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Fiscal Prudence and Economic Growth in Asia: the role of Efficient Public Spending

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ABSTRACT

The present research is an attempt to study the role of public sector efficiencies in determining optimal fiscal size of the governments for selected Asian countries. Studying efficiency of public spending is important because efficient government spending leads to improved provision of public services like health, education, infrastructure, and welfare initiatives. Improving public sector efficiency will help to promote transparency and accountability which reduces the chances of corruption and wastage of scarce public resources. Using the panel data for 19 developing countries for years 1996-2022, efficiency augmented optimal size of government expenditures is calculated. Pooled Mean Group technique is employed to calculate the impact of efficiency on growth maximizing levels of government total spending, government consumption spending and government investment spending. Results establish strong impact of efficiency in public expenditures on optimal fiscal size. Other variables enhancing economic growth include capital stock and trade openness, while human capital has negative effects. Public sector efficiencies are found to reduce growth maximizing size of government spending. The optimal size of government total expenditure is estimated to be 25.19 %, while optimal fiscal size for government consumption expenditure and government investment expenditure are 14.04%, and 11.18 % respectively for developing Asian countries.

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1. Introduction

Government plays pivotal role in a country's political and economic life. Keynesian economics assigns a crucial role to the government in driving up economic growth rates especially in the time of economic slack. There are times when little intervention by the government enhances economic growth significantly, while sometimes a bulk of government resources are needed to do the job (Poku, Opoku, & Agyeiwaa Ennin, 2022; Rahman, 2023). Many studies analyzing the existence, magnitude, and nature of the relationship between public spending and economic growth suggest that the type of expenditure matters in this regard. In many cases government spending and economic growth are negatively related mainly due to excessive non-development and military expenditure (Churchill & Yew, 2017; Nsor-Ambala & Asafo-Adjei, 2023). On the other hand development spending primarily in human capital and infrastructure development, positively and significantly affects economic growth (Agustina & Pramana, 2019; Amusa & Oyinlola, 2019; Odhiambo, 2015). Once the role of government spending in economic growth is established to be significant in most cases, the debate then shifts towards finding the growth maximizing size of public expenditure (Grossman, 1987, 1988). Many studies find that there is a threshold level beyond which any increase in the size of public spending decreases economic growth. This leads the economist to believe in the importance of finding the optimal

fiscal size that enhances economic growth (Altunc & Aydın, 2013; Barro, 1990; Divino, Maciel, & Sosa, 2020; Hussain, Hussain, Ali, & Ahmad, 2021; Scully, 1994). Over the recent past, issue of efficiency of government expenditure has gained marked importance in determining optimal fiscal size. Efficiency in government spending means the ability of the government to make best use of scarce resources in the production of goods and services in order to counter business cycles and achieve higher growth rates in the long run (Arawatari, Hori, & Mino, 2023; Florina, 2017). Efficiency of government expenditure is determined by many factors including GDP per capita, political stability, administrative and judicial independence and control of corruption (Mirzoev et al., 2020; Montes, Bastos, & de Oliveira, 2019; Moreno-Enguix & Lorente Bayona, 2017; Ouertani, Naifar, & Ben Haddad, 2018).

Besides improving the quality of government institutions, efficiency can also be enhanced by involving private sector in the production of various non-core government activities. Research also establishes a strong effect of efficiency in government expenditures on determining growth maximizing fiscal size (António Afonso & Jalles, 2011; Albassam, 2020; Eid & Awad, 2017; Kaya Samut & Cafrı, 2016; Montes, Bastos, & de Oliveira, 2019; Wang & Tao, 2019). Efficiency in the government spending reduces the cost of using scarce national resources which may affect the economic performance of the country (Angelopoulos, Philippopoulos, & Tsionas, 2008; Kamiguchi & Tamai, 2019; Sumandeep, Kiran, & Sharma, 2024). The present study aims to determine the effects of public expenditure efficiency on the optimal fiscal size. Present study is significant in context of selected Asian economies as there is a noticeable emphasis on the role of fiscal policies in countering the effects of recent financial crisis occurring in 2008, 2013 and now economic crunch after onset of COVID-19 pandemic in 2020. Finding the efficient level of optimal government spending will enhance the effectiveness of fiscal policy in achieving the goal of accelerated economic growth. In the wake of such financial crises, IMF has launched fiscal adjustment programs in many developing countries. These adjustment programs aim at reducing fiscal deficits which is ensured by reducing development expenditures of the government. Therefore, these programs help to reduce the deficits and improve governments' budgetary positions but slow down the process of economic growth. Owing to these situations, it is important to find the optimal fiscal size for developing countries so that efficient utilization of scarce government resources can be achieved.

1.1. Objectives of the Study

The study aims at assessing the role of efficiency of government spending in determining optimal fiscal size. For this purpose, expenditure efficiency is incorporated in economic growth model to find the effect of efficiency on growth-maximizing level of government expenditure. In this context following hypothesis are tested:

H_0: Expenditure efficiency reduces optimal fiscal size.
H_1: Expenditure efficiency does not reduce optimal fiscal size.

2. Literature Review

There are various channels through which government spending can influence economic growth. Studies show that productive and non-productive spending bring about different impact on economic growth. Directing more resources towards non-productive spending like transfers result in reduction in rate of economic growth. On the other hand, investment spending help to increase economic growth rate (Barro, 1990). Link between government capital investment and economic performance tend to become negative in case of crowding out phenomenon i.e. private investment is curtailed. If government spending rose unnecessarily then it would result in more taxes, thereby reducing private sector investment. This crowding out of private investment results in decreased economic growth (Alesina, Favero, & Giavazzi, 2019; Nhemhafuki, 2023; Sima, Liang, & Qingjie, 2023). Other factors including institutional quality, quality of governance and economic freedom also significantly affect the relation between government spending and economic growth (António Afonso & Jalles, 2011; Di Matteo, 2013; Scartascini & Crain, 2021).

The idea of optimal government size was first proposed and elaborated by Armey (1995). Governments all over the world are focusing on increasing their fiscal space with constrained resources. Finding the optimal size will help the governments to reap maximum benefits from their limited resources with least cost. The optimal fiscal size varies across countries and regions. Studies using panel data showed that the optimal size of government spending is lower in case

of low-income countries and higher for high income countries (De Witte & Moesen, 2010; Divino, Maciel, & Sosa, 2020; Ekinci, 2011; Gholipour & Esfandiar, 2024; Herath, 2012). In a study, Chobanov and Mladenova (2009) measured the optimal fiscal size for larger panels of developed and developing countries. Measuring government size by share of total government spending in real output, it was found that the optimal level of government spending was 25 percent of GDP for developed countries. While for 81 developing countries, optimal fiscal size was estimated to 10.4 percent. Using larger data set for E-27 countries, Facchini and Melki (2011) studied the non-linearity of fiscal size and economic growth relation for France over a longer period i.e. from the year 1871 to 2008. The optimal level of government expenditures was found to be 34 percent of GDP which turned out to be quite higher as compared to several time series studies on the US economy. In case of developing and low income countries, for example, Chiou-Wei, Zhu, and Kuo (2010) studied the non-linear effects of government size on economic growth. They considered a panel data of Asian countries including South Korea, Singapore, Taiwan, Thailand, and Malaysia and measured optimal fiscal size by using dynamic smooth transition autoregressive model. Optimal fiscal size for these countries was found to be 10.8, 10.811 and 15.9 percent respectively. Ul Husnain (2011) undertook an analysis to explain the size-growth relationship for Pakistan and find the optimal level of public expenditures. Collecting data over 1975-2000 time period, the author employed methodology developed by Scully (1994) and (Van Heerden & Schoeman, 2008). Results indicated the optimal fiscal size was 21.48 percent of GDP which was slightly lower than the actual fiscal size of 22.7percent in 2008.Ahmad and Othman (2014) collected data on Malaysian economy over the period of 1970-2012 and applied ARDL bound testing approach to investigate the optimal fiscal size. The optimal fiscal size was calculated to be 16.32 percent.

Researchers nowadays are focusing on the allocative and distributive usefulness of public expenditures and its role in the stability of the economy (Lavado & Domingo, 2015; Zhang, Qu, Zhang, Li, & Miao, 2019). Antonio Afonso, Schuknecht, and Tanzi (2005) computed public sector efficiency scores for 23 industrial countries. It was found that efficiency for public spending was high in countries that had low fiscal size and low in those countries that had larger fiscal size. In another study, António Afonso and Jalles (2011) addressed the issue of efficiency in education and health sector for OECD economies. They applied two different non-parametric methods, Fixed Disposal Hull (FDH) and Data Envelopment analysis (DAE) 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. Gavurova, Kocisova, Belas, and Krajcik (2017) assessed efficiency of government educational expenditure in 15 European countries in 2015. Obtaining data on government expenditure on education and quality of education as measured by PISA indicator, they employed DEA to compute efficiency scores. They obtained high scores of efficiency i.e. 0.955 in case of OECD countries.

It is also observed that efficiency in public spending affects the growth maximizing size of the government (Çakerri, Petanaj, & Muharremi, 2014; Kamiguchi & Tamai, 2019; Khan & Murova, 2015; Kimaro, Keong, & Sea, 2017; Zeraibi, Balsalobre-Lorente, & Shehzad, 2021). Angelopoulos, Philippopoulos, and Tsionas (2008) revisited size of the public sector and economic growth nexus by incorporating the concept of government sector efficiency. They obtained data on 64 developing and developed countries over the range of the year 1980 to 2000 and employing the methodology of Antonio Afonso, Schuknecht, and Tanzi (2005), they established that government spending and economic performance exhibited a non-linear relation which significantly depended upon the efficiency of public expenditures. Rahmayanti and Horn (2010) incorporated efficiency in the model of optimal fiscal size to test whether former effects the later or not. Using the methodology suggested by Angelopoulos, Philippopoulos, and Tsionas (2008), they found that, when efficiency score for a country was greater than 0.865, only then could exist optimal or growth-maximizing level of government expenditures. On average, efficiency score for the developing countries was found to be 0.89 and that gave rise to the optimal fiscal size of 15 percent of GDP. They further noted that beyond a particular point, efficiency led to a reduction in growth-maximizing level of government expenditures.

Review of the above literature explains that there is a need to look into the problem of expenditure efficiency and its impact on economic growth. Furthermore, there exists very few studies on this issue especially in case of developing Asian countries. Only one study by Rahmayanti and Horn (2010) is available in this context. They have measured government

spending efficiency in education, health and infrastructure using DEA, and incorporated these scores as an interaction with government spending, in economic growth model to calculate optimal fiscal size. The present study is different from Rahmayanti and Horn (2010) in many aspects. The efficiency of government spending in the present analysis is calculated for six policy areas namely administration, education, health, infrastructure, economic stability and economic performance, by using DEA bootstrapping which is better technique for efficiency measurement than DEA (Simar & Wilson, 2007). This study will fill this gap in the literature by finding efficiency augmented optimal fiscal size for developing Asian economies.

3. Data Description and Source

Table 1 presents annual data over the period of 1996-2022 for nineteen developing Asian countries[1]. Missing observations in the data are acquired from the statistical yearbook of the relevant economy.

Table 1: Variables Description and Source

Variables	Description	Source
EG	Economic Growth measured by Real GDP per capita growth rate	WDI
GOV	General Government Total Expenditure as Percentage of GDP.	GFS
GCON	General Government Real Consumption Expenditure as Percentage of GDP	GFS
GINV	General Government Real Investment Expenditure as Percentage of GDP	GFS
LCKR	Log of Real Stock of Capital	PWT 09
LHC	Log of Human Capital Index based on Years of Schooling and Returns to Education	PWT 09
TR	Trade Openness measured as Sum of Real Exports and Imports as Percentage of GDP	WDI
EFF	Government spending efficiency scores calculated by using DEA bootstrap technique.[2] Efficiency scores are calculated in six government policy areas including administration (control of corruption, regulatory quality and rule of law), education (years of schooling), health (reduced infant mortality and improved life expectancy), infrastructure (electric power consumption), economic performance (high economic growth and less unemployment) and economic stability (stability of national income and inflation).	Authors' calculations
EFF.GOV	Measures efficiency augmented government spending. Optimal value of this variable will assess fiscal prudence. (similarly for EFF.GCON, EFF.GINV)	

3.1. Model Specification

The following econometric model is constructed to find the efficiency augmented optimal government expenditure[3]. The term $EFF_{it}.GOV_{it}$ is the interaction term, which measures efficiency augmented government expenditure.

$$EG = \alpha_0 + \alpha_1 GOV_{it} + \alpha_2 GOV_{it}^2 + \alpha_3 LCKR_{it} + \alpha_4 LHC_{it} + \alpha_5 TR_{it} + \alpha_6 EFF_{it} GOV_{it} + \alpha_7 (EFF_{it} GOV_{it})^2 + \varepsilon_{it} \quad (1$$

Re-writing the above equation we get

$$EG = \alpha_0 + (\alpha_1 + \alpha_6 EFF_{it}) GOV_{it} + (\alpha_2 + \alpha_7 EFF_{it}^2) GOV_{it}^{\ 2} + \alpha_3 LCKR_{it} + \alpha_4 LHC_{it} + \alpha_5 TR_{it} + \varepsilon_{it} \quad (2$$

To find the optimal fiscal size, the equation has to fulfill the following condition of non-linearity.

[1] The developing Asian countries include Bangladesh, Cambodia, China, Hong Kong, India, Indonesia, Jordan, Kazakhstan, Malaysia, Maldives, Nepal, Pakistan, Philippines, Russia, Sri Lanka, Tajikistan, Thailand, Ukraine, and Vietnam.

[2] See Javaid (2017) for details regarding calculation and interpretation of government spending efficiency scores for selected Asian countries.

[3] The model is derived following methodology of Angelopoulos, Philippopoulos, and Tsionas (2008) and Rahmayanti and Horn (2010).

$$\alpha_2 + \alpha_7 \mathrm{EFF}_{\mathrm{it}}^2 < 0 \quad (3$$

or

$$\alpha_2 < -\alpha_7 \mathrm{EFF}_{\mathrm{it}}^2 \quad (4$$

Critical value of $\mathrm{EFF}_{\mathrm{it}}$ can be found as

$$\mathrm{EFF}_{\mathrm{it}}^2 = \frac{\alpha_2}{-\alpha_7} \quad (5$$

Or

$$\mathrm{EFF}_{\mathrm{it}}^2 = \left(\frac{\alpha_2}{-\alpha_7}\right)^{1/2} \quad (6$$

Optimal fiscal size is then

$$\mathrm{dEG/dGOV}_{\mathrm{it}} = (\alpha_1 + \alpha_6 \mathrm{EFF}_{\mathrm{it}}) + 2(\alpha_2 + \alpha_7 \mathrm{EFF}_{\mathrm{it}}^2)\mathrm{GOV}_{\mathrm{it}} \quad (7$$

Putting '7' equal to zero we get

$$0 = (\alpha_1 + \alpha_6 \mathrm{EFF}_{\mathrm{it}}) + 2(\alpha_2 + \alpha_7 \mathrm{EFF}_{\mathrm{it}}^2)\mathrm{GOV}_{\mathrm{it}} \quad (8$$

$$-2(\alpha_2 + \alpha_7 \mathrm{EFF}_{\mathrm{it}}^2)\mathrm{GOV}_{\mathrm{it}} = \alpha_1 + \alpha_6 \mathrm{EFF}_{\mathrm{it}} \quad (9$$

$$\mathrm{GOV}_{\mathrm{it}} = \frac{\alpha_1 + \alpha_6 \mathrm{EFF}_{\mathrm{it}}}{-2(\alpha_2 + \alpha_7 \mathrm{EFF}_{\mathrm{it}}^2)} \quad (10$$

It shows that optimal fiscal size depends upon the efficiency of government expenditures. Moreover, the total government spending (GOV) is divided into government consumption spending (GCON) and government investment spending (GINV) to conduct the analysis on dis-aggregated level.

4. Methodology

4.1. Panel unit root test

Prior to estimating model with PMG technique, it is important to test the order of integration of the variables as in the presence of I(2) or above variables, F-Statistic of the model is invalid (Ouattara, 2004). In order to examine the level of integration of the variables, this study uses Im, Pesaran, and Shin (2003) panel unit root test. IPS is superior to other panel unit root tests because it is relatively less restrictive and allows for heterogeneity in autoregressive coefficients.

4.2. Pooled Mean Group (PMG) Estimation

Pooled Mean Group (PMG) technique is used to estimate the model. PMG allows the short run dynamic specification differ between the groups while long-run coefficient across groups and assumed to be identical. Unlike dynamic OLS (DOLS) and Fully Modified OLS (FMOLS), this PMG estimator also explain the dynamic adjustment mechanism from short run to long run. To verify the null hypothesis of homogeneity in long run coefficient, Hausman test is used. The PMG model is as follows:

$$eg_{it} = \alpha_i + \sum_{l=1}^{p} \beta_0 eg_{i,t-l} + \sum_{l=0}^{q} \beta_1 gov_{i,t-l} + \sum_{l=0}^{q} \beta_2 gov\Lambda 2_{i,t-l} + \sum_{l=0}^{q} \beta_3 (eff.gov)_{i,t-l} + \sum_{l=0}^{q} \beta_4 (eff.gov)\Lambda 2_{i,t-l} + \sum_{l=0}^{q} \beta_5 x_{i,t-l} + u_{it} \quad (11$$

Reparametrizing the above equation

$$\Delta eg_{it} = \alpha_i + \Phi_i\left(eg_{i,t-l} - \theta_1 gov_{i,t-l} - \theta_2 gov\Lambda 2_{i,t-l} - \theta_3 (eff.gov)_{i,t-l} - \theta_4 (eff.gov)\Lambda 2_{i,t-l} - \theta_5 x_{i,t-l}\right) + \sum_{l=1}^{p-1} \lambda_{il} \Delta eg_{i,t-l} + \sum_{l=0}^{q-1} \lambda'_{il} \Delta gov_{i,t-l} + \sum_{l=0}^{q-1} \lambda''_{il} \Delta gov\Lambda 2_{i,t-l} + \sum_{l=0}^{q-1} \lambda'''_{il} \Delta (eff.gov)_{i,t-l} + \sum_{l=0}^{q-1} \lambda''''_{il} \Delta (eff.gov)\Lambda 2_{i,t-l} + \sum_{l=0}^{q-1} \lambda'''''_{il} \Delta x_{i,t-l} + u_{it} \quad (12$$

In the above equation 'i' and 't' represent country and time respectively. 'eg' represents economic growth while 'gov' measures government expenditures. 'x' is the set of all the control variables. 'Φ' measures error correction in the short run. 'θ' and 'λ' are the long run and short run coefficients of the variables respectively.

5. Results and Discussion

Table 2 presents the results of panel unit root test. These results indicate that the variables in the model have mixed order of integration. Economic growth and human capital are integrated of order 1 while rest of the variables are stationary at level.

Table 2: Results of Panel unit root test

Variables	At Level		At First Difference	
	With Intercept	With Intercept and Trend	With Intercept	With Intercept and Trend
EG	-4.60566 (0.2600)	-2.23234 (0.3128)	-7.0207 (0.0000)*	-6.5364 (0.0000)*
GOV	-4.97860 (0.0000)*	-9.11760 (0.0000)*	-7.3774 (0.0000)*	-5.10102 (0.0000)*
GCON	-3.99034 (0.0000)*	-7.58948 (0.0000)*	-4.76580 (0.0000)*	-3.50427 (0.0002)*
GINV	-5.40162 (0.0000)*	-5.16582 (0.0000)*	-5.20124 (0.0000)*	-3.85972 (0.0000)*
LCKR	-4.63084 (0.00000)*	-3.31031 (0.0005)*	-1.81949 (0.0344)*	-1.69769 (0.0448)*
LHC	-7.6889 (0.00000)*	1.40490 (0.9200)	-2.16264 (0.1053)*	-4.21599 (0.0000)*
TO	-378251 (0.0001)*	-1.72986 (0.0418)*	-1.96084 (0.0249)*	-2.21710 (0.0133)*
EFF	-4.90613 (0.0000)*	-3.58176 (0.0002)*	-12.0047 (0.0000)*	-11.1476 (0.0000)*

Figures in parenthesis are respective P-values. '*' shows significance at 5 percent level. Hausman (1978) is applied to examine the hypothesis whether the slope is homogeneous. In other words, it is used to decide whether Mean Group or Pooled Mean Group estimator is appropriate. Null hypothesis i.e. PMG estimator is efficient, is tested against the alternative hypothesis i.e. MG estimator is efficient. Results are presented in Table 3.

Table 3: Results of Hausman Test

Model	Chi-Sq Test statistic	Probability
Government Total Spending	0.06	0.998
Government Consumption Spending	0.02	0.999
Government Investment Spending	0.02	0.992

Source Author's Own Calculations.

The results of Hausman test show that probability value of Chi-Sq test statistic is greater than 5 percent in all the three models. For government total spending model, test statistic is 0.06 having probability value of 0.998 while for government consumption spending and government investment spending model test statistics and probability value are 0.02 (0.999) and 0.02 (0.992) respectively. It shows that null hypothesis of efficiency of PMG estimator is accepted and hence, PMG technique is employed for estimation. Next step determines the number of lags to be included in the model. Schwarz Information Criterion (SIC) is used to select the optimal lag length of the model. According to this criterion, most suitable lag length is 1 as it corresponds to minimum value of SIC. Results are reported in Table 4.

Table 4: Lag Selection

Model	Lag Specification	SIC
1	1, 1	2.969
2	1, 2	3.001
3	1, 3	3.096
4	1, 4	3.030

Source Author's Own Calculations.

After determining optimal lag length of the model, long run and short run estimates are obtained using PMG technique. Results are presented in Table 5.

Table 5: PMG Estimation Results

EG	Model 1	Model 2	Model 3
Long Run Estimates			
GOV	-0.753937 (0.0001)	-	-

		-4.278434	
GCON		(0.0002)	-
	-		0.928722
GINV		-	(0.0233)
	0.019527		
GOV^2	(0.0000)	-	-
		0.067372	
$GCON^2$		(0.0011)	-
			0.132086
$GINV^2$		-	(0.0011)
	1.649082		
(EFF GOV)	(0.0000)	-	-
		7.573015	
(EFF GCON)		(0.0000)	-
			2.460612
EFF GINV		-	(0.0000)
	-0.056334		
$(EFF\ GOV)^2$	(0.0000)	-	-
		-0.210977	
$(EFF\ GCON)^2$		(0.0000)	-
			-0.343631
$(EFF\ GINV)^2$		-	(0.0000)
	1.918179	2.346011	3.714161
LCKR	(0.0000)	(0.0000)	(0.0000)
	-12.61484	-12.06011	-17.03273
LHC	(0.0000)	(0.0000)	(0.0000)
	0.017547	0.012316	0.020975
TO	(0.0000)	(0.0169)	(0.0000)
Short Run Estimates			
	-0.440997		
COINTEQ01gov	(0.0001)	-	-
		-0.661954	
COINTEQ01gcon		(0.0000)	-
			-0.517737
COINTEQ01ginv		-	(0.0000)
	1.203182		
D(GOV)	(0.7855)	-	-
		-10.59624	
D(GCON)		(0.3428)	-
			9.065362
D(GINV)		-	(0.0740)
	-0.123524		
$D(GOV^2)$	(0.142086)	-	-
		0.971924	
$D(GCON^2)$		(0.3287)	-
	-		1.119926
$D(GINV)^2$		-	(0.0893)
	-0.259517		
D(EFF GOV)	(0.8644)	-	-
		-0.403771	
D(EFF GCON)		(0.8465)	-
			-7.232619
D(EFF GINV)		-	(0.0598)
	0.009813		
D(EFF GOVSQ)2	(0.8517)	-	-
		-0.080352	
$D(EFF\ GCON)^2$		(0.5289)	-
			1.562060
$D(EFF\ GINV)^2$		-	(0.1030)
	-4.574535	-4.724783	-0.931772
D(LCKR)	(0.2618)	(0.2051)	(0.3530)
	84.42139	64.80196	1.018645
D(LHC)	(0.3966)	(0.2405)	(0.3101)
	0.029838	0.021328	1.396876
D(TO)	(0.3764)	(0.6597)	(0.1646)
	-9.586075	-28.16391	-4.639897
C	(0.0001)	(0.0000)	(0.0000)

Source: authors' own calculations. Figures in parenthesis are respective P-values. '*' shows significance at 5 percent level.

5.1. Interpretation and Discussion

Results indicate that government total expenditure, government consumption expenditure and government investment expenditure are significantly affecting economic growth in the long run. To calculate optimal fiscal size, the necessary condition expressed in equation

10, is fulfilled in all the three models. In the long run, efficiency of government spending is significantly affecting economic growth. 1 percent increase in (EFF GOV) increases economic growth by 1.64 percent, (EFF GCON) results in 7.57 percent, while (EFF GINV) brings an increase of 2.46 percent on average, respectively. $(EFF\ GOV)^2$, $(EFF\ GCON)^2$, $(EFF\ GINV)^2$ are influencing economic growth negatively in the long run which shows that, at very high levels of government spending, economic growth is adversely affected by increased fiscal spending. It proves the inverted "U" curve relation between government spending and economic growth. 1 percent increase in $(EFF\ GOV)^2$, $(EFF\ GCON)^2$, $(EFF\ GINV)^2$ decreases economic growth by 0.05, 0.21 and 0.34 percent respectively. Theses results are consistent with the research findings of (António Afonso & Jalles, 2011; Angelopoulos, Philippopoulos, & Tsionas, 2008; Puspitasari & Pujiati, 2017). They found a significant impact of efficiency of government spending on economic growth in developing countries. Capital provides stimulus for long run economic growth and development as described by the endogenous growth models. In the present analysis, capital accumulation as a percentage of GDP has a significant impact on long run economic growth. 1 percent increase in LCKR significantly raises long run economic growth by 1.91, 2.34, 3.71 percent in model 1, 2 and 3 respectively. Capital stock is proved to be crucial for the growth of economy especially in case of developing countries (Bond, Leblebicioğlu, & Schiantarelli, 2010; Poku, Opoku, & Agyeiwaa Ennin, 2022; Rahman, 2023).

Log of human capital represents the proxy of quality labor force in the analysis. The coefficient of LHC is negative and highly significant, implying that in the long run, on average, 1 percent improvement in human capital index decreases economic growth by 12.61 percent, 12.06 percent and 17.03 percent in model 1, 2 and 3 respectively. These results seem to be contradicting to the growth models especially endogenous growth model such as AK model. This negative relation between human capital and long run economic growth in developing Asian countries can be attributed to the problem of lower labor absorption and concept capital flight. It is also important to consider that, for most of the developing Asian economies indicators of human capital are not promising. Education expenditures of government are low and there is high capital flight which may turn out to be growth detrimental. These results are consistent with many investigations on human capital and economic growth nexus. For many researchers, education attainment is not easy because education is financed by the resources that are drawn from other productive activities. Therefore, primary education is ineffective and those who get secondary education are not well prepared. In this way human capital can cause reduction in economic growth in the long run (Agustina & Pramana, 2019; Amusa & Oyinlola, 2019; Arrow, 1973; Chaudhry, Malik, & Faridi, 2010).

Trade openness is found to be positive and significantly influencing economic growth of the developing Asian countries. 1 percent increase in trade openness enhances long run economic growth by 0.017 percent in model 1, 0.01 percent in model 2 and 0.02 percent in model 3. The reason for this growth promoting effects of trade come from the fact that trade openness leads to healthy competition which results in research and innovation, helps to promote optimal allocation of resources and fosters efficiency and leads to greater technological advancements (Oppong-Baah, Bo, Twi-Brempong, Amoah, Prempeh, & Addai, 2022; Rivera-Batiz & Romer, 1991). In the short run, none of the variables have any significant effect on economic growth for all the three models, except for GINV and $(GINV)^2$ in model 3. In the short run GINV and $(GINV)^2$ have a significant effect on economic growth. 1 percent increase in GINV brings 9.06 percent increase in economic growth while 1 percent increase in $(GINV)^2$ decreases economic growth by 1.11 percent. It shows that in case of government investment spending the inverted 'U' curve holds in the short run as well. In Model 1, the error correction term has a coefficient of -0.504 percent having p-value 0.0001 which is significantly negative. It clearly implies that all the variables converge by 0.504 percent towards their equilibrium level in each time period. In model 2, error correction term is negative and significant which proves adjustment towards the long run equilibrium. In each period 0.66 percent adjustment takes place towards the long run equilibrium level. The error correction term is negative and significant and reveals that there is 0.51 percent adjustment towards long run equilibrium in each time period for model 3.

5.2. Finding the optimal fiscal size

Estimating efficiency augmented optimal fiscal size is the main objective of this study. Critical value of efficiency is estimated by employing equation number 6 while optimal fiscal size

of government total spending, consumption spending and investment spending are calculated using the equation number 10. Results are reported as follows:

Table 6: Optimal Fiscal Size

Model	Critical level of Efficiency	Optimal size
Government Total Spending	0.616 percent	25.19 percent
Government consumption Spending	0.564 percent	14.04 percent
Government Investment Spending	0.619 percent	11.18 percent

Source Author's Own Calculations

Table 6 shows that optimal size for government total spending, government consumption spending and government investment spending are 25.19, 14.04 and 11.18 percent respectively in case of developing Asian economies. Critical level of efficiency is the one below which optimal fiscal size cannot be determined. Critical levels of efficiency are 0.616, 0.564 and 0.619 for government total spending, consumption spending and investment spending models respectively. Figures 1, 2 and 3 also help to gain insight into the efficiency and optimal fiscal size relationship. It is clear that when efficiency of government expenditure increases, then less resources are required to achieve growth maximizing level fiscal size. These results are consistent with findings of Kamiguchi and Tamai (2019); Kimaro, Keong, and Sea (2017) who found that increase in efficiency of government spending help to decrease the size of government expenditures. A trend line is also mentioned which shows optimal size of GOV, GCON and GINV. Scatter plot highlights countries spending at, above or below the optimal size.

Malaysia, Russia, Thailand and Ukraine, have spent above the optimal level of GOV and therefore, need to curtail expenditures. While Kazakhstan, Nepal, Pakistan, Philippines, Sri Lanka and Tajikistan are below the optimal level and need to spend more. Maldives is very close to the optimal level.

Figure 1: Efficiency and Optimal GOV

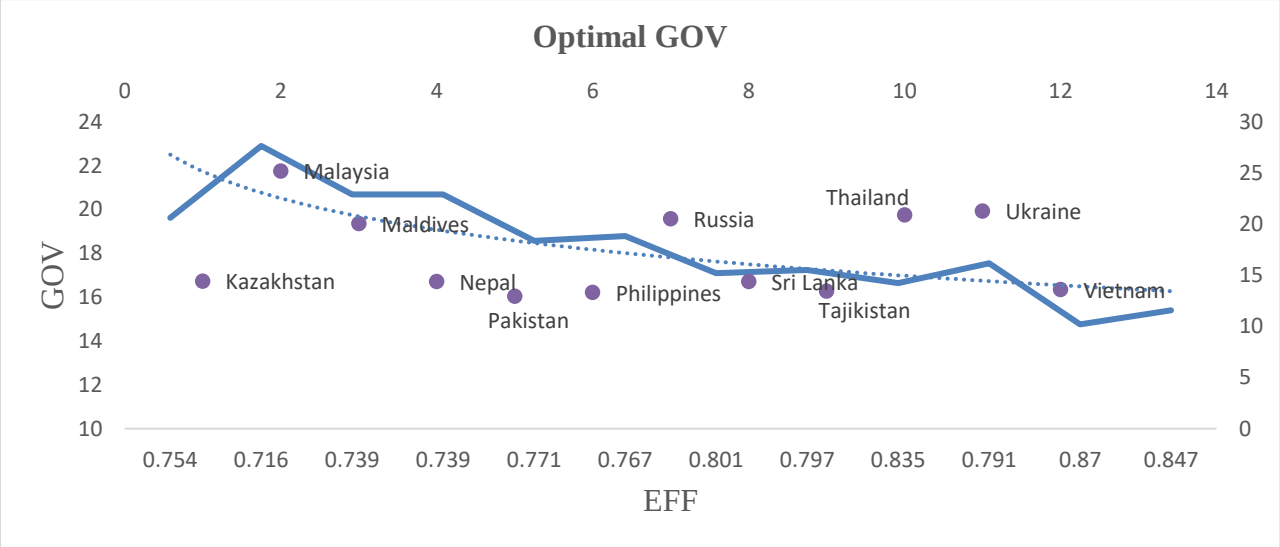


Figure 2 presents the scenario regarding government consumption expenditure. Maldives, Russia, Thailand and Ukraine have expenditures greater than the optimal level so they must reduce the size of GCON. On the other hand, Kazakhstan, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka and Tajikistan need to increase these expenditures.

Figure 3 highlights situation regarding government investment expenditures. According to the figure, Malaysia, Maldives, Thailand and Viet Nam have government investment expenditures higher than the optimal level. While, Kazakhstan, Nepal, Pakistan, Philippines, Russia, Sri Lanka, Tajikistan and Ukraine need to undertake more expenditures in this area.

Figure 2: Efficiency and Optimal GCON

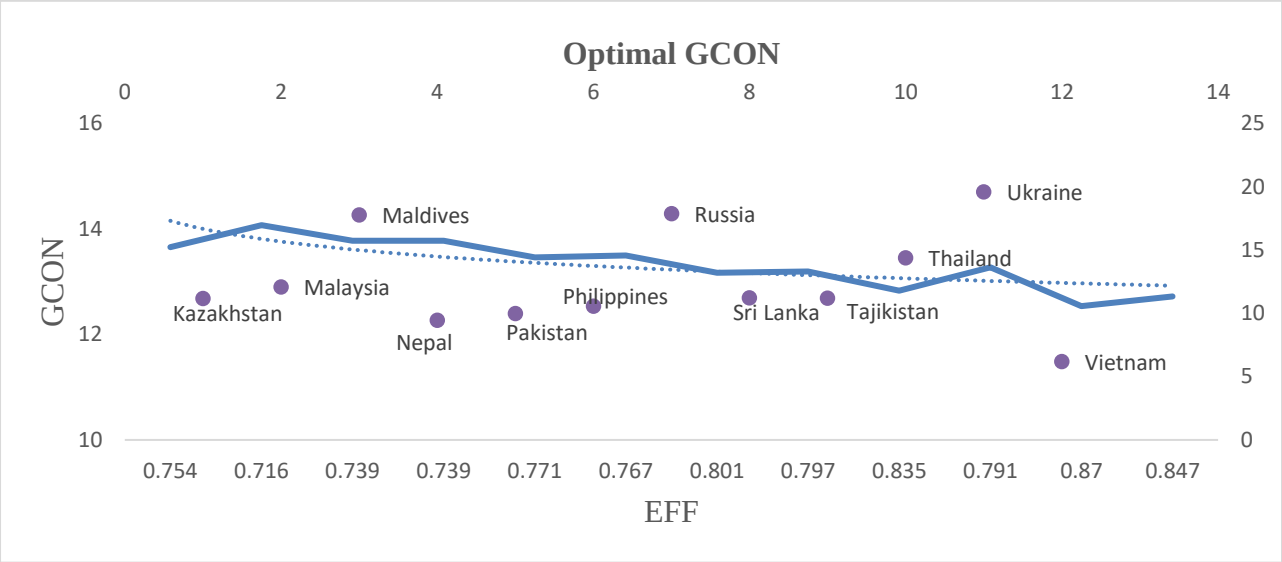
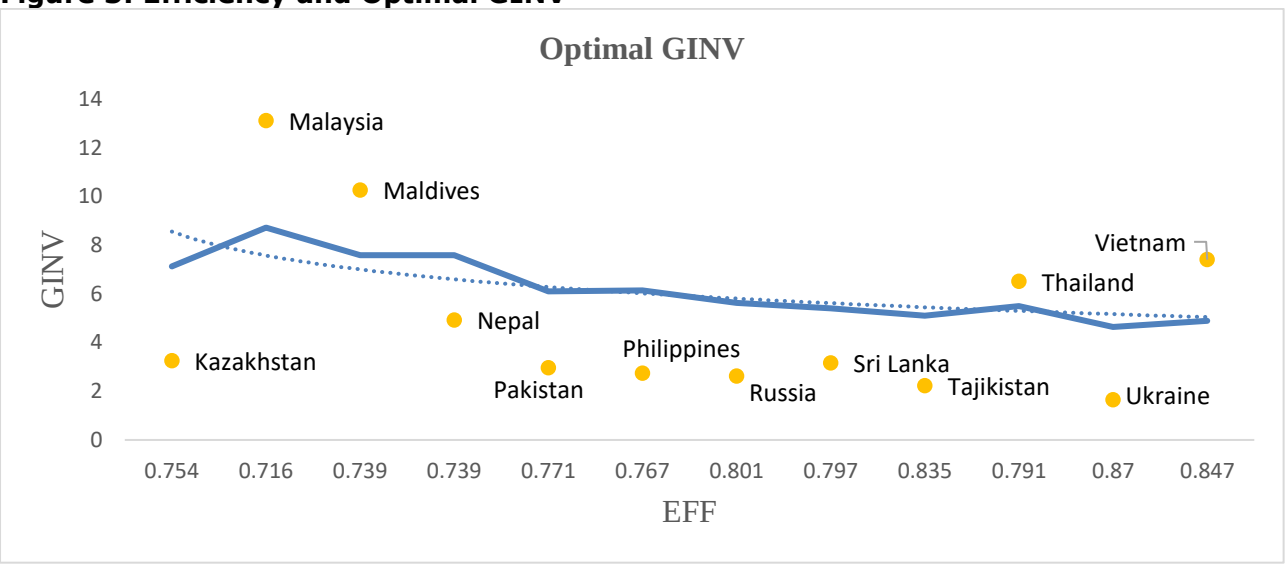


Figure 3: Efficiency and Optimal GINV



As, for seven countries having efficiency scores less than the critical value, optimal fiscal size cannot be determined. For remaining twelve countries optimal fiscal size is calculated and reported in Table 7. The table clearly reveals that countries having higher efficiency scores have a low optimal size of government total expenditures, government consumption expenditures and government investment expenditures. Ukraine has the highest efficiency score i.e. 0.87 that yields to lowest optimal size of government total expenditures, government consumption expenditure and government investment expenditure. Optimal values are 14.75 percent, 12.53 percent and 4.64 percent for GOV, GCON and GINV respectively. On the other hand, Maldives and Nepal have efficiency score of 0.739 that yields to optimal size of 20.68 percent, 13.77 percent and 7.582 percent for government total expenditures, government consumption expenditure and government investment expenditure respectively. Countries that are spending above the optimal level are Malaysia, Russia, Thailand and Ukraine which need to cut down their expenditures. Kazakhstan, Nepal, Philippines, Sri Lanka, Tajikistan, Viet Nam and Pakistan are spending below the optimal level and need to expend their fiscal size. In Malaysia, government total spending and investment spending are much higher than the optimal level while government consumption spending is lower. There is a need to transfer resources from government investment to consumption activities.

Table 7: Optimal Fiscal Size (Average 1996-2022)

Countries	GOV	GCON	GINV	EFF	EFF^2	Optimal GOV	Optimal GCON	Optimal GINV
Kazakhstan	14.42741	11.182	3.244	0.754	0.568	19.620	13.658	7.121
Malaysia	25.198	12.086	13.112	0.716	0.512	22.901	14.072	8.72
Maldives	20.044	17.793	10.251	0.739	0.5461	20.689	13.774	7.582
Nepal	14.3866	9.467	4.919	0.739	0.5461	20.689	13.774	7.582
Pakistan	12.944	9.985	2.959	0.771	0.594	18.571	13.462	6.100
Philippines	13.315	10.583	2.731	0.767	0.588	18.785	13.496	6.141
Russia	20.511	17.887	2.624	0.801	0.641	17.095	13.170	5.626
Sri Lanka	14.3955	11.238	3.156	0.797	0.635	17.247	13.192	5.411
Tajikistan	13.446	11.219	2.226	0.835	0.697	16.637	12.832	5.106
Thailand	20.906	14.399	6.506	0.791	0.625	17.551	13.272	5.502
Ukraine	21.263	19.612	1.650	0.870	0.756	14.759	12.537	4.641
Vietnam	13.601	6.198	7.402	0.847	0.717	15.40	12.722	4.890
Average	17.04	12.64	5.07	0.79	0.62	18.33	13.33	6.20

Source Author's own calculations.Conclusion and Policy Recommendation

Present study is an attempt to establish the link between public sector efficiency and macroeconomic performance of selected Asian countries. Efficiency scores calculated by Javaid (2017) are incorporated in the growth equation to find optimal fiscal size and to test the impact of efficiency on optimal fiscal size. The variables used in the model are economic growth (EG) measured by growth rate of real GDP, (GOV) government total expenditures, $(GOV)^2$ capturing non-linear relation between fiscal size and economic growth, (EFF GOV) measuring efficiency augmented fiscal size and (EFF GOV^2) to capture the non-linear impact of efficiency augmented fiscal size. Control variables include capital, represented by log of gross fixed real capital formation (LCKR) as percentage of GDP, labor , proxied by log of human capital index (LHC) and in order to capture the open economy effects, trade openness (TO), measured by sum of real exports and imports as a percentage of GDP is used. For a dis-aggregate level analysis, total government expenditure as a percentage of GDP is further divided into government consumption expenditure (GCON) and government investment expenditure (GINV), both as percentage of GDP. Thus three different optimal size for GON, GCON and GINV are determined. Results of government total expenditure equations suggest that, in the long run, efficiency of government expenditures strongly affect economic growth. Square of (EFF GOV) term is also significant but negative, which is in accordance with the priori expectations. It confirms the presence of Armey Curve phenomenon in case of developing Asian countries. Capital stock and trade openness are also found to be significantly increasing economic growth. Human capital on the other hand has a significant but negative effect on economic growth of developing Asian countries. This negative relation between human capital and economic growth is partially due to the problem of labor absorption and brain drain in developing countries. In the short run, however, none of the variables are significant. Error correction term is negative and significant in three models confirming convergence towards long run equilibrium in each time period.

Optimal fiscal size is estimated to be 25.17%, 14.04% and 11.18% for government total spending, government consumption spending and government investment spending respectively. Analysis shows that Malaysia, Russia, Thailand and Ukraine are spending above the optimal level. Kazakhstan, Nepal, Philippines, Sri Lanka, Tajikistan, Viet Nam and Pakistan are spending below the optimal level. Therefore, these countries need to expand their fiscal size. It is further noted that countries having higher efficiency scores have lower optimal level of government spending. These results confirm our hypothesis that higher the efficiency of government expenditure, lower will be the growth maximizing size of government spending. Almost all the countries in the analysis are having government investments less than the required level. There is a need to rationalize governments' spending pattern in such a way that more resources should be allocated towards productive developmental ventures and away from non-productive consumption activities. To improve the efficiency of public spending, priority should be given to infrastructure i.e. power generation . Cheap availability of electricity to industries and households should be made possible. In this way developing Asian countries will be able to catch up with the developed countries. Another important area to enhance efficiency of public sending is administration. There is a need to curb corruption and improve rule of law to ensure sound economic environment for investments. This will also bring economic stability and improve economic performance of the countries. Reforms in terms of rationalization of labor market are required to increase labor

absorption so that educated labor gets right jobs and the problem of brain drain can be effectively mitigated in developing Asian countries. Trade openness is crucial for economic growth in the region. Cross-boarder commerce among developing Asian countries can effectively enhance their potential, enlarge the market for their goods and improve internal and external economies.

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