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The Impact of Government Debt on Output Growth, Private Investment and Human Capital in Malaysia

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ABSTRACT

It is important for every country to evaluate the role of government debt on economic growth and macroeconomic factors, especially in developing economies. Some endogenous growth theories predict that if government debt at moderate level is spent on development expenditures such as public infrastructure and human capital – as is the case in Malaysia – it can crowd-in private investment, human capital and economic growth. This paper aims to examine the effect of government debt on output growth, private investment and human capital in Malaysia during the period of 1985-2016, employing Vector Error Correction modeling (VECM) and Generalized Impulse Response (GIR). The result shows that government debt generates positive response in GDP growth and human capital in the long run although not significant. Moreover, the effect on private investment is null. This finding supports prudent debt management in Malaysia. Accordingly, the policy implication would be to focus on more efficient usage and allocation of the government funds, based on the country's priorities, while maintaining the debt within the dominant past range.

JEL Classification: O49, C32
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INTRODUCTION

Over the past decade since global financial crisis (GFC) in 2008, the level of government debt in many countries substantially increased. This fact heated the topic of economic growth effect of government debt among policy makers as well as scholars. In Malaysia, government debt that had taken a rising trend in the aftermath of 1997-1998 Asian financial crisis (AFC), took a sharper trend since GFC (Figure 1).

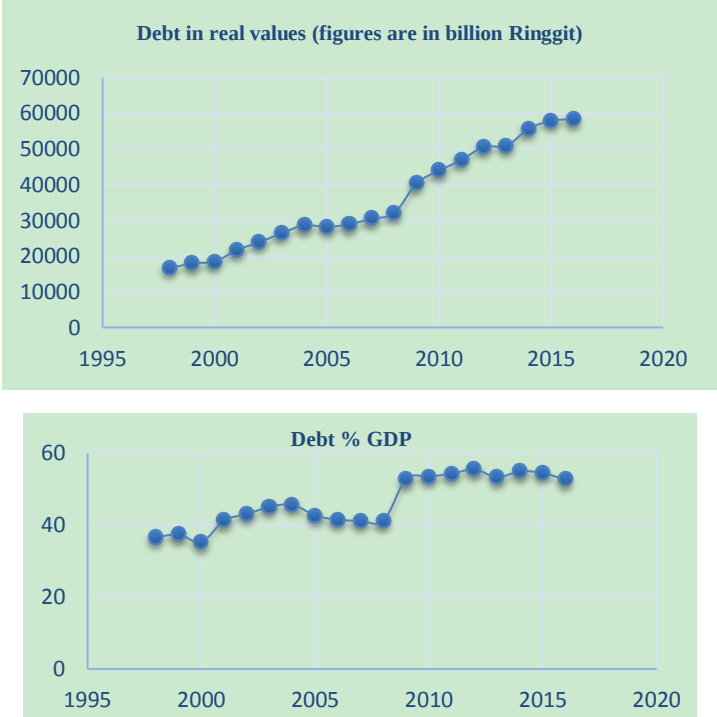


Figure 1 Government debt trend in Malaysia since AFC in 1997 to 2016.

The rising trend created concern among policy makers;[1] and the public[2]seems to regard the government debt level as alarmingly high. However, fairly assessing the government policies and programs, one should not only look at the debt level. Malaysia's fiscal authorities abide by the prudent debt management to spend the borrowed money only for the country's development expenditure (Kim et al., 2014). This type of expenditures - such as investment expenditure on infrastructure, education and health - have social and economic externalities that would lead to higher productivity of private sector and future higher income. The higher income obtained by the private sector would generate higher revenue for the government to pay off its debt. Productivity-driven path of economic development versus investment-driven path is the sustainable approach, which has received deserved attention in Malaysia's second and third Industrial master plan (1996-2005 and 2006-2020, respectively). The government contributes to this process by carrying out development expenditure, which is not feasible to be carried out by private sector. In this regard, government may need to borrow from domestic or external excess saving.

With regard to the availability of financial resources to finance the budget deficit, while government enjoyed relatively easy access to domestic financial resources that provided most of government financial needs due to high private saving rate, fiscal authorities ensured preventing crowding-out of private sector (Vijayaledchumy, 2003). In addition, monetary policy has also supported the expansion of private sector activities by lowering interest rate.

Vijayaledchumy (2003) claims that the increase in the Malaysia's debt is due to government impulses to stimulate economic growth and not due to long term structural rigidities resulting from commitments for operational expenditures or inability to collect taxes. In Malaysia, debt-financed countercyclical expansionary

[1] Hock, E. and Ho, S. (2010), "Idris Jala: M'sia must cut subsidies, debt by 2019 or risk bankruptcy", *The Star Online*, 27 May. https://www.thestar.com.my/news/nation/2010/05/27/idris-jala-msia-must-cut-subsidies-debt-by-2019-or-risk-bankruptcy/

[2] Sulaiman, M. (2016), "managing debt in Malaysia", *New Straits time, 27 Dec.* https://www.nst.com.my/news/2016/12/199695/managing-debt-malaysia.

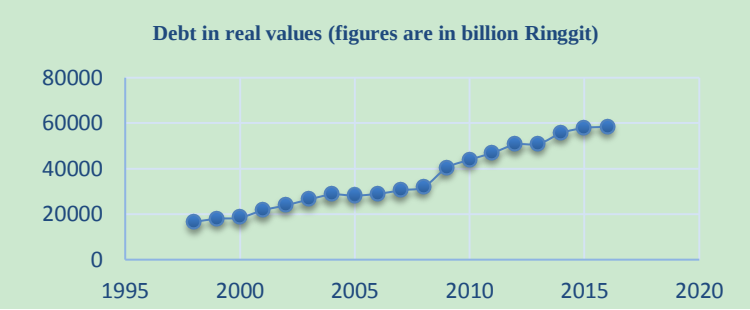
fiscal policy has been used in face of economic downturns, which suggests policy makers' belief in its positive effect. Malaysia has been running budget deficit since Asian financial crisis in 1997-98. Government has used expansionary fiscal policy to stimulate the economy that was facing several downturns since then. This policy application is in line with the countercyclical fiscal policy suggested by Keynesian's fiscal expansion prescription.

Economic background

Malaysia has been a high performing developing economy in the past decades, in terms of economic growth. The average growth rate during the period of 1985-2016 has been 3.28 % that reflects overall strong economic fundamentals (refer to Table 1). Private investment has become sluggish since AFC with an average rate of private investment to GDP for the same period was 12.08 %. However, human capital (measured as the average schooling years of population over 25 years-old age) shows a strongly increasing trend. Finally, the average debt level is 55.88% of GDP and its median is 52.75% of GDP. Several studies have highlighted that, this level is considered as intermediate level. Low debt is defined as debt bellow 30% of GDP (Cordella et al., 2010) while high debt is defined as above 90% of GDP (Cordella et al., 2010; Reinhart and Rogoff, 2010). Furthermore, during recent years fiscal authorities have initiated fiscal consolidation measures to maintain debt level below the self-imposed ceiling of 55% of GDP (Ministry of Finance, 2017/18 report[3]).

Table 1 Descriptive statistics of the variables over the period of 1985-2016

	GDP Growth	Government Debt	Private Investment	Human Capital
Mean	3.28	55.88	12.08	8.12
Median	3.76	52.75	10.73	8.15
Maximum	6.98	109	24.08	10.35
Minimum	-10.13	32.3	4.98	5.05



This Figure 1 is repeated

The preliminary data analysis using scatter plots and fitted linear regression line using data of years 1985-2016 is presented in Figure 2. Debt-GDP growth, debt-private investment and debt-human capital accumulation figures show negative, negative and positive relationship, respectively. The first two graphs suggest minor crowding-out effect advocated by mainstream neoclassical theories (Elmendorf and Mankiw, 1999), while the positive relationship between debt and human capital is in line with endogenous growth models such as claimed by Aizenman et al. (2007) and Greiner (2007).

[3] Economic report 2017/18, Chapter 4, Public sector finance, http://www.treasury.gov.my/pdf/economy/er/1718/chapter4.pdf

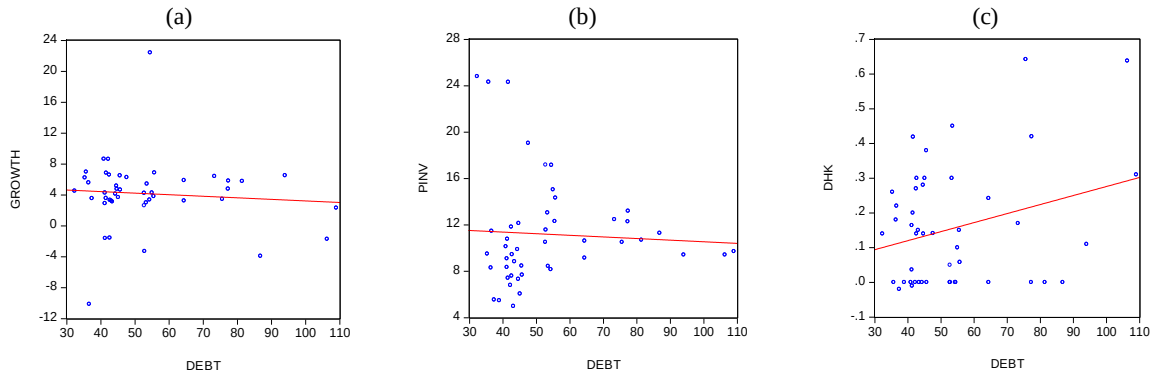


Figure 2 Scatter plot with a fitted linear regression line among (a) GDP growth and initial government debt (% GDP); (b) private fixed capital formation (PINV) and initial government debt (% GDP); Human capital accumulation (DHK) and initial government debt (% GDP).

Despite the favorable discussion on the background of government debt in Malaysia, the dominant theoretical view of neoclassical growth models imply negative debt-growth relationship (Elmendorf and Mankiw, 1999). Nevertheless, there are other theoretical predictions that conclude government debt can positively affect economic growth (e.g. Futagami et al. (1993); Greiner (2007)). In the empirical ground, the answer for the effect of intermediate-debt level on economic growth is still unclear. While some studies could not find a robust relationship when debt is not at excessive levels (e.g. Checherita-Westphal and Rother, 2010), study by Cordella et al. (2010) found a negative and significant relationship. These studies largely focused on panel data models thus, the result could not be generalized to individual countries which obviously differs in terms of its economic structures and fundamental macroeconomics performances.

Given the government debt policy and economic background of Malaysia together with the varied theoretical and empirical results, this paper aims to address the question of whether the rising trend of government debt has any significant effect on the economic growth of Malaysia. Since there is lacking empirical studies focusing on single country, the present study could provide an evaluation on the effect of government debt on the Malaysian economy at the aggregate level, namely on economic growth, private investment and human capital.

LITERATURE REVIEW

Theoretical Review on Debt-Growth Nexus

Theoretical literature contains miscellaneous views regarding the effect of government debt on GDP growth which could be classified into four categories. First, the Keynesian view suggests, government debt-financed fiscal expansion, especially in time of economic downturn, can boost demand and output growth in the short run. By increasing debt the consumer would consider himself to be wealthier thus increasing the consumption level. Assuming sticky prices in short run, increase in demand leads to higher output growth and employment. After price-adjustment output would return to natural level.

Second view is called the Ricardians; which is based on the work of Barro (1974) who considered consumers to be rational and forward-looking. In this view, government deficit is equivalent to discounted sum of future taxes. The increase in debt will not increase consumption because the rational consumer will not see himself wealthier but see current government deficit as future taxes. Therefore, he increases saving in a way that, a decrease in government saving is matched by increase in private saving. Total national saving is unchanged so is investment and interest rate and also national income.

Third is the neoclassicals view which asserts that debt is a burden on the economy (Elmendorf and Mankiw, 1999). In view of neoclassical growth model, debt substitutes capital in the portfolios of wealth owners. This in turn leads to lower capital stock and lower output growth. In the long-run, an increase in the government debt would lower saving of the country. Increasing budget deficit will raise demand for consumption and as it is assumed that marginal propensity to consume is higher than marginal propensity to save, thus saving will be reduced. This would cause real interest rate to rise and eventually crowds-out private investment. As a result, lower steady state capital stock and lower output is achieved (Metzler, 1951; Modigliani, 1961).

Forth are some of the endogenous growth models (Greiner, 2007) that incorporates government debt in the supply side of production function and argue that government debt can contribute to GDP growth. These theories assume certain conditions that need to be met for the outcome. For instance, when government spends the borrowed money into productive investment in the country such as the development expenditures on infrastructure, education and health services, these expenditures would eventually stimulate the private sector's economic activities and contribute to the economic growth. Nevertheless, a certain limit for borrowing is considered, above which negative consequences such as debt-overhanging will dominate the positive impact (Greiner, 2007).

Empirical Review on Debt-Growth Nexus

Empirical studies on the growth effect of government debt are very few. The effect of government debt in advanced economies mainly U.S. has attracted most of the research especially regarding debt-interest rate relationship. More studies in developing countries have focused on external debt effect motivated by debt overhang hypothesis of Krugman (1988) and Sachs (1989). Pattillo et al. (2002 and 2004) reported a negative effect of external debt on growth, as debt levels goes over 60 percent of GDP. In contrast, Cordella et al. (2010) found evidence of debt overhang for intermediate debt levels, but an insignificant debt-growth relationship at very low and very high levels of debt.

A few recent panel data studies found adverse effect of debt on growth and capital formation. For instance, Checherita-Westphal and Rother (2012) found nonlinear relationship with threshold point of about 90% between government debt and growth and also four channels of transmission, namely private saving and investment, public investment, total factor productivity, and sovereign long run interest rate for the sample of 12 Euro countries. They mentioned that the relationship below threshold of 90% remains a question. This indicates ambiguous effect of moderate debt level on the economic growth. Another study by Woo and Kumar (2015) employing multiple panel estimators and accounting for several econometric issues, found negative and significant relationship between government debt and GDP per capita growth both in advanced and emerging economies during 1970-2007.

Schclarek (2004) found linear negative and significant relationship between public external debt and GDP per capita growth for a panel of 59 developing countries during 1970-2002. He found no evidence for nonlinear relationship among debt-growth using exogenous threshold dummies for total external debt of 20% GDP and 30% GDP alternatively. Interesting finding by Panizza and Presbitero (2013) in a recent survey study of debt-growth in advanced countries indicates that debt-growth nexus is different in each country and that future research should focus on cross-country heterogeneity.

Some evidence from the single country studies in developing countries include Bal and Rath (2014) who examined the effect of public debt and debt service on GNP per capita in India. Other explanatory variables were total factor productivity and export. They found significant adverse effect for both of the public debt variables. Prior to Bal and Rath, Singh (1999) investigated domestic debt and growth relationship in India for the period of 1959-1995, using cointegration and Granger causality test and concluded that Ricardian equivalence prevails as debt did not Granger cause growth.

While most of the recent studies have utilized single equation model panel estimators such as GMM and system-GMM, the application of VAR modelling and impulse response tool is rather unique because this technique is suitable to decompose the negative debt-growth correlation. In other words, it addresses the question whether high debt negatively affects output growth or low output growth causes government debt to increase. Few recent papers such as Lof and Malinen (2014) and Swamy (2015) have applied panel bivariate VAR model and impulse response technique to address debt-growth issue. The former found robust evidence that debt does not cause economic growth. The impulse response of the total sample in the later study shows almost insignificant response. However, in low and medium debt regimes, 0-30% and 30-60% respectively, debt shock induced positive and significant response to economic growth. These studies are different from other literature in terms of applied methodology. Nonetheless, some shortcomings prevail. First, like most of the literature on this issue they used large panel samples to derive global stylize facts. Country specific studies are scant. Second, they used bivariate model. Lof and Malinen (2014) admit that although bivariate model is useful for decomposing the correlation, it does not provide any information about the economic channels through which debt affects growth or vice versa.

Panizza and Presbitero (2013) in a survey of studies on advanced economies concluded that although empirical studies tend to find negative effect of high debt on growth, there is no study that makes a strong case for causality of debt to growth. However, a new strand of researches have applied Granger-causality testing to disentangle debt-growth relationship. The results are quite contrasting. For example, a number of research such as Ferreira (2016) for 28 European countries, Ferreira (2009) for 20 OECD countries, Butts (2009) in 27 Latin American and Caribbean countries, Abbas and Christensen (2010) in 93 low-income countries and emerging markets, found bidirectional relationship. In contrast to above, no causality relation was found by Puente-Ajovin and Sanso-Navarro (2015) for 16 OECD countries, Panizza and Presbitero (2014) in a sample of 17 OECD countries and Jayarama and Lau (2009) for six Pacific island countries. Moreover, other findings indicate uni-directional relationship from growth to debt and not vice versa. Examples include Kempa and Khan (2016) in G7 countries, Lof and Malinen (2014) in a sample of 20 advanced countries.

This study contributes to the existing literature in several forms. First, it contributes to the scant timeseries literature focusing on single emerging country. Second, this study focus on the effect of government debt on GDP growth (and growth factors) unlike previous literature in Malaysia that focused on external debt effect (e.g. Mohd Daud et al., 2013) or the effect of government debt on TFP (e.g. Asmaddy and Mohammad, 2015) or fiscal sustainability (Baharumshah et al., 2017). Third, this study employs a new model specification and methodology to investigation of debt-growth issue, which is multivariate VECM modeling and Generalized Impulse Response (GIR) analysis. Moreover, the VECM model provide some interpretation of the long run causality among the variables.

RESEARCH METHODOLOGY

Empirical Framework

The standard neoclassical growth model has been the workhorse for examining the effect of government debt on output growth. Our model is based on the derivation of Mankiw et al. (1992) of the Solow growth model, in that:

$$\ln y_t = lnA_0 + g_t + \frac{\alpha}{1-\alpha}\ln(s_k) - \frac{\alpha}{1-\alpha}\ln(n+g+\delta) + \frac{\beta}{1-\alpha}\ln(h^*) \quad (1)$$

Or

$$y_t = f(A, s_k, n, h)$$

Where: A_0 is level of technology, y_t is the output per capita (labor), h^* is the level of human capital, s_k the share of output allocated for capital accumulation (which could be indexed by investment as percent of GDP) and finally $(n + g + \delta)$ is population growth, technological growth and rate of depreciation respectively. This paper extends the above production function, to include government debt. Similar approach has been taken by several recent relevant empirical studies, that examined the effect of government or external debt on growth, by including debt in the neoclassical growth model such as Pattillo et al. (2011), Sen et al. (2007), Clement et al. (2003), Checherita-Westphal and Rother (2012), Schclarek (2004) in panel framework while the work by Bal and Rath (2014), Mohd Daud et al. (2013), Asmaddy and Mohammad (2015) in time series framework. Present study employs above growth model augmented with government debt. as follows:

$$ly_t = F(lpinv, lH, lB) \quad (2)$$

where:

ly_t : is the real per capita GDP;
$lpinv$: is share of output allocated for capital formation (as s_k in equation 1) indexed by ratio of fixed capital formation in private sector as percent of GDP;
lH : is the capital stock indexed by average years of schooling of population above 25 years;
lB : is the ratio of government debt stock as percent of GDP. The l indicate logarithm form for all variables.

$$ly = F(lpinv, lHK, lB, \quad lBB, lr, lvex) \quad (3)$$

where:

lBB : is budget balance as percent of GDP
lr : is real interest rate
$lvex$: is volatility of exchange rate

Intuitively these variables are expected to be stationary as they cannot increase continuously but they vary within a certain limit. Therefore, econometrically they are treated as exogenous variables in the VECM specification in a separate matrix. Budget balance is to capture general economic instability, volatility of real exchange rate to capture external shocks and finally, real interest rate captures monetary policy in the model. The data of all variables is extracted from World Bank 2018 database except data of government debt, which is obtained from a "historical public debt database" of International Monetary Fund by Abbas et al. (2010) and human capital stock, which is employed from Barro and Lee (2013).

VECM model specification

This paper employs Vector Error Correction model (VECM) and the Generalized Impulse Response (GIR) function of Pesaran et al. (1998) to investigate the average impact of government debt increase on output per capita, private investment and human capital. The use of VECM model is because of three reasons. First, in VAR/VECM model all the variables are treated as endogenous in the first place. Second, using VECM model allows to use the information of the variables at level, so that, it combines long run and short run information. Third, the impulse response tool implemented in VEC model provides a framework in that the effect of government debt on itself, output growth, private investment and human capital can be traced out using the same model. The VECM model used in this study is specified as follows:

$$\Delta ly_t = \lambda_t + \Delta ly_{t-1} + \Delta ly_{t-2} + \Delta lB_{t-1} + \Delta lB_{t-2} + \Delta lpinv_{t-1} + \Delta lpinv_{t-2} + \Delta lH_{t-1} + \Delta lH_{t-2} + lBB_t + lvex_t + lr_t + C$$

$$\Delta lpinv_t = \lambda_t + \Delta ly_{t-1} + \Delta ly_{t-2} + \Delta lB_{t-1} + \Delta lB_{t-2} + \Delta lpinv_{t-1} + \Delta lpinv_{t-2} + \Delta lH_{t-1} + \Delta lH_{t-2} + lBB_t + lvex_t + lr_t + C$$

$$\Delta lB_t = \lambda_t + \Delta ly_{t-1} + \Delta ly_{t-2} + \Delta lB_{t-1} + \Delta lB_{t-2} + \Delta lpinv_{t-1} + \Delta lpinv_{t-2} + \Delta lH_{t-1} + \Delta lH_{t-2} + lBB_t + lvex_t + lr_t + C$$

$$\Delta lH_t = \lambda_t + \Delta ly_{t-1} + \Delta ly_{t-2} + \Delta lB_{t-1} + \Delta lB_{t-2} + \Delta lpinv_{t-1} + \Delta lpinv_{t-2} + \Delta lH_{t-1} + \Delta lH_{t-2} + lBB_t + lvex_t + lr_t + C$$

In order to use VECM, the endogenous variables need to be integrated of order one, I(1). To check unit root of the variables, ADF unit root test is carried out for all variables. Deterministic terms in ADF test are chosen following Elder and Kennedy (2001) guideline. Next, to determine the rank of the system Johansen (1991) multiple cointegration test is performed. VECM model is specified, using the results obtained from the cointegration test and lag length selection based on Akaike information criterion (AIC).

RESULTS AND DISCUSSION

This section discusses the results of unit root and cointegration tests, VECM estimation and impulse response analysis. Employing standard augmented Dickey-Fuller (ADF) test, the order of integration of the variables is examined and the result is presented in Table 2. According to Table 2, the main variables, namely, government debt (lB), private investment (lpinv), output per capita (ly) and human capital stock (lH) are integrated of order one or I(1), while control variables, namely, budget balance (lBB), volatility of real exchange rate (lvex) and real interest rate (lr) are stationary or I(0). The main variables of the model are to be set as the endogenous variables in the VECM/VAR model and the control variables are econometrically treated as exogenous variables in a separate matrix. The rational for including these variables is to capture the shocks to the system of endogenous variables.

Next step is choosing the appropriate number of lags for the model. Table 3 shows the optimal lags chosen by various information criteria for a VAR model of maximum lag three. Based on all criteria, three lags were

chosen for the VAR model. Thus, VECM model will contain two lags[4]. Further, Johansen cointegration test is performed including all endogenous and exogenous variables in a VAR model. Constant and trend terms were allowed as the deterministic terms in the underlying VAR model. The test result (refer to Table 4) indicates the existence of two cointegrating relation at 1%, however to simplify the model specification, one cointegrating equation is assumed.

Table 2 ADF-Unit root tests for sample period 1985-2016

Variabless	Level		First difference	
	Deterministic term	Test-statistics	Deterministic term	Test-statistics
ly	C,T	-1.526	C	-4.861***
lpinv	C,T	-2.625	C	-4.190***
lB	C,T	-0.708	C	-4.383***
lH	C,T	-1.461	C	-8.075***
lBB	C	-2.266**	C	-4.042***
lVEX	C	-2.755***	C	-5.149***
lr	C,T	-6.940**	C	-5.770**

Note: *, **and *** indicate that the null hypothesis of nonstationary variables can be rejected at 10, 5 and 1 percent significant level respectively. C denotes constant deterministic term and T denotes trend term.

Given the optimal number of lags for the VECM (P*=2) and the cointegration rank equal to one, the VECM is estimated and the results are reported in Table 5. In growth equation, the error correction term's (ECT = λ) coefficient is negative and significant, which corroborates existence of long run equilibrium relation. ECT's coefficient equals to -0.17, meaning that output growth adjusts to the deviation from long run equilibrium in a period of about six years (1/ 0.17=5.88). Also, the ECT in private investment equation is significant. The control variable's coefficient sign are in congruence with theoretical expectation. Volatility of exchange rate is negative and significant in growth equation and private investment equation. Budget balance coefficient is positive, significant in growth equation and negative, significant in debt equation. Meaning that budget surplus is associated with higher growth and lower government debt, while higher interest rate is associated with lower output growth and private investment.

To ensure the model is qualified in order to be used for impulse response analysis, post-estimation diagnostic tests of serial correlation and non-normality test are performed (Table 5). The result is in favor of goodness of the model as the null hypothesis of no serial correlation and normal residuals is accepted – the later at 5% significant level. Lastly, the adjusted R-squared of the model is high (68%). Since the model has satisfied the diagnostic tests, impulse response tool can be applied. Figure 3 shows the GIR based on VECM model, whereas Figure 4 depicts GIR based on the corresponding VAR model. VAR model at level variables has one additional lag compared to VECM, which contains regression at first difference. Engle and Granger (1987) suggest that both these models are appropriate to represent dynamic interaction among cointegrated variables. They state that the long run restriction in VECM is also satisfied asymptotically in level-VAR model.

Table 3 Lag order selection by different criteria

Lag	**LR**	**AIC**	**SC**	**HQ**
1	185.78	-11.43	-9.96	-10.94
2	33.28	-12.09	-9.89	-11.36
3	30.96*	-13.03*	-10.10*	-12.06*

Note: * Indicate the number of lags selected by the respective information criterion (significance at 5% level). LR: Sequential modified LR test statistics. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Table 4 Cointegration tests for sample period 1985-2014

Hypothesized no of CE	Trace Statistic	Critical Value	Probability	Max-Eigen Statistic	Critical value	Probability
None* **	110.67	47.856	0.00	60.22	27.584	0.00
At most 1* **	50.45	29.797	0.00	47.17	21.131	0.00
At most 2	3.27	15.494	0.95	3.27	14.264	0.92
At most 3	0.006	3.8414	0.93	0.006	3.8414	0.93

Note: ***, **, * Denotes rejection of the hypothesis at the 1%, 5% and 10% level, respectively.

[4] Optimal lag length of VECM model is equal to optimal lag length of VAR model minus one.

Table 5 VECM model estimated for impulse response analysis

$$\Delta ly_t = -0.17\ \lambda_t^{***} - 0.12\Delta ly_{t-1} + -0.33\ \Delta ly_{t-2} - 0.16\ \Delta lB^{*}_{t-1} - 0.03\ \Delta lB_{t-2} - 0.02\ \Delta lpinv_{t-1} - 0.002\ \Delta lpinv_{t-2} - 0.04\ \Delta lH_{t-1} - 0.20\ \Delta lH^{***}_{t-2} + 0.007\ lBB_t^{***} - 0.07\ lvex_t^{***} - 0.06\ lr_t^{***} - 0.08^{***}$$

$$\Delta lB_t = -0.07\ \lambda_t - 2.04\ \Delta ly^{***}_{t-1} - 0.86\ \Delta ly^{*}_{t-2} + 0.02\ \Delta lB_{t-1} - 0.01\ \Delta lB_{t-2} + 0.09\ \Delta lpinv^{***}_{t-1} + 0.01\ \Delta lpinv_{t-2} + 0.31\ \Delta lH_{t-1} - 0.23\ \Delta lH_{t-2} - 0.02\ lBB_t^{***} - 0.04\ lvex_t^{***} - 0.01\ lr_t + 0.33$$

$$\Delta lpinv_t = -0.66\ \lambda_t^{***} + 4.57\ \Delta ly^{***}_{t-1} - 3.04\ \Delta ly_{t-2} - 1.24\ \Delta lB_{t-1} + 0.49\ \Delta lB_{t-2} - 0.21\ \Delta lpinv_{t-1} - 0.29\ \Delta lpinv^{***}_{t-2} + 0.79\ \Delta lH_{t-1} + 1.16\ \Delta lH_{t-2} - 0.03\ lBB - 0.50\ lvex^{***} - 0.44\ lr^{***} - 0.01$$

$$\Delta lH_t = 0.009\ \lambda_t - 0.09\ \Delta ly_{t-1} - 0.11\ \Delta ly_{t-2} + 0.11\ \Delta lB_{t-1} + 0.03\ \Delta lB_{t-2} + 0.01\ \Delta lpinv_{t-1} + 0.01\ \Delta lpinv_{t-2} - 0.62\ \Delta lH^{***}_{t-1} - 0.46\ \Delta lH^{***}_{t-2} + 0.008\ lBB_t^{***} + 0.002\ lvex_t + 0.04\ lr_t^{***} - 0.11^{***}$$

Diagnostic tests		**Tests of:**	
$R^2_{\Delta B}$	= 0.68	LM serial correlation (lag 1)	11.280
$R^2_{\Delta pinv}$	= 0.85	LM serial correlation (lag 2)	9.679
$R^2_{\Delta ly}$	= 0.62	LM serial correlation (lag 3)	14.447
$R^2_{\Delta H}$	= 0.27	Jarq-Bera nonnormality	15.396*

Note: ***, **, * Denotes rejection of the hypothesis at the 1%, 5% and 10% level, respectively.

According to the result in Figure 3, a one standard deviation (SD) positive shock to government debt will cause an overall increasing positive impact on GDP growth, although the short run effect is negative. The same shock induces government debt itself to rise in three initial years before trending downward to zero-line. Private investment response is negative for four years before going toward zero line. Although the impact effect on human capital is negative, it becomes positive since second year.

Alternatively, the debt impulse to other variables is obtained based on the level-VAR version of the above model provided with bootstrapped confidence intervals (refer to Figure 4). The impulse response from VAR model quite resembles the results obtained from VECM model from both sign and magnitude aspect. However, the confidence intervals suggest that the positive response of GDP growth is not strong enough to be significant. Debt response is also positive and significant only in the first five years. Private investment response is not significant. Finally, human capital can be considered significantly positive in the medium run. Overall, the impulse response result is in line with the initial data analysis provided in the introduction section (Figure 2) while providing more detail and precise information.

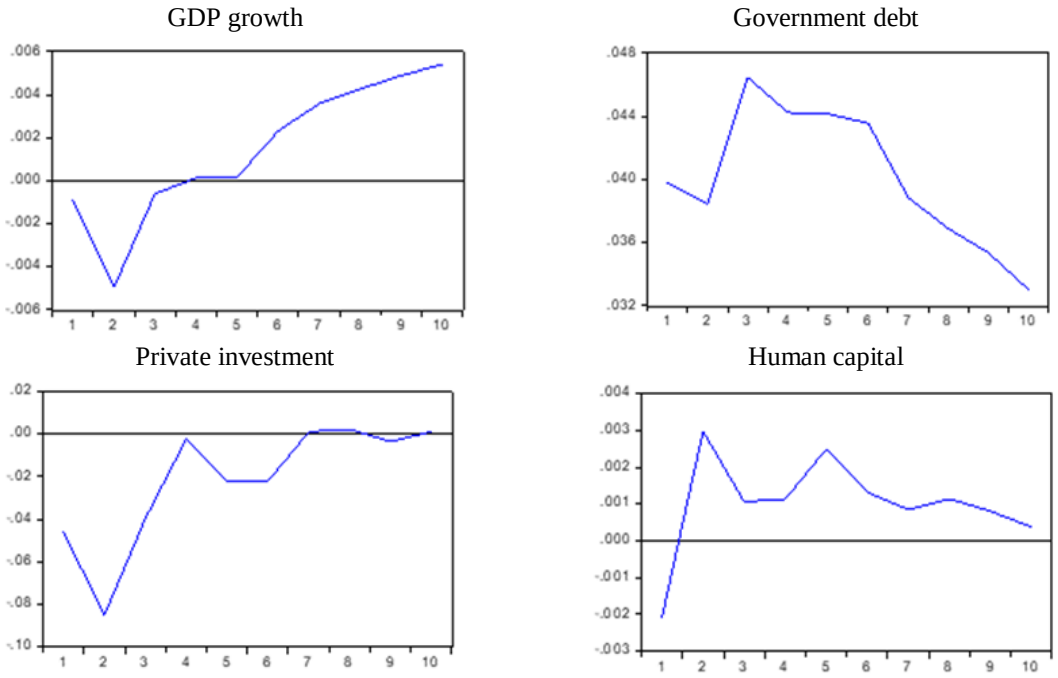


Figure 3 Response to one standard deviation generalized shock to government debt, VECM model, period 1985-2016

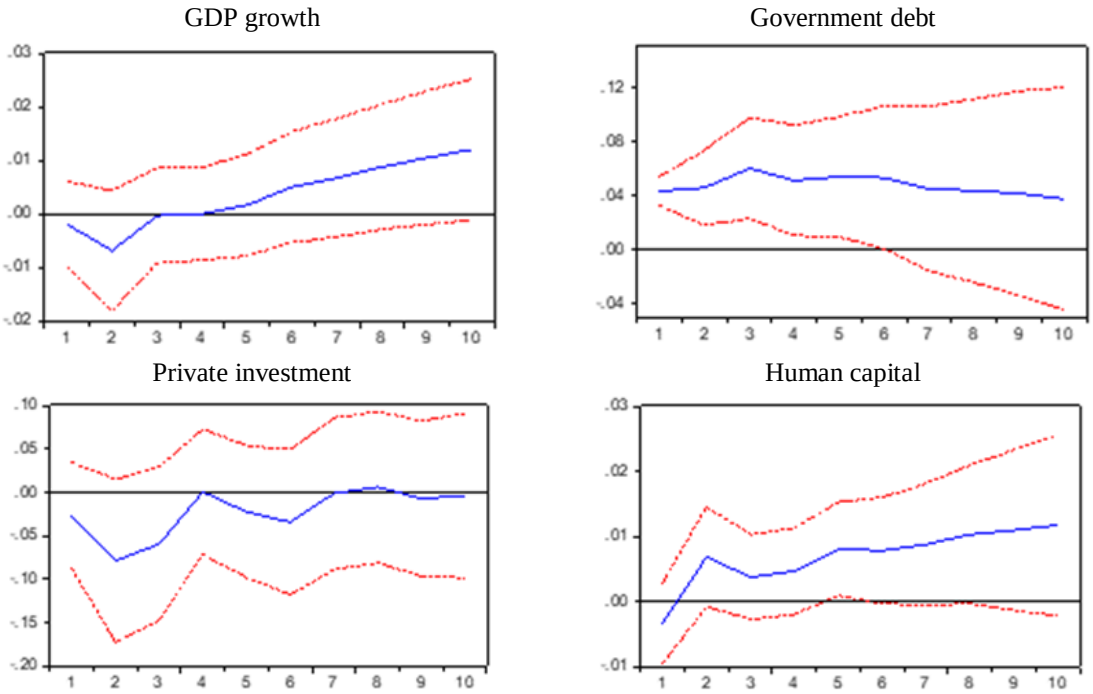


Figure 4 Response to one standard deviation generalized shock to government debt, VAR model, 1985-2016.

The main result of this paper is the positive but insignificant response of GDP growth to government debt in long run; as the VECM/VAR model is specified with focus on GDP growth. Knowing that, government debt is spent on development projects such as human capital and government capital investment it can be inferred that government debt has a positive effect on output growth through increasing productivity of private sector by increasing human capital and providing public infrastructure. Positive effect of government debt in a way that contributes to the production side is supported in some endogenous growth models (Aizenman et al., 2007). In addition, Malaysia's fiscal authorities use countercyclical fiscal expansion; therefore, the possibility of crowding out effect is least because when the economy is in bust phase, private sector activity and investment is reduced, thus, government sector intervention would not become a threat to private sector.

This result also has an implication regarding the appropriateness of the debt level in Malaysia in the last three decades. During 1985-2016, government debt average is 55.88 % GDP, which is very close to the self-imposed 55% debt ceiling by Malaysia's authorities. This means, government had been using debt-leverage about the optimal level (self-imposed debt ceiling). Besides, the median of debt is 50.2 % GDP, saying that half of the data is below this amount. Looking at these statistics and this paper result it can be inferred that fiscal authorities have well-managed debt level, preventing it to rise up to excessive and harmful levels. Considering the average and median of Malaysia's government debt, the positive and insignificant effect on output growth is acceptable.

The main result of this paper corroborates the finding of Asmaddy and Mohammad (2015) who found government debt positively affects productivity growth in Malaysia. Their paper is unique considering the scant literature addressing the issue of government debt on growth in Malaysia. They conclude that the expansionary fiscal policy boosts manufacturing and service sectors, which in turn, raises total factor productivity growth and overall growth. The reason is manufacturing and service sectors have the largest contribution to total factor productivity growth. Ang (2009) found that government investment crowds-in private investment in Malaysia. Knowing that government investment in capital infrastructure absorbs a large portion of government borrowings, it could be inferred that government debt would have positive effect on private investment. However, this paper found negative, insignificant effect on private investment.

In contrast to the findings of Woo and Kumar (2010), this paper does not support significant negative nexus between government debt and output growth/private investment. Woo and Kumar (2010) found adverse effect of government debt on output growth and private investment in emerging economies including Malaysia. The result of panel studies (e.g. Woo and Kumar, 2010) is not appropriate to be generalized to individual

countries, since debt-growth effect highly depends on individual economy's characteristics (Panizza and Presbitero, 2013).

Regarding negative insignificant effect of debt on private investment, our result is similar to the finding of two studies. First, Bende-Nabende and Slater (2003) found insignificant effect of external debt on two subsamples of 1971-1985 and 1986-1999 for four ASEAN countries including Malaysia, and second, Unteroberdoerster and Guimaraes (2006). Finally, the result of the effect of debt on human capital is positive and in line with Malaysia's government goals to increase productivity through education and training, yet the result did not turn out to be significant. Pattillo et al. (2002) various panel estimators for a sample of 61 developing countries did not found significant result except for the result from system-generalized method moment. That showed for debt below 18% of GDP the effect is positive on human capital accumulation at 10% significant level. However, above this level debt is associated with lower human capital accumulation.

CONCLUSION

The debate on debt-growth nexus has regained attention among scholars and policy makers in the last decade due to the general increase in the global debt levels. However, existing empirical literature has not reached a consensus on the effect of debt on economic growth. This paper attempted to investigate this issue in the case of Malaysia, an economically successful developing country. It is noteworthy that the government debt of Malaysia while steady rising since Asian financial crisis, had jumped to higher level as the aftermath of global financial crisis. Using VECM model and generalized impulse response analysis for the sample period of 1985-2016, this study found that government debt has a positive effect on output growth in the long run. Such effect is negative in the short to medium- run, although overall remains insignificant. Also, the human capital responds positively, but significant only in the medium run. The private investment response is entirely insignificant while the sign is negative in the medium term.

In order to yield crowding-in instead of crowding-out effect, policymakers need to stabilize the debt trend and effectively allocate government-borrowing funds. Malaysia's fiscal authorities seem to have well managed debt, as the result of this paper does not show any evidence for negative significant effect of debt on output growth or growth factors such as private investment and human capital. This conclusion is supported by (Baharumshah et al., 2017) finding that Malaysia's fiscal deficit is sustainable.

Since Malaysia fiscal authority spend the borrowed money into development expenditures and the debt has not been excessively high, (average level was of 55.88 % of GDP during 1985-2016) according to endogenous growth theories such as Greiner (2007) and Aizenman et al. (2007), these investments could generate externalities to enhance productivity of private investments and labor force. Although the debt effect on growth and growth factors namely private investment and human capital are insignificant we do not conclude in favor of debt neutrality as in Ricardian theorem, because in order to do that, further examination about the response of private saving to government debt is required. The findings of this paper indicate although in short run negative effect can be observed, in the long run economic growth shows positive-insignificant trend in response to government debt shock. Moreover, human capital responds positively but only significant at some points in medium term. Finally, private investment response is null to this shock.

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