP, Primary Enrolment Ratio, Population growth rate, Private Health Expenditure as percentage of GDP, Women in Government at Ministerial Level as percentage of Total: Human Development Reports

Governance Indicators (s_G): All governance indicators have been taken from Kaufmann, Kraay and Mastruzzi (2006). Kaufmann *et al.* have constructed six indicators of governance – (1) voice and accountability: the degree to which a country's citizens are able to participate in the political decision making process (2) political stability and absence of violence: measures the stability of a government to

political violence and terrorism (3) government effectiveness: measures the capability of a government to implement effective policies and maintain credibility (4) regulatory quality: the ability of the government to formulate and implement sound policies that encourage private sector participation (5) rule of law: the existence of a good legal system including property rights and enforcement of contracts (6) control of corruption: the degree to which public power is used for private gain.

Each individual indicator is averaged over the seven years. The individual averaged indicators are then averaged to construct an overall composite governance index (quality index). The transition model given by equation (4) in Section 2, is tested using the individual and composite governance indicators in the following section.

4 Empirical Results

Table 1 presents results for the transition model. The dependent variable is the change in income per capita between 2003 – 1996. Equation (1) is estimated without the government. Equation (2) incorporates the size variable as measured by the stock of public capital and equations (3) – (11) incorporate the quality variables. The coefficient on the initial level of income is negative in all equations and statistically significant suggesting convergence among the economies. The inclusion of the governance indices increase the explanatory power of the models. Both public and private capital have a positive and insignificant effect on the growth in per capita income. Human capital is significant at the 5% and 1% levels in all equations. The governance indices are statistically significant in all equations. Equation (3) which incorporates the composite quality index shows that a 1 unit rise in the governance

index will lead to a 8.7% increase in per capita income in 2003 relative to 1996 over 7 years or 1.2% per year.

Table 1: Transition to Steady State OLS Estimation

Dependent Variable: $\ln(Y/L)_{2003} - \ln(Y/L)_{1996}$

	Without Govt.	With Govt. Size	With Government Size and Quality								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Private Capital a_1	0.15 (0.55)	0.15 (0.55)	0.18 (0.74)	0.33 (1.11)	0.29 (1.08)	0.09 (0.35)	0.14 (0.53)	0.27 (1.13)	0.17 (0.66)	0.23 (0.86)	0.05 (0.18)
Human Capital a_2	0.58 (3.36)**	0.57 (3.21)**	0.43 (2.79)**	0.45 (2.43)**	0.48 (2.82)**	0.57 (3.62)***	0.46 (2.71)**	0.44 (2.87)**	0.44 (2.53)**	0.53 (3.08)**	0.48 (3.03)**
Public Capital a_3	-	0.03 (0.09)	0.21 (0.81)	0.17 (0.55)	0.22 (0.75)	0.22 (0.82)	0.04 (0.16)	0.05 (0.20)	0.09 (0.31)	0.18 (0.62)	0.14 (0.52)
Initial GDP a_4	-0.50 (-5.94)***	-0.50 (-5.88)***	-0.58 (-7.71)***	-0.60 (-6.77)***	-0.52 (-6.50)***	-0.57 (-7.44)***	-0.55 (-6.75)***	-0.56 (-7.61)***	-0.53 (-6.52)***	-0.56 (-6.60)***	-0.59 (-7.64)***
Composite Governance Index μ	-	-	0.87 (4.22)***	0.82 (2.93)**	-	-	-	-	-	-	-
Voice and Accountability	-	-	-	-	0.44 (2.64)**	-	-	-	-	-	0.01 (0.04)
Political Stability	-	-	-	-	-	0.52 (3.86)***	-	-	-	-	0.40 (2.79)**
Govt. Effectiveness	-	-	-	-	-	-	0.51 (2.73)**	-	-	-	0.01 (0.03)
Regulatory Quality	-	-	-	-	-	-	-	0.66 (4.34)**	-	-	0.62 (2.64)**
Rule of Law	-	-	-	-	-		-	-	0.52 (2.56)**	-	0.10 (0.24)
Control of Corruption	-	-	-	-	-	-	-	-	-	0.55 (2.37)**	0.18 (0.45)
Asia and the Pacific				0.28 (0.78)							
South America and the West Indies				0.70 (1.72)*							
Middle East				0.44 (0.88)							
Africa				0.34 (0.90)							
Constant	1.18 (1.61)*	1.27 (1.02)	3.10 (2.69)**	2.26 (1.23)	2.09 (1.72)*	3.23 (2.67)**	2.27 (1.85)*	2.01 (1.88)*	2.63 (1.82)*	2.35 (1.84)*	2.97 (2.56)**
$\overline{R^2}$	0.40	0.39	0.55	0.54	0.46	0.53	0.46	0.56	0.45	0.44	0.59

Notes: t ratios reported within parenthesis. *, **, ***, significant at the 10%, 5% and 1% levels respectively. The model was also estimated with an interaction variable for government size and quality. This was not significant.

The problem of endogenity encountered in growth models is widely documented in the literature. In order to correct for this, both the instrumental variable (IV)

technique and dummy variables are used.[1] The use of dummy variables is justified in the work of Temple (1998) and Koop, Osiewalski and Steel (1995) who point out that differences in technology are more likely to arise between different regions rather then within them. Similarly, differences in governance would be greater between regions than within them. Hence, the composite governance index augmented model is also estimated with regional dummies in Table 1 - see equation (4). Selecting Europe and Central Asia as the base group, four regional dummies are defined for: (1) Asia and the Pacific, (2) South America and the West Indies, (3) the Middle East and (4) Africa. All of the regional dummies are positive implying that they all grow at a faster rate than Europe and Central Asia. South America and the West Indies record the fastest growth compared to Europe and Central Asia, followed by the Middle East, Asia and the Pacific and Africa. The regional dummy for South America and the West Indies is marginally statistically significantly different from the mean growth rate.

In order to confirm that poorer countries grow at a faster rate than richer ones, the estimation is also carried out by dividing the sample into two groups – low income and low middle income (see Quah 1996, Temple 1998).[2] Table 2 reports results for the transition model by income distribution. The results are interesting with significant evidence of the lower income group growing at a faster rate than the

[1] The results for IV estimation are not reported. The equations were estimated using government. education expenditure as % of GDP in 1996, private health expenditure as % of GDP in 1996, govt. military expenditure as % of GDP in 1996, the population growth rate, women in govt. at ministerial level as % of total 2005, regulatory quality and political stability as instruments. A Hausman(1978) test indicated the absence of endogenity and a Sargan(1964) test the confirms the validity of instruments.

[2] Income groups are selected according to the World Bank classification. Except for Malaysia, Brazil and Botswana which fell into the upper-middle income group, the rest of the sample fell into the lower-middle income group and low income group. Therefore Malaysia, Brazil and Botswana have been left out of the estimation and the rest of the countries are grouped into two - low income and low middle income.

middle income group. The explanatory power of the low income group is very high indicating that these variables explain 75% of the variation in income in this group. The results are consistent with those of Quah and Temple who find that the poorest income group grew at a faster rate than the rest of the countries. However, in contrast to their results which showed that the growth rate of the middle income group remained relatively stagnant, the results of this study show that the middle income group too is growing, although at a slower pace than the low income group. The composite governance indicator is significant at the 10% and 5% levels in the two groups, while government size has a positive and insignificant impact on growth in the two income groups. The results in Table 2 suggest that a one unit rise in the governance index will lead to a 6.3% increase in per capita income in the low income group and a 5% increase in per capita income in the low middle income group over 7 years.

Table 2: Transition to Steady State by Global Income Distribution

Dependent Variable: $\ln(Y/L)_{2003} - \ln(Y/L)_{1996}$

	With Govt. Size and Quality	
Variable	Low Income Group	Low Middle Income Group
Initial GDP	-0.81	-0.31
	(-8.68)***	(-2.20)**
Private Capital a_1	0.21	0.01
	(0.66)	(0.04)
Human Capital a_2	0.35	0.01
	(1.75)*	(0.02)
Public Investment	0.34	0.12
	(1.00)	(0.35)
Composite Governance Index μ	0.63	0.50
	(1.65)*	(2.34)**
Constant	4.72	2.37
	(1.65)*	(1.52)*
$\bar{R}^2$	0.75	0.21

Notes: t ratios reported within parenthesis. *, **, ***, significant at the 10%, 5% and 1% levels respectively.

Next, estimation is carried out by using both government investment and government consumption as proxies for government size. The results are reported in Table 3.

Table 3: Transition to Steady State Model: With Government Expenditure Disaggregated into Investment and Consumption

Dependent Variable: $\ln(Y/L)_{2003} - \ln(Y/L)_{1996}$

	With Govt. Size	With Govt. Size and Quality						
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Initial GDP	-0.50	-0.58	-0.52	-0.58	-0.55	-0.57	-0.52	-0.56
	(-5.64)***	(-7.41)***	(-6.19)***	(-7.22)***	(-6.46)***	(-7.33)***	(-6.22)***	(-6.34)***
Private Capital	0.17	0.19	0.29	-0.06	0.14	0.29	0.18	0.24
	(0.58)	(0.77)	(1.07)	(-0.25)	(0.54)	(1.18)	(0.66)	(0.88)
Human Capital	0.57	0.44	0.49	0.57	0.46	0.44	0.44	0.53
	(3.19)**	(2.82)**	(2.90)**	(3.65)***	(2.68)**	(2.83)**	(2.50)**	(3.12)**
Public Investment	0.01	0.17	0.08	0.12	0.04	0.05	0.05	0.08
	(0.03)	(0.68)	(0.66)	(1.06)	(0.35)	(0.51)	(0.47)	(0.66)
Public Consumption	-0.03	-0.09	-0.14	-0.10	-0.08	-0.02	-0.14	-0.13
	(-0.28)	(-0.89)	(-0.50)	(-0.41)	(-0.29)	(-0.06)	(-0.50)	(-0.47)
Composite Governance Index μ	-	0.88 (4.23)***	-	-	-	-	-	-
Voice and Accountability	-	-	0.43 (2.60)**	-	-	-	-	-
Political Stability	-	-		0.53 (3.88)***	-	-	-	-
Government Effectiveness	-	-	-	-	0.52 (2.72)**	-	-	-
Regulatory Quality	-	-	-	-	-	0.66 (4.32)***	-	-
Rule of Law	-	-	-	-	-	-	0.53 (2.58)**	-
Control of Corruption	-	-	-	-	-	-	-	0.55 (2.36)**
Constant	1.28	3.03	1.87	3.04	2.42	2.01	2.45	2.25
	(1.17)	(2.97)**	(1.78)*	(2.88)**	(2.19)**	(2.14)**	(2.18)**	(2.00)*
$\bar{R}^2$	0.37	0.54	0.44	0.52	0.45	0.55	0.44	0.43

Notes: t ratios reported within parenthesis. *, **, ***, significant at the 10%, 5% and 1% levels.
The composite quality index augmented model was also tested with regional dummies. The regional dummies were not significant.

Government consumption has a negative and insignificant impact on economic growth while government investment has a positive and insignificant effect on growth. Good governance has a positive and significant impact on economic growth. Equation (2) in Table 3 shows that a 10% rise in the public capital stock will lead to 1.7% increase in output per head over 7 years and a one unit rise in the composite governance index increases output per head by 8.8% over 7 years.

Estimation is also carried out by disaggregating government expenditure into health, education and military expenditure. The results are presented in Table 4.

Table 4: Transition to Steady State Model with Further Disaggregation of Government Expenditure

Dependent Variable: $\ln(Y/L)_{2003} - \ln(Y/L)_{1996}$

	With Govt. Size	With Govt. Size and Quality					
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Initial GDP a_4	-0.55 (-6.55)***	-0.60 (-8.25)***	-0.55 (-7.03)***	-0.58 (-7.94)***	-0.60 (-7.69)***	-0.59 (-7.99)***	-0.57 (-7.41)***	-0.60 (-7.32)***
Private Capital a_1	0.15 (0.55)	0.17 (0.75)	0.33 (1.25)	0.12 (0.48)	0.14 (0.57)	0.23 (0.98)	0.16 (0.64)	0.22 (0.87)
Human Capital a_2	0.61 (3.01)**	0.53 (3.05)**	0.54 (2.82)**	0.65 (3.65)***	0.51 (2.72)**	0.50 (2.82)**	0.54 (2.84)**	0.61 (3.16)**
Health	0.53 (2.59)**	0.42 (2.38)**	0.39 (1.96)*	0.34 (1.86)*	0.56 (3.02)**	0.42 (2.33)**	0.53 (2.84)**	0.51 (2.65)**
Education	-0.55 (-2.16)**	-0.59 (-2.70)**	-0.61 (-2.51)**	-0.56 (-2.51)**	-0.63 (-2.69)**	-0.40 (-1.76)*	-0.64 (-2.68)**	-0.63 (-2.57)**
Military Expenditure	0.15 (1.32)	0.13 (1.35)	0.17 (1.61)*	0.22 (2.15)**	0.06 (0.59)	0.16 (1.58)*	0.10 (0.89)	0.11 (1.01)
Composite Governance Index μ	-	0.74 (3.95)***	-	-	-	-	-	-
Voice and Accountability			0.41 (2.53)**	-	-	-	-	-
Political Stability			-	0.48 (3.66)***	-	-	-	-
Government Effectiveness			-	-	0.52 (3.03)**	-	-	-
Regulatory Quality			-	-	-	0.54 (3.66)***	-	-
Rule of Law			-	-	-	-	0.52 (2.84)**	-
Control of Corruption			-	-	-	-	-	0.50 (2.40)**
Constant	1.47 (2.05)**	2.44 (3.70)***	1.53 (2.27)**	2.64 (3.76)***	2.49 (3.39)***	1.93 (3.02)**	2.24 (3.13)**	1.97 (2.77)**
$\bar{R}^2$	0.54	0.67	0.60	0.65	0.62	0.65	0.61	0.59

Notes: t ratios reported within parenthesis. *, **, ***, significant at the 10%, 5% and 1% levels.

The coefficients on human capital are positive and statistically significant and the coefficients on private capital are positive and insignificant. The inclusion of the governance variable leads to a significant increase in the explanatory power of the equations. In contrast to the findings of Devarajan *et al*. and Hulton (1996) , health has a positive and significant impact on growth, while military expenditure has a positive but lesser impact than health on economic growth. Contrary to expectations, government expenditure on education is negative and significant in all equations.

However, according to Devarajan *et al.* if education expenditure is negatively related to growth, it does not necessarily imply that education expenditure is unproductive but that slow growing economies spend more on education in an attempt to grow faster (Devarajan, Swaroop, Zou 1996). An examination of the disaggregated model by income distribution suggests that this is the case (see Table 5).

Table 5: Transition to Steady State by Global Income Distribution in the Disaggregated Models

Dependent Variable: $\ln(Y/L)_{2003} - \ln(Y/L)_{1996}$

	With Govt. Size and Quality			
	(1)	(2)	(3)	(4)
Variable	Low Income Group	Low Middle Income Group	Low Income Group	Low Middle Income Group
Initial GDP	-0.81	-0.26	-0.75	-0.35
	(-8.22)***	(-1.84)*	(-7.87)***	(-1.74)*
Private Capital	0.19	0.003	0.29	0.06
	(0.55)	(0.01)	(0.82)	(0.23)
Human Capital	0.38	0.05	0.50	0.22
	(1.86)*	(0.18)	(2.01)*	(0.78)
Public Investment	0.10	0.06	-	-
	(0.65)	(0.46)		
Public Consumption	-0.28	-0.08	-	-
	(-0.80)	(-0.25)		
Health	-	-	0.30	0.44
			(1.24)	(1.65)*
Education	-	-	-0.69	-0.43
			(-2.31)**	(-1.13)
Military Expenditure	-	-	0.15	-0.07
			(1.08)	(-0.64)
Composite Governance Index μ	0.61	0.51	0.41	0.58
	(1.50)*	(2.32)**	(1.50)*	(2.51)**
Constant	4.49	2.56	3.30	2.27
	(3.32)**	(1.64)*	(3.27)**	(1.33)
$\bar{R}^2$	0.74	0.17	0.79	0.36

Notes: t ratios reported within parenthesis. *, **, ***, significant at the 10%, 5% and 1% levels.

Table 5 reports results for the government expenditure disaggregated models by global income distribution. The negative coefficients on the initial levels of per capita income are consistent with convergence. There is evidence to indicate that the low income group grows at a faster rate than the low middle income group. Government

investment has a positive insignificant impact on growth and government consumption a negative insignificant impact on growth. Health has a positive impact on growth. As pointed out by Devarajan *et al*. the negative values on the education coefficients in equations (3) and (4) suggest that the low income group spends more on education than the low middle income group in an attempt to grow faster.

5 Conclusions

This study examines the effects of government size and quality on economic growth in 51 developing and transition economies. The model is also estimated by grouping the countries according to income distribution. There is significant evidence of convergence among the income groups. The results show that while the size of the government as measured by the stock of public capital has a positive insignificant effect on growth, the quality of the government as measured by governance has a positive and significant impact on economic growth. The results suggest that for developing economies that already allocate a considerable share of public resources to social services, further spending may not improve growth outcomes. Increases in the size of the government can impede growth due to the disincentive effects of taxes, increased rent seeking and the crowding out effect on private investment. The results are consistent with those of Barro (1991) who finds a positive but insignificant relation between public investment and economic growth for a group of developed and developing economies. The results indicate that good governance can improve growth outcomes. This is consistent with the conclusions of Hulton, Aschuer and Prichett who show that improving the efficacy of public capital can lead to improved growth. Therefore in conclusion it can be stated that public spending is a necessary but not sufficient condition for economic growth.

Appendix

Countries used in study:

Armenia, Bangladesh, Belarus, Botswana, Brazil, Burundi, Cameroon, Central African Republic, China, Colombia, Central African Republic, Dominican Republic, Ecuador, El Salvador, Ethiopia, Fiji, Ghana, Guinea Bissau, Guyana, India, Indonesia, Iran, Jamaica, Kazakhstan, Kenya, Lesotho, Madagascar, Malaysia, Maldives, Moldova, Mozambique, Nepal, Nicaragua, Niger, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Romania, Russia, Senegal, South Africa, Sri Lanka, Tajikistan, Thailand, Tunisia, Turkey, Uganda, Ukraine, Viet Nam, Zambia.

Country Groups by Income Level:

Low Income – Armenia, Bangladesh, Burundi, Cameroon, Central African Republic, Ethiopia, Ghana, Guinea-Bissau, India, Indonesia, Kenya, Lesotho, Madagascar, Moldova, Mozambique, Nepal, Nicaragua, Niger, Pakistan, Papua New Guinea, Senegal, Tajikistan, Uganda, Ukraine, Viet Nam, Zambia

Low Middle Income – Belarus, China, Columbia, Dominican Republic, Ecuador, El Salvador, Fiji, Guyana, Iran, Jamaica, Kazakhstan, Maldives, Paraguay, Peru, Philippines, Romania, Russia, South Africa, Sri Lanka, Thailand, Tunisia, Turkey

High Middle Income – Brazil, Botswana and Malaysia. These three countries were omitted from the regressions by income distribution.

References

Aschauer, David. 2000. "Public Capital and Economic Growth: Issues of Quantity, Finance and Efficiency." *Economic Development and Cultural Change*, 48(2): 391 -406.

Barro, Robert. 1991. "Economic Growth in a Cross Section of Countries." *Quarterly Journal of Economics*, 106(2), 407-443.

Barro, Robert, and Xavier Sala-i-Martin. 1992. "Public Finance in Models of Economic Growth." *Review of Economic Studies*, 59(4): 645-661.

Devarajan, Shantayanan, Vinaya Swaroop and Heng-fu Zou. 1996. "The Composition of Public Expenditure and Economic Growth." *Journal of Monetary Economics*, 37(2), 313-344.

Easterly, William and Sergio Rebelo. 1993. "Fiscal Policy and Economic Growth: An Empirical Investigation." *Journal of Monetary Economics*, 32(3), 417-458.

Hausman, Jerry. 1978. "Specification Tests in Econometrics." *Econometrica*, 46(6), 1251-1271

Hulton, Charles. 1996. "Infrastructure Capital and Economic Growth: How Well You Use it May be More Important than How Much You Have." NBER Working paper 5847.

Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi. 2006. "Governance Matters V: Governance Indicators for 1996-2005." World Bank Policy Research Working Paper 4012.

Koop, Gary, Jacek Osiewalski and Mark Steel. 1995. "Measuring the Sources of Output Growth in a Panel of Countries." CORE Discussion Paper 9542.

Mankiw, Gregory, David Romer and David Weil. 1992. "A Contribution to the Empirics of Economic Growth." *Quarterly Journal of Economics*, 107(2), 407-437.

Pritchett, Lant. 1996. "Mind You P's and Q's: The Cost of Public Investment is Not the Value of Public Capital." World Bank Policy Research Working Paper 1660.

Quah, Danny. 1996. "Empirics for Economic Growth and Convergence." *European Economic Review*, 40(6), 1353-1375.

Sargan, J. 1964. "Wages and Prices in the United Kingdom: a Study in Econometric Methodology." In *Econometric Analysis for National Planning*, eds. P E Hart, E Mills and J K Whitaker, London: Butterworth.

Temple, Jonathan. 1998. "Robustness Tests of the Augmented Solow Model." *Journal of Applied Econometrics*, 13(4), 361-375.