Government Expenditure and Economic Growth in ASEAN-5 Economies: an Autoregressive Distributed Lag (ARDL) Approach

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ABSTRACT

In this paper, we examine the relationship between components of government expenditure and economic growth in ASEAN-5 using the autoregressive distributed lag (ARDL) approach developed by Pesaran, Shin, and Smith. Bound testing approaches to analysis of level relationship, and this test suggested that the all variables in functional form framework are bound together in long run. The results also show that there are possible long-run coefficient effects between the variables. Breaking down the components of government expenditure, we found that health expenditure (*he*), information and communication technology expenditure (*ice*), education expenditure (*ee*), and housing and community facilities expenditure (*hce*) have a positive effect on economic growth among the ASEAN5 countries. The military expenditure (*me*) has a negative significant effect on economic growth in Indonesia and the Philippines. These results support those of other studies that indicate that in the long-run coefficients of the variables are an important determinant of the real GDP.

Keywords: Government expenditure GDP growth Cointegration
Autoregressive Distributed Lag Model (ARDL)

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การใช้จ่ายของรัฐบาลและการเติบโตทางเศรษฐกิจของ 5 ประเทศในอาเซียน : ตามแนวทางการปรับการกระจายของการถดถอยโดยอัตโนมัติ (ARDL)

ฮัสซิน อับดุลลาร์* มูซาฟา ชา ฮาบิบุลลาร์** และซิออง ฮุค ลอ**

บทคัดย่อ

บทความนี้ทดสอบความสัมพันธ์ระหว่างส่วนประกอบของค่าใช้จ่ายของรัฐบาลและการเจริญเติบโตทางเศรษฐกิจของ 5 ประเทศ ในอาเซียน (ASEAN) โดยการใช้แนวทางการปรับการกระจายของการถดถอยโดยอัตโนมัติ (ARDL) พัฒนาโดย เปเซวัน ชิน และ สมิท มีหลายแนวทางสำหรับการทดสอบเพื่อวิเคราะห์ระดับของความสัมพันธ์ และการทดสอบนี้แนะนำว่า ตัวแปรทั้งหมดในกรอบแนวคิดถูกนำมาใช้ประกอบกัน เพื่อการทำนายระยะยาว ผลที่ได้คือ มีความเป็นไปได้ของสัมประสิทธิ์ระยะยาวระหว่างตัวแปรต่าง ๆ ถ้าแยกพิจารณาส่วนประกอบของค่าใช้จ่ายของรัฐบาลก็พบว่า ค่าใช้จ่ายส่วนของสุขภาพ (he), ค่าใช้จ่ายของการติดต่อสื่อสารของเทคโนโลยี (ice), ค่าใช้จ่ายของการศึกษา (ce), และค่าใช้จ่ายของการสร้างบ้านและที่อยู่อาศัย (hce) มีความสัมพันธ์ในทางบวกกับการเจริญเติบโตทางเศรษฐกิจระหว่าง 5 ประเทศ ในอาเซียน (ASEAN) ค่าใช้จ่ายทางทหาร (me) มีผลกระทบทางลบอย่างมีนัยสำคัญต่อการเจริญเติบโตทางเศรษฐกิจในประเทศอินโดนีเซียและฟิลิปปินส์ ผลเหล่านี้สนับสนุนการศึกษาอื่นๆ ที่ชี้ให้เห็นว่าสัมประสิทธิ์ระยะยาวของตัวแปรเป็นตัวกำหนดที่สำคัญต่อผลผลิตมวลรวมเบื้องต้นภายในประเทศ (GDP) ที่แท้จริง

คำสำคัญ : ค่าใช้จ่ายของรัฐบาล การเติบโตของผลผลิตมวลรวมภายในประเทศ
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Introduction

The effect of government expenditure on economic growth is still a controversial issue in both questions relating to theoretical and empirical. Although the place of theoretical towards this issue deviates, the common notion is that large government expenditure is a source of economic instability or that the economy will be halted. Empirical studies, on the other hand, are at least, controversial supporting this common notion.

Concerning the overall level of government expenditure, several studies have stated that there exists a positive and significant relationship between government expenditure and economic growth. Besides that, other studies have found a negative or an insignificant relationship or that there exists no relationship between the increase of government expenditure and growth in real output. Previous work on the composition of government expenditure has been relatively limited. Nelson and Singh (1994) examine the effect of overall government size, measured with central government production output as a percentage of GDP on average GDP growth rate (1). They find no relationship between growth in government expenditure and growth rate in GDP. Devarajan, *et al.* investigate the relationship between a section of government expenditure in GDP and growth in real per capita GDP (2). They find a significant and negative relationship between the two. Ghura (1995) investigates the relationship between government consumption as a percentage of GDP and economic growth that uses data from developing countries (3). He find a significantly negative relationship between government consumption and growth in real per capita GDP.

Lindauer and Velenchik conclude that there was no direct significant relationship between government expenditure and economic growth (4). However, they argue that government expenditure may indirectly give a positive effect on economic growth through its influence on efficient distribution of private sector inputs. Aschauer reportes that a positive and significant relationship existed between government expenditure and output levels (5). Grier and Tullock demonstrate that government variables as growth rate in a section of government consumption in GDP, and test a model using a 30-year data from 24 OECD countries and a 20-year data from developing countries (6). They find a negative and significant relationship between a section of government consumption in GDP and growth in GDP in both sample countries.

Barro defines productive government expenditure as proportional choice to GDP and as total proportion of public and private investments (7). In another similar study, Barro made a regression of the average annual growth rate in real GDP on real proportion of government consumption to real GDP (8). He finds a significantly negative relationship exists between economic growth and government consumption.

In sum, empirical evidence in relation to the effect of government expenditure on economic growth clearly shows a mixed

result. Furthermore, previous studies have shown that empirical results are specification-dependent.

Figure 1 shows the government expenditure and GDP growth of ASEAN-5 nations for the years 1985-2003. The average GDP growth of these countries is more than 7% (sometimes almost 10%), except for the Philippines where its growth rate is lower, but still at an average of 5 %. On the other hand, during the East Asia's financial crisis (1997-1998) the growth rate of Indonesia, Thailand, Malaysia, and the Philippines fell rapidly. At the end of 1999, the economy of East Asia slowly improved from the decline caused by the financial crisis, although it takes into account rapid economic growth level or at least it has managed to maintain a moderate growth rate.

As for government expenditure, most ASEAN-5 nations have an inclination towards a larger portion of government expenditure from the years 1985-2003. Generally, government expenditure has increased, although some countries have shown a decline in specific years but later showed an upward trend. As depicted in Figure 1, we can observe that there exist a positive and negative relationship, that is, a mixed relationship between government expenditure and economic growth.

Percentage of GDP on government expenditure has shown a slight decline for most ASEAN-5 nations. However, overall trend shows an increase in government expenditure from the year 1985-2003. In terms of GDP growth, economic differences in ASEAN-5 expose a wavelike growth pattern. Looking at the counterpart for government expenditure and GDP growth rate, we can observe a mixed relationship. An increase in government expenditure is not a significant factor on GDP growth rate. However, it is a positive government effect on economic growth like Malaysia (1995-1996 & 2002-2003), the Philippines (1995-1996), and Thailand (1992-1993).

There is a vast difference among ASEAN-5 nations in terms of living standards and also in other situations, just as in the policies that they implement. Large government size becomes an obstacle to efficiency and economic growth because taxes are needed to support government expenditure. This will also cause a distorted incentive to work and invest. Absorption of funds, on the other hand, will be used by the private sector in searching for investment profit; generally, it will decrease the efficiency of resource allocation and subsequently decrease output level. In addition, often government operations are implemented inefficiently and subject to procedural rules surpassing burden and cost on the economic system. Subsequently, in countries where larger government expenditure (is considered) as output proportion, they should experience smaller economic growth. This argument, together with a financial crisis experience would stimulate most countries to begin market deregulation and privatization of public enterprises. Based on the above arguments and as stated earlier, Keynesian economic predicts that government expenditure should stimulate economic growth. Subsequently,

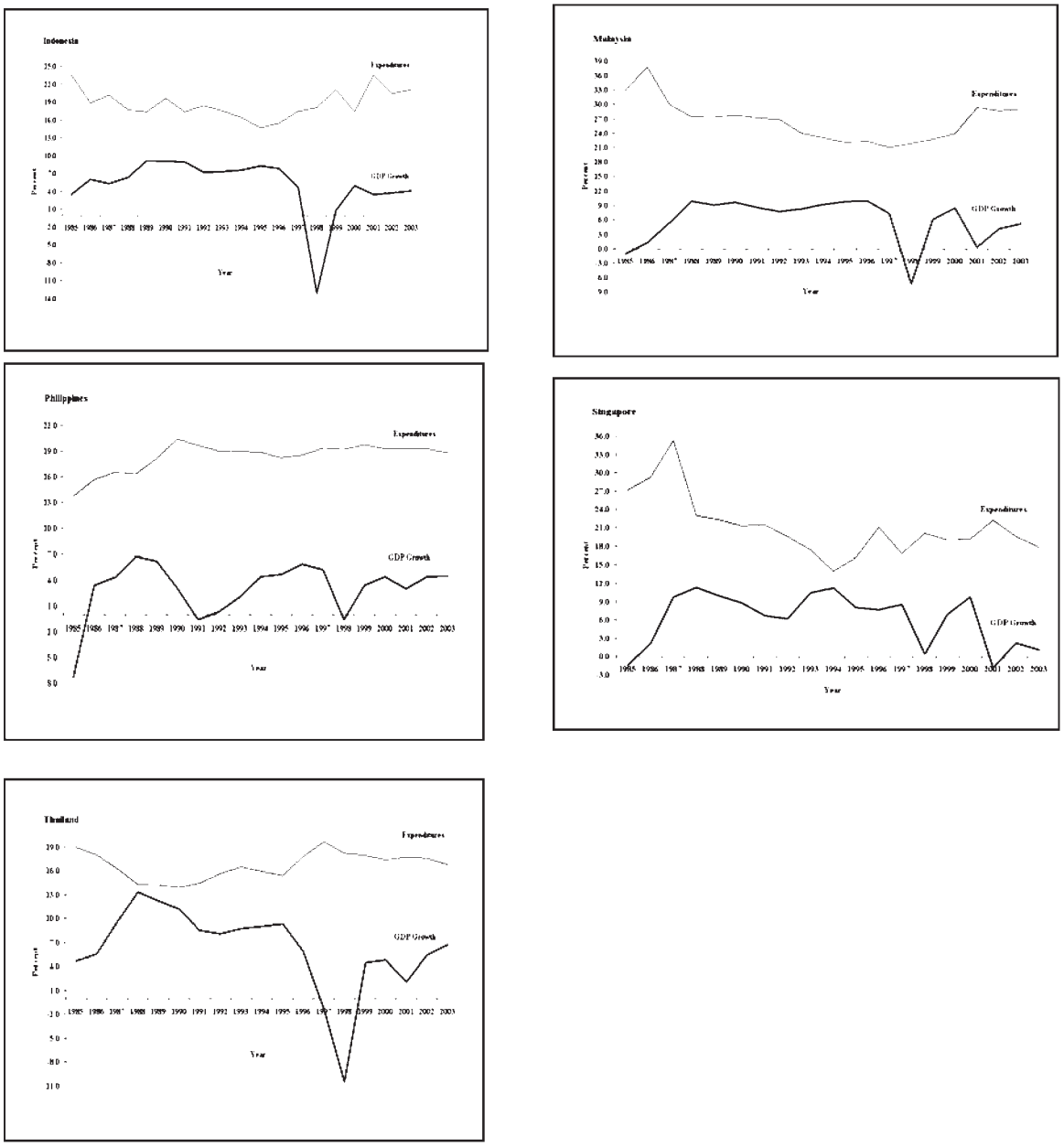

Fig. 1 Government Expenditure of GDP and Economic Growth for ASEAN-5
Source: 2005 World Development Indicators (World Bank)

what is the real effect of government expenditure on economic growth? Figure 1 clearly show that government expenditure of all ASEAN-5 nations is almost at the same level but their GDP growth provides a different picture. In general, there exists a mixed relationship between government expenditure and economic growth.

In looking at the implementation of growth of ASEAN-5 nations for several decades, we should pay attention to two observations. Firstly, growth has decreased and significantly has been stagnant since 1985. Secondly, higher government expenditure wholly prevents potential economic growth of ASEAN-5. This is a consensus that shows that development of fiscal basis contributes relatively to weak

implementation of growth in ASEAN-5 nations.

The objective of this study is to examine the relationship between the components of government expenditure and economic growth in five ASEAN countries namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand. The objective of this study is in line to previous study within the same scope. However, we use the autoregressive distributed lag (ARDL) bounds test methodology of Pesaran, Shin, and Smith to test for the existence of a long-run relationship between the government expenditure and economic growth (9). This technique does not require the researcher to assume that the underlying the components of government expenditure and economic growth series are *I*(1) or *I*(0). Instead, the ARDL regression yields a test statistic which can be compared to two asymptotic critical values. If the test statistic is above an upper critical value, the null hypothesis of no long-run relationship can be rejected regardless of whether the underlying orders of integration of the components if government expenditure and economic growth are zero or one. Alternatively, when the test statistic falls below a lower critical value, the null hypothesis is accepted, again regardless of whether the two series are *I*(1) or *I*(0). If the sample test statistic falls between these two bounds, the result is inconclusive.

Methods

In this study, we specify the log-linear model to investigate the relationship between components of government expenditure on economic growth, which is as follows:

$$\ln rgdp_t = \beta_0 + \beta_1 \ln \overset{(+)}{he_t} + \beta_2 \ln \overset{(+,-)}{me_t} + \beta_3 \ln \overset{(+)}{ice_t} + \beta_4 \ln \overset{(+)}{ee_t} + \beta_5 \ln \overset{(+)}{hce_t} + \varepsilon_t \qquad [1]$$

where;

$rgdp_t$ = real GDP

he_t = Total government expenditure on health

me_t = Total government expenditure on military

ice_t = Total government expenditure on information and communication technology

ee_t = Total government expenditure on education

hce_t = Total government expenditure on housing and community facilities

t = time period

ε_t = error term.

The variables of Equation (1) are defined and discussed below. A positive sign (+) indicates an anticipated positive effect on growth and a negative sign (-) indicates an anticipated negative effect on growth. Health expenditure may provide relatively direct and immediate and more indirect and longer run benefits. Improved health enhances work effort in the short run and thereby raises growth and raise long run growth by raising life expectancy. Therefore, health expenditure (*he*) is expected to have positive sign on economic growth.

Military expenditure (*me*) is expected to have positive or negative signs on economic growth because in one hand, military expenditures may foster economic growth by enhancing aggregate demand, promoting human capital, creating infrastructure, contributing to nation building, securing property right, and fostering political stability (8, 10). On the other hand, military expenditure may inhibit growth by draining resources from productive use elsewhere in the economy. High military expenditure may be negatively related to economic growth and signal an expansionist domestic agenda or vulnerability to external aggression (8).

Human capital acquisitions via education foster economic growth by enhancing the labour force's productive capacity. The consequence is greater earning capacity that promotes income equality. Therefore, education expenditure (*he*) is expected to have positive sign on economic growth.

Information and communication technology has been recognized as powerful tool to promote economic development. Its will represent an important enabling tool in this transformation process through the enhancement of productivity and quality of the workforce. The information and communication technology expenditure (*ice*) is expected to have positive sign to enhance economic growth.

Similar arguments can be applied to housing and community facilities expenditure (*hce*). This expenditure may be expected to have positive sign in fostering growth via worker productivity effects resulting from improvements in physical well-being.

In applying the cointegration technique, we need to determine the order of cointegration of each variable. However, as noted in the literature, depending on the power of the unit root tests, different tests yield different results. In view of this problem, Pesaran and Shin and Perasan, Shin, and Smith introduce a new method of testing for cointegration (11, 9). This approach is known as the autoregressive distributed lag (ARDL) approach. The main advantage of this approach lies in the fact that it obviates the need to classify variables into *I*(1) or *I*(0). The test involves three steps. First, we estimate each equation by using ordinary least square (OLS) technique. Second, we calculate Wald test (F-statistic) to discern the long-run relationship between the concerned variables. Wald test can be conducted by imposing restrictions on the estimated long-run coefficients.

Using the assumptions made by Pesaran, Shin, and Smith in Case III

[unrestricted intercepts and no trend] (9) and imposes the restriction $\lambda_{yx} = 0, \mu \neq 0$, the relationship between government expenditure and economic growth in Equation [1] as follows.

$$rgdp_t = \beta_0 + \beta_1 rgdp_{t-1} + \beta_2 he_{t-1} + \beta_3 ice_{t-1} + \beta_4 me_{t-1} + \beta_5 ee_{t-1} + \beta_6 hce_{t-1} + \beta_{7,i}\sum_{i=1}^{p}\Delta RGDP_{t-i} + \beta_{8,i}\sum_{i=1}^{q}\Delta he_{t-i1} + \beta_{9,i}\sum_{i=1}^{r}\Delta ice_{t-i} + \beta_{10,i}\sum_{i=1}^{s}\Delta me_{t-i} + \beta_{11,i}\sum_{i=1}^{v}\Delta ee_{t-i} + \beta_{12,i}\sum_{i=1}^{w}\Delta hce_{t-i} + u_t \quad [2]$$

Where Δ is the first difference operator, u_t is white noise disturbance term and all variable are expressed in logarithms. Equation [2] also can be interpreted as an Autoregressive Distributed Lag (ARDL) (*p,q,r,s,v,w*) model. We apply Akaike's Information Criterion (AIC) for the possibility of different lag lengths. From the estimation of unrestricted error correction model, the long-run elasticities are the coefficient of the one lagged explanatory variables (multiplied with a negative sign) divided of the one lagged dependent variable.

We estimate Equation [2] by Ordinary Least Squares (OLS) technique and then calculate the F-statistic (Wald test) for the existence of the long-run relationship between the concerned variables. The null and alternative hypotheses are constructed as follows:

$H_0 : \beta_1 = 0 \quad and \quad \beta_2 = \beta_3 = \mathrm{K} = \beta_6 = 0$
(no long-run levels relationship)
$H_A : \beta_1 \neq 0 \quad and \quad \beta_2 \neq \beta_3 \neq \mathrm{K} \neq \beta_6 \neq 0$
(long-run levels relationship exist)

Third, we follow the bound test approach [Table 2 CI(iii)] suggested by Pesaran, Shin, and Smith and when our sample test statistic is below the associated lower critical value that means we accept the null hypothesis at a particular significance level (9). The null hypothesis is then accepted regardless of whether the underlying orders of integration of government expenditure and economic growth are *I*(0) or *I*(1). According to Pesaran, Shin, and Smith, the lower bound critical values assume that the explanatory variables, x_t are integrated of oerder zero, or I(0), while the upper bound critical values assume that x_t are integrated of order one, or I(1). Therefore, if the computed F-statistic from our sample test statistic exceeds the upper bound value that means we reject the null in favor of the alternative that there exists a long-run relationship between the government expenditure and economic growth. Conversely, if the computed F-statistic from our sample test statistic is smaller than the lower bound value, then we do not reject the null hypothesis and we

conclude that economic growth and its determinants are not cointegrated. Otherwise, if the computed F-statistic from our sample test statistic fall between the lower and upper bound value, the results are inconclusive at this particular significance level (9).

Results

To ensure there is long term relationship among the variables in this model, the Augmented Dickey-Fuller (ADF) test or stationarity data is carried out for all variables namely $rgdp_t, he_t, me_t, ice_t, ee_t,$ and hce_t for every country in ASEAN-5. If the variables found in equation (1) has the same level of stationarity that is *I*(1), then long run relationship or cointegration may exist between variables in the equation. Cointegration which exists means that the result of regression in equation (1) is not a spurious regression and it forms a similar wave in the long term. The concept of stationarity and cointegration produces a quite attractive phenomenon in the econometric analysis. If the variables and are cointegrated, this shows that long run relationship or equilibrium among variables exists in the equation.

Table 1 reports the statistics for unit root for each series in time series. The empirical results show that we cannot reject the existence of unit root in almost variables at significant statistical conventional level except the health expenditure (*he*) for the Phillipines and the health and the housing and community facilities expenditure (*hce*) for Thailand. This means that *he* for the Phillipines, and Thailand and *hce* for Thailand are stationary in level. The ADF test

Table 1 The Augmented Dickey-Fuller (ADF) test for a unit root

	Test for *I*(0)				
Variables	Indonesia	Malaysia	Philippines	Singapore	Thailand
rgdp	-1.8683 (7)	-1.8750 (0)	-1.6662 (3)	-2.4870 (0)	-0.9817 (0)
he	-0.8082 (0)	-1.0143 (0)	-3.0063 (7)**	-0.2498 (0)	-4.8036 (0)*
ice	0.8000 (5)	-0.8812 (2)	1.4017 (0)	0.1599 (6)	-0.9326 (0)
me	1.3152 (3)	-2.1181 (0)	-0.9701(0)	0.3592 (2)	-0.2633 (2)
ee	0.6731(2)	-0.6233 (0)	-1.1957 (0)	-0.9350 (0)	-0.0962 (0)
hce	1.2751(4)	0.8536 (0)	-0.5544 (2)	0.8079 (0)	-2.6630 (6)***
	Test for *I*(1)				
Variables	Indonesia	Malaysia	Philippines	Singapore	Thailand
rgdp	-15.7433 (0)*	-6.4037 (0)*	-7.8829 (2)*	-5.3656 (1)*	-7.1069 (0)*
he	-6.1983 (0) *	-5.1507 (0)*	-	-6.8246 (2)*	-
ice	-7.8469 (0)*	-2.6756 (8)***	-4.6887 (0)*	-4.6842 (5)*	-6.2680 (0)*
me	-5.4633 (2)*	-7.2564 (0)*	-5.7794 (0)*	-9.5076 (0)*	-6.2105 (0)*
ee	-7.0891(0)*	-2.7766 (5)***	-5.3467 (0)*	-5.3767 (0)*	-3.1341 (7)**
hce	-5.3390 (0)*	-4.3761 (0)*	-6.1724 (1)*	-5.0539 (0)*	-

Figure in parentheses ( ) refer to the selected lag length. The number of lag was selected based on Akaike Information Criterion (AIC)[iii]. The null hypothesis is that series is non-stationary and the rejection of null hypothesis for ADF test is based on the MacKinnon critical value (15).

* Significant at 1% level
** Significant at 5% level
*** Significant at 10% level

is carried out again in first difference approach and the result is reported in Table 1. This result demonstrated that almost all series are stationary at 1% significance level. However, it is found that variables of *he* and *hce* for Thailand are non-stationary in first difference.

We concluded that the results in Table 1 shows that the majority of variables are *I*(1), although *he* and *hce* for Thailand are *I*(0) and *he* for Phillipines is borderline between *I*(0) and *I*(1). The ambiguities in the order of integration of the variables lend support to use the ARDL bounds approach rather than one of the alternative cointegration tests.

The proposed Bound test is more appropriate to be used in testing the cointegration relationship for a small sample size (12, 13, and 9). Pesaran and Shin and Pesaran, Shin, and Smith advocate the use of ARDL models for the estimation of long-run relations (9, 11). The OLS based ARDL modeling approach have been employed for cointegration analysis. Pesaran *et al*. (2001) also demonstrate that robust asymptotes on long and short-run parameters can be made under least squares estimates of an ARDL model. The order of the ARDL model is appropriately augmented to allow for contemporaneous correlations between stochastic components of the data generating process included in estimation. The Bound test allows the *I*(0) or *I*(1) variable as regressors, that means the order of integration of interested variables are not necessarily to be the same.

The unrestricted ARDL model for ASEAN-5 countries was used to estimate the model, as reported in Table 2. The high values of for the models show that the overall goodness of fit of the models is satisfactory. The F-statistics measuring the joint significance of all regressors in the model are statically significant at the 1 per cent and 5 per cent for the models in ASEAN-5 countries.

To ascertain the goodness of the ARDL model, the diagnostic test and the stability test are conducted. Hence, Table 3 shows that the model passes the tests of the Breusch-Godfrey Serial Correlation LM test, Jacque-Bera normality test and Ramsey RESET stability test. The structural stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residual (CUSUMSQ). According to Pesaran and Pesaran, the stability of the estimated coefficients of the model should be empirically investigated (14). A graphical representation of CUSUM and CUSUMSQ statistics are shown in Figure 2. It is clear that the plots of both the CUSUM and the CUSUMSQ are within the boundaries and hence these statistics confirm the stability of the long-run coefficients of the components of government expenditure and economic growth in ARDL models.

The bounds tests for the each of the sample countries are presented in Table 4. Using the asymptotic critical value computed by Pesaran, Shin, and Smith, all the test statistics are significant at the 1% and 5% levels (9). These results leading us to reject

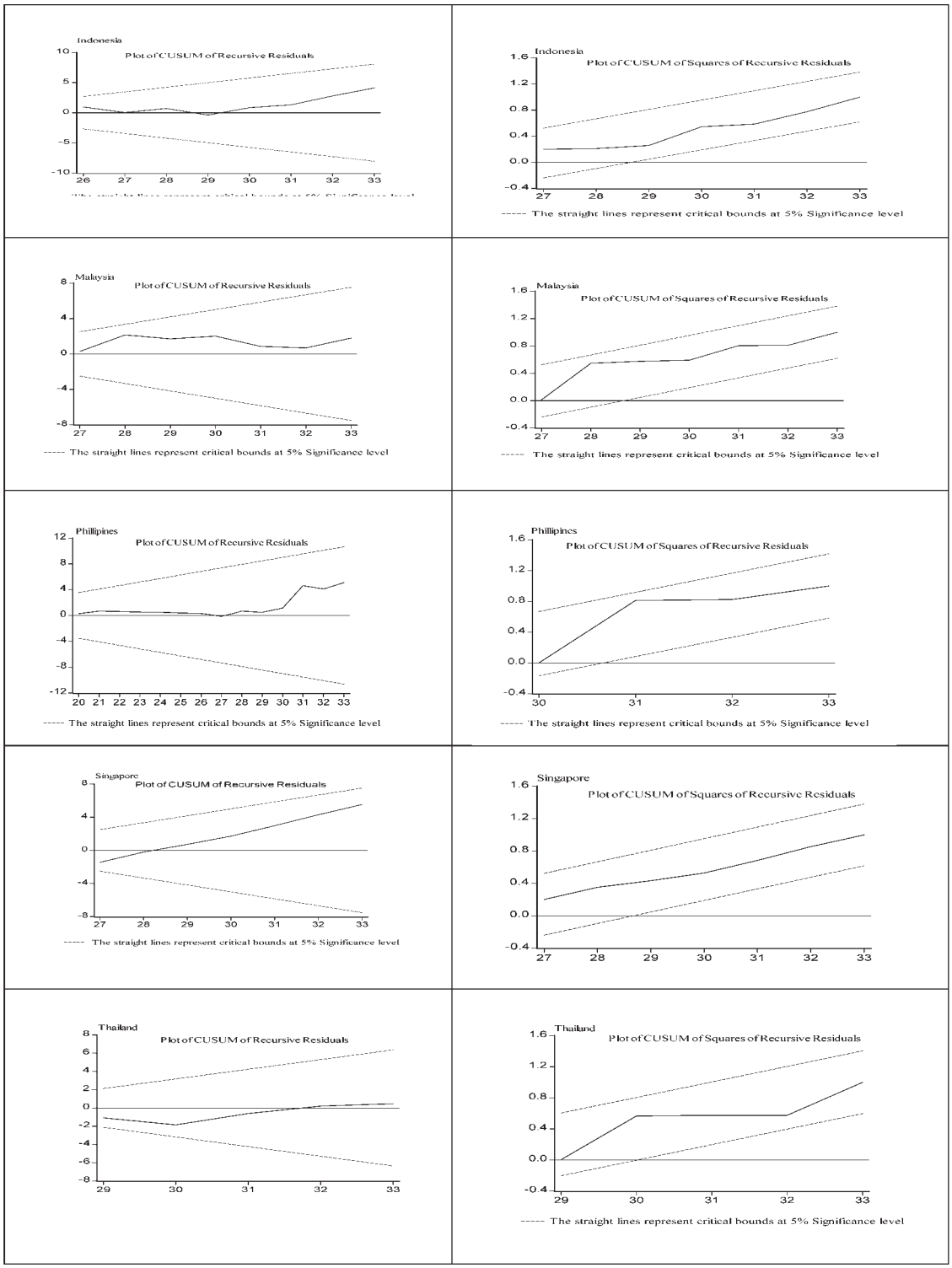

Fig. 2 Stability Test – CUSUM and CUSUMSQ

The plots of the stability test results (CUSUM and CUSUMSQ) of the ARDL model for ASEAN-5 countries are given below. The CUSUM and CUSUMSQ plotted against the critical bound of 5 percent significance level show that the model is stable over time.

Table 2 ARDL test for cointegration of the unrestricted models in ASEAN-5

Variables	Indonesia	Malaysia	Philippines	Singapore	Thailand
$rgdp_{(t-1)}$	-0.633 (-2.867)**	-1.335 (-3.892)*	-0.253 (-1.766)***	-0.754 (-5.04)*	-3.476 (-5.894)*
$he_{(t-1)}$	0.914 (3.065)**	-1.027 (-3.133)**	0.273 (1.021)	0.093 (0.440)	4.290 (5.767)*
$ice_{(t-1)}$	-0.194 (-0.348)	3.155 (3.889)*	-1.139 (-2.276)**	0.923 (3.671)*	0.789 (3.257)**
$me_{(t-1)}$	-1.232 (-3.225)*	-0.433 (-1.503)	-2.061 (-3.158)*	-0.025 (-0.073)	-0.384 (-1.813)
$ee_{(t-1)}$	-0.269 (-0.556)	-0.396 (-2.668)**	0.035 (0.120)	-0.449 (-4.304)*	0.524 (2.806)**
$hce_{(t-1)}$	1.366 (2.513)**	1.171 (3.223)*	-0.545 (-3.125)*	1.106 (2.667)**	-1.095 (-4.690)*
$D(rgdp_{(t-1)})$	-0.774 (-3.080)**	0.370 (1.326)	-0.082 (-0.397)	0.228 (1.093)	2.070 (4.582)*
$D(rgdp_{(t-2)})$	-0.445 (-2.040)***	0.261 (1.286)	-	-0.502 (-3.009)**	1.109 (3.107)**
$D(rgdp_{(t-3)})$	-	-0.065 (-0.286)	-	-0.133 (-0.865)	0.599 (3.144)**
$D(he_{(t-1)})$	0.046 (0.129)	0.692 (2.226)	-0.325 (-1.607)	-0.144 (-0.999)	-3.393 (-5.692)*
$D(he_{(t-2)})$	-0.439 (-1.632)	0.136 (0.800)	-	-0.009 (-0.074)	-1.888 (-4.152)*
$D(ice_{(t-1)})$	-0.249 (-0.570)	-2.692 (-3.754)	0.381 (0.877)	-1.545 (-3.664)*	-0.144 (-0.613)
$D(ice_{(t-2)})$	0.378 (0.957)	-1.479 (-2.201)***	-	-0.284 (-0.998)	-0.264 (-1.495)
$D(ice_{(t-3)})$	0.316 (1.119)	-0.978 (-2.454)**	-	-	-0.088 (-0.612)
$D(me_{(t-1)})$	0.553 (1.777)	0.951 (3.610)*	1.352 (2.665)**	0.590 (2.067)***	0.676 (2.153)***
$D(me_{(t-2)})$	0.172 (0.746)	0.802 (2.963)**	1.151 (2.228)**	-0.145 (-0.592)	0.686 (2.960)**
$D(ee_{(t-1)})$	0.348 (0.724)	0.142 (1.096)**	-0.073 (-0.278)	-0.036 (-0.310)	-0.395 (-3.427)**
$D(ee_{(t-2)})$	-0.020 (-0.064)	0.334 (3.021)**	-0.119 (-0.481)	0.492 (2.671)**	0.133 (1.166)
$D(ee_{(t-3)})$	-	-	-	0.441 (2.755)**	0.211 (1.492)
$D(hce_{(t-1)})$	-0.632 (-1.568)	-0.969 (-2.813)**	0.509 (5.315)*	-1.236 (-2.598)**	0.961 (3.857)*
$D(hce_{(t-2)})$	-0.852 (-2.548)**	-0.475 (-1.901)***	-	-1.215 (-3.442)*	0.334 (1.637)
$D(hce_{(t-3)})$	-0.518 (-1.718)	-0.499 (-2.346)**	-	-0.782 (-4.408)*	0.070 (0.466)
R^2	0.871	0.940	0.794	0.940	0.965
Adj.R^2	0.549	0.762	0.602	0.762	0.806
S.E.	0.041	0.030	0.115	0.026	0.030
F-Statistic	2.710	5.282	4.137	5.280	6.074
Prob(F-Stat)	0.055	0.015	0.004	0.015	0.026

Note : *, **, *** denote significant at 1%, 5% and 10% significance levels

Table 3 Diagnostic checking

	Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)		Jacque_Bera Normality Test		Ramsey RESET Stability Test	
	F-Statistic	Prob.	$\chi^2(2)$	Prob.	F-Statistic	Prob.
Indonesia	2.5618	0.2301	0.5714	0.7515	1.4223	0.3122
Malaysia	3.8536	0.1127	0.2551	0.8802	0.0283	0.9723
Phillipines	0.8437	0.4523	0.3942	0.8211	0.2984	0.7491
Singapore	0.6439	0.5639	2.0992	0.3501	0.5725	0.6274
Thailand	1.4326	0.4363	1.7877	0.4091	0.1408	0.8741

Note: Number of fitted terms for Ramsey RESET is 2

Table 4 Bounds test for the existence of a long-run relationship

COUNTRY	VALUE	
INDONESIA	4.5856**	
MALAYSIA	8.4309*	
PHILLIPINES	6.8835*	
SINGAPORE	5.2039*	
THAILAND	9.0165*	
	CRITICAL VALUE	
	LOWER	UPPER
1% significance level	3.41	4.68
5% significance level	2.62	3.79
10% significance level	2.26	3.35

Note: The critical values are taken from Table CI(iii) Case III: Unrestricted intercept and no trend (9).
*, ** and *** denote significant at 1%, 5% and 10% significance levels.

Table 5 The elasticity of long-run coefficients results

	he	*ice*	*me*	*ee*	*hce*
Indonesia	1.4445**	0.2123	-6.349**	0.2187	5.0710**
Malaysia	0.7694**	3.0718*	0.1375	0.9133**	2.9544**
Philippines	1.0798	4.1659**	-1.8091*	0.0174	15.2329*
Singapore	0.1239	9.8873*	0.0272	17.8685*	2.4609**
Thailand	1.2344*	0.1840**	0.4869	1.3650**	2.0867*

*, ** and *** denote significant at 1%, 5% and 10% significance levels.

the null hypothesis of no cointegration, regardless of whether the variables are *I*(1) or *I*(0) or a mix of both. These tests also indicate the presence of a valid long run relationship between the components of government expenditure and economic growth at the test statistics exceed the respective upper critical values.

The long-run coefficients of the variables under investigations are shown in the Table 5. The results show that in the long-run health expenditure (*he*) has a statistically significant at 5 per cent level effect on real GDP for Indonesia (1.44) and Malaysia (0.77), meanwhile the coefficient of *he* for Thailand is 1.23, which is positive and statistically significant at the 1 per cent level. In addition, the coefficient of *he* in the Phillipines and Singapore countries are not statistically significant.

The results also show that the information and communication technology expenditure (*ice*) in Indonesia does not significant. In Malaysia and Singapore their coefficients are 3.07 and 9.87, respectively, which is statistically significant at 1 per cent level. The coefficient 4.17 and 0.18 for the Phillipines and Thailand respectively show that these are statistically significant at 5 per cent level.

The long-run coefficients as shown in Table 5 also indicate that the military expenditure (*me*) in Indonesia and the Phillipines have a negative effect on real GDP, which is significant at 5 per cent and 1 per cent, with coefficients -6.35 and -1.8091 respectively. The results also show that education expenditure (*ee*) in Singapore

(17.87) is statistically significant determinant of real GDP at 1 per cent level. In addition, the coefficients of *ee* in Malaysia and Thailand are 0.91 and 0.137, which are statistically significant at 5 per cent level.

We also found that the coefficient of housing and community facilities expenditure (*hce*) in Indonesia (5.07), Malaysia (2.95), and Singapore (2.46) are significant at 5 per cent level. A long-run coefficient of *hce* in the Phillipines (15.23) and Thailand (2.09) are statistically significant at 1 per cent level.

Discussion

This study examined the question of whether components of government expenditure and economic growth are cointegrated over time using an ARDL bounds testing procedure that allows testing for a level relationship irrespective of the order of integration of the underlying series. This empirical test based on the results of Wald test (F-statistic) from the ARDL bounds test approach in every single country of ASEAN-5, we concluded that there exists a steady state long-run relationship among economic growth, health expenditure, information and communication technology expenditure, military expenditure, education expenditure, and housing and community facilities expenditure. The bounds test suggested that the all variables in functional form framework are bound together in long run.

The estimated long-run coefficients showed that the effects of the most of the variables under investigations are highly significant on economic growth in ASEAN-5 countries. Breaking down the components of government expenditure, we have found that health expenditure (*he*) has a positive and significant effect on real GDP for Indonesia, Malaysia, and Thailand. Means, the result suggests that health expenditure increases along with GDP growth in these countries. While, the information and communication technology expenditure (*ice*) in Indonesia does not significant compare to the others countries. We also found that education expenditure (*ee*) has significant effect on economic growth in Singapore, Malaysia, and Thailand. There is also a significant effect of housing and community facilities expenditure (*hce*) on economic growth for all ASEAN5 countries. These results support those of other studies that indicate that in the long-run coefficients of the variables are an important determinant of the real GDP.

The military expenditure (*me*) has a negative significant effect on economic growth in Indonesia and the Philippines. Although negative and significant relationship between military expenditure and GDP growth has been established in these countries, mainstream theory predicts that the negative effect should be expected in countries where the size of government sector exceeds a certain threshold.

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