The Impact of Public Education Spending on Economic Growth in ASEAN Countries

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Abstract

The main objective of the paper is to examine the relationship between public spending on education sector and the economic growth in ASEAN nations over the period from 1995 to 2018. Furthermore, this study also investigated how the government budget distribution, particularly on education, impacts on the education quality which measured by achieving the compulsory education at nationwide level in context of other macro variances. While the Logarithmic Multiple Regression Model and Musgrave and Rostow model (2013) were applied to analyze the link between the public spending and the economic growth based on the time series data from 2000 to 2017, the Vector Auto regression (VAR) Model was employed to highlight the role of government budgeting activities in boosting the education quality. In addition, the Unit root test, Johansen Co-integration test and Causality test have been performed to verify the integration order of the variables as analytical techniques. As a lack of data, in the scope of this article, the discussion does not have intention to draw a picture of the attribute structure of education expenditures for each level of the teaching system or evaluate their influences. This study found that government spending on education and economic growth in ASEAN countries is positively and significantly related and the appropriate level of investment in education did support the promotion of the education quality, particularly maintaining the targeted literacy rate in long-run. Thanks to these findings, the paper concludes with a discussion of challenges and some recommendations that expected to be founded other factors to produce quality education by which eventually raises the countries' economic growth.

Keywords: Education, economic growth, government budget, ASEAN

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Introduction

As part of the superstructure system, education plays an important role in social reform through achieving the optimistic human endeavor indicated by aspirations for betterment and developing every individual to their full potential, thereby providing them the chance to enjoy the full quality life as their capabilities reach.

In the world that is non-stop globalized, competitive and experiencing at an ever faster rate of technical change, education is to be a prerequisite of an indeed survival and wealthy of a well-being. According to Lucas, the accumulation of labor resources is one of the motivations for economic growth. It also helps to raise the productivity and efficiency standard as well as produces more skilled manpower leading to the path of economic development. Hence, education is not only being seen as one of the most powerful engine for each of individual reaching their success, but it also is considered a determinant that significantly impact on the country's development and future prosperity. Hanushek and Woessmann (2007), Stevens and Weale, Schultz (1961), and Li and Wye (2022) all found empirical evidence to support the influence of education expenditure on economic growth. Accordingly, education, from the standpoint of human resource management, enhances the workforce's human capital, increases worker productivity and transformational growth toward a higher equilibrium level of production, resulting in increased value and income and an increase in the country's average GDP. Based on growth theory, education boosts the economy's innovation capability and understanding of new technology, goods, and processes, hence promoting growth (Hanushek & Woessmann, 2007). However, this impact discriminates between nations or locations based on income, economic status, and degree of education.

As a result, the relationship between government funding on education and the economic growth as well as how this investment benefit the economy become a well debated issues for a wide range of research papers with both theoretical and empirical models. Although the study results dedicated to different countries depend on the level of the development and the political mechanism of the researched country or region, education seems still be a vital factor for a nation's development level and with the standard of living. In case of Vietnam, a developing country is doing the utmost to accomplish the national goal of poverty reduction, social welfare extent and efficient manpower improvement through better public financing decision, especially in education. Education and training sector is always in the priority in State Budget planning such as being accounted for around 20 percent of budget and always in the uptrend for absolute figures.

Therefore, the examination of the link between public financing on education and nation's growth not only helps to verify whether the investment in education brings the significant premium to the country's wealth but also to support the formation and stability of the State fiscal policy structure to ensure the synchronous, positive and sustainable development. Due to the limit resources in the ability to exploit the detail portfolio of ASEAN education spending for each of the schooling level, the paper context might be restrained vertically. However, by employing the Vector Auto regression (VAR) model, the research horizontally enhanced the scope through investigating whether the quality of education also increased along with extent public funding on education for the period from 2000 to 2017.

Theoretical Framework and Literature Reviews

The Growth Model

The main theoretical framework of the paper is mainly based on the combination of theory of Musgrave and Rostow (Aladejare, 2013) which was an extensive version of Solow-Swan growth model and Cobb - Douglas production function (Cobb & Douglas, 1928). In which, the growth model initiated by Solow – Swan, which measured the residual growth of output through capital accumulation under the effect of exogenous variables in a certain time period and the production function that represents the technological relationship between the amounts of two or more components such as physical capital and labor. The process of capital accumulation can be explained by technological advances or improved management activities in the private or public sector of the economy. Accordingly, in order to analyze the correlation between public expenditure on education and indirect economic growth by determining the impact of changing labor and budget capital on capital accumulation, it is necessary to use the function export as:

$$Y = f(A, K, L, H\ldots)$$

With Y is the change of capital accumulation, A, K, L are indicators of labor, capital, technology that basic required elements for production process.

Furthermore, the combination of the theory of Musgrave and Rostow (Aladejare, 2013) which emphasized that the investment in education is one of the necessities for the transition of the economy from the traditional stage to the take off stage of economic development and production function is also coherent explain the relationship between public expenditure, especially on education and economic outputs.

According to Gupta et al. (1999), production processes depend on the education system, human resources and control variables such as the social, economic and physical conditions of the workforce. This shows that the model of education quality is a combination of the output elements of education with the input variables of both economic and non-economic categories. The general model used by Gupta et al. (1999) is also based on the Cobb - Douglas function presented as follows:

$$Y_j = f\ (X_{1j}\ldots X_{nj}, Z_{1j\ldots}\ Z_{nj})$$

In which Yt is a social indicator reflecting the educational efficiency that a country can achieve, X1j ... Xnj are proportional variables that reflect the input of education, including public expenditure on education and training, non-state investment capital, the level of allocation for training programs and etc.. In which, Z1j ... Znj is a vector of socio-economic values such as population growth rate (Mankiw et al., 1992), per capita GDP, macroeconomic instability, urbanization, population density, and etc. (Gupta et al., 1999) that can affect the quality of education.

Overview of the Related Research

There are a numerous of theoretical and empirical studies discussed about the relationship of the public financing on education and the nation’s economic growth.

From the philosophical point of view, humans are not only the forces that truly possess nature in a meaningful way, but also the subject of material production, which is a determinant in social production forces. The philosopher of the Enlightenment movement Jean-Jacques Rousseau also acknowledged that nature formed physical people, education are tasked with forming a spiritual person (Rousseau, 1979). This shows that a nation's economy might be defined through material values it generated and leveraged, however, it is the educational representatives, who are capable of producing spiritual values as well as structuring the core manpower for whole manufacturing process. Therefore, the development of each country remarkably depends on how skillful the human resources would be that mainly accumulated from appropriate education and training activities, especially universal enrollment in non-tertiary education.

From the economic theory perspective, Solow-Swan growth model (Solow, 1956; Swan, 1956) is one of the initial studies which attempted to explain the relationship between economic growth and education by investigating the volatility of capital accumulation, labor and population growth and technology progress. Musgrave and Rostow (Aladejare, 2013), separately conducted their researches on the public expenditure and suggested that the growth of public expenditure might be related to the pattern of economic growth and development in societies. Particularly, the reviews highlighted the increasing need in high-income communities for skilled labour escalating education to become beneficial investment good for whole society. Furthermore, the bouncing model and its empirical specification were also developed by Mankiw, Romer and Weil (1992) with demographic factors such as the rate of population growth, the average living standard, etc. also helped to confirm the correlation between education and economy. In particular, the government expenditure on education was proved to be a material component in every single period of the economic history of several European countries (Nunes, 2001). The indispensable role of education as the vital factor in increasing human capital as a determinant of economic growths result was later reinforced by Mallick, Das and Pradhan (2016), confirming the existence of long-run equilibrium relationship between public spending on education and long-term economic growth in all 14 Asian countries (i.e., Bangladesh, China, Hong Kong, India, Japan, Nepal, Pakistan, Malaysia, The Philippines, Saudi Arabia, Singapore, Sri Lanka, Thailand, and Turkey).

Despite the evident effects predicted by these studies, a vast of the empirical evidences on the impact of education on economic growth has long been mixed, especially in the context of different countries and distinct political structure (Jaoul, 2004). While Gylfason and Zoega (2003) used endogenous growth model with sample size of 87 countries, indicating that public spending on education is the direct cause of economic development, Jaoul (2004) figured out that the total domestic products in Germany were not influenced by the educational investment at all. The variations in the sample of observed countries, investigated additional variables, covered periods and measurement scheme contributed to the diverse empirical results obtained for the impacts of education on economic growth (Bosworth & Collins, 2003). Furthermore, the skeptical study of Bils and Klenow (2000) did raise the caveats with respect the issue of causality. They claimed that there was a causal effect mechanism of education on growth in the cross-country association on the top of the reverse causation of combination between an advanced economic growth and additional education.

It seems beyond the scope of current empirical evidence to draw strong conclusions about the functional relationship between education which is considered as investment in human capital and economic growth. Although there is a number of research investigated the

correlation of education and economic growth have been conducted in many territories but such type of study remains absent in Vietnam.

On the other hand, following the contribution of earlier literatures, extent sociological reviews were conducted to explore the association between public expenditure and the qualitative measurement of education based on historical data (Craigwell et al., 2012) and (Mekdad et al., 2014). Most of these studies agreed with the viewpoint that public financing on education brings positive effects to welfare and society (Schultz, 1961; Devarajan et al., 1996; Psacharopoulos & Patrinos, 2002). However, the degree of effectiveness as mentioned is considered as a sub-component of overall economic growth and barely suitable in some specific areas such as Africa and Caribbean (Harbison & Hanushek, 1992). Multinational application also causes deviations in research results or errors in statistical interpretation on the connection among the output elements of education despite observing same spaces at different periods. Therefore, there should be in-depth studies with the aggregate data set of each country at specific stages of the effectiveness of public spending in educational outcome, the literacy rate in particular, to determine the balance of fiscal policy, indeed brings economic growth while improving the quality of education.

Notwithstanding the diversity of literature in regards with positive impact of education on economy, it is unclear whether the sufficient government budget could afford the qualitative education system or the countries that invested more in education universally experienced a higher growth rate. Hence, this article aims to employ and extend the existing economical models that explain the association between public financing on education and the economic prosperity in ASEAN countries for the period from 1995 to 2018, and explore and evaluate the effectiveness of public expenditure on education through the literacy rate which is one of the vital output of a qualitative education environment.

Data and Methodologies

Data Source

The study focused on assessing the impact of public expenditure on national growth and at the same time examining the effectiveness of public spending on education based on the assessment of the education quality, especially in literacy rate. Secondary data on GDP growth rate, the share of education expenditure on GDP, inflation rate, and average income were collected from the annual socio-economic reports of the Government of eight countries belong to ASEAN, including Vietnam, Thailand, Singapore, Indonesia, Malaysia, Brunei, Cambodia and Philippines, in the period from 1995 - 2018. All variables are measured in real terms, deflated using the consumer price index (CPI). In addition, due to the lack of data, the value of universal education level is extracted from the CIA Source Book, the World Bank, the Statista, Ceica data, and Indexmundi.

Methodologies

To assess the effect of public expenditure on education and the impact of this budget expenditure category on growth, OLS minimum squares method is used to estimate the coefficient of explanatory variables by mentioned endogenous growth production function. Accordingly, the added value of GDP is determined to consider the impact of public expenditure on national growth. The research is also based on Cobb – Douglas production function (Cobb & Douglas, 1928) and the theory of Musgrave and Rostow (Aladejare, 2013)

that allows the model to describe the relationship of spending on education and GDP growth as follows:

$$Y = f(A, K, L, H\ldots)$$

With Y is the change of capital accumulation, A, K, L, etc. are indicators of labor, capital, technology, etc. which the necessities for manufacturing. In this paper, the value of GDP will represent the change of capital accumulation, the percentage change in the public expenditure index for education is the explanatory variable involved in the model. At the same time, to smooth out the data set in time series and the objective of the discussion is to determine the causal relationship between the two basic elements; the production function will be transformed as follows:

$$\text{GDP} = f\ (\text{EXP}) \Rightarrow log\text{GDP}\ =\ \beta_0 + \beta_1 log\text{EXP} + \varepsilon \quad (1)$$

While GDP is the national gross domestic product by year of conversion at current prices, EXP is the value of public expenditure portfolio for education in the period 2000 – 2017, ε is the error value. Although public expenditure portfolio (EXP) is part of government expenditure which is a component of GDP value, the logarithm base 1 of the production function helps to raise real causal relationship between EXP and GDP, and most of the investment requires a period of time to realize its returns.

In addition, the level of output of education based on economic growth may include government spending on education as an indispensable variable in production function and some specific social-economic variables such as average income, labor market rate, inflation, and etc.. Accordingly, the model to determine the effectiveness of public expenditure on education will be indirectly illustrated through assessing of educational performance as below formula:

$$\gamma_t = \alpha_0 + \alpha_1\gamma_{t-1} + \alpha_2\gamma_{t-2} + \ldots + \alpha_p\gamma_{t-p} + \mu = \text{f (EPE/GDP, INC, INF, LR)} \quad (2)$$

With γ_t is the vector of endogenous variables (LR is the national literacy rate, which measures literacy among persons aged 15 to 24 years (UNESCO, 1999), based on adult data; EPE / GDP is the percentage of public spending on education over GDP, INC is the income per capita, INF is the inflation rate); α_i is coefficient matrices, *p* is the delay, and μ is the vector noise (residual). The variables were chosen based on the studies of Blaug (1966), Widarmi et al., Cooray (2009), Maitra and Mukhopadhyay (2012), Mabrouki (2022), Rahman (2013), and Chaturvedi et al. As a result, all of these variables not only influence economic growth and literacy rates, but also show their relationship.

Assuming a linear relationship between LR and independent variables, equation (2) can be written as follows:

$$\gamma_t = \alpha_0 + \alpha_1\frac{\text{EPE}}{\text{GDP}}t + \alpha_2\text{INC}_t + \alpha_3\text{INF}_t + \alpha_3\text{LR}_t + \mu \quad (3)$$

From the theoretical framework presented, the expected hypothesis is: $\alpha1 > 0$, $\alpha2 > 0$, $\alpha3 < 0$. To consider and ensure the stability of the time series, the test of stop and homogeneity links will be made. As long as the majority of economic variables are non-stationary, a formal method to test for stationary of a series, known as Augmented Dickey Fuller Unit Root test and Johansen Co-integration test were utilized to verify whether all variables found to be stationary, no presence of unit roots and the co-integration for each variable before conduction the model.

According to Komolafe (1996), two variables are considered to be consolidated if there is a long-term relationship between dependent and independent variables. This unity requires economic fluctuations to occur only in the short term and equilibrium is long-term. This ensures maintaining the correctness of the basis of the effect of public expenditure on growth (Mallick, Das & Pradhan, 2016). If there is a difference, it is indispensable to show the error model estimation (VAR) to evaluate the causal impact of the explanatory variables in a unified system. Due to the requirement from VAR model, the data would be first order differ to ensure the stationary. Next, the mentioned model is formulated to test for a causal relation with Granger Causality Test. Finally, in order to test the level of effect of factors, Impulse Response Function (IRF) is also used.

Results

Table 1 and 2 present the regression results of public expenditure variables on education with GDP growth value in billions USD over the period from 1995 to 2018.

Table 1 Regression Results for Economic Growth Model.

	Vietnam	Thailand	Singapore	Indonesia	Malaysia	Brunei	Cambodia	Philippines
β_o (ρ_{value})	1.500 (*0.000*)	1.363 (*0.000*)	1.456 (*0.000*)	1.924 (*0.000*)	1.271 (*0.000*)	1.423 (*0.000*)	1.662 (*0.000*)	1.572 (*0.000*)
log (EPE) (ρ_{value})	0.500 (*0.000*)	1.036 (*0.000*)	1.029 (*0.000*)	0.672 (*0.000*)	1.003 (*0.000*)	0.937 (*0.000*)	0.912 (*0.000*)	0.913 (*0.000*)
R-Sq	1.000	0.919	0.969	0.926	0.901	0.679	0.898	0.934
R^2 (Adj)	1.000	0.915	0.968	0.922	0.896	0.665	0.893	0.931
F-Stat (ρ_{value})	$2.46e^{19}$ (*0.000*)	246.93 (*0.000*)	690.87 (*0.000*)	275.13 (*0.000*)	199.53 (*0.000*)	46.59 (*0.000*)	193.79 (*0.000*)	312.09 (*0.000*)
VIF	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DW Stat	2.145	0.771	0.523	0.458	0.618	0.234	0.758	0.431
Breusch – Godfrey Serial Correlation LM Test ρ_{value}	0.4149	0.0270	0.0006	0.0034	0.0058	0.0001	0.0549	0.0004
Heteroskedasticity Test : WHITE	0.9670	0.4904	0.0717	0.0116	0.0293	0.5238	0.3022	0.8983

Table 2 Regression Results for Adjusted Economic Growth Model.

	Thailand	Singapore	Indonesia	Malaysia	Brunei	Cambodia		Philippines
β_o^* (ρ_{value})	0.5503 (0.000)	0.4030 (0.000)	0.3767 (0.000)	0.4361 (0.000)	0.1528 (0.000)	0.5664 (0.000)	0.5976 (0.000)	0.3813 (0.000)
log (EPE) (-1) (ρ_{value})	0.9682 (0.000)	0.9281 (0.000)	0.7896 (0.000)	0.8623 (0.000)	0.5637 (0.000)	0.6642 (0.000)	0.7739 (0.000)	0.6585 (0.000)
R-Sq*	0.7546	0.8522	0.7768	0.6137	0.5209	0.7808	0.8546	0.7016
R^2 (Adj) *	0.7429	0.8451	0.7662	0.5953	0.4981	0.7703	0.8477	0.6873
F-Stat* (ρ_{value})	64.572 (0.000)	121.05 (0.000)	73.099 (0.000)	33.365 (0.000)	22.833 (0.000)	74.791 (0.000)	123.47 (0.000)	49.366 (0.000)
VIF*	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DW Stat*	1.4871	1.2312	2.3922	1.7824	1.6732	1.8899	2.4301	1.6535
Breusch – Godfrey Serial Correlation LM Test ρ_{value} *	0.5263	0.1847	0.1549	0.1408	0.3681	0.9946	1.000	0.2115
Heteroskedasticity Test : WHITE *	0.0826	0.5807	0.0525	0.8155	0.7635	0.0290	0.4502	0.9020

Although the Durbin-Watson is a common offer to check the autocorrelation, it showed few drawbacks (Khattak & Khan, 2012), and became inappropriate when the results are inconclusive. Hence, to avoid such problems LM test developed by Breusch and Godfrey has been used for detection of autocorrelation. The results of LM test are displayed in table 1 and 2. There is no autocorrelation since the change error and multi-collinear (ρ value> α (0.05), VIF <2) in Vietnam data, but ρ-values in Breusch – Godfrey Serial Correlation LM test of another countries are smaller than a level of significance at 5 percent. This shows that the regression models of Thailand, Singapore, Indonesia, Malaysia, Brunei, Cambodia and the Philippines have the phenomenon of serial autocorrelation. Therefore, standard errors for linear regression parameters of these models are adjusted to calculate series correlation. According to the regression results of adjusted economic growth models in table 2, there is no autocorrelation and they simultaneously correct for heteroskedasticity in models of Indonesia and Malaysia. However, Cambodia still has unequal variances (ρ-value in White test <0.05). If the model only has heteroskedasticity, the OLS estimate is still an unbiased and consistent estimator, but it is not the best estimator. In this case, the variance of the error cannot be minimized anymore, leads to the regression coefficient tests and the F-test of the model become unreliable, and it is incorrect to draw conclusions based on these tests. The method of weighted least squares (WLS) is used so as overcome the problems of associated with heteroskedasticity in model of Cambodia.

The OLS results show that government spending on education affects economic growth positively and statistically significant at 5 percent level of significance. The values of R-Sq remained over 60 percent which show validity of variation in GDP growth of ASEAN countries as explained by changes in public expenditure on education which in line the literature of Cobb – Douglas production function. The results are illustrated in Table 1a for Vietnam and 1b for the other. The probability gives a value less than 0.05, so the logEPE variable affects the dependent variable logGDP. However, the adjusted R-Sq (Adj) coefficient is quite high, showing the relationship between EPE independent factor and extremely tight GDP dependency factor, similar to Bils and Klenow (2000) which negated the necessity for study aim for the causal relationship between two variables of total labor productivity. Therefore, it calls for additional research to identify other relevant factors to explain more specifically in later studies.

Table 3 provides a stop-test result to ensure a stable data sequence. Augmented Dickey Fuller (ADF) statistics compared with MacKinnon (2010) show that almost variables have a unit solution, equivalent to a non-stop string with 5 percent significance level.

Table 3 Result of Unit Root Tests Using Augmented Dickey Fuller (ADF).

			Vietnam	Thailand	Singapore	Indonesia	Malaysia	Brunei	Cambodia	Philippines
LR	ADF Test Statistic	At level	-1.2736	-3.1169	-2.8379	-1.6830	-2.2641	-1.8904	-1.3839	-0.6532
		Difference	-4.6869*		-7.4668**	-4.3719*	-4.5912*	-5.3666*	-13.572**	-6.4198*
	95% ADF Critical Value	At level	-2.9981	-2.9981	-3.0049	-2.9981	-3.0299	-2.9981	-3.0124	-3.0049
		Difference	-3.0048*		-3.0124**	-3.0049*	-3.0049*	-3.0049*	-3.0124**	-3.0049*
EPE/ GDP	ADF Test Statistic	At level	-2.1892	-2.2398	-2.7066	-2.1621	-3.0569	-0.8891	-3.6153	-1.4842
		Difference	-4.9045*	-4.2612*	-3.1297*	-7.9430*		-4.0016*		-5.3318*
	95% ADF Critical Value	At level	-2.9981	-2.9981	-3.0049	-3.0049	-3.0124	-2.9981	-2.9981	-2.9981
		Difference	-3.0049*	-3.0049*	-3.0049*	-3.0049*		-3.0049*		-3.0049*
INC	ADF Test Statistic	At level	3.6594	0.9646	0.9234	0.1711	-0.1484	-1.3092	4.9609	1.0589
		Difference		-3.2793*	-3.1908*	-3.2788*	-4.1719*	-3.6210*		-3.2187*
	95% ADF Critical Value	At level	-2.9981	-2.9981	-2.9981	-2.9981	-2.9981	-2.9981	-2.9981	-2.9981
		Difference		-3.0049*	-3.0124*	-3.0049*	-3.0049*	-3.0049*		-3.0049*
INF	ADF Test Statistic	At level	-3.5179	-3.3677	-3.0327	-2.0356	-4.1156	-5.5769	-4.3680	-3.1339
		Difference				-5.5574*				
	95% ADF Critical Value	At level	-2.9981	-2.9981	-2.9981	-3.0124	-3.0404	-2.9981	-2.9981	-2.9981
		Difference				-3.0124*				

Note: *: At 1st Difference / **: At 2nd Difference

Because the variables used in the regression model are not stationary at the original series, it is possible that the vectors are co-connected. The Johansen Cointegration testing method to examine this hypothesis, with the support of Eviews, the results for testing the effect of government spending on education rejected the null hypothesis of no co-integration by showing the existence of at most one co-integrating equation in almost ASEAN countries, except Thailand and Brunei. This means that government spending on education affects GDP in long run in Vietnam, Singapore, Indonesia, Malaysia, Cambodia and Philippines. Furthermore, the trace test for results in table 4 with at least 1 unified vector exists. In general,

co-integration testing shows the effectiveness of education through literacy rates with independent public investment spending variables, the inflation rate and the average co-income, interconnected, i.e. conditional balance can keep them proportional to each other for a long time. The results are displayed in table 4.

Table 4 Johansen Cointegration Tests Results.

Vietnam				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.7239	59.4144	47.8561	0.0029
At most 1 *	0.4786	31.1020	29.7971	0.0352
At most 2 *	0.4175	16.7751	15.4947	0.0319
At most 3 *	0.1991	4.8844	3.8415	0.0271
Thailand				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.572184	39.60433	47.85613	0.2370
At most 1	0.429357	20.92497	29.79707	0.3623
At most 2	0.304862	8.583140	15.49471	0.4053
At most 3	0.026150	0.582950	3.841466	0.4452
Singapore				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.765351	72.92143	47.85613	0.0001
At most 1 *	0.680799	41.02880	29.79707	0.0017
At most 2 *	0.390240	15.90628	15.49471	0.0433
At most 3 *	0.204133	5.023101	3.841466	0.0250
Indonesia				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.691768	55.36710	47.85613	0.0084
At most 1	0.530134	29.47527	29.79707	0.0544
At most 2	0.268854	12.85849	15.49471	0.1201
At most 3 *	0.237639	5.969361	3.841466	0.0146
Malaysia				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.742711	67.70289	47.85613	0.0003
At most 1 *	0.664025	37.83664	29.79707	0.0048
At most 2	0.452016	13.84084	15.49471	0.0874
At most 3	0.027243	0.607656	3.841466	0.4357
Brunei				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.536978	39.58739	47.85613	0.2376
At most 1	0.455075	22.64781	29.79707	0.2638
At most 2	0.299440	9.291456	15.49471	0.3391
At most 3	0.064303	1.462200	3.841466	0.2266

Variables are as defined in Table 2 and no difference has been performed
** denotes rejection of the hypothesis at 5% (1%) significance level.*
***MacKinnon-Haug-Michelis (1999) p-values*

Table 4 Johansen Cointegration Tests Results (Continued).

Cambodia				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.866363	86.07652	47.85613	0.0000
At most 1 *	0.668825	41.79875	29.79707	0.0013
At most 2 *	0.452612	17.48635	15.49471	0.0247
At most 3 *	0.174888	4.229196	3.841466	0.0397
Philippines				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.649611	53.28948	47.85613	0.0142
At most 1 *	0.531412	30.21785	29.79707	0.0447
At most 2	0.405822	13.54115	15.49471	0.0964
At most 3	0.090564	2.088466	3.841466	0.1484

Variables are as defined in Table 2 and no difference has been performed
** denotes rejection of the hypothesis at 5% (1%) significance level.*
***MacKinnon-Haug-Michelis (1999) p-values*

Based on an intuitive result, the Vector Auto regression (VAR) technique was employed to estimate the causal impact of each independent variable on the quality of education. VAR is necessary for the mechanism that predicts the random disturbances in a continuous-time series with exogenous assumptions provided by the latency of endogenous variables. In order to implement the VAR technique, the data series of the independent variables must be a stationary sequence, hence the data is carried out in the corresponding order differentiation. The optimal delay in accordance with the compatible VAR model is calculated as 2 for Indonesia, 3 for Vietnam, Singapore, Malaysia and Cambodia. Accordingly, the VAR model estimation result with the respective optimal delay is illustrated in table 5. Thailand, Brunei and Philippines are three exceptional cases which the zero lag-lengths based on the lowest AIC are preferred. In while VAR model requires at least a variable's lagged (past) value, so a model with just an intercept but no lags, not be able to get impulse response functions, and none of the variables explains the variance. The selection of zero lag suggests that VAR might not be a good model for data of Thailand, Philippines and Brunei. Therefore, Granger causality test is used for testing the relation between expenditure on education and educational output of countries, except Thailand, Philippines and Brunei in detail.

Table 5 Parsimonious Representation of the VAR model – D (LR).

Vietnam				
DLR = C(14)*D(EXP/GDP(-1)) + C(15)*D(EXP/GDP(-2)) + C(16)*D(EXP/GDP(-3)) + C(17)*DLR(-1) + C(18)*DLR(-2) + C(19)*DLR(-3) + C(20)*INC(-1) + C(21)*INC(-2) + C(22)*INC(-3) + C(23)*INF(-1) + C(24)*INF(-2) + C(25)*INF(-3) + C(26)				
Variables	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
C	0.7990	0.3634	2.1988	0.0363**
D (EXP/GDP(-1))	-0.0618	0.0606	-1.0198	0.3166
D (EXP/GDP(-2))	-0.1799	0.0755	-2.3819	0.0243**
D (EXP/GDP(-3))	-0.0917	0.1103	-0.8316	0.4127
DLR (-1)	0.0612	0.4022	0.1522	0.8801
DLR (-2)	0.2020	0.3390	0.5958	0.5561
DLR (-3)	-0.4200	0.4134	-1.016	0.3184
INC(-1)	0.0053	0.0023	2.2596	0.0318**
INC(-2)	-0.0037	0.0030	-1.2310	0.2286
INC(-3)	-0.0022	0.0024	-0.9084	0.3714
INF(-1)	-0.0319	0.0234	-1.3633	0.1837
INF(-2)	-0.0564	0.0249	-2.2633	0.0316**
INF(-3)	0.0077	0.0183	0.4194	0.6781
R-Sq	0.6718	Durbin Watson Stat	2.5265	
Adjusted R-Sq	0.1092	F- Statistic (Prob.)	1.1942 (0.00)	
Singapore				
DLR = C(27)*D(EXP/GDP(-1)) + C(28)*D(EXP/GDP(-2)) + C(29)*D(EXP/GDP(-3) + C(30)*INC(-1) + C(31)*INC(-2) + C(32)*INC(-3) + C(33)*DLR(-1) + C(34)*DLR(-2) + C(35)*DLR(-3) + C(36)*INF(-1) + C(37)*INF(-2) + C(38)*INF(-3) + C(39)				
Variables	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
C	0.0228	0.0415	0.5497	0.5876
D (EXP/GDP(-1))	-0.0756	0.1576	-0.4795	0.6359
D (EXP/GDP(-2))	0.1075	0.1358	0.7921	0.4361
D (EXP/GDP(-3))	-0.1353	0.1434	-0.9434	0.3549
DLR (-1)	-0.8318	0.4237	-1.9633	0.0613***
DLR (-2)	-0.2782	0.6319	-0.4403	0.6637
DLR (-3)	-0.2666	0.4103	-0.6498	0.5220
INC(-1)	$-6.92e^{-06}$	$1.97e^{-05}$	-0.3520	0.7279
INC(-2)	$1.84e^{-05}$	$2.03e^{-05}$	0.9067	0.3736
INC(-3)	$-2.45e^{-07}$	$2.20e^{-05}$	-0.0111	0.9912
INF(-1)	-0.0198	0.0231	-0.8578	0.3995
INF(-2)	-0.0170	0.0269	-0.6323	0.5332
INF(-3)	-0.0056	0.0308	-0.1826	0.8566
R-Sq	0.6347	Durbin Watson Stat	2.1461	
Adjusted R-Sq	-0.0960	F- Statistic (Prob.)	0.8686 (0.00)	

*Note: * significance level at 1%, ** significance level at 5%, *** significance level at 10%*

Table 5 Parsimonious Representation of the VAR model – D (LR) (Continued).

Indonesia DLR = C(19)*D(EXP/GDP(-1)) + C(20)*D(EXP/GDP(-2)) + C(25)*INC(-1) + C(26)*INC(-2) + C(23)*DLR(-1) + C(24)*DLR(-2) + C(21)*INF(-1) + C(22)*INF(-2) + C(27)				
Variables	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
C	0.1551	0.3244	0.4782	0.6347
D (EXP/GDP(-1))	0.5580	0.3560	1.5676	0.1235
D (EXP/GDP(-2))	0.1445	0.4547	0.3178	0.7520
DLR (-1)	0.3636	0.3638	0.9994	0.3226
DLR (-2)	0.0396	0.3036	0.1303	0.8969
INC(-1)	0.0002	0.0006	0.2977	0.7672
INC(-2)	$7.93e^{-05}$	0.0006	0.1410	0.8885
INF(-1)	0.0003	0.0092	0.0301	0.9761
INF(-2)	0.0092	0.0080	1.1498	0.2559
R-Sq	0.6347	Durbin Watson Stat	2.1461	
Adjusted R-Sq	-0.0960	F- Statistic (Prob.)	0.6600 (0.00)	
Malaysia DLR = C(20)*D(EXP/GDP(-1)) + C(21)*D(EXP/GDP(-2)) + C(22)*D(EXP/GDP(-3) + C(14)*INC(-1) + C(15)*INC(-2) + C(16)*INC(-3) + C(17)*DLR(-1) + C(18)*DLR(-2) + C(19)*DLR(-3) + C(23)*INF(-1) + C(24)*INF(-2) + C(25)*INF(-3) + C(26)				
Variables	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
C	-4.014651	3.195675	-1.256276	0.2194
D (EXP/GDP(-1))	0.456694	0.347126	1.315643	0.1990
D (EXP/GDP(-2))	-0.351668	0.510141	-0.689355	0.4963
D (EXP/GDP(-3))	0.421659	0.449524	0.938010	0.3563
DLR (-1)	-0.309117	0.311208	-0.993280	0.3291
DLR (-2)	0.005742	0.450030	0.012759	0.9899
DLR (-3)	-0.479108	0.555383	-0.862661	0.3957
INC(-1)	0.000372	0.000245	1.519119	0.1399
INC(-2)	-0.000225	0.000250	-0.901098	0.3752
INC(-3)	0.000142	0.000275	0.515037	0.6106
INF(-1)	0.300561	0.188566	1.593929	0.1222
INF(-2)	0.331876	0.230700	1.438559	0.1614
INF(-3)	0.101642	0.236884	0.429077	0.6712
R-Sq	0.5419	Durbin Watson Stat	2.7077	
Adjusted R-Sq	-0.2433	F- Statistic (Prob.)	0.6901 (0.00)	

*Note: * significance level at 1%, ** significance level at 5%, *** significance level at 10%*

Table 5 Parsimonious Representation of the VAR model – D (LR) (Continued).

Cambodia DLR = C(4)*D(EXP/GDP(-1)) + C(5)*D(EXP/GDP(-2)) + C(6)*D(EXP/GDP(-3) + C(7)*INC(-1) + C(8)*INC(-2) + C(9)*INC(-3) + C(1)*DLR(-1) + C(2)*DLR(-2) + C(3)*DLR(-3) + C(10)*INF(-1) + C(11)*INF(-2) + C(12)*INF(-3) + C(13)				
Variables	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
C	1.964761	6.114932	0.321305	0.7508
D (EXP/GDP(-1))	-2.359684	3.278573	-0.719729	0.0786***
D (EXP/GDP(-2))	-2.087014	2.970360	-0.702613	0.4891
D (EXP/GDP(-3))	1.803101	1.912360	0.942867	0.3551
DLR (-1)	-1.536848	0.318515	-4.825037	0.0001*
DLR (-2)	-0.696440	0.498714	-1.396470	0.1754
DLR (-3)	-0.217813	0.317334	-0.686386	0.4990
INC(-1)	-0.027309	0.030376	-0.899029	0.0377**
INC(-2)	0.028254	0.051552	0.548061	0.5887
INC(-3)	0.004585	0.029329	0.156340	0.8771
INF(-1)	0.056070	0.125323	0.447400	0.6586
INF(-2)	-0.007583	0.157718	-0.048079	0.9621
INF(-3)	0.051659	0.078764	0.655871	0.5181
R-Sq	0.9277	Durbin Watson Stat	2.8610	
Adjusted R-Sq	0.7830	F- Statistic (Prob.)	6.4125 (0.00)	

*Note: * significance level at 1%, ** significance level at 5%, *** significance level at 10%*

The coefficients of the independent variables are in averaged range and showed the usual meaning. The relevance of R-Sq is higher 0.5 that calls that the stronger the relationship between the independence factors and the dependent factor, VAR results also support to the conclusion that public financing on education has a significant impact on educational effectiveness, especially the literacy rate of the entire population in Vietnam. This is also in consistent with the practices, when public investment helps to improve and develop infrastructure, localize the universal education system, enhance the quality of teachers and their remuneration, etc. The income per capita amount has instant impact on improving education quality in Vietnam. Furthermore, the more increase in household income, the more spending citizens are willing to pay for children's education. Therefore, the sustainable increased trend of the average income level is always a prerequisite for the people's social security and welfare that are completely guaranteed by macroeconomic stability. In Vietnam, the stable investment in education and constant improvement in training effectiveness is capable of maintaining the fair income distribution, diminishing the poverty rates, and indirectly enhance macroeconomic stability. However, the computational definition of adjusted R-Sq in models of Singapore, Indonesia and Malaysia yield negative values. This can arise whenever the number the observations is lower than the number of estimated parameters, leading the predictions that are being compared to the corresponding outcomes have not been derived from a model-fitting procedure using those data. The adjusted R-sq is only valuable in comparing models with the same dependent variable in the case of the low value of R-sq or those data are correlated (Buteikis, 2018), but Durbin Watson tests in above VAR models show that data of Singapore, Indonesia and Malaysia have no correlation phenomenon and the values of R-sq are high (>0.5), so the negative values of adjusted R-Sq call for the replacement respectively of another explanatory variable such as endogenous macro variables related to education, specific budget allocations, economic fluctuations, etc. This is consistent with the estimated results of almost

the variables in the VAR models of Singapore, Malaysia and Indonesia when they are not statistically significant ($p > 0.5$).

As above recommended, Granger Causality Test and Impulse Response Function (IRF) are also used for testing and analyzing the relationship between variables in detail. The results are illustrated in table 6 and figure 1.

Table 6 Causality Testing of Public expenditure on education with other variables

Country	Null Hypothesis	F-stat	ρ-value
Vietnam	DLRV does not Granger Cause DEPEGDPV	0.09618	0.9608
	DEPEGDPV does not Granger Cause DLRV	0.34833	0.7910
	INCV does not Granger Cause DEPEGDPV	1.98434	0.1662
	DEPEGDPV does not Granger Cause INCV	3.27657	0.0555
	INFV does not Granger Cause DEPEGDPV	0.72623	0.5543
	DEPEGDPV does not Granger Cause INFV	2.43824	0.1111
Singapore	DEPEGDPS does not Granger Cause DLRS2	0.43880	0.7294
	DLRS2 does not Granger Cause DEPEGDPS	1.61009	0.2389
	DINCS does not Granger Cause DEPEGDPS	0.32144	0.8098
	DEPEGDPS does not Granger Cause DINCS	0.71660	0.5595
	INFS does not Granger Cause DEPEGDPS	0.52239	0.6744
	DEPEGDPS does not Granger Cause INFS	0.48568	0.6980
Indonesia	DINCI does not Granger Cause DEPEGDPI	0.85566	0.4436
	DEPEGDPI does not Granger Cause DINCI	0.24335	0.7868
	DINFI does not Granger Cause DEPEGDPI	0.07415	0.9289
	DEPEGDPI does not Granger Cause DINFI	0.84576	0.4475
	DLRI does not Granger Cause DEPEGDPI	0.26392	0.7713
	DEPEGDPI does not Granger Cause DLRI	1.70567	0.2131
Malaysia	EPEGDPM does not Granger Cause DLRM	0.39337	0.7599
	DLRM does not Granger Cause EPEGDPM	2.03645	0.1585
	DINCM does not Granger Cause EPEGDPM	1.22564	0.3399
	EPEGDPM does not Granger Cause DINCM	0.30845	0.8189
	INFM does not Granger Cause EPEGDPM	6.36646	**0.0060**
	EPEGDPM does not Granger Cause INFM	2.64584	0.0898
Cambodia	EPEGDPC does not Granger Cause DLRC2	1.86780	0.1888
	DLRC2 does not Granger Cause EPEGDPC	0.78683	0.5240
	INCC does not Granger Cause EPEGDPC	5.32811	**0.0117**
	EPEGDPC does not Granger Cause INCC	1.06484	0.3954
	INFC does not Granger Cause EPEGDPC	0.85759	0.4858
	EPEGDPC does not Granger Cause INFC	0.50061	0.6879

According to the results of Granger causality test, it cannot be denied that government spending on education has causal relationship with the educational output (in this article is the literacy rate) and a few macroeconomic variables such as inflation rate, income per capita. A distinctive point in table 6 is inflation rate and income per capita have no causal relationship with public expenditure on education in Malaysia and Cambodia respectively. Meanwhile, Impulse Response Function in Figure 1 show that the government expenditure on education not only has negative effect to the literacy rate in Vietnam, Singapore and Malaysia in first quarter but also has positive impact to the one in these countries in third quarter. On the

contrary, Cambodia's spending on education caused literacy rates to decline in the first quarter but increase at the end of the year. Public expenditure on education also leads to the thriving of inflation rate in Malaysia and Cambodia in second quarter. Unlike other countries, education spending in Indonesia has almost no impact on educational performance or on the macroeconomic factors studied.

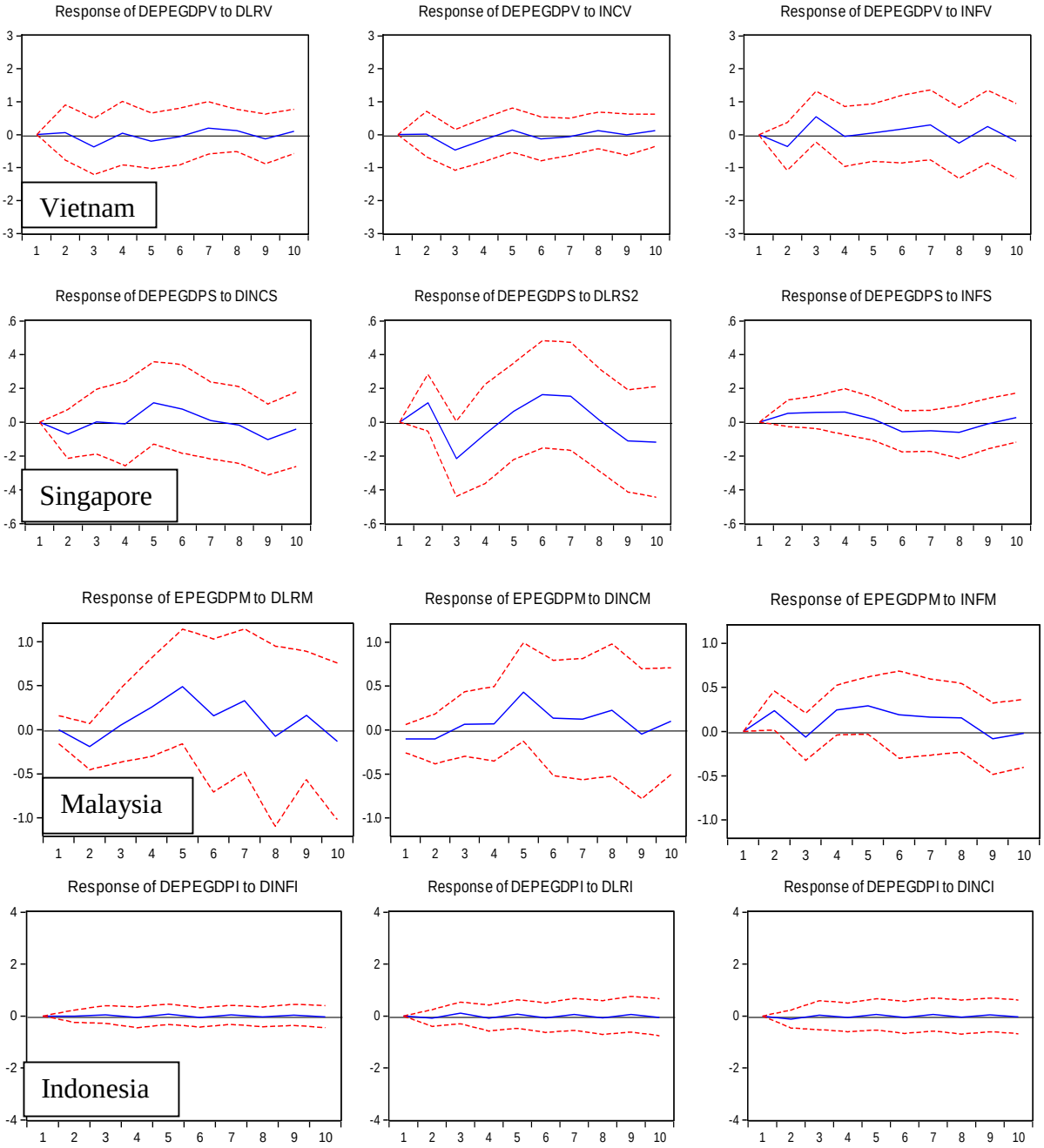

Figure 1 Impulse Response Function of Public Expenditure on Education on Other Variables.

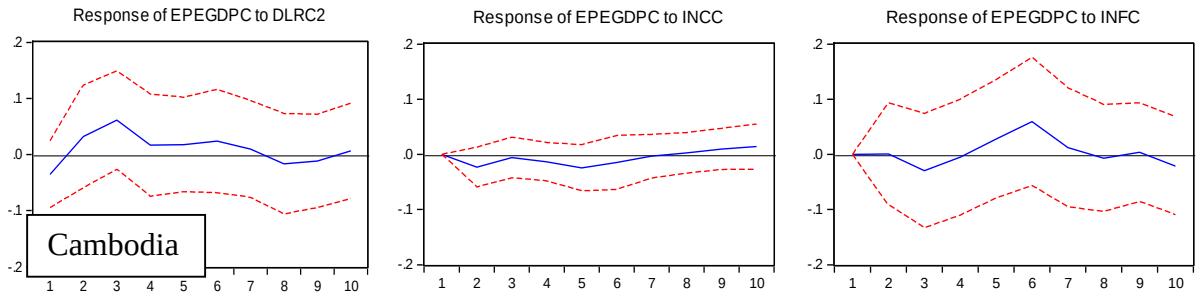

Figure 1 Impulse Response Function of Public Expenditure on Education on Other Variables (Continued).

Discussion and Conclusion

In most studies as well as practical experience, budget overspending has always been the biggest problem not only of the political system in general but also of national development in particular. Meanwhile, the role of education in economic growth also has been recognized in the conventional economic literature such as "New Growth Theories" (Mukherjee, 2007; Yildirim et al., 2011) or “The Knowledge Economy” (Wolf, 2002). Therefore, it is necessary to develop a flexible management mechanism, clear and consistent orientation so as to make the most of the effectiveness of budget spending on education as well as promote economic growth and balance the expenses, ensuring maintenance and strengthening spending on research and development. Based on the OLS regression results of the paper, it is also easy to see the extent to which public spending, especially education spending, is in fact present, despite the belongings to each stage and distribution structure but always have a positive impact on economic development. However, ASEAN's share of public expenditure on education is about 3 percent of GDP (World Bank data). Compared to North America and the European Union, this figure is less than half the budget of North America and about 2 percent less than the European region. Although with different managerial system, the effectiveness of public spending to educational quality and economic growth is also divergent (Green, 1999; De & Endow, 2008), it is not deny that ASEAN still has many blanks for financing pedagogical development by governments. Moreover, many studies have concluded that there is convergence in educational administration policy in Europe and East Asia but this does not seem to lead to any notable convergence in structure and process (Green, 1999). The reason can be by educational attainment which closely related to personal income, earnings distribution, and economic growth, not only includes literacy level but also people's cognitive skills (Hanushek & Woessmann, 2007) and influenced by national culture and valuation norms in education (Green, 1999). As a region with considerable cultural diversity, ASEAN has certain difficulties in internationalizing or commercializing the education sector like European countries or the United States. Therefore, the budget for education still largely depends on the government's public expenditure portfolio. This is also a burden and barrier for promoting economic development through education and vice versa in Southeast Asian countries.

On the other hand, the budget spending on education should have a specific and detailed effective evaluation mechanism to ensure proper fiscal policy, especially in Vietnam and Cambodia. At the same time, because the meaning of the VAR model of Singapore, Indonesia and Malaysia is not really ideal, the study still needs the additional data and other explanatory variables to have a more accurate and reasonable view of the educational effectiveness effected by public spending. There is a need for specific analysis of budget spending by another model for Thailand, Brunei and Philippines when VAR model is not a suitable method. In Vietnam

and Cambodia, although the economy is still in the stage of industrialization and modernization, per capita income is only average compared to the world but during the period 2000 - 2017, these countries still try to increase the budget expenditure for education and maintain the rate of 2-4 percent / GDP annually to ensure the education - training system has a foundation to build and develop. However, such budget allocation and minimal requirements indirectly produce budget deficits and overspending without properly examining the actual efficacy of education budget expenditure. As a result, in order to secure the long-term positive of the correlation connection between public expenditure and growth, the function of state budget accounting, as well as the position of national audit, must be examined. more advanced. Furthermore, the development of socialization and privatization of education and training activities leads to growing investment capital for education, lowering the budget load while still supporting growth. Moreover, with the estimation of VAR model, it can be seen that the proportion of spending on education on GDP is important to educational efficiency but also depends on other endogenous macro variables such as per capita income people, inflation rate, etc. So, depending on the time, depending on the level of macroeconomic stability, the Government can adjust the budget for education accordingly to achieve educational efficiency - optimal training. However, it is necessary to distinguish the effectiveness of education through universal education (literacy) is only the most basic assessment of the quality of national scale training. The real factor that can directly bring about economic and social security is the high level of the population (University or higher), this indicator is still very low in Vietnam and Cambodia. Therefore, the long-term direction of the study is to follow investment spending for research and development activities rather than universal education.

To be more specific, in order to improve educational effectiveness, a number of solutions in both research and policy should be considered, such as:

- There is agreement on management policies, synchronous development, and linkages between research fields, educational levels, and training systems to be able to take advantage, limit losses, and maintain integrity. Labor credentials must be standardized and thorough.
- Overcoming the issues of budget loss, public relations, and revenue and expenditure transparency.
- Strengthen management team training to ensure that they are fair, clean, capable, and informed about the law, the economy, and the education and training system from the national to the local levels.
- Increasing the privatization of education and training activities in order to reduce the fiscal burden

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