



Asian Journal of Economics and Banking

ISSN 2588-1396

<http://ajeb.buh.edu.vn/Home>

# The Effects of Public Expenditure on Economic Growth in Asia Countries: A Bayesian Model Averaging Approach

Nguyen Ngoc Thach<sup>1,†\*</sup>; Le Hoang Anh<sup>2</sup>, and Pham Thi Ha An<sup>3</sup>

<sup>1</sup>Banking University HCMC, Ho Chi Minh City, Vietnam

<sup>2</sup>HCMC University of Food Industry, Ho Chi Minh City, Vietnam

<sup>3</sup>Van Lang University, Ho Chi Minh City, Vietnam

## Article Info

Received: 28/01/2018

Accepted: 12/02/2019

Available online: In Press

## Keywords

Bayesian model averaging, Economic growth, Public expenditure

## JEL classification

C11, E02, E62, H50

## Abstract

The impact of public expenditure on economic growth is a topic that has been of great interest to many researchers, e.g., [1], [10], [14], [23], [33]. However, the studies on this impact illustrate that the results are inconsistent. Besides, certain explanatory variables which should be included in the model were not specified. This ambiguity affects the reliability of the results. Using Bayesian Model Averaging (BMA) method with the data obtained from 43 Asian countries in the period 2004-2016, we estimate the impact of public expenditure on economic growth with a large number of explanatory variables included in the model. The research results show that public expenditure has a negative impact on the economic growth in Asian countries. On the other hand, the components of public expenditure have a weak impact on economic growth. The empirical results confirm that since the majority of Asian countries are developing countries with a large proportion of state-owned sectors and low governance quality, large scale of public expenditure does not have positive effects on the economic growth. Based on the research results, this study provides policy implications to improve governance quality and efficiency of public expenditures in Asian countries.

\*†Corresponding author: Nguyen Ngoc Thach, Banking University HCMC, Ho Chi Minh City.  
Email address: thachnn@buh.edu.vn

## 1 INTRODUCTION

Economic growth has been the topic of great concern in economic theory from classical schools to modern ideologies. It is also one of the most topical issues under research in several nations. Over the past decades, the impact of public expenditure on economic growth has been studied by many researchers such as [1], [10], [14], [23], [33]. However, the studies on the impact of public expenditure on economic growth show mixed findings. In general, three main conclusions were drawn in the related literature: first, public expenditure has no effect on economic growth [10]; second, public expenditure has a positive impact on economic growth [1], [33]; and third, the relationship between public expenditure and economic growth is nonlinear, it means that increasing public expenditure spurs economic growth, but when public expenditure surpasses a certain threshold, it will reduce economic growth [23].

Most of the empirical studies above indicate that the number of explanatory variables was predefined in such regression models. The research objective is then focused on the estimation of the parameters of the models. Employing such approach, there is an uncertainty in the model because the number of explanatory variables that need to be included is unspecified. The uncertainty of the model and its parameters, as well as the potentially variable deviation, may be omitted due to the inadequate set of explanatory variables that would make the econometric analysis inaccurate. BMA analysis is the best tool for estimating transnational

variations and finding strong growth determinants. To explain the uncertainty of the model, Hoeting et al. [16] show that the BMA results were superior to those obtained by traditional estimation methods. Especially, the BMA estimates a large number of models and takes the following average value of the coefficient (total model space weights), so the result will be more accurate for predictions. The unconditional parameters obtained from the BMA do not depend on a specific model because they are the average of the conditional parameters of all models in the model space. This helps to avoid a bias from choosing a particular model.

The study is structured into six sections. Following the introduction, presented in Section 1, Section 2 presents the theoretical framework and empirical studies on the impact of public expenditure on economic growth. Section 3 explains the research methods and data analysis. The results and discussion of empirical analysis are then presented in Section 4. Based on the research results, Section 5 draws conclusions and makes policy recommendations.

## 2 THEORETICAL FRAMEWORK AND EMPIRICAL STUDIES

### 2.1 Theoretical Framework

In order to study the relationship between public expenditure and economic growth, the relationship between the state and the market is analyzed because public expenditure is one of the main tools of the fiscal policy which

aimed at the proactive impact of the state on an economy. There are two well-known concepts regarding this relationship: market fiasco and government fiasco.

**Market fiasco.** In order to have strong arguments for the objective necessity for state intervention in an economy, Keynesian economics uses the concept of market failures. Recognizing the certain advantages of the free-market economic system over the centrally planned economy, Keynesians point out that the market economy is not able to solve many problems or solve them with low efficiency. The ability of the free market to ensure general equilibrium and high efficiency is very low. This situation is called market failure. The typical types of market fiasco are: (i) the full effect of producing or consuming many goods and services is not fully reflected in their market prices because of the existence of externalities, so the state is responsible for neutralizing those effects; (ii) the market cannot produce enough public products (e.g. education, health or defence services, etc.), so the state must participate in the production of all or part of public goods; (iii) market relations, based on increasing competition, lead to the emergence of monopolies, so one of the state's tasks is to protect the competitive environment; (iv) business cycles are an objective phenomenon appearing periodically in a market economy, which goes through flourishing periods that are replaced by crisis periods, so the state has a duty to stabilize business cycles, its economic policies should aim at two objectives: full employment and

price stability; (v) the market recognizes the only income distribution that is considered fair when the winner gets a high income, while the loser does not receive any income or receive a low income. But such income distribution is not fair in terms of humanity, so the state needs to redistribute national income to minimize the differentiation of welfare; and (vi) market mechanisms that allow effective use of social forces, but cannot create a huge breakthrough in fundamental research as well as deep shifts in economic structures. In some economic sectors where investment has a long payback period, high levels of risk are not attractive to private companies. Therefore, another important task of the state is to stimulate technical progress and implement economic restructuring.

Market failures require state intervention in an economy. However, excessive state intervention can distort the market mechanism, causing an inefficient distribution of resources. Neoclassical economists, especially new institutionalists, pay attention to government failures.

**Government fiasco.** The classical and neo-classical schools support the view of government failures. The failures of the state are summarized as follows: (i) access to information is often limited, so the government reduces its responsibility in cases when it does not have all necessary information to accurately forecast the consequences of economic policies; (ii) the state cannot control the reaction of agents to its policies, so their final impact does not depend entirely on itself; (iii) incomplete politi-

cal processes such as electors' irrational behavior, arbitrary decisions, and the influence of interest groups; (iv) control over the government apparatus is limited. A system or part of public servants uses state power to realize their interests; (v) seeking to indiscriminately increase production of public goods and services that lead to waste of existing resources; (vi) creating privileges for certain groups of people; and (vii) inflating the costs of maintaining the excessive bureaucracy.

The world has witnessed many economic growth models applied among which there are five popular ones. These models are based on one or the other-market failures or government failures.

**Demand-side model** (see [18], [15], [9]). Based on Keynesian theory, this model was applied in the United States after the Second World War until the 1970s. Its main task is to keep aggregate demand higher than aggregate supply to boost economic growth in which public expenditure was considered the most important element of aggregate demand.

**Supply-side model** (based on the perspective of the classical and neo-classical schools from the classical economists, such as Adam Smith, David Ricardo, John Stuart Mill to the new classical school with [12], [27], [20]). This model aims to enhance the development of productive forces and to restructure an economy, even allowing some imbalance in it. These measurements which help encourage economic growth were used in the least developed countries and some developed countries in 1970s-1980s after the Keynesian theory was in

crisis.

**Export promotion model.** It is applied in the countries where exports account for a large share (such as Sweden, France, Germany and emerging industrial countries of Asia). The main task of this model is to improve efficiency in export industries and thus to increase the country's international competitiveness in the world market.

**Import substitution model.** This model is used in the countries which have been greatly dependent on import in the context of weak competitiveness of domestic products. The model was applied in the former Soviet Union and some Latin American countries with an aim to implement the catch-up industrialization strategy with the states active role, but their economies were low-efficient.

**Balanced growth model.** This model aims to maintain steady economic growth with the possible highest level of balance. So, maximizing growth is not a goal in itself. This model is widely used in developed countries nowadays.

Next, the relationship between public expenditure and economic growth is analyzed.

For a proper understanding of the probable impact of public expenditure on economic growth, it is necessary to classify public expenditure in some meaningful ways. Since there are different classification system, choice of suitable system depends on the objectives that an analyst would like to achieve. Aschauer [3] further makes classifications of public expenditures in the context of productive and protective expen-

ditures. Productive expenditure comprises economic services and social and community services while protective expenditure includes administration and transfers. Devarajan et al. [8] also note the productive and unproductive public expenditures when they opine that productive expenditures when used in excess, could become unproductive. The results of their study imply that developing countries' governments have been misallocating public expenditures in favor of capital expenditures at the expense of current expenditures.

Productive and unproductive expenditures show that while some expenditures are like consumption, others are like investments which helps an economy to improve its productive capacity. Bhatia [6] submits that under the laissez-faire philosophy, the only productive public expenditures are those which are incurred to create and maintain social overheads. Expenditures on administration, defense, justice, law and order, and maintenance of the state are unproductive (i.e., protective). It must be noted, however, that these protective expenditures would be essential for the productive efficiency of the economy.

Rele and Westerhout [26] view the classification of public expenditure clearly in an analytical manner. They classify public expenditure into two main categories. The first category includes consumption expenditure which are the expenditure items generating benefits in the period in which the expenditure occurs. The second one is an investment, including all items of public expenditure that generate benefits in

the future.

In most countries, public expenditure is used as a tool of fiscal policy, but its impact on economic growth is a controversial issue. The two important conceptions of the relationship between public expenditure and economic growth are the Wagner Law and Keynesian theory. Wagner [32] points out a causal relationship between public expenditure and national income. However, the researcher states that public expenditure is not the cause but an endogenous variable of economic growth. The rise of economic growth results in an increase in public expenditure. Contrary to Wagner's point of view, Keynesian theory [18] suggests that an increase in public expenditure has a positive impact on economic growth. Thus, public expenditure is an exogenous force that promotes economic growth [19]. According to Keynesian theory, discrete fiscal policy is an important tool available to the governments to stimulate economic growth [28]. Unlike Keynes, Solow [30] proposes a neoclassical growth model in which there is no long-term effect of public expenditure on economic growth. Neoclassical growth models prove that fiscal policy cannot lead to long-term changes in output growth. Neoclassical economists claim that long-term growth is due to changes in population, labor force and technical progress which are identified as exogenous. In contrast to Keynes' theory, with the new classical's endogenous growth model, Barro [5] argues that public expenditure has a negative impact on economic growth. He maintains that public expenditure may over-

whelm private investment but does not provide a stimulus to compensate for investment and growth.

## **2.2 Empirical Studies**

There has been a large body of research on the impact of public expenditure on economic growth. However, their results are not consistent with the essence of this impact. Some studies show the positive linear impacts of public expenditure on economic growth, e.g., [1], [7], [33]. Meanwhile, others indicate that public expenditure does not affect economic growth (see in [10]) or that the effect is nonlinear (see in [23]).

Yasin [33] examines the effects of government expenditure on economic growth using panel data from Sub-Saharan, Africa. This model is derived from an aggregate production function that includes input variables of government expenditure, private investment, ODA (Official Development Aid) and trade openness. Fixed effect (FE) and random effect (RE) models were applied. The results from both estimation techniques indicate that government expenditure, trade openness and private investment have a significant positive impact on economic growth.

Similar to Yasin [33], Alexiou [1] provides further evidence of the relationship between government expenditure and economic growth. Like Yasin [33], the researcher employed two estimation methods, fixed effect and random effect, with panel data. These models were used for seven transition economies in South East Europe (SEE) between 1995 and 2005. The findings show that government expenditure can

improve the economic efficiency of the countries in this region. More specifically, the evidence has shown that four of the five variables used in the model government expenditure, ODA, private investment, and trade openness have a significant positive impact on economic growth.

Cooray [7], one of the well-known studies, analyzes the impact of government expenditure on economic growth. This study aims to assess the role of government in enhancing economic growth based on the extension of the classical production function by considering two aspects as the size of public expenditure and government quality known as public institutions. The study was conducted in 71 countries. The empirical results show that both public expenditure and public institutions have a positive impact on economic growth.

In contrast to the studies of Yasin [33], Alexiou [1], Cooray [7], and Easterly & Rebelo [10] uses data obtained from 125 countries during the 1870-1988 period. By using the multiple regression method with many explanatory variables, including government expenditure, real government consumption/real GDP, public investment, taxation, the research results show that taxation and public expenditure have no impact on economic growth.

Also, Nurudeen and Usman [25] analyze government expenditure and economic growth in Nigeria. By using the co-integration and error correction methods and employing time-series data for the 1979-2007 period, they develop a model based on Keynesian and endogenous growth one. Their study

concludes that capital expenditure, total recurrent expenditures, and government expenditure on education have a negative effect on economic growth.

### 3 RESEARCH METHODS AND DATA

#### 3.1 Research Methods

##### 3.1.1 Research Models

To assess the impact of public expenditure on economic growth, we construct a model based on the studies of Alexiou [1] and Cooray [7], starting with the Cobb-Douglas production function as follows:

$$Y(t) = (K(t))^\alpha (H(t))^\beta (G(t))^\gamma \times (A(t) \times L(t))^{1-\alpha-\beta-\gamma} \quad (1)$$

Where Y, H, K, G, L, and A stand for national income, human capital, private capital, government capital, labor, and technical progress, respectively. And  $\alpha + \beta + \gamma < 1$ .

Suppose L and A have growth rates n and g, respectively, then:  $L(t) = L(0) \times e^{nt}$ ;  $A(t) = A(0) \times e^{gt}$

With the assumption of savings is the constant s rate of national income and savings equal to investment. Thus, savings will be allocated to invest in human capital, private capital and government capital, then:  $s = s_k + s_h + s_g$ , where  $s_k$  is the savings ratio used to invest in private capital,  $s_h$  is the savings ratio used to invest in human capital,  $s_g$  is the savings ratio used to invest in government capital.

Divide both sides of (1) by A(t)L(t) and carry out some transformations, we

get:

$$\frac{Y(t)}{A(t)L(t)} = \left(\frac{K(t)}{A(t)L(t)}\right)^\alpha \times \left(\frac{H(t)}{A(t)L(t)}\right)^\beta \times \left(\frac{G(t)}{A(t)L(t)}\right)^\gamma$$

Put  $y(t) = \frac{Y(t)}{A(t)L(t)}$ ,  $k(t) = \frac{K(t)}{A(t)L(t)}$ ,  $h(t) = \frac{H(t)}{A(t)L(t)}$ ,  $g(t) = \frac{G(t)}{A(t)L(t)}$ , we get:

$$y(t) = (k(t))^\alpha (h(t))^\beta (g(t))^\gamma \quad (2)$$

Since savings are used for investment, we have the capital accumulation equations for human capital investment, private investment and government expenditure as follows:

$$\begin{cases} \overline{k(t)} = s_k y(t) - (n + g + \delta) k(t) \\ \overline{h(t)} = s_h y(t) - (n + g + \delta) h(t) \\ \overline{g(t)} = s_g y(t) - (n + g + \delta) g(t) \end{cases}$$

At equilibrium  $k^*$ ,  $h^*$ ,  $g^*$ ,  $\overline{k(t)} = 0$ ,  $\overline{h(t)} = 0$ ,  $\overline{g(t)} = 0$

The above equation system takes the form:

$$\begin{cases} s_k y^* = (n + g + \delta) k^* \\ s_h y^* = (n + g + \delta) h^* \\ s_g y^* = (n + g + \delta) g^* \end{cases}$$

This equation system is equivalent to:

$$\begin{cases} s_k k^{*\alpha} h^{*\beta} g^{*\gamma} = (n + g + \delta) k^* \\ s_h k^{*\alpha} h^{*\beta} g^{*\gamma} = (n + g + \delta) h^* \\ s_g k^{*\alpha} h^{*\beta} g^{*\gamma} = (n + g + \delta) g^* \end{cases}$$

So:

$$\frac{k^*}{s_k} = \frac{h^*}{s_h} = \frac{g^*}{s_g}$$

Putting  $h^* = \frac{s_h k^*}{s_k}$  and  $\frac{s_g k^*}{s_k}$  into the first equation of the system, will calculate:

$$k^* = \left( \frac{s_k^{1-\beta-\gamma} s_h^\beta s_g^\gamma}{n + g + \delta} \right)^{\frac{1}{1-\alpha-\beta-\gamma}}$$

In the same way, it will also calculate:

$$h^* = \left( \frac{s_h^{1-\alpha-\gamma} s_k^\alpha s_g^\gamma}{n + g + \delta} \right)^{\frac{1}{1-\alpha-\beta-\gamma}}$$

and

$$g^* = \left( \frac{s_g^{1-\beta-\alpha} s_h^\beta s_k^\alpha}{n + g + \delta} \right)^{\frac{1}{1-\alpha-\beta-\gamma}}$$

Placing  $k^*$ ,  $h^*$ ,  $g^*$  into (2), we get:

$$y^* = \left( \frac{s_k^{1-\beta-\gamma} s_h^\beta s_g^\gamma}{n + g + \delta} \right)^{\frac{\alpha}{1-\alpha-\beta-\gamma}} \times \left( \frac{s_h^{1-\alpha-\gamma} s_k^\alpha s_g^\gamma}{n + g + \delta} \right)^{\frac{\beta}{1-\alpha-\beta-\gamma}} \times \left( \frac{s_g^{1-\beta-\alpha} s_h^\beta s_k^\alpha}{n + g + \delta} \right)^{\frac{\gamma}{1-\alpha-\beta-\gamma}}$$

By taking the logarithm of the two sides of the above equation and the basic transformations, the equilibrium state of economic growth is expressed as a linear logarithmic function as follows:

$$\begin{aligned} \ln y^* &= \frac{\alpha}{1 - \alpha - \beta - \gamma} \ln s_k \\ &+ \frac{\beta}{1 - \alpha - \beta - \gamma} \ln s_h \\ &+ \frac{\gamma}{1 - \alpha - \beta - \gamma} \ln s_g \\ &- \frac{\alpha + \beta + \gamma}{1 - \alpha - \beta - \gamma} \ln (n + g + \delta) \end{aligned}$$

Or:

$$\begin{aligned} \ln y^* &= \rho_0 + \rho_1 \ln s_k \\ &+ \rho_2 \ln s_h + \rho_3 \ln s_g \end{aligned} \quad (3)$$

Where  $\rho_0 = -\frac{\alpha+\beta+\gamma}{1-\alpha-\beta-\gamma} \ln (n + g + \delta)$ ,  $\rho_1 = \frac{\alpha}{1-\alpha-\beta-\gamma}$ ,  $\rho_2 = \frac{\beta}{1-\alpha-\beta-\gamma}$ ,  $\rho_3 = \frac{\gamma}{1-\alpha-\beta-\gamma}$

On the other hand, the growth rate of GDP per capita in equilibrium is expressed in the form of:

$$\begin{aligned} \ln y(t) - \ln y(t-1) &= (1 - e^{-\lambda}) [\ln y^* - \ln y(t-1)] \end{aligned} \quad (4)$$

Where  $y(t-1)$  is GDP per capita of the previous year and  $y^*$  is the average GDP per capita in the equilibrium defined by equation (3). Placing (3) into (4) and performing basic transformations, obtain:

$$\begin{aligned} \ln y(t) - \ln y(t-1) &= \varphi_0 + \varphi_1 \ln y(t-1) + \varphi_2 \ln s_k \\ &+ \varphi_3 \ln s_h + \varphi_4 \ln s_g \end{aligned}$$

Therefore, the growth rate of GDP per capita will depend on the growth rate of GDP per capita in the previous period, private capital, human capital, and government capital.

Also, we also analyze the impact of public expenditure components on economic growth. The components of public expenditure are included in the model based on Anh [2] and Efendic & Trkic-Izmirlija [11]. These components are public expenditure on health (g1), government consumption (g2); public expenditure on education (g3); and public expenditure on defence (g4).

The role of institutions for economic growth was first claimed by North and Thomas [24]. In addition to the variables shown above, empirical research by [29] shows that governance affects economic growth. Nguyen Ngoc Thach et al. [31] also confirm that institutional quality, democracy freedom,

and economic freedom play an important role in economic growth. Therefore, governance variables need to be included in the model. In this study, we use observed variables as the indicators of governance quality in two data sets: Worldwide Governance Indicators (WGI) and International Country Risk Guide (ICRG). Each set of data includes six major indicators: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption. Siddiqui and Ahmed [29] also include trade openness and inflation in the model to analyze its impact on economic growth.

Thus, in this study, up to 23 variables can be included in the model to explain economic growth as the dependent variable. In general, according to Zeugner [35], the probability of each model is the same and there will be a maximum of  $2^{23}$  models to be estimated.

### 3.1.2 Method of Estimation

We estimate the model by Bayesian Model Averaging (BMA). This method is chosen because of its advantages over traditional probabilistic methods. In the context that many explanatory variables can be included in the model, there will be more than one model with equal explanatory capacity. If only one model is selected, it may lead to risks from unstable model. The main purpose of model averaging is to consider and estimate all possible models (the model space) and to focus on summarized statistics based on weighted averages of the models in the model space. Madigan and Raftery [22] and Kass and Raftery [17] provide a sound statistical

derivation for a model combination procedure, called BMA, where the model weights are derived as additional statistical parameters in a Bayesian estimation set up.

Consider a linear regression model with a constant term,  $\beta_0$ , and  $k$  potential explanatory variables  $x_1, x_2, \dots, x_k$  as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \varepsilon$$

With  $k$  potential explanatory variables, we will have  $2^k$  combinations of explanatory variables on the right side. Each of these combinations will create a new model denoted by  $M_j$  with  $j = 1, 2, \dots, 2^k$ . At this time, a model space has been constructed. The posterior distribution for any coefficient, say  $\beta_h$ , given the data  $D$ , is

$$P(\beta_h|D) = \sum_{j:\beta_h \in M_j} P(\beta_h|M_j) P(M_j|D)$$

With  $P(M_j|D)$  is the posterior probability of any  $M_j$  model with the data set  $D$ , calculated by the formula:

$$P(M_j|D) = \frac{P(D|M_j) P(M_j)}{\sum_{j=1}^{2^k} P(D|M_j) P(M_j)}$$

Where

$$\begin{aligned} P(D|M_j) &= \int P(D|\beta^j, M_j) P(\beta^j|M_j) d\beta^j \end{aligned}$$

and  $\beta^j$  is the estimated parameter vector of the model  $M_j$ .  $P(\beta^j|M_j)$  is the a prior probability distribution assigned to the parameters of the model  $M_j$ .  $P(M_j)$  is the prior probability that  $M_j$  is the true model.

The estimated posterior means and standard deviations of  $\beta_h$  is then con-

structured as

$$\begin{aligned}
 E[\beta_h|D] &= \sum_{j=1}^{2^k} \hat{\beta}_h P(M_j|D) \\
 \delta[\beta_h|D] &= \sqrt{VAR[\beta_h|D]} = \\
 &\left( \sum_{j=1}^{2^k} (VAR[\beta_h|D, M_j] + \hat{\beta}_h^2) P(M_j|D) \right. \\
 &\quad \left. - E[\beta_h|D]^2 \right)^{1/2}
 \end{aligned}$$

Thus, to apply the BMA method, it is necessary to determine the prior probability of the model  $M_j(P(M_j))$  and the prior probability assigned to parameters of model  $M_j(P(\beta^j|M_j))$ .

According to Zeugner [35], a popular choice for a prior probability  $P(M_j)$  is a uniform probability distribution because each model is equally likely to occur, so:

$$P(M_j) = \frac{1}{2^k}$$

In contrast to the choice of a prior probability  $P(M_j)$ , the prior probability  $(P(\beta^j|M_j))$  depends significantly on the information that the researcher has about the probability distribution of  $\beta^j$ . In the Bayesian linear regression model, a priori probability distribution of the parameters commonly used by researchers is Zellner's g-prior. Zellner [34] proposed g-prior as a common benchmark prior. The g-prior depends on the data and thus does not violate the conditional probability rule. Fernandez et al. [13] show that the most efficient g-prior is benchmark prior which is  $g = [\max\{N, K^2\}]^{-1}$ .

### 3.2 Data Analysis

According to the Asian Development Bank (ADB), there are 50 coun-

tries in Asia. However, since some countries have data omission, the study used data obtained from 43 countries, accounting for 86% of Asian countries. Therefore, the research sample is still representative.

In terms of observation time, we analyze the data obtained from 43 countries during the 2004-2016 period. This research period is selected for many reasons. First, this period allows 43 countries to have sufficient data available for this research. Second, this period covers the time before, during and after the global economic crisis (2004-2007, 2008-2009, 2010-2016 respectively). Therefore, we can comprehensively analyze the impact of public expenditure on economic growth during an economic cycle in Asian countries.

Research database concludes secondary data collected from reliable sources. The measurement data of GDP per capita, private investment on GDP, public expenditure on GDP, the proportion of public expenditure components on GDP, trade openness, inflation, human capital are taken from World Economic Outlook (WEO) of the International Monetary Fund (IMF) and World Development Indicators (WDI) of the World Bank for 43 Asian countries during the period 2004-2016.

For governance data, Worldwide Governance Indicators (WGI) of 43 Asian countries from 2004 to 2016 are obtained from the World Bank database. International Country Risk Guide (ICRG) of 43 Asian countries from 2004 to 2016 is taken from the Political Risk Services Group (PRS Group).

**Table 1. Summary of variables**

Variables	Notation	Definitions and Calculations
Economic growth	$growth_{it}$	$lny_{it} - lny_{i(t-1)}$ with $y_{it}$ and $y_{i(t-1)}$ respectively GDP per capita of country i year t and year (t-1)
GDP per capita	$lngdp_{i(t-1)}$	Logarithm of GDP per capita of country i year (t-1)
Investment	$inv_{it}$	Investment capital per GDP of country i year t
Human capital	$l_{it}$	Labor force ratio of country i year t
Public expenditures	$g_{it}$	Total public expenditure (fraction of GDP)
	$g1_{it}$	Public expenditure on health (fraction of GDP)
	$g2_{it}$	Public expenditure on consumption (fraction of GDP)
	$g3_{it}$	Public expenditure on education (fraction of GDP)
	$g4_{it}$	Public expenditure on defence (fraction of GDP)
Trade openness	Open	Import-export ratio per GDP of country i year t
Inflation	inf	Inflation rate of country i year t
Governance	CCICRG	Control of Corruption belongs to the ICRG index
	RLICRG	Rule of Law belongs to the ICRG index
	RQICRG	Regulatory Quality belongs to the ICRG index
	GEICRG	Government Effectiveness belongs to the ICRG index
	PVICRG	Political stability and Absence of Violence belongs to the ICRG index
	VAICRG	Voice and Accountability belongs to the ICRG index
	CCWGI	Control of Corruption belongs to the WGI index

RLWGI	Rule of Law belongs to the WGI index
RQWGI	Regulatory Quality belongs to the WGI index
GEWGI	Government Effectiveness belongs to the WGI index
PVWGI	Political stability and Absence of Violence belongs to the WGI index
VAWGI	Voice and Accountability belongs to the WGI index

#### 4 RESULTS AND DISCUSSION

Descriptive statistical results of variables are shown in Table 2. measuring specific quantities for study

**Table 2. Descriptive statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
growth	516	0.0316401	0.0605082	-0.359409	0.4534836
inv	516	0.246965	0.1208961	0	0.73002
g	516	0.2783847	0.0955985	0.0407	0.6474
l	516	0.4570435	0.1115448	0.218291	0.754537
open	516	0.925404	0.6116208	0	4.41604
inf	516	0.0607963	0.0619118	-0.06811	0.53248
CCICRG	516	0.412824	0.1549858	0.0833	0.8333
RLICRG	516	0.6320698	0.1816965	0.25	1
RQICRG	516	0.6979359	0.1791875	0.1364	1
GEICRG	516	0.5426357	0.23819	0	1
PVICRG	516	0.6908537	0.1178424	0.3542	0.9356
VAICRG	516	0.5873686	0.1804532	0	1
CCWGI	516	0.4014103	0.2782792	0.0047	0.9857
RLWGI	516	0.4161641	0.2616907	0.0047	0.9663
RQWGI	516	0.4387847	0.2615059	0.0049	1
GEWGI	516	0.467837	0.262525	0.0098	1
PVWGI	516	0.3615572	0.2726462	0	0.9668
VAWGI	516	0.2849407	0.2030283	0	0.8545
g1	516	0.019363	0.0156711	0	0.1011755
g2	516	0.1437506	0.1212648	0	1.098691

g3	516	0.0218131	0.0222088	0	0.1193353
g4	516	0.026215	0.0244717	0	0.1608328

*Source: Calculated results from R 3.5.2.*

The descriptive statistics show that the average economic growth rate during the 2004-2016 period in 43 Asian countries is 3.16% per year. The average share of public expenditure in GDP during this period in these countries is 27.84% per year. The ratio of private investment to GDP is 24.69% per year. The average inflation rate is 6% per year. The average labor force ratio is 45.70%. The average trade openness is 92.54%.

In terms of public expenditure components, public expenditure on consumption, public expenditure on education, public expenditure on health and public expenditure on defence, in turn, averaged in 43 Asian countries during the 2004-2016 period are 14.37% of GDP, 2.18% of GDP, 1.94% of GDP, and 2.62% of GDP.

The correlation between the variables in the model is shown in the correlation matrix in Table 3.

Correlation coefficients measure the degree of linear relationship between two variables regardless of whether or not one variable depends on the other. The results of correlation matrix show that total public expenditure is negatively correlated with economic growth. Besides, some public expenditure components are also negatively correlated with economic growth but this correlation is small.

Next, the study will estimate the models by the BMA method. First, we

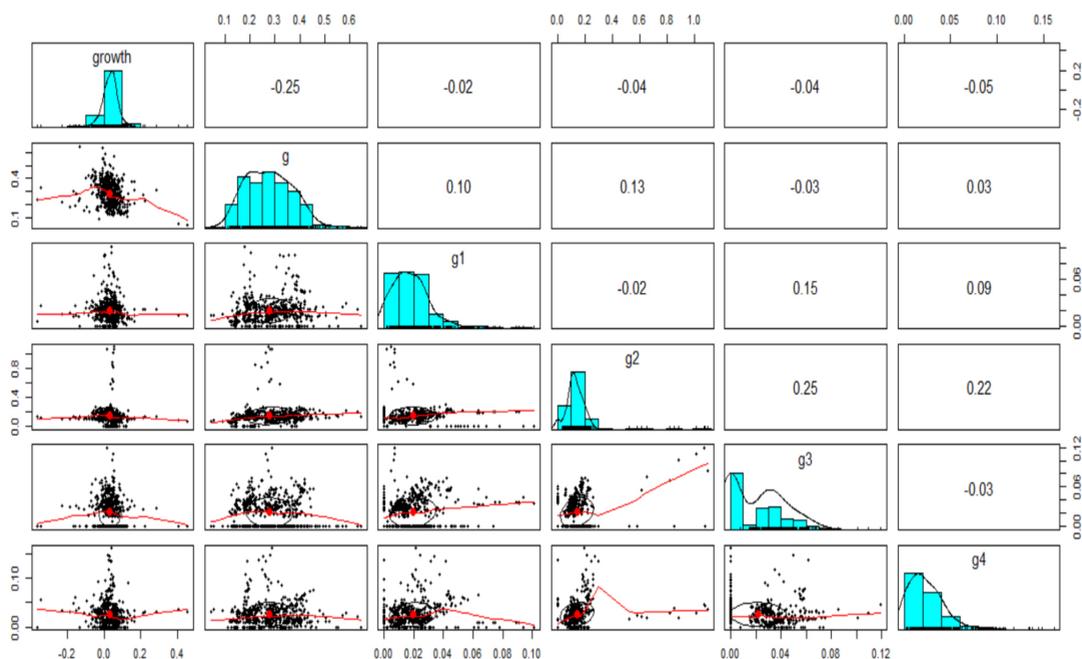
estimate the impact of total public expenditure on economic growth. The impact of public expenditure components on economic growth will be considered in the following estimation. The estimation results are presented in Table 4.

Table 4 shows the variables in the model and the corresponding statistical values. The analysis of results focuses only on the three first columns of this table. The first column PIP representing posterior inclusion probabilities is the sum of PMPs for all models wherein a covariate is included. The second column Post Mean displays the coefficients averaged over all models, including the ones wherein the variable is not contained (implying that the coefficient is zero in this case). The third column shows the posterior standard deviation of the regression coefficient.

For total public expenditure variable *g*, its PIP closes to 1. This indicates that total public expenditure appears on all models. Its Post mean is -0.1569 with a negative value, it means that total public expenditure has a negative impact on economic growth. Post SD is 0.029, implying that total public expenditure certainly has a negative impact on economic growth because the confidence interval of the posterior regression coefficient lies in the negative value domain.

On the other hand, PIP values of the variables RLICRG, RLWGI, and VAWGI are more than 50%, indicating

**Table 3.** Correlation matrix



Source: Calculated results from R 3.5.2.

**Table 4:** Results of estimating models with total public expenditure

	PIP	Post Mean	Post SD	Cond.Pos.	Sign	Idx
g	1.000e+00	-1.569e-01	2.902e-02	0.000e+00		4.000e+00
RLICRG	9.611e-01	6.324e-02	2.162e-02	1.000e+00		8.000e+00
RLWGI	5.690e-01	-3.021e-02	3.060e-02	0.000e+00		1.400e+01
VAWGI	5.287e-01	2.207e-02	2.403e-02	9.998e-01		1.800e+01
CCWGI	2.502e-01	-9.384e-03	1.912e-02	4.596e-03		1.300e+01
inv	1.988e-01	8.019e-03	1.881e-02	1.000e+00		2.000e+00
RQWGI	1.786e-01	-6.435e-03	1.645e-02	9.104e-04		1.500e+01
l	1.746e-01	9.416e-03	2.438e-02	9.986e-01		3.000e+00
GEWGI	1.104e-01	-1.441e-03	1.307e-02	3.559e-01		1.600e+01
VAICRG	1.078e-01	2.624e-03	9.648e-03	1.000e+00		1.200e+01
PVWGI	9.934e-02	-1.772e-03	6.995e-03	3.093e-05		1.700e+01
inf	9.700e-02	-5.598e-03	2.181e-02	0.000e+00		6.000e+00
RQICRG	6.175e-02	-9.878e-04	6.651e-03	3.389e-02		9.000e+00
GEICRG	5.599e-02	5.484e-04	4.643e-03	9.188e-01		1.000e+01
open	4.808e-02	-9.936e-05	1.146e-03	9.580e-02		5.000e+00
PVICRG	4.747e-02	-3.901e-04	7.150e-03	1.207e-01		1.100e+01
CCICRG	4.638e-02	-6.695e-05	4.940e-03	3.583e-01		7.000e+00
lngdp	4.386e-02	1.725e-07	1.896e-04	4.731e-01		1.000e+00

Source: Calculated results from R 3.5.2.

that the variables representing the quality of governance also appear in most models. Meanwhile, the remaining variables have PIP values less than 50%.

Table 5 shows that the average number of explanatory variables in the posterior models, or model size is 4.579. The model has 18 explanatory variables, so the estimation is done with the model space including  $2^{18} = 262144$  models. In particular, the best posterior model with the probability of occurrence is 11.90%, including explanatory variables: total public expenditure *g* and three variables representing the quality of governance are RLICRG, RLWGI, and VAWGI. In other words, 11.90% of these four variables explain

the economic growth of Asian countries.

For a more comprehensive overview of the models, we examine the 500 best posterior models.

Fig. 1 with the vertical axis is the explanatory variable in the model, the horizontal axis is the cumulative posterior model probability. The orange color in Fig. 1 indicates the negative regression coefficient with a negative value, the green color the positive regression coefficient with positive value.

One problem in applying the BMA method is that the probability of the posterior model is affected by the probability of the prior model. Therefore, the selection of the prior model will affect the posterior model results. In

**Table 5:** Descriptive Statistics and Top 3 Models

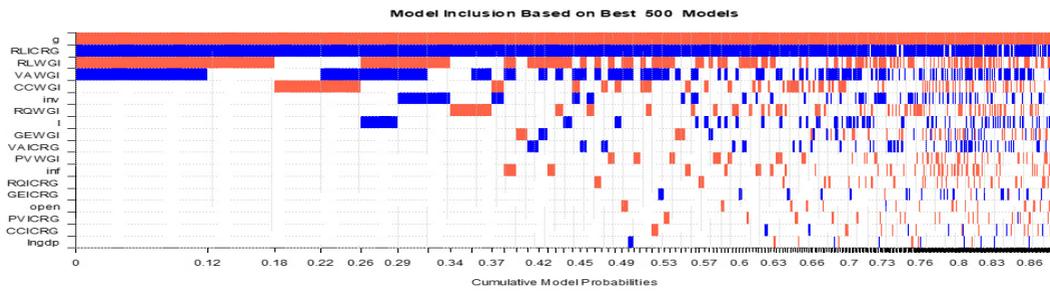
Mean no. regressors	Draws	Burnins	Time	No. models visited
"4.5790"	"262144"	"0"	"14.05204 secs"	"262144"
Modelspace 2^K	% visited	% Topmodels	Corr PMP	No. Obs.
"262144"	"100"	"0.19"	"NA"	"516"
Model Prior	g-Prior	Shrinkage-Stats		
"uniform / 9"	"BRIC"	"Av=0.9981"		

	04411	04410	04420
lngdp	0.00000	0.00000	0.00000
inv	0.00000	0.00000	0.00000
l	0.00000	0.00000	0.00000
g	1.00000	1.00000	1.00000
open	0.00000	0.00000	0.00000
inf	0.00000	0.00000	0.00000
CCICRG	0.00000	0.00000	0.00000
RLICRG	1.00000	1.00000	1.00000
RQICRG	0.00000	0.00000	0.00000
GEICRG	0.00000	0.00000	0.00000
PVICRG	0.00000	0.00000	0.00000
VAICRG	0.00000	0.00000	0.00000
CCWGI	0.00000	0.00000	1.00000
RLWGI	1.00000	1.00000	0.00000
RQWGI	0.00000	0.00000	0.00000
GEWGI	0.00000	0.00000	0.00000
PVWGI	0.00000	0.00000	0.00000
VAWGI	1.00000	0.00000	0.00000
PMP (Exact)	0.11897	0.06020	0.04136
PMP (MCMC)	0.11897	0.06020	0.04136

Source: Calculated results from R 3.5.2.

**Fig. 1: 500 best posterior models**



Source: Calculated results from R 3.5.2.

this study, we select a uniform probability distribution assigned to the models. To test the appropriateness of this prior probability distribution, we compare the distribution of the fixed prior probability and random prior probability. Results are presented in Fig. 2.

Fig. 2 shows the uniform probability distribution and the fixed prior probability distribution with the same PIP values. In contrast, the random prior probability distribution has lower PIP values than the above two distributions. Therefore, the choice of the uniform probability distribution is appropriate.

Thus, the research results indicate that economic growth is explained by total public expenditure and three variables representing the quality of governance (RLICRG, RLWGI, VAWGI).

However, the estimation results in Table 3 only provide information about the average value of the regression coefficients corresponding to these four variables. In order to draw clearer conclusions, we continue to graph analysis of the density function of these regression coefficients.

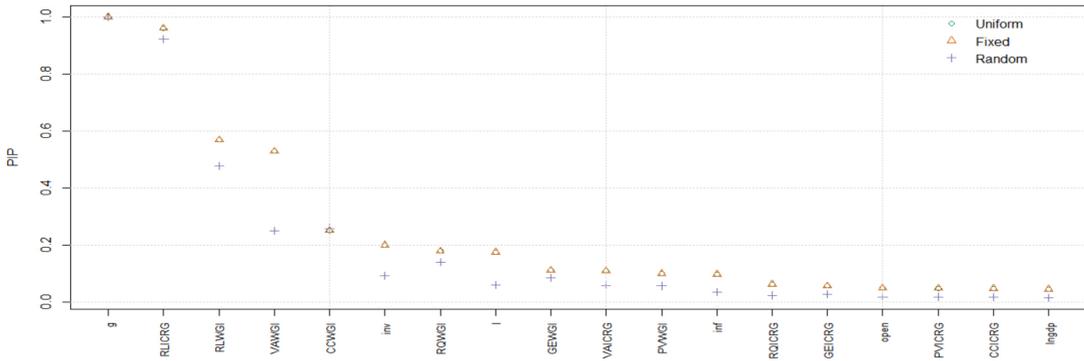
Fig. 3 shows that the posterior

regression coefficient of the total public expenditure ( $g$ ) is almost certainly less than 0. The probability of the marginal density of this regression coefficient is approximately 100%, which confirms the PIP value of this variable (see table 3). Thus, total public expenditure has a negative impact on economic growth in Asian countries.

The posterior regression coefficients of Rule of Law of the ICRG index (RLICRG) are almost certainly greater than 0. The probability of the marginal density of this regression coefficient is 98.41%, confirming the PIP value of 96.11% of this variable in Table 3. Thus, the Rule of Law has a positive impact on economic growth in Asian countries. On the other hand, the posterior regression coefficient of the Rule of Law of the WGI set (RLWGI) can be less than 0, but the probability of marginal density is not high.

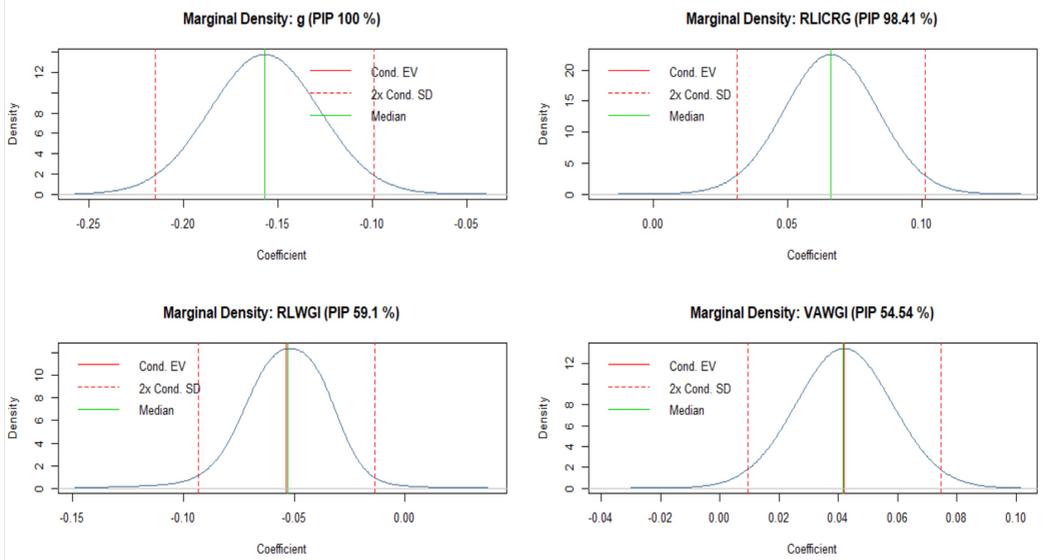
Similarly, the posterior regression coefficient of Voice and Accountability (VAWGI) is almost certainly more than 0. The probability of the marginal density of this regression coefficient is 54.54%, confirming the PIP value of 52.87% of this variable in Table 3. Thus,

Fig. 2. PIPs for Uniform, Fixed, and Random Model Priors



Source: Calculated results from R 3.5.2.

Fig. 3. Densities of Selected Coefficients



Voice and Accountability (VAWGI) has a positive impact on economic growth in Asian countries.

Next, we analyze the impact of public expenditure components on economic growth by estimating models by the BMA method. The results are presented in Table 6.

The estimation results show that public expenditure components have PIP values less than 10%. Specifically, public expenditure on defence (g4) has

a PIP value of 6.15% with the average value of the regression coefficient of 0.49%. Public expenditure on health (g1) has a PIP value of 5.94% with the average value of the regression coefficient of 0.87%. Public expenditure on consumption (g2) has a PIP value of 4.99% with the average value of the regression coefficient of -0.04%. Public expenditure on education (g3) has a PIP value of 4.51% with the average value of the regression coefficient

**Table 6: Estimation results of models**

	<b>PIP</b>	<b>Post Mean</b>	<b>Post SD</b>	<b>Cond.Pos.</b>	<b>Sign</b>	<b>Idx</b>
<b>I</b>	6.467e-01	5.818e-02	5.105e-02	1.000e+00		3.000e+00
<b>RLICRG</b>	6.365e-01	3.188e-02	2.821e-02	1.000e+00		7.000e+00
<b>RLWGI</b>	4.785e-01	-2.664e-02	3.086e-02	0.000e+00		1.300e+01
<b>RQWGI</b>	2.996e-01	-1.394e-02	2.389e-02	0.000e+00		1.400e+01
<b>PVWGI</b>	2.244e-01	-6.092e-03	1.322e-02	9.640e-06		1.600e+01
<b>CCWGI</b>	1.895e-01	-7.581e-03	1.865e-02	2.093e-02		1.200e+01
<b>GEWGI</b>	1.727e-01	-7.015e-03	2.027e-02	9.578e-02		1.500e+01
<b>VAWGI</b>	1.171e-01	2.934e-03	1.010e-02	9.964e-01		1.700e+01
<b>VAICRG</b>	1.124e-01	2.629e-03	9.323e-03	1.000e+00		1.100e+01
<b>inv</b>	9.776e-02	2.954e-03	1.153e-02	1.000e+00		2.000e+00
<b>inf</b>	7.943e-02	-4.089e-03	1.885e-02	4.825e-05		5.000e+00
<b>g4</b>	6.154e-02	4.907e-03	4.255e-02	7.367e-01		2.100e+01
<b>RQICRG</b>	6.033e-02	1.015e-04	6.103e-03	4.697e-01		8.000e+00
<b>g1</b>	5.938e-02	8.714e-03	5.605e-02	9.994e-01		1.800e+01
<b>GEICRG</b>	5.876e-02	-1.158e-04	4.211e-03	3.919e-01		9.000e+00
<b>PVICRG</b>	5.645e-02	8.722e-04	9.167e-03	6.522e-01		1.000e+01
<b>CCICRG</b>	5.469e-02	4.036e-04	5.927e-03	7.159e-01		6.000e+00
<b>open</b>	5.163e-02	-1.433e-04	1.295e-03	6.371e-02		4.000e+00
<b>g2</b>	4.993e-02	-4.329e-04	5.866e-03	3.018e-01		1.900e+01
<b>g3</b>	4.509e-02	-1.744e-03	2.719e-02	1.408e-02		2.000e+01
<b>lngdp</b>	4.426e-02	7.858e-06	1.980e-04	7.231e-01		1.000e+00

Source: Calculated results from R 3.5.2.

of -0.17%. Thus, public expenditure on defence and public expenditure on health have a positive impact on economic growth. Meanwhile, public expenditure on education and public expenditure on consumption have a negative impact on economic growth.

The next part provides discussions based on the empirical results.

According to the empirical results, total public expenditure has a significant impact on economic growth in Asian countries. An increase in total public expenditure has a negative impact on economic growth. Our findings are consistent with some studies, such as [4], [25]. One possible explanation is that governments have used these expenditures excessively, which lead to an increase in tax and/or borrowing to finance government expenditures, and this may hinder the overall economic performance.

In analyzing the components of public expenditure, the results show that public expenditure on defence has a positive impact on economic growth. Public expenditure on defence is a mandatory expense of governments. In addition to procuring equipment needed for national defense and security, expenditures for national security help to guarantee the stability, security and order of a country and ownership of assets. Stability strengthens the confidence of domestic and foreign investors who can increase their investment in the host country.

Similarly, public expenditure on health has a positive impact on economic growth. Improving people's health has not only a positive impact on economic development but also contributes to improving human capital. Thus, it can foster economic growth, e.g., [21].

Meanwhile, public expenditure on consumption has a negative impact on economic growth. This can be explained by the increase in government consumption expenditure leading to reducing resources for real investment. This results in a slowdown in economic growth.

In addition, the findings show that public expenditure on education has a negative impact on economic growth. This can be due to the "brain drain" phenomenon in Asian countries. Public expenditure on education accounts for a large proportion of the total expenditure. This spending includes building facilities, supporting student tuition fees and scholarships. However, many students tend to work for international organizations or working overseas after graduation because of better working condition and higher salaries. Their income is calculated not in the GDP of their home countries but in that of the host countries where they work.

The research results also show the impact of governance on economic growth in Asian countries. The low-quality institutional environment in many Asian countries, reflected in the low Global Governance indicators, is due to the following reasons: (i) many developing Asian countries have not created favorable institutional conditions to support sustainable economic growth; (ii) imperfect market institutions, such as ineffective ownership, e.g. owners with weak control over their assets or weak regulatory institutions leading to high transaction costs and imperfect information; and (iii) institutions that regulate operational conflicts

with low-efficiency increase transaction costs.

## **5 CONCLUSIONS AND POLICY RECOMMENDATIONS**

The empirical results indicate that total public expenditure has a significant negative impact on economic growth of Asian countries. However, public expenditure components have different impacts on economic growth. Especially, public expenditures on defence and health have a positive impact on economic growth, whereas, public expenditures on education and consumption have a negative impact. In addition, the research results point out a statistically significant impact of governance on economic growth in Asian countries.

Based on the research findings outlined in the previous sections, we propose policy implications aimed at reducing public expenditure and/or effectively managing public expenditures to achieve their positive impact on economic growth in Asian countries.

First of all, the research results show that increasing public expenditure in a well-improved quality institutional environment can boost economic growth in Asian countries. Therefore, it is necessary to effectively manage public revenues. At the same time, governments need to take measures to improve the efficiency of public expenditures which can help to promote their positive impact on economic growth.

Second, the research results indicate that several factors representing Global Governance Indicators, especially Voice and Accountability and Rule of Law,

have a positive impact on economic growth. Therefore, improving these factors can help to increase public expenditures' efficiency and thereby contribute to encouraging economic growth. To achieve this target, several recommendations are made to improve the efficiency of Asian governments as follows:

In terms of Voice and Accountability, a lack of voice and accountability can lead to an increase in corruption in the executive apparatus. Improving the voice of people and the accountability of bureaucracy will create transparency and enhance the governments' governance effectiveness. In order to improve accountability, governments need to be aware of the significance of implementing accountability. Besides, thanks to the good quality of regulations and rules of law, personal freedom is well protected, and all citizens are equal before the law. Adherence to the laws will ensure sustainable growth. To do so, first of all, it is necessary to improve the quality of law dissemination and education to all strata of the society by enhancing a sense of respect for law and law observance acts among citizens.

Second, it is important to ascertain that all citizens are equal before the law and this equality is well expressed in all areas of social life, especially in legal, judicial and administrative domains.

Third, the research results show the different impacts of public expenditure components on economic growth in Asian countries. Therefore, govern-

ments should implement public expenditure restructuring towards reducing public expenditure in areas not promoting economic growth. Effective allocation of public resources helps to increase investment in the areas which encourage economic growth.

Fourth, it is necessary to construct a high-quality institutional system sequentially and harmoniously to ensure stable economic growth. Failure to do so would lead to an economic recession. For example, ownership must go hand in hand with control; effectively regulatory institutions help to minimize market failures, and assurance of macroeconomic stability; high-quality institutions such as court, representative political institutions, independent unions, social partnerships, and social security can solve conflicts well.

Fifth, institutional development requires time and unusual decisions. The economic success of some Asian countries in the post-World War II period certainly is the result of cautious institutional reforms.

Finally, factors contributing to brain drain include war and insecurity, epileptic healthcare, education systems, and inflation, extreme poverty and inequality occasioned by bad governance. Thus, if these problems are addressed, brain drain would be reduced. Governments should, moreover, create programs that can enable youths to realize their potentials.

## References

- [1] Alexiou, C. (2009). Government Spending and Economic Growth: Econometric Evidence from the South Eastern Europe (SEE). *Journal of Economic and Social Research*, 11, 1-16.
- [2] Anh, P. T. (2008). Analysis of government expenditure structure and economic growth in Vietnam. *The Center of Economic and Policy Research, Institute of Economics and Business, Vietnam National University, Hanoi*.
- [3] Aschauer, D. A. (1989). Is public expenditure productive? *Journal of Monetary Economics*, 23(2), 177-200. [https://doi.org/10.1016/0304-3932\(89\)90047-0](https://doi.org/10.1016/0304-3932(89)90047-0)
- [4] Barro, R. (1996). Determinants of Economic Growth: A Cross-Country Empirical Study. *National Bureau of Economic Research*. <https://doi.org/10.3386/w5698>
- [5] Barro, R. J. (1989). Economic Growth in a Cross Section of Countries. *National Bureau of Economic Research Working Paper Series*, No. 3120. <https://doi.org/10.3386/w3120>
- [6] Bhatia, H. L. (2008). *Public Finance (26th ed.)*. New Delhi, India: Vikas Publishing House PVT Ltd.
- [7] Cooray, A. (2009). Government Expenditure, Governance and Economic Growth. *Comparative Economic Studies* (Vol. 51). *Comparative Economic Studies*. <https://doi.org/10.1057/ces.2009.7>
- [8] Devarajan, S., Swaroop, V., & Zou, H. (1996). The composition of public expenditure and economic growth. *Journal of Monetary Economics*, 37(2), 313-344. [https://doi.org/10.1016/s0304-3932\(96\)90039-2](https://doi.org/10.1016/s0304-3932(96)90039-2)
- [9] Dow, L. A., & Domar, E. D. (1958). Essays in the Theory of Economic Growth. *Southern Economic Journal*, 24(4), 489. <https://doi.org/10.2307/1055711>
- [10] Easterly, W., & Rebelo, S. (1993). Fiscal policy and economic growth. *Journal of Monetary Economics*, 32(3), 417-458. [https://doi.org/10.1016/0304-3932\(93\)90025-b](https://doi.org/10.1016/0304-3932(93)90025-b)
- [11] Efendic, A., & Trkic-Izmirlija, N. (2013). Effects of the global economic crisis and public spending on income distribution in Bosnia and Herzegovina (wiiw Balkan Observatory Working Papers). *The Vienna Institute for International Economic Studies*, wiiw. <https://doi.org/DOI:>

- [12] Feldstein, M. (1982). Capital Taxation. *National Bureau of Economic Research Working Paper Series*, No. 877. <https://doi.org/10.3386/w0877>
- [13] Fernandez, C., Ley, E., & Steel, M. (2001). Benchmark priors for Bayesian model averaging. *Journal of Econometrics*, 100(2), 381–427. Retrieved from <https://econpapers.repec.org/RePEc:eee:econom:v:100:y:2001:i:2:p:381-427>
- [14] Gemmell, N., Kneller, R., & Sanz, I. (2014). Does the Composition of Government Expenditure Matter for Long-Run GDP Levels? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2484917>
- [15] Harrod, R. (1949). Towards a Dynamic Economics. Some Recent Developments of Economic Theory and their Application to Policy. *Journal of the Royal Statistical Society. Series A (General)*, 112(1), 86. <https://doi.org/10.2307/2984185>
- [16] Hoeting, J. A., Madigan, D., Raftery, A. E., & Volinsky, C. T. (2000). Correction to: Bayesian model averaging: a tutorial [Statist. Sci. 14 (1999), no. 4, 382–417; MR 2001a:62033]. *Statistical Science*, 15(3), 193–195. <https://doi.org/10.1214/ss/1009212814>
- [17] Kass, R. E., & Raftery, A. E. (1995). Bayes Factors. *Journal of the American Statistical Association*, 90(430), 773–795. <https://doi.org/10.1080/01621459.1995.10476572>
- [18] Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. Palgrave Macmillan.
- [19] Loizides, J., & Vamvoukas, G. (2005). Government Expenditure and Economic Growth: Evidence from Trivariate Causality Testing. *Journal of Applied Economics*, 8(1), 125–152. <https://doi.org/10.1080/15140326.2005.12040621>
- [20] Lucas, R. E., & Prescott, E. C. (1971). Investment Under Uncertainty. *Econometrica*, 39(5), 659. <https://doi.org/10.2307/1909571>
- [21] Machuki, E., Oloo, D., Momanyi, E., Owang, F., & Ochieng, F. (2013). *Human Capital Development and Economic Growth in Kenya (1981-2011)*. University of Nairobi. Retrieved from <http://economics.uonbi.ac.ke/node/3189>
- [22] Madigan, D., & Raftery, A. E. (1994). Model Selection and Accounting for Model Uncertainty in Graphical Models Using Occam's Window. *Journal of the American Statistical Association*, 89(428), 1535–1546. <https://doi.org/10.2307/2291017>

- [23] Malek, H. (2014). The Effect of Government Size on Economic Freedom and Economic Growth in Iran. *Kuwait Chapter of Arabian Journal of Business and Management Review*, 3(12), 328–338. <https://doi.org/10.12816/0018836>
- [24] North, D. C., & Thomas, R. P. (1975). The Rise of the Western World. Cambridge, at the University Press, 1973, VIII p.170. *Louvain Economic Review*, 41(2), 183. <https://doi.org/DOI: 10.1017/S0770451800000634>
- [25] Nurudeen, A., & Usman, A. (2010). Government Expenditure And Economic Growth In Nigeria, 1970-2008: A Disaggregated Analysis. *Business and Economics Journal*, 4, 1–11.
- [26] Rele, H., & Westerhout, E. (2003). *Does an increase of public expenditure justify slower debt reduction?* CPB Report 2003.
- [27] Sargent, T. J., & Wallace, N. (1973). The Stability of Models of Money and Growth with Perfect Foresight. *Econometrica*, 41(6), 1043. <https://doi.org/10.2307/1914034>
- [28] Shafuda, C. P. P. (2015). *An Examination of the Relationship between Government Spending and Economic Growth in Namibia*. The University of Namibia. Retrieved from <http://hdl.handle.net/11070/1471>
- [29] Siddiqui, D. A., & Ahmed, Q. M. (2013). The effect of institutions on economic growth: A global analysis based on GMM dynamic panel estimation. *Structural Change and Economic Dynamics*, 24(C), 18–33. <https://doi.org/DOI: 10.1016/j.strueco.2012.12>,
- [30] Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70(1), 65–94. <https://doi.org/10.2307/1884513>
- [31] Thach, N. N., Duong, M. B., & Oanh, T. T. K. (2017). Effects of Corruption on Economic Growth- Empirical Study of Asia Countries. *Imperial Journal of Interdisciplinary Research*, 7(3), 791–804.
- [32] Wagner, A. (1883). Three Extracts on Public Finance. (R. A. Masgrave and A.T. Peacock, Ed.), Classics in the Theory of Public Finance. *Translated and reprinted in Palgrave Macmillan UK*. <https://doi.org/10.1007/978-1-349-23426-4>
- [33] Yasin, M. (2000). Public Spending and Economic Growth: Empirical Investigation of Sub-Saharan Africa. *Southwestern Economic Review*, 4(1), 59–68.

- [34] Zellner, A. (1986). *On assessing prior distributions and Bayesian regression analysis with g-prior distributions. In Bayesian Inference and Decision Techniques: Essays in Honour of Bruno de Finetti. (pp. 233–243).* North-Holland, Amsterdam.
- [35] Zeugner, S. (2011). *Bayesian Model Averaging with BMS for BMS version 0.3. 0.* Online: Www. Bms. Zeugner. Eu. Retrieved from <https://cran.r-project.org/web/packages/BMS/vignettes/bms.pdf>