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EXPENDITURE EFFICIENCY AND FISCAL SIZE: AN EMPIRICAL EVIDENCE FROM DEVELOPING ASIAN COUNTRIES

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Abstract. Efficiency of government expenditures has a significant role in achieving macroeconomic policy goals of the government. This research empirically investigates the relationship between efficiency of government expenditures and fiscal size. Performance of government sector in nineteen developing Asian countries is analyzed for six policy areas including administration, health, education, infrastructure, economic performance and economic stability. Results of the study show that medium-sized governments are relatively more efficient in all public policy areas as compared to large-sized government. There is a need to curtail wasteful expenditures and divert government resources towards sectors that strengthen market forces and help to create equal opportunities for the people.

Keywords: Technical efficiency, Public sector performance, DEA double bootstrap, Developing Asia

JEL classification: H21, L25, O53

I. INTRODUCTION

Public sector expenditure is an important source of satisfying collective needs of the society. Government addresses such societal needs by

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providing public goods and services and by correcting market failures. These goods and services are too costly to be delivered by the private sector. If the government does not spend at all, then the provision of basic facilities like infrastructure, security of property rights, and contract enforcement would become difficult. Therefore, government's involvement in economic activity is sometimes indispensable for the economic and social well-being of the masses. According to World Bank (2005), the efficiency of government expenditures has a significant influence on attainment of government's macroeconomic policy goals. Efficiency means the capability of a government to utilize its revenues in the production of goods and services in the best possible manner, to ensure attainment of desired benefits to the economy and enhancement of economic growth.

After the onset of global financial crisis (GFC), many researchers are devising policy frameworks to minimize the effects of business cycles on the economy. Owing to the reduction in world inflation, many economies have followed monetary expansion which aimed at decreasing interest rates to boost economic growth. But paired with exchange rate depreciations, export-oriented countries could not take desired benefits. Provided with a little room for monetary policy in such a situation, a proactive fiscal policy is needed to combat economic fluctuations faced by both developed and developing countries.

Therefore, many economies around the world favor the concept of government expenditures as a tool of fiscal policy for mitigating the harmful consequences of the economic crisis. The main drawback of such countercyclical expansionary stance in fiscal policy is rising fiscal deficits. These rise in deficits can sometimes cause harmful effects especially in case of low income countries. In many developing economies, this issue of high fiscal deficits has given rise to increasing debt to GDP ratio and debt overhang. International financial institutions, like IMF, have introduced fiscal adjustment programs in response to rising debt and fiscal deficits in developing countries.

This scenario has led many researchers to focus on the allocative and distributive usefulness of public expenditures and its role in the stability of the economy. Studies by Mueller (1997), Shleifer and Vishny (1998), and Gwartney *et.al* (2002) concluded that if efficiency of government

funds is improved then the size of government spending will be reduced. Measuring efficiency of government expenditures will, therefore, help to evaluate the usefulness of public spending and allow the optimal use of scarce government resources in such a way that unnecessary rise in public spending could be curtailed, market distortions could be minimized and fiscal deficits could be controlled.

FISCAL POLICY TRENDS IN DEVELOPING ASIA

In context of Asia, it is evident that this economy is significantly influencing the regional and global economic outlook. Although Asia was the first region to come out of global financial and economic turmoil of 2008-09, economic growth of this region is fragile since then. Asian countries are following expansionary stance in fiscal policy and 40 percent of the countries experienced growing fiscal deficits. (ADB, 2016). Two large economies of developing Asia i.e. China and India strongly influenced the growth pattern of the region. China has shifted its policies towards increasing consumption demand while India and Indonesia pursued more investment projects to build capital stock. Republic of Korea has undertaken additional expenditures of $13 billion in 2015 for job creation and social security services while in 2016 government spending grew at a rate of 3%. In Russia, even though government experienced reduction in revenues due to fall in international oil prices, expenditures in social sector payments and manufacturing sector support were raised. Philippines planned to double the budget allocated for development sectors. Spending was increased to 38%, 12% and 29% in health, education and infrastructure sectors respectively. (ADB, 2016)

In Thailand, $4 billion stimulus package was introduced by the government which included support for farmers, developmental projects in villages and tax concessions for small-scale industries. (Abdon *et.al*. 2014). In Malaysia and Pakistan, where governments are running high deficits, the countercyclical fiscal stance is crucial. In Pakistan and many other South Asian countries large fiscal deficits are due to low tax buoyancy, therefore, tax net is required to be expanded.

To give a comprehensive overview of the situation, Table 1 reports fiscal deficits experienced by developing Asian countries over the years 2010 to 2015.

TABLE 1

Budget Deficit (%GDP)

Years	2010	2011	2012	2013	2014	2015
Bangladesh	–2.8	–3.6	–3.2	–3.3	–3.1	-3.2
Cambodia	–8.8	–7.6	–6.8	–7.1	–3.8	–2.6
China	–1.7	–1.1	–1.6	–1.9	–1.8	–3.5
Hong Kong	4.2	3.8	3.2	1.0	3.7	0.6
India	–4.8	–5.9	–4.9	–4.5	–4.1	–3.9
Indonesia	–0.7	–1.1	–1.8	–2.2	–2.1	–2.5
Jordan	-2.42	-7.27	-4.24	-3.29	-2.39	-3.19
Kazakhstan	–2.4	–1.9	–2.8	–1.9	–2.7	–2.2
Malaysia	–5.3	–4.7	–4.3	–3.8	–3.4	–3.2
Maldives	–14.4	–6.6	–7.7	–4.1	–2.9	–6.9
Nepal	–1.9	–2.4	–2.0	0.6	0.9	–0.7
Pakistan	–5.9	–6.3	–8.6	–8.1	–4.2	–4.1
Philippines	–3.5	–2.0	–2.3	–1.4	–0.6	–0.9
Sri Lanka	–7.0	–6.2	–5.6	–5.4	–5.7	–7.4
Tajikistan	–7.1	–5.8	–3.1	–4.8	–3.7	–6.5
Vietnam	–2.1	–0.5	–3.4	–5.0	–4.4	–4.6

Source: Asian Development Bank 2016

All the countries except Hong Kong have run high fiscal deficits over time. The highest fiscal deficit was experienced by Sri Lanka i.e.7.4 percent of GDP, while lowest value was of Nepal i.e. 0.7 percent of GDP in 2015. Almost all the countries in this region have reasonable fiscal space, thus there is a need for constant evaluation of fiscal policies in line with the macroeconomic goals set by the government.

This study is aimed at analyzing the performance of government sector in six policy areas i.e. administration, health, education, infrastructure, economic performance and economic stability for selected developing Asian countries. Efficiency of government expenditures is measured through Data Envelopment Analysis (DEA) double bootstrap

procedure. This study also intends to highlight the pattern of relationship between government size and its efficiency for the selected panel of countries. This research is very important in context of Asian countries because there is a marked emphasis on the role of fiscal policies in keeping the countries' economies in check after GFC. In many developing Asian countries, IMF has launched fiscal adjustment programs that require phenomenal reduction in government expenditures especially investment spending. It improves the government budgetary position but at the cost of future economic growth. In such a case, measuring efficiency of government expenditures will help to achieve optimal utilization of public resources in achieving high economic growth rates and lower fiscal deficits.

II. LITERATURE REVIEW

The issue of measuring efficiency of government expenditures is gaining marked importance among researchers so that policies can be formulated in line with governments' objective of achieving high and stable economic growth rates.

Grossman *et.al*. (1999) defined technical inefficiency as, given the combination of selected inputs, any level of production which is lower than the maximum output that can be produced. They used Stochastic Frontier Analysis (SFA) to estimate technical inefficiency in local government sector in U.S. They collected samples of 49 local governments in U.S and found that different local governments that are larger in size were having various degrees of technical inefficiencies that changed with estimated degrees of competitive pressures.

Evans *et. al*. (2000) conducted a pioneer study by measuring efficiency of health sector in 191 countries using data over 1993-1997 and employing SFA fixed effect model. They selected mortality and ill health to proxy output indicator and total health expenditure per capita PPP to measure input indicator. The results indicated that Sri Lanka and China had the most efficient health care system among all other developing countries. Oman could significantly reduce child immortality over last 25 years. France on the other hand, had the highest score in provision of health care facilities. Results also revealed that efficiency of health sector is directly related to percentage expenditures on health.

In an investigation, Gupta and Verhoeven (2001) measured government efficiency in health and education sectors for African countries. They selected 37 African Countries and used data from years 1984-1995 to conduct a comparison of efficiency levels among different countries in Africa, and Africa with Asia and western economies. The result portrayed that government spending on health and education was less efficient in Africa as compared to Asia and western countries. They suggested that government should focus on other variables for improvement in education and health input in Africa rather than allocating large budgets in these sectors.

Hollingsworth and Wildman (2003) using the data of World Bank (2000) and Evans *et. al*. (2000) re-estimated country ranking using SFA and DEA to incorporate heterogeneity among member countries. They further divided the countries in OECD and non-OECD economies and concluded that results of OECD countries were relatively more stable as compared to non-OECD countries.

Afonso *et. al*. (2003) computed public sector efficiency scores for 23 industrial countries by developing public sector performance (PSP) and public sector efficiency (PSE) indicators. Their results from PSE index indicated that efficiency for public spending was higher in countries that had low fiscal size and lower in countries that had larger fiscal size. Similar results were obtained with efficiency measurement through non-parametric technique i.e. Fixed Disposal Hull (FDH). They suggested that countries with large public size should reduce the size of government expenditures by almost 35 percent to increase efficiency of public spending. Findings further indicated that EU-15 countries were spending 27 percent more than the countries having higher level of efficiency and almost similar public sector efficiency scores.

In another study, Afonso and Aubyn (2005) addressed the issue of education and health efficiency for OECD economies. They applied two different non-parametric methods FDH and Data Envelopment Analysis (DEA) to generate efficiency scores for their sample of countries. Efficiency scores were found to be higher for some core countries i.e. Japan, Korea and Sweden. Average efficiency scores in health ranged between 0.832 and 0.946 and in education varied between 0.859 and 0.886.

Herrera and Pang (2005) investigated that how efficiently government in developing countries provided its social services. Government spending on health and education was used as inputs. Education sector output was measured by enrollment in primary and secondary schools, completion rates, and scores on learning. For output of health sector, they used life expectancy at birth, rates of DPT and measles immunization and life expectancy (disability adjusted). The results suggested that economies having larger government size, higher wage expenses, larger share of public financing in provision of services, high inequality and foreign aid, performed poorly as indicated by their low efficiency scores.

Afonso *et. al*. (2006) measured efficiency scores of countries entering in EU, EU candidates, and emerging markets. Public sector performance and efficiency scores revealed that those countries having fiscal size of not more than 30 percent were more efficient. They also applied data envelopment analysis (DEA) to measure efficiency scores. DEA scores revealed that Singapore, Korea, Thailand, Cyprus, and Ireland were quite near to the production possibility frontier. Countries having higher ranks used one third of the input utilized by the countries having lower rankings.

Using dataset over 1990-2002 on health, education and infrastructure sectors for 192 countries, Estache *et. al*. (2007) generated efficiency measures for each sector. They maintained that data constraint on output and input on sectoral level was a big hurdle in monitoring the performance of government in different sectors and explained the ways in which this limited data can be employed in most appropriate manner to reach country specific outcomes. Their findings indicated that, on average, high income countries perform better, although not in all the sectors, compared to low income countries. Moreover, they also found that efficiency improved in energy and education sectors during 1990's.

Lavado and Domingo (2015) collected data over the years 1995-2010 to measure health and education sector efficiency in Asian economies. Inputs used were education and health expenditures by the government per country and outputs were measured by primary and secondary completion rates. For education, due to data unavailability, they took average values of data from years 2006 to 2012 and conducted

DEA. Results of their analysis indicated that Singapore, Fiji, Vanuatu and Thailand had highest efficiency scores in health sector generated from DEA. Average score of output efficiency was 0.96 percent. In education sector, input oriented DEA scores indicated that sample countries had spent 27 percent more than required to attain that output level. Bangladesh, Cambodia and Nepal were most efficient based on input oriented DEA while Maldives and Samoa were most efficient as per output oriented DEA.

It can be observed from the above review of literature that, there exists a gap on the issue of efficiency measurement in context of developing Asian countries. Furthermore, most of the studies have conducted efficiency analysis for limited policy areas mainly health and education sectors. Present study has conducted the efficiency analysis on a broader perspective by including six important policy areas of the government. In this paper, the latest technique of efficiency measurement i.e. DEA double bootstrap method is employed to measure government sector efficiency in the selected sample of economies. DEA double bootstrap overcomes several drawbacks related to traditional efficiency measurement methods. (Simar and Wilson, 2007).

III. DATA AND METHODOLOGY

DATA

The study uses Annual dataset for 19 developing Asian countries from 1996-2015. These countries include Bangladesh, Cambodia, China, Hong Kong, India, Indonesia, Jordan, Kazakhstan, Malaysia, Maldives, Nepal, Pakistan, Philippines, Russia, Sri Lanka, Tajikistan, Thailand, Ukraine and Vietnam. Data is obtained from World Development Indicators (WDI) (2016), Penn World Tables (PWT) version 09, World Governance Indicators (WGI) (2016) and Government Finance Statistics (GFS) (2016) published by International Monetary Fund. Detail of variables, interpretation and sources are discussed in Table 2.

TABLE 2

Description of Variables

Policy Area	Variables	Source
Administration (Admin)	Control of corruption	WGI (2016)
	Regulatory quality	
	Rule of law	
Education (Edu)	Human capital index based on years of schooling and returns to education	PWT ver. 09
Health (Hea)	Infant (mortality inversed values)	WDI (2016)
	Life expectancy	
Infrastructure (Infra)	Electric power consumption kwh	WDI (2016)
Economic Performance (EP)	Real GDP growth rate	WDI (2016)
	Unemployment (rate inversed values)	
Economic Stability (ES)	Stability of real (GDP coefficient of variation)	WDI (2016)
	Inflation (5-year average)	
GEXP	Government total expenditure as % GDP equals government consumption expenditure as % GDP and government investment expenditure as % GDP	WDI (2016) GFS (2016)

Control of corruption, regulatory quality and rule of law are all expressed in percentile ranks which indicates the country's rank among all the countries included in the aggregate indicator. They range between 0 and 100, with 0 corresponding to lowest rank, and 100 to highest rank. Values of infant mortality rate and unemployment rate are inversed and then incorporated into the analysis because these are negative indicators i.e. higher value of these variables exerts negative influence. Government total expenditure is used as the input in efficiency measurement in DEA double bootstrap model.

METHODOLOGY FOR PUBLIC SECTOR PERFORMANCE (PSP) INDEX

First step in the analysis is to construct public sector performance index using six government policy areas. For this purpose, Principal Component Analysis technique is employed. Principal Component Analysis (PCA) is a useful and acknowledged way to reduce many variables in a data set into one or more coherent and uncorrelated factors. Each new component thus obtained is a linear and weighted combination of initial variables. These weights are produced by the Eigen vectors of the correlation matrix or the covariance matrix (in case of standardized data). The factors are ordered in a way that first component accounts for the maximum variation in the original variables. The second component accounts for the maximum possible variation in original variables that could not be accounted for by the first component and so on. There are many assumptions needed to be tested before applying PCA. (see for example; Nardo, Saisana, Saltelli and Tarantola, 2005; Tabachnick and Fedell, 2007; Krishnan, 2010).

General formula to generate scores through PCA, using the first principal component is:

$PC_1 = a_{11}(X_1) + a_{12}(X_2) + a_{13}(X_3) + \ldots.. a_{1n}(X_n)$ ------i

Where;

PC_1 is the variable score on first principal component, a_{1n} is the weight of variable 'n' in calculating first principal component and X_n is value of variable 'n'.

METHODOLOGY FOR DEA DOUBLE BOOTSTRAP MODEL

After the construction of PSP index, next step is to measure the efficiency scores. PSP index is used as output while government total expenditure as percentage of GDP is used as input. The study uses smooth bootstrap technique presented by Simar and Wilson (1998, 2000) to generate efficiency scores. It produces DEA bias corrected scores and their confidence intervals with bootstrapping approach.

Output oriented variables return to scales (VRS) model is used to estimate the efficiency scores. Output orientation is adopted because it is assumed that governments want to maximize the level of output given the

size of budget. VRS assumption is used because it helps to remove the scale effect of budget which is feared to effect outputs (Banker et al, 1984).

Output oriented DEA estimates for data set (x_i, y_i) for each country can be obtained by solving the following linear programming equation.

$$\widehat{\emptyset}_{vrsi} = max \begin{bmatrix} \emptyset > 0 | \emptyset_i Y_i \leq \sum_{i=1}^{n} \gamma_i Y_i ; \; X_i \geq \sum_{i=1}^{n} \gamma_i X_i ; \\ \sum_{i=1}^{n} \gamma_i = 1; \; \gamma_i > 0, \; i = 1, \ldots, n \end{bmatrix} \text{----------ii}$$

In equation 'ii' above, variables Y, and X represent output and input respectively, while 'i' represents cross sections. $\emptyset_i Y_i$ represents efficient level of output. $\emptyset$ is a scalar while γ_i is a non-negative vector of optimal weights of inputs and outputs. $\widehat{\emptyset}_{vrsi}$ is technical efficiency term. $\widehat{\emptyset}_{vrsi}$ = 1 means that country "i" is fully efficient. If $\widehat{\emptyset}_{vrsi}$ < 1 then it implies that country is less efficient and needs to increase output given the level of inputs.

IV. RESULTS AND INTERPRETATIONS

RESULTS AND INTERPRETATIONS OF PUBLIC SECTOR PERFORMANCE INDEX

Following the steps discussed in methodology, all the assumptions are tested before applying PCA. (Results will be provided upon request). Scores of PSP index are reported in the table below.

TABLE 3

Average PSP Scores (1996-2015)

Country	Admin	Hea	Edu	Infra	E P	ES	PSP	GEXP
Bangladesh	0.409	0.498	0.558	0.449	0.418	0.467	1.119	10.967
Cambodia	0.585	0.409	0.454	0.382	0.461	0.503	1.076	11.512
China	0.493	0.522	0.477	0.410	0.380	0.516	1.118	32.313
Hong Kong	0.703	0.561	0.533	0.695	0.544	0.459	1.414	13.592
India	0.517	0.550	0.475	0.402	0.461	0.429	1.182	17.073
Indonesia	0.502	0.614	0.495	0.437	0.612	0.446	1.334	10.931
Jordan	0.433	0.619	0.483	0.559	0.441	0.318	1.231	29.109
Kazakhstan	0.463	0.660	0.359	0.546	0.453	0.479	1.220	14.455

Country	Admin	Hea	Edu	Infra	E P	ES	PSP	GEXP
Malaysia	0.436	0.539	0.567	0.479	0.485	0.503	1.248	25.220
Maldives	0.538	0.287	0.521	0.431	0.455	0.452	1.145	28.040
Nepal	0.423	0.385	0.513	0.434	0.557	0.416	1.158	14.351
Pakistan	0.493	0.692	0.486	0.518	0.514	0.499	1.306	13.028
Philippines	0.425	0.556	0.486	0.530	0.613	0.434	1.252	13.349
Russian Federation	0.518	0.651	0.432	0.539	0.529	0.511	1.321	20.699
Sri Lanka	0.552	0.753	0.569	0.559	0.551	0.454	1.389	14.393
Tajikistan	0.497	0.590	0.511	0.519	0.620	0.380	1.266	13.597
Thailand	0.433	0.493	0.477	0.504	0.588	0.477	1.222	20.946
Ukraine	0.494	0.634	0.428	0.519	0.574	0.534	1.323	21.352
Vietnam	0.564	0.476	0.521	0.439	0.485	0.434	1.160	13.646

Source: Author's Own Calculations

Table 3 presents scores of PSP and sub-indices averaged over the period of 1996-2015. Detailed results of each year for every country are presented in the table 7 in Appendix A.

First column of the table shows countries of interest. Second, third, fourth, fifth, sixth and seventh columns present the scores of sub-indices administration, health, education, infrastructure, economic performance and economic stability respectively. In eighth column results of PSP index are reported. Higher value of sub-indices and total PSP index corresponds to better performance. In ninth column the values of government expenditure as percentage of GDP are mentioned. Using the values of GEXP, we have divided countries based on government size. Small-sized governments are those having GEXP value less than or equal 10.93%, medium-sized governments are those having GEXP value of greater than 10.96 % and less than 21.62% while large sized governments have GEXP value of 21.62% and above.

It is clear from the table that there is not much variation in the PSP scores across countries with a few exceptions. The highest value is achieved by Hong Kong i.e. 1.41. Sri Lanka (1.38), Indonesia (1.33), Ukraine and Russia (1.32) and Pakistan (1.30) are next to follow. Lowest performing country is Cambodia with a score of 1.07. Among better performing countries, all except Indonesia, have medium size

governments while Indonesia has a small-sized government. It means that outcome and performance of public sector is determined by the size of governments as well. Small and medium-sized governments perform better, on average, as compared to the large-sized governments. These results are consistent with findings of Afonso *et. al.* (2003)

Considering the values of sub-indicators, countries having highest scores are Hong Kong (Administration), Tajikistan (Infrastructure), Sri Lanka (Health and Education), and Ukraine (Economic stability). It is evident from these results that countries having medium-sized governments generate higher efficiency scores in these areas.

To get advantage of the data available, a comparison of countries' performance on total PSP index for years 2008 and 2015 is made. It helps to understand the impact of global recession that took place in year 2008, on government performance in these countries. This comparison is illustrated in Table 4.

TABLE 4

Comparison of PSP Index (2008 and 2015)

Countries	2008		2015	
	GEXP	PSP	GEXP	PSP
Bangladesh	9.662	1.447	13.380	1.795
Cambodia	12.665	1.272	12.503	2.026
China	28.296	1.428	30.085	1.932
Hong Kong	11.425	1.736	14.180	2.066
India	17.911	1.369	16.802	1.922
Indonesia	11.040	1.705	12.272	2.088
Jordan	28.473	1.673	25.378	1.804
Kazakhstan	15.588	1.625	14.299	1.870
Malaysia	23.515	1.338	25.695	2.182
Maldives	27.804	1.074	33.916	1.699
Nepal	14.371	1.467	15.898	1.861
Pakistan	13.643	1.585	14.307	1.931

Countries	2008		2015	
	GEXP	PSP	GEXP	PSP
Philippines	11.356	1.474	14.078	2.149
Russia	21.606	1.713	22.547	1.991
Sri Lanka	21.043	1.703	11.629	1.787
Tajikistan	12.290	1.453	15.778	1.347
Thailand	19.919	1.423	21.968	2.058
Ukraine	20.314	1.832	19.469	1.813
Vietnam	13.705	1.228	13.639	2.033

Source: Author's Own Calculations

Table reveals that almost all the countries have improved on PSP index in year 2015 as compared to year 2008 except Tajikistan and Ukraine. It shows that developing Asian countries are not harshly affected by GFC. Cambodia, Hong Kong, Indonesia, Malaysia, Philippines, Thailand and Vietnam have shown significant improvements over the period. It is also evident that all these countries have increased the size of government to some extent. This increase in expenditures is in line with Asian Development Bank policy implementations. (ADB, 2015).

Tajikistan experienced a decline in PSP value from 1.45 to 1.34. Tajikistan economy is experiencing the effects of recessionary waves in Russia and trade problems with its partners Kazakhstan and China. It has put pressures on government's budgetary positions especially when government is aimed at reducing poverty and unemployment. On the other hand, Ukraine has also shown a deteriorating performance on PSP index. Its value decreased slightly from 1.83 to 1.81 from year 2008 to 2015. Ukraine economy was severely affected by 2008 crisis. It started recovering afterwards but is still facing harsh economic conditions since 2013. This is due to internal political factors and, on external front, strict policy by the trading partner Russia.

INTERPRETATION OF DEA DOUBLE BOOTSTRAP RESULTS

In the final stage, DEA Double Bootstrap model is estimated to calculate efficiency scores. Output was measured by total PSP index

calculated in the previous section and input was measured by GEXP. Results of the model estimated by DEA Double Bootstrap technique are presented in following table. The efficiency score lies between 0 and 1. The efficiency scores closer to 1 means higher efficiency while the efficiency scores closer to zero means lower efficiency. Output oriented model implies that by using same level of inputs, different levels of outputs are produced. Therefore, if maximum level of output is generated with given level of inputs, then the efficiency score should be maximum. Mean efficiency score for 1996-2015 for each country are presented in Table 5.

TABLE 5

Average Efficiency Scores (1996-2015)

Countries	DEA	B.C DEA
Bangladesh	0.682	0.625
Cambodia	0.641	0.593
China	0.647	0.614
Hong Kong	0.829	0.784
India	0.697	0.662
Indonesia	0.793	0.748
Jordan	0.736	0.699
Kazakhstan	0.706	0.678
Malaysia	0.760	0.703
Maldives	0.816	0.657
Nepal	0.670	0.636
Pakistan	0.757	0.709
Philippines	0.754	0.694
Russia	0.790	0.730
Sri Lanka	0.888	0.754
Tajikistan	0.793	0.680
Thailand	0.708	0.663
Ukraine	0.794	0.743
Vietnam	0.686	0.644

Source: Author's Own Calculations

First column of the table shows countries of interest. Second column gives DEA scores while third column represents bias corrected DEA scores. Detailed results of DEA bias corrected scores for each year and each country are presented in table 8 of Appendix A. From table above, DEA overestimates coefficients and underestimates the frontier. While bias correction after applying 2500 iteration removes exaggeration (Simar and Wilson, 2007).

It is evident from table 5 that 20-year average Bias corrected scores do not show much variation in the developing Asian countries groups. Highest score is attained by Hong Kong i.e. 0.784 which shows that approximately 21.6% output can be increased by making use of same set of inputs. Hong Kong is followed by Sri Lanka (0.753), Indonesia (0.748), Ukraine (0.743), and Russia (0.730). Lowest score is exhibited by Cambodia i.e. 0.593.

To compare the pre and post GFC impact on public sector efficiency in these countries, a comparison between efficiency scores of years 2008 and 2015 is made. Results are reported in the following table.

TABLE 6

Average Efficiency Scores (1996-2015)

Countries	2008				2015			
	DEA	B.C DEA	L.B	U.B	DEA	B.C DEA	L.B	U.B
Bangladesh	1.000	0.756	0.707	0.991	0.819	0.810	0.791	0.819
Cambodia	0.695	0.682	0.659	0.694	0.928	0.908	0.883	0.926
China	0.780	0.738	0.703	0.777	0.928	0.903	0.871	0.925
Hong Kong	1.000	0.927	0.877	0.992	0.945	0.931	0.906	0.944
India	0.748	0.736	0.713	0.747	0.905	0.881	0.854	0.903
Indonesia	0.931	0.916	0.887	0.930	0.954	0.943	0.920	0.953
Jordan	0.914	0.894	0.859	0.913	0.900	0.860	0.813	0.897
Kazakhstan	0.887	0.874	0.847	0.887	0.856	0.839	0.816	0.855
Malaysia	0.730	0.687	0.654	0.727	1.000	0.968	0.941	0.993
Maldives	0.587	0.568	0.541	0.585	0.778	0.763	0.741	0.777
Nepal	0.801	0.787	0.761	0.800	0.850	0.840	0.820	0.849

Countries	2008				2015			
	DEA	B.C DEA	L.B	U.B	DEA	B.C DEA	L.B	U.B
Pakistan	0.865	0.849	0.820	0.865	0.884	0.870	0.846	0.883
Philippines	0.890	0.835	0.781	0.883	0.984	0.964	0.937	0.983
Russia	0.935	0.921	0.892	0.935	0.910	0.899	0.877	0.908
Sri Lanka	0.930	0.916	0.888	0.929	0.896	0.844	0.794	0.892
Tajikistan	0.793	0.768	0.731	0.792	0.616	0.606	0.590	0.616
Thailand	0.777	0.748	0.712	0.775	0.942	0.927	0.901	0.941
Ukraine	1.000	0.935	0.892	0.991	0.903	0.866	0.819	0.901
Vietnam	0.671	0.656	0.631	0.670	0.939	0.912	0.886	0.937

Source: Author's Own Calculations

Table 6 indicates mixed results across countries. Bangladesh, Cambodia, China, Honking, India, Indonesia, Malaysia, Maldives, Nepal, Pakistan, Philippines, Thailand and Vietnam have shown improvements in their government expenditures efficiency scores. Significant improvement is observed in Malaysia, Maldives and Vietnam as the efficiency scores improved from 0.69 to 0.96, 0.56 to 0.76 and 0.65 to 0.91 respectively.

Countries like Jordan, Russia, Kazakhstan, Sri Lanka, Tajikistan and Ukraine observed a decline in efficiency scores. The reason could be attributed to the fact that most of the labor force migrates from Kazakhstan, Tajikistan and Ukraine to Russia. Russian economy being badly hit by 2008 GFC and then international oil prices crises in 2013, also harmed the economies of neighboring countries. Inflow of remittance slowed down while development projects by the governments were adversely affected due to high fiscal deficits. In Sri Lanka however, this decline in efficiency scores can be related to the effects of GFC transmitted from U.S. and also to the internal political unrest. It resulted in reduction in capital inflows, high fiscal deficits and piling up of debt stock. Furthermore, recent internal political situation had retarding effects on Sri Lankan economic growth. (Perera, 2014). Economy of Jordan is also facing hard time as it is badly affected by high food and oil price crisis since 2011. Strict conditions in international financial environment also caused decreased capital inflows and high fiscal deficits.

V. CONCLUSION AND POLICY IMPLICATIONS

Performance of government sector in nineteen developing Asian countries is analyzed by considering six policy areas including administration, health, education, infrastructure, economic performance and economic stability. An index of Public Sector Performance (PSP) is constructed which shows that medium-sized governments perform relatively better in all the sectors. Comparison of PSP values also reveal that all the countries except Tajikistan and Ukraine have improved their performance during 2008-2015 period. DEA double bootstrap model is employed to generate government expenditure efficiency scores. The results of the model exhibit that countries having medium-sized governments have better efficiencies. Majority of the countries have improved their efficiency scores over the years 2008-2015 except Sri Lanka and Jordan, and other central Asian developing countries including Russia, Kazakhstan, Tajikistan and Ukraine.

Study concludes that relationship between government size and efficiency of government spending is not very clear if we consider each country separately. Some countries have shown improvements in efficiency score with increase in fiscal size while other countries have shown improvement in efficiency score by reducing the fiscal size. On average, medium-sized governments have shown high efficiency score. Furthermore, on average, central Asian countries have less efficient governments.

Study suggests some important policy recommendations. It is crucial to achieve macroeconomic stability as it has a direct influence on government performance and on the efficiency of government spending. Governments of developing Asian countries especially central Asian region should focus on removing economic fluctuations and achieving lesser unemployment rates. Governments of these countries should allocate more funds towards programs that create employment opportunities for the masses. There should be a proper check on corruption and embezzlement of government resources by officials and bureaucracy, maintenance of law and order and enforcement of property rights to ensure good administration. Moderate spending of governments seems to be key in achieving higher efficiency. Therefore, unnecessary expenditures should be minimized and fiscal space should be created towards sectors that improve infrastructure, enhance human capital and improve economic performance.

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APPENDIX

TABLE 7

PSP Scores of Countries (1996-2015)

Countries	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bangladesh	0.350	0.442	0.558	0.599	0.686	0.702	0.706	0.746	0.848	1.036	1.253	1.402	1.447	1.490	1.680	1.823	1.450	1.638	1.721	1.795
Cambodia	0.266	0.304	0.361	0.488	0.616	0.663	0.683	0.699	0.791	0.890	1.060	1.147	1.272	1.333	1.425	1.672	1.848	1.928	2.041	2.026
China	0.315	0.386	0.382	0.343	0.608	0.642	0.725	0.960	1.015	1.190	1.285	1.405	1.428	1.339	1.511	1.646	1.655	1.746	1.840	1.932
Hong Kong	0.548	0.585	0.564	0.636	0.812	0.787	0.926	1.135	1.586	1.637	1.684	1.789	1.736	1.715	1.987	1.918	2.016	2.116	2.041	2.066
India	0.588	0.449	0.523	0.677	0.544	0.578	0.603	0.898	0.970	1.297	1.355	1.380	1.369	1.554	1.826	1.733	1.671	1.773	1.930	1.922
Indonesia	0.809	0.712	0.377	0.681	0.794	0.851	0.879	0.922	1.115	1.249	1.385	1.542	1.705	1.732	1.891	1.962	1.937	1.987	2.059	2.088
Jordan	0.445	0.562	0.606	0.739	0.820	0.834	0.895	0.977	1.285	1.362	1.396	1.548	1.673	1.576	1.482	1.589	1.632	1.623	1.767	1.804
Kazakhstan	0.247	0.277	0.266	0.389	0.700	0.873	0.864	1.100	1.213	1.469	1.565	1.585	1.625	1.467	1.748	1.806	1.753	1.755	1.825	1.870
Malaysia	0.728	0.656	0.448	0.687	0.861	0.690	0.892	1.021	1.155	1.222	1.163	1.350	1.338	1.245	1.692	1.711	1.815	1.975	2.119	2.182
Maldives	0.855	0.878	0.877	0.943	0.957	0.922	0.944	0.959	0.882	0.829	1.045	0.986	1.074	0.999	1.522	1.707	1.627	1.532	1.656	1.699
Nepal	0.496	0.472	0.356	0.552	0.748	0.731	0.677	1.035	0.962	1.098	1.244	1.312	1.467	1.546	1.578	1.616	1.741	1.746	1.924	1.861
Pakistan	0.482	0.463	0.540	0.546	0.596	0.625	0.860	1.118	1.367	1.706	1.875	1.795	1.585	1.699	1.745	1.756	1.707	1.798	1.916	1.931
Philippines	0.596	0.638	0.502	0.558	0.684	0.677	0.735	0.906	1.024	1.154	1.254	1.488	1.474	1.417	1.822	1.778	1.919	2.122	2.135	2.149
Russia	0.342	0.517	0.404	0.613	0.833	0.851	0.993	1.145	1.260	1.373	1.575	1.691	1.713	1.380	1.865	1.946	1.972	1.965	1.996	1.991
Sri Lanka	0.360	0.514	0.565	0.764	0.998	0.931	1.214	1.344	1.327	1.452	1.651	1.719	1.703	1.707	1.897	2.038	2.022	1.932	1.860	1.787
Tajikistan	0.664	0.744	0.729	1.002	1.202	1.283	1.347	1.474	1.487	1.503	1.541	1.529	1.453	1.318	1.421	1.363	1.325	1.269	1.325	1.347
Thailand	0.503	0.376	0.298	0.584	0.656	0.702	0.856	1.025	1.122	1.225	1.270	1.391	1.423	1.410	1.830	1.759	2.046	1.928	1.980	2.058
Ukraine	0.451	0.472	0.463	0.494	0.576	0.754	0.867	1.139	1.384	1.566	1.762	1.895	1.832	1.386	1.931	2.002	1.956	1.884	1.824	1.813
Vietnam	0.662	0.600	0.453	0.371	0.634	0.668	0.726	0.875	0.996	1.197	1.184	1.355	1.228	1.272	1.598	1.697	1.721	1.896	2.035	2.033

Source: Author's Own Calculations

TABLE 8

DEA Double Bootstrap Scores (1996-2015)

Countries	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bangladesh	0.304	0.414	0.520	0.515	0.452	0.497	0.467	0.473	0.559	0.590	0.674	0.723	0.756	0.748	0.861	0.874	0.697	0.760	0.799	0.810
Cambodia	0.231	0.282	0.299	0.484	0.373	0.464	0.467	0.445	0.523	0.534	0.672	0.582	0.682	0.682	0.709	0.809	0.890	0.890	0.940	0.908
China	0.270	0.303	0.290	0.251	0.408	0.475	0.508	0.628	0.639	0.681	0.690	0.698	0.738	0.739	0.762	0.770	0.791	0.848	0.895	0.903
Hong Kong	0.468	0.535	0.476	0.464	0.543	0.581	0.650	0.745	0.952	0.934	0.884	0.886	0.927	0.927	0.972	0.923	0.968	0.977	0.943	0.931
India	0.507	0.424	0.437	0.494	0.364	0.425	0.414	0.566	0.748	0.709	0.746	0.712	0.736	0.736	0.908	0.834	0.804	0.856	0.942	0.881
Indonesia	0.692	0.581	0.314	0.655	0.536	0.613	0.603	0.605	0.670	0.717	0.706	0.792	0.916	0.916	0.939	0.951	0.934	0.924	0.955	0.943
Jordan	0.384	0.447	0.481	0.542	0.547	0.610	0.625	0.641	0.772	0.767	0.750	0.790	0.894	0.894	0.778	0.764	0.771	0.795	0.875	0.860
Kazakhstan	0.214	0.256	0.247	0.394	0.443	0.644	0.588	0.715	0.738	0.842	0.824	0.815	0.874	0.874	0.870	0.875	0.846	0.813	0.839	0.839
Malaysia	0.638	0.611	0.381	0.644	0.501	0.508	0.627	0.670	0.749	0.657	0.622	0.696	0.687	0.687	0.834	0.823	0.873	0.909	0.969	0.968
Maldives	0.690	0.763	0.629	0.853	0.601	0.385	0.455	0.528	0.667	0.669	0.671	0.507	0.568	0.568	0.753	0.823	0.781	0.710	0.764	0.763
Nepal	0.423	0.378	0.276	0.414	0.501	0.503	0.442	0.587	0.740	0.599	0.671	0.669	0.787	0.787	0.785	0.783	0.840	0.809	0.892	0.840
Pakistan	0.416	0.365	0.462	0.455	0.425	0.404	0.556	0.690	0.901	0.846	0.945	0.919	0.849	0.849	0.862	0.840	0.820	0.827	0.878	0.870
Philippines	0.505	0.511	0.361	0.405	0.456	0.492	0.501	0.565	0.777	0.604	0.698	0.778	0.835	0.835	0.899	0.829	0.921	0.974	0.972	0.964
Russia	0.286	0.405	0.354	0.545	0.318	0.618	0.694	0.747	0.799	0.784	0.794	0.865	0.921	0.921	0.927	0.943	0.950	0.913	0.925	0.899
Sri Lanka	0.315	0.465	0.069	0.612	0.731	0.496	0.812	0.851	0.875	0.830	0.835	0.883	0.916	0.916	0.937	0.936	0.950	0.881	0.917	0.844
Tajikistan	0.572	0.596	0.677	0.808	0.764	0.418	0.437	0.541	0.965	0.862	0.828	0.789	0.768	0.768	0.697	0.660	0.627	0.600	0.609	0.606
Thailand	0.426	0.301	0.252	0.447	0.430	0.488	0.488	0.512	0.870	0.684	0.696	0.713	0.748	0.748	0.903	0.849	0.982	0.888	0.913	0.927
Ukraine	0.393	0.378	0.384	0.486	0.375	0.492	0.524	0.722	0.917	0.883	0.956	0.955	0.935	0.935	0.951	0.948	0.925	0.922	0.912	0.866
Vietnam	0.569	0.566	0.344	0.338	0.378	0.443	0.486	0.570	0.659	0.681	0.642	0.690	0.656	0.656	0.795	0.822	0.828	0.898	0.942	0.912

Source: Author's Own Calculations