Global Economy and Finance Journal
Vol. 4. No. 2. September 2011. Pp. 46-59

Expenditure Efficiency and the Optimal Size of Government in Developing Countries*

Yogi Rahmayanti[a] and Theara Horn[b]

Government efficiency plays a significant role in the relationship between government expenditure and economic growth. Using panel data for 63 developing countries for the period 1990 to 2003, we calculated these countries' efficiency scores through data envelopment analysis, incorporating them into a simple model of growth through government expenditure. We found that above a critical threshold, efficiency lowers the optimal size of government expenditure required to maximize growth.

Field of Research: Fiscal Policy, Government Expenditure, Public Sector Efficiency, Growth

1. Introduction

International Monetary Fund (IMF) fiscal adjustment programs, which are in place in many developing countries, have created a heated debate in the field of fiscal policy. These programs often rely heavily on public investment cuts that may improve current government cash flows but at the expense of future economic growth (Ley 2009). Another important issue related to the government budget is the efficiency of government expenditure. Small changes in the efficient use of resources can have major impacts on developing countries' gross domestic product (GDP) and attainment of government objectives (World Bank 2005). The recent global financial crisis only served to emphasize the importance of fiscal policy in keeping countries' economies in check.

Many studies have attempted to establish an identifiable link between government expenditure and economic growth since the nineties. Barro (1990) laid down the theoretical framework for examining this relationship, adding government spending to the list of growth determinants which include capital and labour. Scully (1989) suggested another approach which disregards typical growth determinants and presumes the role of government size in growth. Meanwhile, other empirical studies have produced mixed results. Although both positive and negative relationships between expenditure and growth were found, negative findings such as those by Fölster and Henrekson (2001) dominated. Another significant finding of these

---

* The authors thank Nobuo Akai, Tsunehiro Ootsuki, and David Flath for their comments and suggestions, which have greatly improved the quality of this paper. Theara Horn gratefully acknowledges financial support from Japanese Society for the Promotion of Science, Research Fellowships for Young Scientists.

[a] Osaka School of International Public Policy, Osaka University, Osaka, Japan

[b] Corresponding Author, Graduate School of Economics, Osaka University, Osaka, Japan;
Email: hge016ht@mail2.econ.osaka-u.ac.jp; 1-7 Machikaneyama, Toyonaka, Osaka, 560-0043, Japan

studies is that government size matters to growth, as was observed by Chao and Grubel(1998).

At present, there are two distinct issues surrounding the relationship of government expenditure and economic growth. The first issue, pertaining to the optimal size of government expenditure, has been explored in numerous studies. One such study by Scully (1994) described the relationship between government expenditure and growth as an inverted U curve, indicating the existence of an optimal point for government size. The second issue pertains to efficiency, a subject that has only been addressed recently. A study by Afonso et al. (2003) assessed public sector efficiency by constructing a public sector efficiency (PSE) index for 23 industrialized countries. The PSE index was developed from the ratio of selected public sector performance indicators to their respective government expenditures. It is a relative measurement of efficiency, with each indicator expressed as a ratio to the average value of all countries. Other studies on government expenditure efficiency used varying methods including free disposal hull (FDH) analysis utilized by Gupta and Verhoeven (2001), FDH analysis together with data envelopment analysis (DEA) by Afonso and Aubyn (2004), and stochastic frontier analysis (SFA) by Greene (2005).

There have been many studies on government expenditure efficiency but only few of them explicitly link this efficiency to macroeconomic performance. One such study by Angelopoulos et al. (2008) used public sector efficiency to examine the relationship between fiscal size and economic growth. Using data for 64 developed and developing countries for the period 1980 to 2000, the study calculated the countries' PSE indices and SFA efficiency scores, and found that efficiency explains much of the dynamic relationship between fiscal size and economic growth. The study also found that the relationship between government size and economic growth changes with the level of efficiency. However, it was inconclusive with regard to the effect of efficiency on the optimal size of government for maximizing economic growth.

Our study aims to contribute to the current body of literature by considering both efficiency and optimal size in examining the relationship between government expenditure and economic growth. We incorporate efficiency into an estimation model to find the optimal size of government expenditure that maximizes economic growth.

There are two main differences between our study and that of Angelopoulos et al. (2008). First, we used a different method of efficiency measurement—DEA—and a different set of data. Since the specific production function is hard to define for the public sector (Sijpe and Rayp 2007), we decided that the DEA method would be more appropriate as it does not require the production function to be specified. Additionally, this study considered only data for developing countries in order to avoid possible skewed benchmarking due to significant differences between developed and developing countries. Second, we extended the purpose of our research to that of estimating the effect of efficiency on the optimal size of government expenditure required to maximize economic growth.

Our study found that efficiency indeed plays a significant role in explaining the relationship between the optimal size of government expenditure and growth. Above a certain threshold, our study showed that efficiency reduces the government expenditure required to maximize growth. Based on these findings, we concluded that to maximize economic growth, governments of developing countries should pay attention on both the size and efficiency of their government expenditure.

2. Methodology and Data

2.1 Efficiency Measurement

In this study, efficiency measures how effectively a government spends its budget to achieve objectives. We assumed that all governments favour optimal growth and consequently spend their budgets on expenditures expected to positively impact growth. The efficiency score was calculated using a set of outputs, which indicate a government’s objectives related to economic growth, and inputs, which indicate the cost of achieving those objectives.

We used DEA with output orientation and variable return to scale (VRS) assumption. The use of output orientation is based on the assumption that governments are concerned with maximizing outcome given a pre-determined budget size. Meanwhile, the VRS model originally suggested by Banker et al. (1984) is used to eliminate the scale effect of the budget, which could influence the outputs. Using the convexity assumption of the VRS model, we measured a country’s efficiency by benchmarking it with those of other countries that are similar in size. The efficiency score of each country is determined by the following optimization problem:

$$max_{\theta\lambda}\theta \qquad (1)$$

subject to

$$x_0 - X\lambda \geq 0$$
$$\theta y_0 - Y\lambda \leq 0$$
$$\lambda_i \geq 0, \textstyle\sum_i \lambda_i = 1$$

where θ denotes the technical efficiency score;(x_0, y_0) represents a vector of input and output; (X, Y) represents the compared optimal units of (x_0, y_0); and λ_i is a vector of weights. Here, 0≤ θ ≤1, where θ =1 represents the efficiency score of the best-performing unit located on the efficiency frontier and a smaller θ denotes lower efficiency. The optimal value of λ_i is determined by solving the optimization problem illustrated in Equation 1 and restricting the sum to one to assure convexity of the efficiency frontier. The DEA estimation was processed through the DEAP Version 2.1 computer program developed by Coelli (1996).

2.2 Expenditure Efficiency and Growth

2.2.1 Econometric Model

We extended the growth regression and efficiency equation used by Angelopoulos et al. (2008) into:

$$\text{growth}_{it} = constant + \propto_1 size_{it} + \propto_2 efficiency_{it} * size_{it} + \beta_1 size_{it}^2 + \beta_2 efficiency_{it}^2 * size_{it}^2 + X_{it} + \epsilon_{it} \ (2)$$

where $growth_{it}$ is the growth rate of a country *i* at time *t*; $efficiency_{it}$ is a measure of government efficiency calculated through DEA; $size_{it}$ is a measure of government expenditure as a ratio of GDP; and X_{it} represents control variables.

2.2.2 Critical Value of Efficiency on Optimal Size of Government

The above equation can be rewritten as follows:

$$\text{growth}_{it} = (\propto_1 + \propto_2 efficiency_{it}) * size_{it} + (\beta_1 + \beta_2 efficiency_{it}^2) * size_{it}^2 + constant + X_{it} + \epsilon_{it} \ (3)$$

Size is measured as a ratio of government expenditure to GDP and can be any number from 0 to 1. However, in reality, it is uncommon for this ratio to equal 0 or 1. Therefore, the optimal size of government is represented as size $\in (0,1)$.

The quadratic function exhibits a parabolic form in which the vertex of the inverted U-shaped curve represents the optimal solution. Based on Equation (3), for the parabolic curve to have an inverted U shape, it must satisfy the following condition:

$$\beta_1 + \beta_2 efficiency_{it}^2 < 0 \quad or\ \beta_1 < -\beta_2 efficiency_{it}^2$$

Therefore, the critical value of efficiency is as follows:

$$efficiency^* = \sqrt{\beta_1/(-\beta_2)}$$

The optimal government size to maximize growth is then:

$$size^* = \frac{\alpha_1 + \alpha_2 efficiency}{-2(\beta_1 + \beta_2 efficiency^2)}$$

Therefore, we conclude that optimal government expenditure is conditional to efficiency.

2.3 Data Description

We used data for 63 developing countries for the years 1990 to 2003. Developing countries here refer to those classified by the World Bank as low-income, lower-middle-income, and upper-middle-income countries. We focused on developing countries for several reasons. First, the income similarities among sample countries make the comparison more reasonable. Second, not enough attention has been paid to developing countries in the literature on optimal size of government expenditure. Third, most high-income countries have high literacy rates (up to 99% in some cases) and life expectancies which largely remain unchanged over time. This may cause a significant bias in determining the DEA frontier.

We used three output indicators and one input indicator in the DEA calculation. The output indicators are literacy rate for education, life expectancy for health, and electricity usage for infrastructure. Education and health indicators have been used as output indicators in many studies measuring government efficiency (Gupta and Verhoeven 2001; Afonso and Aubyn 2004; Wilson 2004; Herrera and Pang 2005; Sijpe and Rayp 2007). Many studies also found a long-term effect of infrastructure on growth. Infrastructure development is also an important goal of governments in developing countries, as shown in empirical studies including that of Afonso et al. (2003) and Angelopoulos et al. (2008). The data on literacy rate and life expectancy were taken from the Human Development Index (HDI) of the United Nations Development Project, while the data on electricity usage were obtained from the World Development Indicator (WDI) of the World Bank.

For growth regression, the dependent variable is either the constant growth or per capita growth. The independent variables consist of the share of final consumption of government to GDP, natural logarithm of labour force, capital share relative to GDP, trade openness and FDI. Labour force is the number of individuals in the labour force. Capital share to GDP is the ratio of gross fixed capital formation to GDP. Trade openness is obtained from the ratio of the sum of exports and imports to GDP. Data for these variables were taken from the WDI. The summary and definition of these variables are shown in Table 1.

Table 1: Descriptive Statistics of Variables

Variable	Definition	Mean	Standard Deviation	Min.	Max.
DEA Measurement					
Output					
Literacy rate	Percent of adults (15 years or older) who can read and write(%)	78.70	19.80	28.35	99.00
Life expectancy	Expected number of years of life remaining at a given age (%)	64.60	8.92	36.29	78.21
Electricity	Power consumption per capita (kwh	1208	1207.77	20.38	6734
Input	Government share to GDP (%)	13.60	4.90	2.90	43.47
Efficiency	Efficiency score obtained from DEA measurement	0.89	0.10	0.55	1.00
Growth	Growth rate at constant US dollars(%)	0.03	0.06	-0.42	0.38
Size	Government share to GDP (%)	13.60	4.90	2.90	43.47
Ln Labour	Natural log of total labour force	15.88	1.44	13.15	20.45
Capital	Ratio of gross fixed capital formation to GDP (%)	21.04	5.75	6.17	44.35
Openness	Ratio of sum of imports and exports amount to GDP (%)	0.70	0.30	0.10	2.80
FDI	Ratio of net inflows of foreign direct investment (FDI) to GDP (%)	2.90	12.93	-6.89	348.19
Ln Population	Natural log of total population	16.78	1.39	14.17	20.98
Per capita ODA	Per capita official development assistance (ODA) (million US dollars)	27.93	33.34	-21.90	278.16

3. The Effect of Efficiency on the Growth-Maximizing Optimal Size of Government

We incorporated the efficiency scores into the model to observe the effect of efficiency on the relationship between government expenditure and growth. These scores and other relevant results are reported in the Appendix.

Before estimating the models, we conducted a poolability test to determine the appropriateness of using panel regression through the F test and the Hausman test, and the results showed that panel fixed effect regression is appropriate (details are available upon request). This is consistent with the fact that the slope parameters of the independent variables are not likely to be similar given the differences among the sample countries. In the panel regression, we took into account the autocorrelation and heteroscedasticity of the error component, and the endogeneity of the explanatory variables.

Failing to address the problems of autocorrelation and heteroscedasticity would have resulted in inefficient estimates. We tested for and found autocorrelation and heteroscedasticity in the error component (details are available upon request). On the other hand, the problem of endogeneity of the explanatory variables, a typical problem in the study of government and growth, may lead to a biased estimation of how the public sector impacts growth. This problem can take the form of omitted variables (Agell et al. 2006). Fixed effect estimation with panel data can be used in the presence of time-constant omitted variables. However, it will not be sufficient in the presence of time-varying omitted variables that are correlated with the explanatory variables. One way of dealing with this endogeneity problem is to use some instrumental variables. For a variable to be instrumental, it must be exogenous in the equation; that is, it must have no partial effect on the dependent variable and should not be correlated with the unobserved factors, while at the same time being related either positively or negatively to the endogenous variable (Wooldridge 2002).

We tested the endogeneity of the explanatory variable $size$, measured as government expenditure relative to GDP, using the Davidson-MacKinnon test. The null hypothesis that any endogeneity among the regressors would not have deleterious effects was rejected, indicating that the endogenous regressor's effect is significant. Consequently, we used the instrumental variable estimation method that takes into account the presence of heteroscedasticity and autocorrelation. To this end, we used the generalized method of moments with heteroscedasticity-and-autocorrelation-consistent standard error (GMM-HAC) estimation method. For the instrumental variables, we used the logarithm of population and the per capita official development assistance (ODA) as they can influence the size of each country's government expenditure but not necessarily influence economic growth.

To test the appropriateness of the instrumental variables, we computed the Kleibergen and Paaprk LM statistic for testing underidentification, and Hansen J statistic for testing overidentification. We rejected the null hypothesis in the underidentification test, indicating that the variables are necessary. Based on the results of the overidentifying restriction test, we did not reject the null hypothesis, implying that the variables are exogenous.

Our results show that optimal size for government expenditure exists for a country only when its efficiency score is higher than 0.865. Based on an average efficiency score of 0.89, the optimal size of government expenditure for developing countries is around 15% of their GDP.

The coefficient of the control variable *labour* is significant and negative, implying a possible labour overcapacity in developing countries. The coefficients of *capital* and *openness* are not statistically significant, while that of *FDI* is significant and negative. To test the robustness of the relationship between government size and growth, we simulated other regressions without *openness* and *FDI*, and essentially producing the same results. Additionally, we regressed the model using per capita growth as a dependent variable, which again yielded similar results. Table 2 summarizes these estimations' results.

Table 2: The Effect of Efficiency on Optimal Government Size

Dependent Variable	Growth	Growth	Per Capita Growth	Per Capita Growth
Size	-0.260** (0.143)	-0.409** (0.197)	-0.268* (0.145)	-0.418** (0.201)
Efficiency*Size	0.301** (0.168)	0.472** (0.230)	0.311* (0.171)	0.483** (0.235)
$Size^2$	0.004** (0.002)	0.007** (0.003)	0.004 * (0.002)	0.007** (0.003)
$(Efficiency*Size)^2$	-0.006** (0.003)	-0.009** (0.004)	-0.006 * (0.003)	-0.009** (0.004)
Ln(Labour)	-0.209*** (0.079)	-0.330*** (0.111)	-0.191** (0.081)	-0.313*** (0.114)
Capital	0.001 (0.0009)	0.001 (0.001)	0.001 (0.0009)	0.001 (0.001)
Openness	-0.010 (0.024)	-	0.012 (0.025)	-
FDI	-0.0009*** (0.0002)	-	-0.001*** (0.0002)	-
Hansen J statistic	1.086	2.259	0.412	1.486
Kleibergen-Paaprk LM Statistic	4.766*	5.050*	4.766*	5.050*
Instrumented variable	Government	Government	Government	Government
Instrumental variables	Ln(pop), Per Capita ODA	Ln(pop), Per Capita ODA	Ln(pop), Per Capita ODA	Ln(pop), Per Capita ODA
Optimal size at average efficiency(=0.89)	15.38%	24.09%	15.18%	23.27%
Sample	772	810	772	810

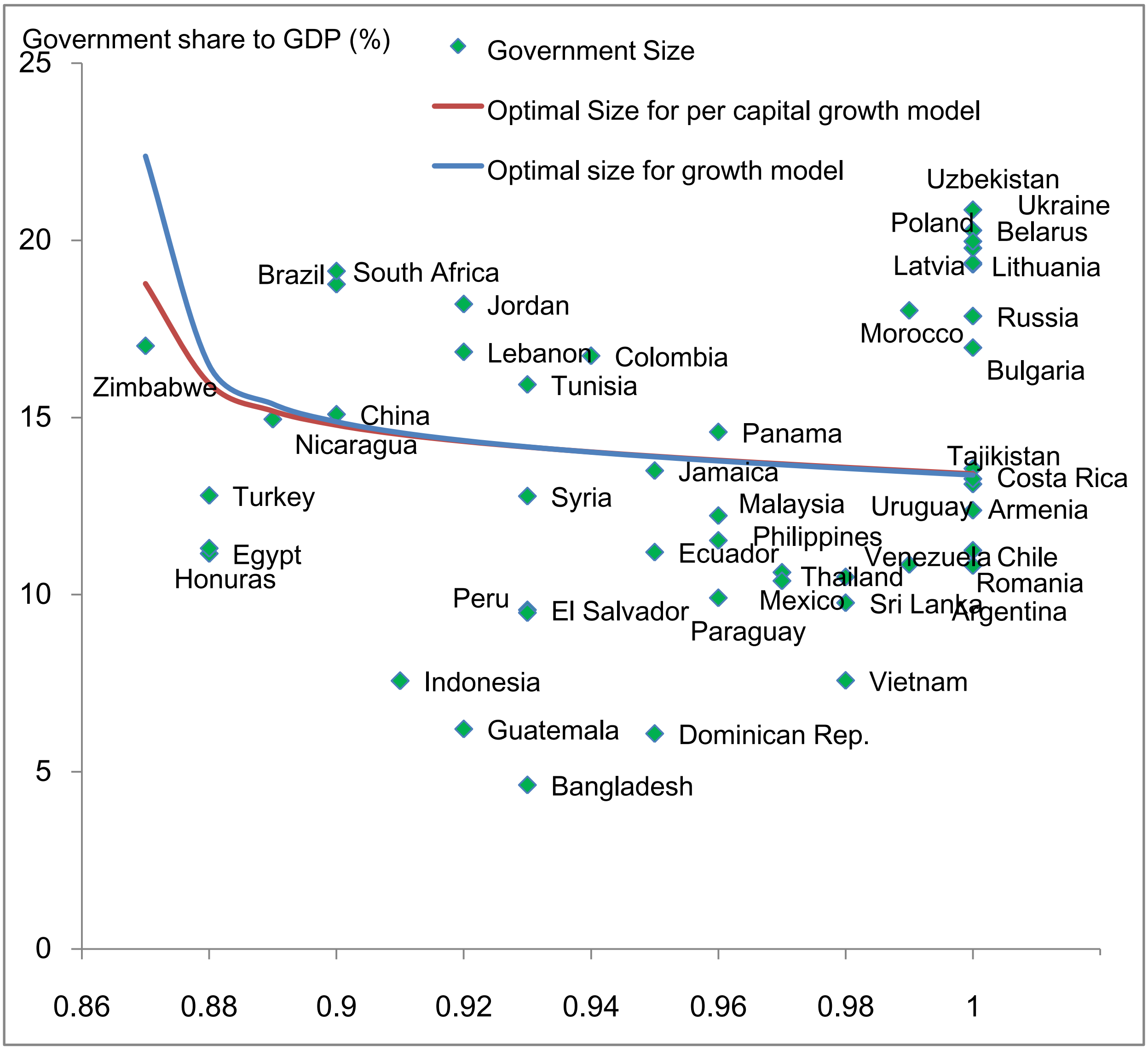
Figures in parentheses are standard error values. Asterisks indicate variables whose coefficients are significant at 10 percent (*), 5 percent (**) and 1 percent (***), respectively.

Out of the 63 countries in our sample, 16 had efficiency scores below the critical value, for which no optimal government expenditure size could be determined. For the 47 countries for which we were able to determine the optimal expenditure sizes, we simulated these sizes with their corresponding average efficiency scores for the period 1990 to 2003. The results are presented in Figure 1. We found that the optimal government size decreases when the efficiency of government spending increases.

We also observed that more countries were under-spending than overspending. Some countries, such as China, Tajikistan, and Costa Rica, lie very close to the optimal line, implying that their governments, with respect to their efficiency levels, are spending optimally to maximize their economic growth.

Meanwhile, countries that lie above the optimal level should reduce their spending to achieve their optimal size, a crucial step especially for countries running budget deficits. Uzbekistan, Belarus, and Ukraine, for example, may cut their spending to sustain their budgets without forgoing their growth targets. However, if these countries are utilizing their own revenues as opposed to other funding sources, expenditure can be directed towards projects other than growth-promotion, such as improving social security and public welfare.

Figure1: Decreasing Function of Optimal Size of Government with Respect to Efficiency



Finally, countries that lie closely under the optimal line may achieve their optimal size simply by improving their efficiency scores. Countries which lie far below the optimal line, such as Guatemala, Bangladesh, Dominican Republic, Indonesia, and Vietnam, imply that their governments may be spending too little, and as such, can get closer to the optimal line significantly by increasing their expenditure. However, by improving efficiency, the amount required to achieve the optimal size would be less. Increasing government spending using loans creates interest liability and reduces budget flexibility. Hence, improving efficiency would not only help to achieve optimal government size, it would also support budget sustainability. Improving efficiency may take various forms, such as choosing more productive spending and improving governance, that is, carefully considering what to spend resources on and how to spend them. Focusing on expenditures that directly impact economic growth, such as education, health and infrastructure, will improve the efficiency level. On the other hand, efficiency can also be improved through better budget disbursement by streamlining the bureaucratic chain and increasing accountability.

4. Concluding Remarks

This study aimed to explore the role of efficiency in the relationship between government expenditure and economic growth for developing countries. We found that the optimal government size exists only above a certain efficiency threshold for which the optimal size is a decreasing function of the efficiency scores.

Our findings suggest that improving efficiency will reduce the optimal government size required to maximize growth. Understandably, when a government spends its resources towards the right purposes and in an efficient manner, the amount required to maximize growth will be smaller. We therefore recommend that governments of developing countries, when considering economic growth, pay attention not only to their budget sizes but also to what to spend their budgets on and how to spend them. Improving expenditure efficiency can help alleviate the fiscal deficit that is often experienced by developing countries.

We would like to note, however, that the results of this study should be taken as indicative rather than definitive, owing to the limitation arising from the method of developing the efficiency scores. Using a non-parametrical approach provides little choice in terms of statistical assessment. Furthermore, as sample choice may differ from one study to another, the efficiency score should only be considered as a relative measurement.

References

Afonso, A, Schuknecht, L & Tanzi, V 2003, 'Public Sector Efficiency: an International Comparison', *European Central Bank Working Paper Series,* No. 242.

Afonso, A &Aubyn, MSt 2004, 'Non-parametric Approaches to Education and Health Expenditure Efficiency in OECD Countries', *Department of Economics of School of Economics and Management of Technical University of Lisbon Working Papers Series*, No. 2004/01.

Agell, J, Ohlsson, H & Thoursie, PS 2006, 'Growth Effects of Government Expenditure and Taxation in Rich Countries: A Comment', *European Economic Review,* Vol. 50 pp. 211-218.

Angelopoulos, K, Philippopoulos, A & Tsionas, E. 2008, 'Does Public Sector Efficiency matter? Revisiting the Relation between Fiscal Size and Economic Growth in a World Sample', *Public Choice,* Vol. 137, pp. 245-278.

Barro, RJ 1990, 'Government Spending in A Simple Model of Endogenous Growth', *The Journal of Political Economy,* Vol. 98, No. 5, pp. 103–125.

Banker RD,Charnes, A & Cooper, WW 1984, 'Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis', *Management Science*, Vol. 30, pp. 1080-1092.

Chao, JCP & Grubel H 1998, 'Optimal Levels of Spending and Taxation in Canada', in H Grubel (ed.). *How to use the fiscal surplus*, The Fraser Institute, Vancouver, pp. 53-68.

Coelli TJ 1996, 'A Guide to DEAP Version 21.1: A Data Envelopment Analysis (Computer) Program', *CEPA Working Papers*, No. 8/96.

Fölster, S & Henrekson, M 2001, 'Growth Effects of Government Expenditure and Taxation in Rich Countries', *European Economic Review*, Vol. 45, pp. 1501-1520.

Greene, W 2005, 'Efficiency of Public Spending in Developing Countries: A Stochastic Frontier Approach' *Paper by World Bank Staff and Consultants, The World Bank.*

Gupta, S & Verhoeven, M 2001, 'The Efficiency of Government Expenditure: Experiences from Africa', *Journal of Policy Modeling* Vol. 23, pp. 433-467.

Herrera, S & Pang, G 2005, 'Efficiency of Public Spending in Developing Countries: An Efficiency Frontier Approach', *World Bank Policy Research Working Paper.*
http://siteresources.worldbank.org/INTQFA/Resources/EfficiencyofPublicSpendinginDevelopingCountries_MAY05.pdf (retrieved in 2011)

Ley, E 2009, 'Fiscal Policy for Growth', *World Bank'sPoverty Reduction and Economic Management Notes,* No. 131.

Sijpe, N., & Rayp, G. 2007, 'Measuring and Explaining Government Efficiency in Developing Countries', *Journal of Development Studies*, Vol. 43 , No. 2, pp. 360-381.

Scully, GW 1994, 'What is the Optimal Size of Government in the United States?', *National Center for Policy Analysis*, No.188.

Wilson, P 2004, 'Preliminary Non-parametric Analysis of Public Education and Health Expenditures in Developing Countries', *Paper by World Bank Staff and Consultants, The World Bank.*
http://siteresources.worldbank.org/INTQFA/Resources/369257-1216648454509/20041208_03.pdf (retrieved in 2011)

Wooldridge, JM 2002, *Introductory to Econometrics: A Modern Approach Second Edition*, South Western, Mason.

World Bank 2005, 'Economic Policy and Debt, Efficiency of Public Spending', The World Bank.
http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTDEBTDEPT/0,,contentMDK:20297571~menuPK:64166739~pagePK:64166689~piPK:64166646~theSitePK:469043~isCURL:Y,00.html *(retrieved in 2011)*

Appendix: Performance, Government Size and Optimal Size with Rank Order

Country	Efficiency	Rank	Government Size (%)	Per Capital Growth as dependent variable		Growth as dependent variable	
				Optimal Size (%)	Deviation from optimal size	Optimal Size (%)	Deviation from optimal size
Armenia	1	1	13.12	13.76	-0.64	12.98	0.14
Belarus	1	1	20.28	13.76	6.52	12.98	7.30
Bulgaria	1	1	16.97	13.76	3.21	12.98	3.99
Chile	1	1	11.25	13.76	-2.51	12.98	-1.73
Costa Rica	1	1	13.56	13.76	-0.20	12.98	0.58
Latvia	1	1	19.32	13.76	5.56	12.98	6.34
Lithuania	1	1	19.36	13.76	5.60	12.98	6.38
Poland	1	1	19.78	13.76	6.02	12.98	6.80
Romania	1	1	10.82	13.76	-2.94	12.98	-2.16
Russia	1	1	17.86	13.76	4.10	12.98	4.88
Tajikistan	1	1	13.27	13.76	-0.49	12.98	0.29
Ukraine	1	1	19.97	13.76	6.21	12.98	6.99
Uruguay	1	1	12.38	13.76	-1.38	12.98	-0.60
Uzbekistan	1	1	20.86	13.76	7.10	12.98	7.88
Argentina	0.99	15	10.85	13.88	-3.03	13.04	-2.19
Morocco	0.99	15	18.02	13.88	4.14	13.04	4.98
Sri Lanka	0.98	17	9.77	14.00	-4.23	13.11	-3.34
Venezuela	0.98	17	10.5	14.00	-3.50	13.11	-2.61
Vietnam	0.98	17	7.58	14.00	-6.42	13.11	-5.53
Mexico	0.97	20	10.63	14.14	-3.51	13.17	-2.54
Thailand	0.97	20	10.39	14.14	-3.75	13.17	-2.78
Country	Efficiency	Rank	Government	Per Capital Growth as		Growth as dependent variable	

			Size (%)	dependent variable			
				Optimal Size (%)	Deviation from optimal size	Optimal Size (%)	Deviation from optimal size
Malaysia	0.96	22	12.23	14.29	-2.06	13.23	-1.00
Panama	0.96	22	14.59	14.29	0.30	13.23	1.36
Paraguay	0.96	22	9.91	14.29	-4.38	13.23	-3.32
Philippines	0.96	22	11.53	14.29	-2.76	13.23	-1.70
Dominican Rep.	0.95	26	6.08	14.45	-8.37	13.29	-7.21
Ecuador	0.95	26	11.2	14.45	-3.25	13.29	-2.09
Jamaica	0.95	26	13.5	14.45	-0.95	13.29	0.21
Colombia	0.94	29	16.74	14.65	2.09	13.35	3.39
Bangladesh	0.93	30	4.63	14.88	-10.25	13.40	-8.77
El Salvador	0.93	30	9.57	14.88	-5.31	13.40	-3.83
Peru	0.93	30	9.49	14.88	-5.39	13.40	-3.91
Syria	0.93	30	12.78	14.88	-2.10	13.40	-0.62
Tunisia	0.93	30	15.93	14.88	1.05	13.40	2.53
Guatemala	0.92	35	6.21	15.17	-8.96	13.45	-7.24
Jordan	0.92	35	18.2	15.17	3.03	13.45	4.75
Lebanon	0.92	35	16.85	15.17	1.68	13.45	3.40
Indonesia	0.91	38	7.57	15.55	-7.98	13.49	-5.92
Indonesia	0.91	38	7.57	15.55	-7.98	13.49	-5.92
Brazil	0.9	39	18.76	16.12	2.64	13.50	5.26
China	0.9	39	15.09	16.12	-1.03	13.50	1.59
South Africa	0.9	39	19.13	16.12	3.01	13.50	5.63
Nicaragua	0.89	43	14.95	17.10	-2.15	13.47	1.48
Country	Efficiency	Rank	Government	Per Capital Growth as		Growth as dependent variable	

			Size (%)	dependent variable			
				Optimal Size (%)	Deviation from optimal size	Optimal Size (%)	Deviation from optimal size
Egypt	0.88	44	11.16	19.36	-8.20	13.31	-2.15
Honduras	0.88	44	11.31	19.36	-8.05	13.31	-2.00
Turkey	0.88	44	12.8	19.36	-6.56	13.31	-0.51
Zimbabwe	0.87	47	17.02	32.62	-15.60	12.52	4.50
Bolivia	0.85	48	14.01	-	-	-	-
Pakistan	0.82	49	11.41	-	-	-	-
Botswana	0.8	50	25.32	-	-	-	-
India	0.8	50	11.6	-	-	-	-
Kenya	0.8	50	16.08	-	-	-	-
Nepal	0.79	53	9.08	-	-	-	-
Ghana	0.76	54	11.33	-	-	-	-
Togo	0.75	55	11.92	-	-	-	-
Yemen, Rep.	0.75	55	16.1	-	-	-	-
Zambia	0.75	55	16.15	-	-	-	-
Tanzania	0.74	58	12.8	-	-	-	-
Senegal	0.71	59	13.27	-	-	-	-
Cote d'Ivoire	0.66	60	10.71	-	-	-	-
Ethiopia	0.63	61	11.83	-	-	-	-
Nigeria	0.63	61	16.07	-	-	-	-
Mozambique	0.58	63	10.7	-	-	-	-

Note: (-) refers to "not available" for countries whose efficiency score is lower than the critical value (0.865), for which the optimal size does not exist.