

GOVERNMENT DEBT-ECONOMIC GROWTH NEXUS IN ASEAN-4 COUNTRIES

Hoda Hajian*¹

Azali Mohamed²

Shivee Ranjane Kaliappan³ 

¹University of Science and Culture, Islamic Republic of Iran

^{2,3}Universiti Putra Malaysia, Malaysia

ABSTRACT

Given a background of controversial political and theoretical academic debate and diverse empirical result, as Checherita and Rother (2010) concluded government debt and economic growth relationship is a country specific issue. This paper aims to investigate the causal and dynamic effect of government debt on output growth in the context of developing economies with generally medium debt regime in ASEAN-4 countries. Namely, Indonesia, Malaysia, the Philippines and Thailand during 1985 to 2019 years. A robust multi-variable vector autoregressive (VAR) model at level is employed to capture the long run relations, and causality is addressed using Toda-Yamamoto (1995) approach. As a by-product of the analysis the effect of government debt on two essential factors of sustainable GDP growth, namely, private capital formation and human capital is examined. The findings of this paper which contrast with the general negative effect found in some empirical studies for developing countries, shows debt does not cause output growth in Indonesia, Malaysia and Thailand but the reverse is true. GDP response to debt shock is negative, positive and positive, respectively yet statistically insignificant. In other hand, in the Philippines the result shows the economy is debt-driven as debt positively cause GDP without improving private investment or human capital. Overall, the findings support well debt management. Given current debt regime, improvements on tax collection and government fund allocation in terms of priorities and efficiencies must be continued.

Keywords: Government debt, GDP Growth, ASEAN countries, VAR model, time-series.

JEL: O49; C32

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*Correspondence:
Hoda Hajian

E-mail:
hoda.econ.upm@gmail.com

Introduction

The issue of government debt has long engaged great economists. Along with the academic and political debate the general increase in the worldwide debt level stimulated new series of empirical and theoretical research. However, they only add to the dimensions of the controversy. Overall, several conclusions has been highlighted. First, debt-growth relationship is an empirical question. Second, this relationship is quite heterogeneous across countries. Therefore, result obtained from large panel research cannot be generalized to individual countries.

From theoretical perspective, recent endogenous growth models argue that fiscal policy and even the method of finance can influence economic growth and private investment. In many theories, private investment is considered as the main channel through which debt affects economic growth (e.g. Modigliani (1961), Diamond (1965)). In view of neoclassical economic school of thought, debt mainly negatively affects growth (Elmendorf and Mankiw, 1999) while in endogenous growth models some cases of crowding-in is considered, that could particularly relate to the case of developing countries. In that, the financially constrained developing governments channel the debt funds into development expenditure which is highly productive and necessary for future economic growth. Finally, the third strand of economic views, the so-called “Ricardians” hold the view that debt-financed expenditures are the same as tax-financed expenditures. Implying that debt does not have a real impact on output, etc.

This paper aims to investigate government debt-growth issue in four largest emerging/developing ASEAN countries namely, Indonesia, Malaysia, the Philippines and Thailand (ASEAN-4). ASEAN-4 countries have experienced high growth rate - to less extent for the Philippines- in the past recent decades and considered as economic miracles. They also have bright economic growth prospect. In the other hand, these countries has experienced continuous budget deficit since 1970, except the period between 1985 until before the 1997 crisis. Furthermore, the government of these countries are known to be successful in using of counter cyclical fiscal policy to stimulate economic growth. They are also known to be conservative regarding maintaining the budget deficit ratio within the self-imposed ceiling rate. Medium level budget deficit caused by expansionary fiscal policy adds to the government debt stock. Theoretical literature contains that this policy of debt accumulation can have its own impact on several macroeconomic factors such as economic growth and private investment which are the focus of this paper. Finally, government debt has the potential to influence human capital, specially, in developing countries.

Economic theory does not provide a unanimous prediction for the relationship of government debt and economic growth rather the conclusion is that the issue is an empirical question. Recently, as the consequence of the rise in global debt trend a number of empirical studies emerged to find a global link between debt and growth in developed and developing countries using sample of large number of countries. Reading related literature three conclusions can be made: 1- the results are contradictory. 2- Such relationship is unique for every country and the results obtained for the panel sample cannot be simply interpreted for each individual country (Checherita and Rother, 2010). 3- While all above argument makes the case for investigating this relationship at country level there are lack of evidence for such empirical studies.

Considering the various theoretical prediction and inconclusive empirical findings majority based on large panel samples, the question remains whether the government debt accumulation in ASEAN-4 countries contributed to economic growth? This paper attempts to employ time-series models and tools to address this issue in ASEAN-4 countries. The paper is organized as follows. Section 1.1. provides economic background of ASEAN-4 countries. Section two presents literature review. Methodology, model specification and data are discussed in section three. The result of this paper is presented in section four. Finally, section five is to conclude this research.

Economic Background

This section elaborates on the historical data of government debt and the issue in ASEAN-4 countries. ASEAN-4 experienced budget deficit during 1970-2019 years except between

1985-1996, in the economic boom. Although budget deficits may not be very large, they have been persistent and worsened after each economic crisis. As a result, the government debt spiked after adverse events, especially in mid-1980s. Next as the aftermath of Asian financial crisis (AFC, hereafter) in 1997-98 debt rose again, another time after global financial crisis 2007-8 and currently due to Covid-pandemic. Government debt accumulation brief history in each country is followed.

Indonesia started 1980 with high amount of external debt utilized to finance development. Declining oil prices in the first half of 1980s resulted in the rapid accumulation of debt from 16.9 (%GDP) in 1981 to 52.44 (%GDP) in 1987. In the late 1980s and mid 1990s, during Indonesia's economic boom, total foreign debt (both government and private) increased due to high foreign investment. AFC hardest hit Indonesia among ASEAN-4. Already having high level of total external debt, the currency depreciation multiplied the burden of government external debt. To restore market confidence Central Bank bailed out private companies including private bank's external debt. These events explain the massive evolution of government debt in a short time. Government debt spiked from 26.8 (%GDP) in 1996 to 92.91 (%GDP) in 1999.

Since 2000, authorities focused on debt reduction to prevent negative consequences of running large debt and to create fiscal space. Meanwhile, Indonesia has undergone fiscal, economic, social and political reform. Fiscal and economic reforms that were part of the debt exit strategy and fiscal sustainability include but not limited to: government decentralization, cutting off food and energy subsidies and privatization. Such that, the burden of debt service declined leaving some resources for development expenditure. Moreover, the composition of government debt has shifted toward domestic debt. The ratio of domestic debt relative to total debt increased from 45% in 2005 to 54% in 2010.

In Malaysia, large stock of government debt cumulated from 1980 to 1987 reaching 100 percent of GDP due to increase in government spending on projects in the aftermath of commodity crisis 1985-86. Afterwards the debt reduction episode embarked from 1987 to 1997 in that government debt reduced from 80% to 35%, respectively. The decline was due to some factors such as high economic growth, sound fiscal policy, well debt management and privatization of government agencies leading to debt reduction to the minimum of 31.9% in 1997. Since government of Malaysia dominantly relies on domestic borrowing, its debt is not sensitive to exchange rate fluctuation. After the experience of mid-1980s crisis Malaysia has taken a conservative approach to foreign debt; that was beneficial in AFC considerable currency depreciation. After AFC, government utilized expansionary fiscal policy to alleviate the effect of economic slowdown. During 1998-2002 expansionary monetary policy via lowest interest rate supported private sector activities. Fiscal consolidation effort imposed by the government from 2000 to 2007. But, subsequent to global financial crisis (GFC) government debt increased again as large fiscal stimulus was implemented. Something to add for recent event.

In the Philippines, the historical high government debt level in 1986, was accumulated since 1970 as a result of sizable and burdensome borrowing to finance investment in a short time. Beside banking crisis in 1980s, the Philippines defaulted on its external debt in 1983. External debt crisis continued until 1992. during that time, servicing the debt was the main challenge for the new government of Aquino. By improving economic condition from 1987 to 1998 the country could reduce the debt level from 80% to 51% respectively. By the outburst of AFC the debt took rise again until it reached the peak of almost 70% in 2003. In following years, as the economy recovered Philippines managed to reduce its debt to the minimum of

39.6% in 2019. The debt reduction accomplished mainly by government significant fiscal consolidation via reducing expenditure, privatization, and major tax reforms in 2005-6 to improve poor government revenue.

In Thailand during 1970s, average of government debt to GDP was 22.3%. But the sustained deficits in the 1980s led to a rapid rise in the government debt level leading to a peak of over 36 per cent in 1986. Meanwhile, in this period Thailand suffered from banking crisis from 1980 to 1987. The period of budget surpluses during economic boom from 1987 to 1996 created the resources to pay down the government debt. And the debt ratio fell to a record low of about 11 per cent of GDP in 1996 as implementing government fiscal consolidation including 3% of GDP reduction in government spending from mid 1980s to late 80s. But the AFC in 1997 made a dramatic rise in government debt in following years. Debt reached the climax of near 60% GDP in 2001. The sharp upward trend triggered worrisome and forecast of debt to be exceeding 65% in 2005. But actually Thailand managed to considerably reduce its debt from 2001 to 2007 by about 20% of GDP. Global crisis in 2008, reversed the trend upward, yet remained around 40% (GDP) till 2019.

Table 1 shows the average level of government debt of ASEAN-4 in the last five decades. The debt level is far more than the 25% recommended by IMF (Makin, 2005). While the general trend of government debt in Malaysia has been upward since 1997, that has triggered concerns among the policy-makers and the public in the recent years in Indonesia in the late 2010s debt is about and below 30% GDP that is considered relatively low. Some economist criticize too low government debt as it prevents formation of necessary capital investment in the country. Having said that, the debt management in ASEAN-4 is known to be prudent. According to formal statistics the operational budget has been in surplus for almost all of the 1985-2019 years. Prudent governments should only borrow to finance investment to be able to maintain a sustainable budget balance. Much of the change in fiscal positions in ASEAN-4 is explained by discretionary fiscal stimulus packages consisting of development expenditures. Government debt can increase in the future due to factors such as infrastructure spending, stimulating private consumption and expanding social safety nets (Kawai and Morgan, 2013).

As a preliminary data analysis Figure 1 shows the scatterplots of the pair of initial government debt-GDP growth data with a fitted regression line for each sample country. The slope of the lines are negative for Indonesia and the Philippines. In contrast, for Malaysia and Thailand the slope is positive. A part of this initial result seems to be in line with the general negative view about the effect of government debt. Whereas the other part is in line with growth-supporting view similar to the result of Ferreira (2016) and Abbas and Christensen (2010). This further highlights the need for a formal analysis of the issue in each of ASEAN-4 countries.

Literature Review

In economic theory literature, there are different views regarding the effects of government debt. That can be classified into four categories. First is the Keynesian's view that suggests in the short run government debt-financed fiscal expansion, specially in recession periods, can increase demand and subsequently output. Second view, is the so-called Ricardians, which following the work of Barro (1991). Barro argued that government borrowing which creates deficit in government saving will be compensated by private sector's saving rise, thus, government borrowing action cannot have any effect on the real sector. Third group refers to the conventional neoclassical view of public debt. They hold negative effect for public debt rise (Mankiw, 1999) as it reduce capital formation and thus output in the long run. The

literature contains two mechanisms for the reduction in capital accumulation that are called crowding-out effect. One way is that, large government borrowing could compete with private sector in loanable funds market, and reduce available funds for private sector. Another way, is crowding-out through interest rate; as the government borrowing may push the interest rate up, therefore, reduces the private investment. Other adverse effect could occur via expected higher uncertainty about the economy and future taxes when the government debt level is high.

Moreover, “debt overhang” hypothesis coined by [Krugman \(1988\)](#) argues that in low income developing countries when the government debt surpasses its future capacity to pay off the debt, economic growth declines. Having high opportunity cost, a high proportion of a countries’ foreign exchange earnings should be used for servicing the foreign debt ([Krugman, 1988](#); [Sachs, 1989](#)). As [Hofman and Reisen \(1990\)](#) puts it the requirement to service debt reduces funds available for investment purposes. In addition, a high proportion of government expenditure budget will be absorbed by debt service burden, thus, changes the composition of public spending ([Checherita-Westphal and Rother, 2012](#)). Above reasons decline incentive to invest.

Table 1: Average government debt level in five decades in ASEAN-4

Year	Government Debt (as percent of GDP)			
	Indonesia	Malaysia	Philippines	Thailand
1970s	NA	42.13	17.14	22.33
1980s	34.4	79.22	51.6	40.30
1990s	45.84	50.19	60.21	21.33
2000s	53.46	43.00	55.86	46.27
2010s	29.07	53.13	43.20	43.00
2019	30.5	52.7	39.6	41.1
2020	38.5	60.7	53.5	50.5

Fourth group among neoclassicals showed that government debt can contribute to GDP growth, utilizing endogenous growth models that incorporate government debt in the supply side of production function. These theories usually consider conditions for this outcome to happen such as when government spend borrowings into productive investment in the country. In developing countries, especially at the initial stages of development, the return on public investment in infrastructure such as roads, electricity, etc., human capital and health is quite high. Yet, usually there is a threshold for borrowing, exceeding that limit negative consequences gets larger than the positive impacts ([Greiner, 2007](#)).

Empirical studies on the effect of government debt before the notable study of [Reinhart and Rogoff \(2010\)](#) was a few and mostly about advanced economies specially the U.S. More studies in developing countries had focused on external debt effect motivated by debt overhang hypothesis of [Krugman \(1988\)](#) and [Sachs \(1989\)](#). [Pattillo, et. al \(2002, 2004\)](#) reported negative and significant impact on growth at high debt levels (typically, over 60 percent GDP), but an insignificant impact at low debt levels. In contrast, [Cordella, et. al. \(2005\)](#) found evidence of debt overhang for intermediate debt levels, but an insignificant debt-growth relationship at very low and very high levels of debt. Overall the mainstream view about the effect of high government debt was negative ([Elmendorf and Mankiw, 1999](#)). [Pattillo, et. al \(2004\)](#) found that the negative effects of external debt transmit to growth through physical capital accumulation and total factor productivity.

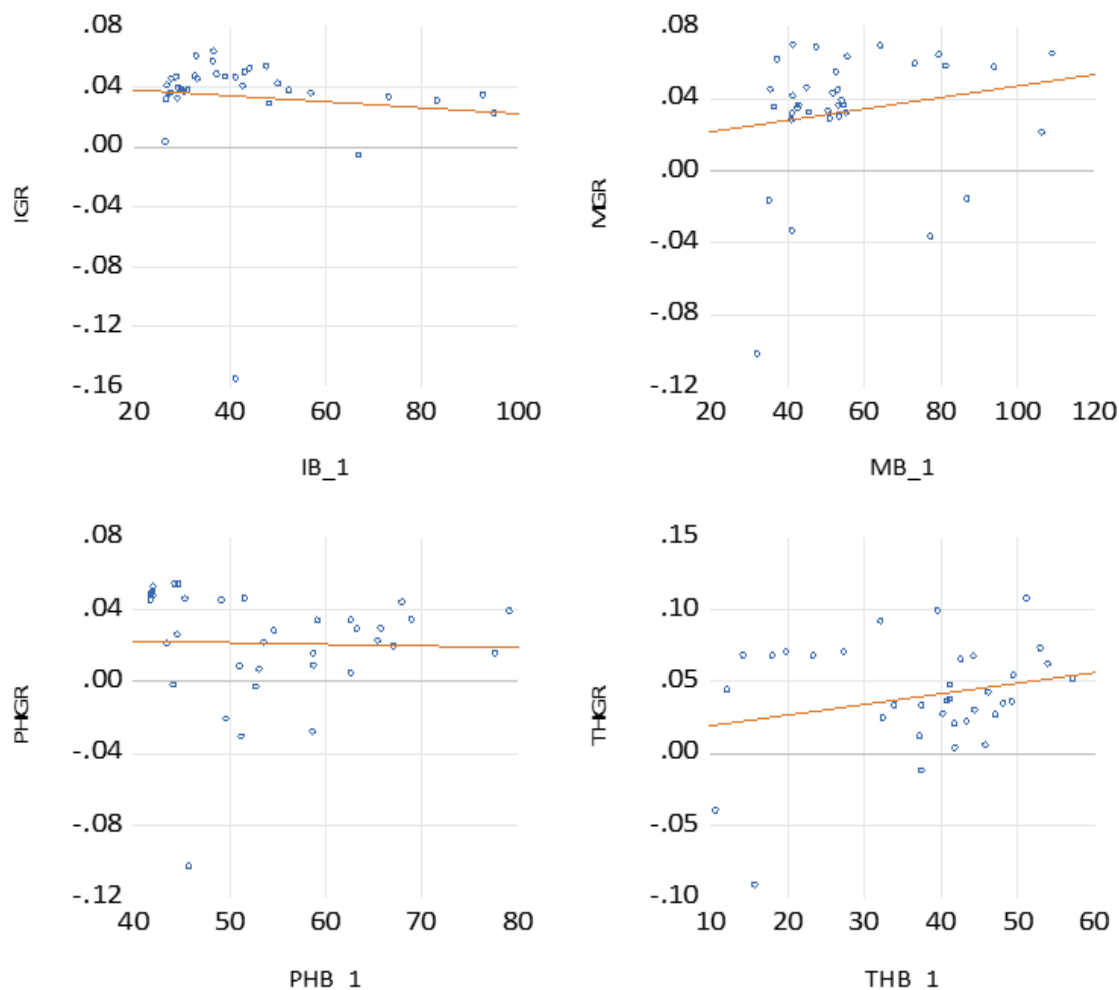


Figure 1: presents the initial debt-GDP growth scatterplot for each country

The first left plot shows the pair of data for Indonesia, that has a correlation of -0.109. Next plot refers to the data of Malaysia with a correlation of 0.233. Following plots on the right show data of the Philippines and Thailand with correlation of -0.058, and 0.263, respectively.

After 2007-2008 financial crisis followed by the European debt crisis, debt-growth relationship attracted numerous studies, leading by [Reinhart and Rogoff \(2010\)](#). [De Rugy and Salmon \(2020\)](#) reviewed 24 panel studies in the last decade (2010 to 2020) and concluded that all except two studies found negative effect of high government debt on output growth irrespective of finding a threshold or not. They also mentioned that the majority of the thresholds were found to be between 75 to 100 percent of GDP. However, [Law et al. \(2021\)](#) found a much lower threshold of 51.65 % GDP for 71 developing countries. [Checherita and Rother \(2012\)](#) found negative relationship between government debt and growth at high levels of government debt (90 % GDP). The same result was found for the 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.

Unlike above mentioned, other studies did not find a common threshold. For example, [Chudik et al. \(2017\)](#) using panel ARDL for a sample of 40 developing economies finds negative effect. Negative effect and significant effect was also found by [Woo and Kumar \(2010\)](#) for a

sample of 38 advanced and emerging economies during 1970-2007. They employed multiple panel estimators and accounting for several econometric issues. Moreover, [Schclarek \(2004\)](#) found linear negative and significant relationship among public external debt and GDP per capita growth and also between public external debt and capital growth for a panel of 59 developing countries during 1970-2002. Using exogenous threshold dummies of total external debt of 20% GDP and 30% GDP alternatively no evidence for nonlinear relationship was obtained. [Panizza and Presbitero \(2013\)](#) in a recent survey of debt-growth nexus in advanced countries emphasize on the point that the debt-growth nexus is not homogenous across countries, and future research should take account of this fact. Among the rare evidence from the single country studies in developing countries include [Bal and Rath \(2014\)](#) that examined the effect of public debt (divided into domestic and external debt) on GNP per capita. Other explanatory variables were debt service, total factor productivity and export. They found significant adverse effect for both public debt variables and recommended to reduce the debt. Prior to Bal and Rath, [Singh \(2012\)](#) investigated domestic debt and growth relationship in India for the period of 1959-95, using cointegration and Granger causality test and concluded that Ricardian equivalence prevails as debt did not Granger cause growth. Moreover, [Swamy \(2015\)](#) observed a negative relationship from debt to growth. In contrast to above negative results, [Thao \(2018\)](#) is among the few researches that found government debt promotes GDP growth. He used a panel sample of 6 ASEAN countries, namely, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam over 1995-2015. Employing GMM estimation technique he found significant positive effect of government debt on GDP growth.

While most of the recent papers as reviewed above, have utilized single equation models and panel estimators such as the generalized method of moments (GMM) and system-GMM, application of vector autoregressive (VAR) modelling and impulse response tool is rather unique. Statistically, this approach is suitable to disentangle the negative debt-growth correlation usually found in empirical papers. In other words, most of the previous findings only showed the existence of negative correlation but did not address the issue of causality. That means, whether high debt negatively affects output growth or low output growth causes government debt to increase. Few recent papers such as [Lof and Malinen \(2014\)](#) applied panel bivariate VAR model and impulse response technique to address this issue. Their robust result indicated debt did not cause economic growth. The impulse response of the total sample in the said study shows an almost insignificant response. However, in low and medium debt regimes, 0-30% and 30-60% respectively, debt shock induced a positive and significant response to economic growth. These studies are outstanding from other literature in terms of the applied methodology. Nonetheless, some shortcomings prevail. First, like most of the relevant literature on this issue, they used large panel samples to derive global stylised facts. Country-specific studies are scant. Second, they used bivariate models. Lof and Manila (2014) admit that although the 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.

In a survey study of advanced economies, [Panizza and Presbitero \(2013\)](#) concluded that although empirical studies tend to find negative effects of high debt on output growth there is no paper that makes a strong case for causality of debt to growth. Nonetheless, the results are quite contrasting in a new strand of debt-growth research. 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 \(2010b\)](#) in 93 low-income countries and emerging markets, found bidirectional relationship.

In contrast, no causality relation was found by [Puentes-Ajovín \(2015\)](#) in 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 such as in [Jacobs et al. \(2020\)](#) for 31 OECD countries, [Kempa and Khan \(2016\)](#) in G7 countries, [Lof and Malinen \(2014\)](#) in a sample of 20 advanced countries, indicate uni-directional relationship from growth to debt and not vice versa.

In sum, majority of the extant empirical literature on the effect of government debt on GDP growth shows negative effect based on large panel data, whether a threshold is found or not ([De Rugy and Salmon, 2020](#)), without making a strong case for causality of debt to growth ([Panizza and Presbitero, 2013](#)). Although it has become a fact that debt-GDP growth is a country specific empirical issue both in the matters of causality and sign there is a lack of studies based on single countries including ASEAN-4 economies.

Data and Research Method

The model in this paper follows the standard neoclassical growth model, which has been the workhorse for examining the effect of government debt on output growth in the empirical papers. More specifically, our model is based on derivation of [Mankiw, et al. \(1992\)](#) of the Solow growth model which shows, output per capita depends on population growth, and investment in physical capital, and human capital.

$$\ln Y_t = \ln A_0 + g_t + \frac{\alpha}{1-\alpha} \ln(s_k) - \frac{\alpha}{1-\alpha} \ln(n + g + \delta) + \frac{\beta}{1-\alpha} \ln(h^*) \quad (1)$$

Where: A_0 is level of technology; y_t is the output per capita or labour; h^* is the level of human capital; s_k the share of output that is allocated for physical 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 above output per capita function, to include government debt. Adding debt variable (external or government debt) to the growth equation to investigate the effect of it on growth is a common practice in empirical literature. To name a few examples of this approach in panel framework, are: [Pattillo, et. al., \(2011\)](#), [Sen et al., \(2007\)](#), [Clement et al., \(2003\)](#), [Checherita-Westphal and Rother \(2012\)](#), [Schclarek \(2004\)](#); and in time-series framework: [Bal and Rath \(2014\)](#), [Mohd Daud et. al., \(2013\)](#), [Asmaddy and Mohammad \(2015\)](#). Therefore, present study employs bellow baseline growth model:

$$\ln Y_t = F(\ln inv, IHK, ID) \quad (2)$$

Where: $\ln y_t$ is the real per capita GDP; $\ln inv$ shows private investment ratio which is captured by ratio of private fixed capital formation to GDP. IHK is human capital stock indexed by total average years of schooling of the population above 25 years old. ID is the ratio of government debt stock as percent of GDP which represent the government debt burden of the country. All variables are used in logarithm form indicated by \ln . Data are collected for the period of 1985 to 2019 from the following sources. The data of government debt is collected from A historical public debt database, [Abbas, S. M, et al. \(2010\)](#), government debt from 2010 to 2019 is obtained from the World bank database. The data of human capital is obtained from Barro-Lee Human capital database (total population over 25 years), v. 2.1, Feb. 2016 . All other data are collected from World Bank database, June 2021. For the years of 2010 to 2019 Barro-Lee data projection was used.

In addition, this model incorporates some control variables, which are important determinants of both economic growth and government debt, namely, budget balance, ex-

change rate volatility and real interest rate. Budget balance variable captures general economic instability; real interest rate is included as a monetary policy tool. Finally, exchange rate volatility, that is an economic risk factor, could reflect external shocks which are relevant to ASEAN-4 economies. Large currency depreciation during AFC, considerably increased external government debt value in terms of domestic currency. That experience lead to government debt restructuring and relying further on borrowing from domestic market.

These control variables are expected to be stationary. This fact led us to specify the control variables in the vector of exogenous variables¹. This approach is beneficial for the need to keep the number of endogenous variables small partly due to small sample size. In addition, employing rather small VAR model will reduce the problem of model identification. This study Utilizes a VAR model with four endogenous variables, namely government debt, GDP per capita, private investment and human capital; and three exogenous variables including budget balance, exchange rate volatility and real interest rate. Since all explanatory variables are endogenous with respect to the dependent variable and we found strong different cointegration relations in each of the sample countries, employing a VAR model is preferred over the single equation modelling (Stock and Watson, 2001). In a VAR model all variables can be endogenous whereas using single equation estimators such as ARDL, FMOLS, DOLS explanatory variables must be exogenous with respect to the dependent variable (Pesaran et al, 2001), in this case, GDP growth. From theoretical perspective these single-equation models assume a single cointegration relation normalizing on the dependent variable (GDP growth) which is not the case here. Table 2 summarizes the variables of the model.

The contribution of this paper is to utilize a small-reduced VAR model to entangle the issue of debt-growth causality beyond bivariate VAR models and investigate the dynamic response of GDP growth to a shock to government debt stock in individual ASEAN-4 economies using historical data from 1985 to 2019. As a by-product of the model, responses of the two major growth factors, namely, private investment and human capital to a debt shock are presented. However, the model is focused on GDP growth.

Basically, in this VAR model, GDP per capita equation represents endogenous growth model (equation 4). This model in terms of variable specification resembles the growth model used by Mariotti (2002) who investigated the effect of government spending on GDP growth. The theoretical and empirical support for including government debt in growth model was reviewed in section 2. Private investment equation represents endogenous investment model (equation 5); the prominent empirical paper by Aschauer (1989a, 1989b) is among the early works that emphasized on the role of fiscal policy on private investment. Aschauer (1989a) concludes that government budget deficit can be important in determining private investment decisions and in long term, government debt can be found to crowd-in private investment if it is spent on productive public capital that has spill-over effect to private investment. Bende and Slater (2003) in both individual country estimation but significant only for Malaysia (negative-significant in the Philippines) and a pool-sample of ASEAN-4 countries (1971-1999) found crowding-in effect of external debt. The theoretical and empirical literature consider private investment as an important channel through which debt affects economic growth.

Human capital is written as a function of output growth index, private investment, government debt (equation 6). Pattillo, et al. (2004) argued that government debt is a determinant of human capital and investigated the effect of government debt on human capital. And finally, we have government debt as a function of output per capita, private investment,

¹ Similar approach is used by Guimaraes and Unteroberdoerster (2006).

human capital and the control variables, budget balance, interest rate and exchange rate volatility (equation 7). Low or drop in output growth can cause government debt to rise. Also high economic growth can contribute to debt reduction if it is the government policy. Government budget balance, interest rate and exchange rate volatility (regarding external portion of government liabilities) are also important determinants of government debt.

Table 2: Variable Description

	Variable	Form-transformation	Description	Source
ly	Real GDP per capita –local currency	Real per capita	Index for growth	WB2
D	Gross government debt	% GDP	Gross outstanding central government debt	IMF3 new database
pinv	Private domestic investment	% GDP	fixed capital formation-private sector minus FDI (%GDP)	WB 4
Hk	Human capital stock	Linear interpolation with respect to time	Average years of total schooling of people age above 25 years old.	Barro-Lee Human capital database (2016)
BB	Budget balance	% GDP	Final budget balance	WB and country's Central Bank websites
vex	Volatility of real exchange rate to USD	-	Subtracting trend (using Hodrick-Prescott filter) from real USD exchange rate	WB
r	Real interest rate	-	Bank lending interest rate, usually refer to short and medium-term needs of borrowers, adjusted for inflation by the GDP deflator	WB

Notes:

1. All data are annual and transformed into logarithm form
2. WB indicates World Bank database June 2015 latest version.
3. IMF, indicates International Monetary Fund
4. Private investment for Indonesia is not provided in World Bank (WB) 2015 database. The paper used data from (Bende-Nabende & Slater, 2003) data for 1985-1999 years. Data for 2000-2014 was calculated by reducing government development expenditure plus FDI from total fixed capital formation. Data of development expenditure is taken from Ministry of Finance Indonesia. The rationale behind it is that most of government development expenditure in Indonesia is in infrastructure. Therefore, development expenditure is a good proxy for government investment or government capital formation.

Referring to above model specification the reduced form VAR representation is as follows:

$$ID_t = ly_{t-1} + \dots + ly_{t-k} + lpinv_{t-1} + \dots + lpinv_{t-k} + IHK_{t-1} + \dots + IHK_{t-k} + ID_{t-1} + \dots + ID_{t-k} + lbb_t + lr_t + lvex_t + c \quad (3)$$

$$ly_t = ly_{t-1} + \dots + ly_{t-k} + lpinv_{t-1} + \dots + lpinv_{t-k} + IHK_{t-1} + \dots + IHK_{t-k} + ID_{t-1} + \dots + ID_{t-k} + lbb_t + lr_t + lvex_t + c \quad (4)$$

$$lpinv_t = ly_{t-1} + \dots + ly_{t-k} + lpinv_{t-1} + \dots + lpinv_{t-k} + IHK_{t-1} + \dots + IHK_{t-k} + ID_{t-1} + \dots + ID_{t-k} + lbb_t + lr_t + lvex_t + c \quad (5)$$

$$IHK_t = ly_{t-1} + \dots + ly_{t-k} + lpinv_{t-1} + \dots + lpinv_{t-n} + IHK_{t-1} + \dots + IHK_{t-n} + ID_{t-1} + \dots + ID_{t-n} + lbb_t + lr_t + c \quad (6)$$

The optimal lag for the above VAR model is chosen based on Akaike information criterion (AIC). Since this criterion compared to Schwarz information criterion (SIC) selects higher order of lags, which is more appropriate in order to better capture the behaviour of the data in small samples. Prior to estimation of the model the level of integration of the variables must be determined by unit root test. Augmented Dickey Fuller (ADF) test is a dominant test procedure that is also followed in this research. Usually it is the case that economic time-series are integrated of first order. Furthermore, economic theory suggests the variables in the growth function, namely, output growth, investment rate, government debt and human capital are cointegrated. Applying Johansen cointegration test, verifies this issue. Information regarding unit root and cointegration has implication in VAR model specification. [Engle and Granger \(1987\)](#) suggest that both VAR model at level and vector error correction model (VECM) which regress variables at first difference on their lags, are appropriate to represent the cointegrated relationship among the variables. That means the long run constraint which is imposed on the level variables in VECM are also satisfied asymptotically in a level VAR model. [Ramaswamy and Slok \(1998\)](#) outlined several advantages of using the level VAR as opposed to VECM. The most notable argument in favour of the level VAR is the economic interpretation attached to the impulse-response functions of the model. While the impulse responses from the VECM tend to imply that the impacts of certain shocks are permanent, those from the level VAR allow history to decide on whether the effects of shocks are permanent or not. They further note that if there is no a prior theory to suggest the number of cointegrating vectors and how to interpret them, the VAR model in level for cointegrated series is a reasonable approach.

The issue of causality between GDP growth and government debt had been less attended in related empirical studies. To examine this issue this research employs [Toda-Yamamoto \(1995\)](#) method. The merit of using this method compared to Granger causality test by [Granger \(1969\)](#) is that it can be used to test general restrictions on the parameter matrices even if the processes may be integrated or cointegrated. Given that there is cointegration among the variables, it is expected that at least one direction causality will be obtained.

In order to make inferences about the effect of government debt on output growth, generalized impulse-response (GIR) method proposed by [Pesaran and Shin \(1998\)](#) is used. The graphical response function provided by this method provides dynamic response of the variable through the specified 10 year-period, including the magnitude and sign of the effect within the bootstrapped generated confidence intervals of ± 2 standard deviation. If both of the generated bootstrapped lines fall either in positive or negative area, then, it can be inferred that the effect is significant, otherwise insignificant. The merit of using GIR is to circumvent the issue of variable ordering² meaning that this method is invariant to the order of the variables. Unlike other identification methods such as Cholesky ordering that hold some variables constant at the time of shock, GIR takes variables to be variant. This property of GIR is quite useful in current situation. Usually, ordering of the variables come along with several problems that makes the ordering assumptions unrealistic. The potential simultaneous effect among some variables and country specific economic differences are among the challenges for variables ordering.

However, to justify appropriateness of the choice of GIR shock identification, the result of Cholesky impulse-response based on two alternative variables ordering will be presented in

² This problem is dominant in the popular Sims or Cholesky method

Appendix A. Moreover, [Lof and Malinen \(2014\)](#) found similar result from the VAR model which debt was first placed and the model that debt came second after output growth.

Results and Discussion

Table 2: ADF Unit Root Test Result of The Variables Included in Growth Model for ASEAN-4 Countries

Variable	Variable at Level		Variable at Frist Difference	
	C		C.T	C
Indonesia				
ly		-1.527		-4.202***
lpinv		-3.126		-7.584***
IDebt		-2.438		-3.986***
IHK		-3.118		-3.604**
IBB	-4.982***			
IVEX	-3.450***			
lr		-3.636**		
Malaysia				
ly		-1.719		-5.263***
lpinv		-3.063		-4.201***
IDebt		-1.011		-4.131***
IHK		-3.101		-6.305***
IBB	-3.214**			
IVEX	-3.895***			
lr	-5.885***			
Philipines				
ly		0.370		-3.015**
lpinv		-2.490		-6.746***
IDebt		-3.366*		-6.030***
IHK		-2.708		-6.539***
IBB	-5.110***			
IVEX	-5.901***			
lr	-4.618***			
Thailand				
ly		-3.495*		-3.203**
lpinv		-3.277*		-4.003***
IDebt		-1.884		-4.096***
IHK		-1.626		-5.232***
IBB	-6.135**			
IVEX	-5.463**			
lr	-4.980**			

Optimal Lag length selection in ADF unit root testing was automatically selected from an automatic maximum lag based on SC criteria.

*, **, *** indicate 10%, 5% and 1% level of significance respectively.

C and T denote constant and trend respectively.

The result of ADF unit root test is presented in Table 2. The endogenous variables for all countries are I(1) at 5% significance level and the variables become stationary at first difference. As explained in methodological framework the endogenous variables enter the model at level. As expected based on theory, they form a cointegrating relation together as verified by the result of Johansen cointegration test in Table 3. That implies combination of I(1) variables becomes a stationary process. The control variables that are defined as exogenous in this model setting are shown to be I(0). Table 3 shows that there is at least one cointegrating relation in every country among government debt, output per capita, private investment and human capital.

Table 3: Johansen Cointegration Test Result

Hypothesized no of CE	Trace Statistic	Critical Value	Prob	Max-Eigen statistic	Critical Value	Prob
Indonesia						
None***	105.203	47.856	0.00	49.547	27.584	0.00
at most 1***	55.655	29.797	0.00	33.243	21.131	0.00
at most 2***	22.411	15.494	0.00	20.376	14.264	0.00
at most 3	2.035	3.841	0.153	2.035	3.841	0.15
Malaysia						
None***	70.091	47.856	0.00	41.158	27.584	0.00
at most 1*	28.932	29.797	0.062	20.572	21.131	0.059
at most 2	8.359	15.595	0.427	8.345	14.264	0.344
at most 3	0.014	3.841	3.841	0.014	3.841	0.904
Philippines						
None***	146.141	47.856	0.00	74.784	27.584	0.00
at most 1**	71.356	29.797	0.00	48.251	21.131	0.00
at most 2	23.104	15.494	0.00	22.802	14.262	0.00
at most 3	0.302	3.841	0.582	0.302	3.841	0.582
Thailand						
None***	152.091	47.856	0.00	85.291	27.584	0.00
at most 1***	66.799	29.797	0.00	52.340	21.131	0.00
at most 2	14.459	15.494	0.071	14.420	14.264	0.047
at most 3	0.039	3.841	0.842	0.039	3.841	0.842

Note: All specifications include constant and trend in VAR model.

- Prob means Probability

Having the information regarding stationarity of, and cointegration among the variables, we can proceed to estimation of the model. VAR model with optimal lag of three was chosen for all countries. Then the Toda-Yamamoto Granger causality test was performed, the result of which is presented in Table 4 below. The result of Toda-Yamamoto Granger causality for Indonesia, shows that government debt does not cause output growth. But it is the GDP growth that Granger cause government debt at 1 percent significance level. In case of Malaysia, no causal relationship from debt to GDP growth was found. However, strong evidence was obtained for output growth causing government debt in Malaysia. In the Philippines, government debt and GDP growth are shown to have bidirectional relationship. Government debt causes growth at 1 percent significant but the reverse causal relationship is rather weak only significant at 10 percent.

Table 4: Toda-Yamamoto- Granger causality test result

	VAR MODEL	INDONESIA	MALAYSIA	PHILIPINES	THAILAND
$Y \rightarrow B$	VAR (P=3)	3.276 (0.35)	3.016 (0.399)	20.182 (0.007)	5.087 (0.165)
$B \rightarrow Y$	VAR (P=3)	12.427 (0.00)	17.540 (0.00)	7.031 (0.07)	67.982 (0.00)

The result for Thailand, similar to Indonesia and Malaysia supports GDP growth causing government debt (at 1 percent significant level) not vice versa. Overall, result of Table 4 provides evidence for unidirectional causality that is from GDP growth to government debt. Only in the Philippines strong evidence for government debt causing GDP growth was found.

In the next step, the result of generalized impulse-response based on VAR ($p^*=3$) for all sample countries are presented in Figures 3 to 6. In Indonesia, the result of impulse response (Figure 3) shows a shock to government debt has negative effect on output growth only in short run while the response becomes insignificant after the first year. This result is compatible with the evidence of no causality from debt to GDP growth (Table 4). Although single equation models which have been examined by the authors of this paper (the result is not reported) tend to render a significant negative coefficient for government debt, this significant result is suspected to be due to the endogeneity problem. That is the case in [Handra and Kurniawan \(2020\)](#) and [Cholifihani \(2008\)](#). Regarding private investment although the response line is in negative area but the confidence bands encompass the zero-line (Figure 3); therefore, the private investment response is not significant. Within this concept, [Adiningsih \(2009\)](#) using monthly data of 2000-2008 and ECM model claims that rising government debt increases interest rate, thus, crowds out private investment. The response of human capital is negligible as well. Finally, response of government debt to itself shows that the increase in government debt fades away in a ten-year period.

In Malaysia, GDP growth response to a shock to government debt is increasingly positive but statistically insignificant (Figure 4). This result is compatible with the Granger causality result in that, debt did not Granger cause output growth in Malaysia (refer to Table 4). Similarly, positive and partially significant result was obtained by [Burhanudin et Al. \(2017\)](#) employing ARDL model with one lag and data of 1970 to 2015 of Malaysia. However, as mentioned in this study, choosing single equation models (e.g. ARDL) in this case is not appropriate. Similar to output growth response, private investment response to one standard deviation (S.D) debt shock is initially negative but then rising and positive. Yet, the response remains insignificant. Although their variable is not the same as present study, [Bende and Slater \(2003\)](#) found positive effect of 'external debt' to private investment for ASEAN-4 countries during 1971-1999. The government debt could have positive impact on Malaysia's GDP growth through increasing productivity. Using data from 1970 to 2012, [Asmaddy and Abubaker \(2015\)](#) found positive effect of government debt on growth of total factor productivity in Malaysia. Another reason that prevents crowding-out of private investment in Malaysia is its deep and liquid government bond market that provides the government with reliable and relatively low interest rate financing. This issue plus complementary monetary policy prevent interest rate to increase and reduce private investment.

A policy of debt reduction in the long-run can be observed through the response of government debt to a shock to itself (Figure 4). The insignificant response of output growth and private investment is compatible with the Ricardian's view implication. However, the result of above examination is not enough to conclude Indonesian and Malaysian consumer's

behaviour are of Ricardian type. For that to conclude needs further hypothesis testing in other studies.

In the Philippines (Figure 5) response of GDP to government debt shock is positive and significant for four and half years, although, both private investment and human capital response are close to zero line; thus, insignificant. The short term to medium run positive output growth shows that Philippines economy is debt-driven. In Thailand, debt shock generates a positive GDP response in short run (Figure 6). The response of output growth is significant in the first and second years. Furthermore, some positive but insignificant response of private investment (except third year that is positive and significant) and human capital are obtained in the short run before the effect tend to zero.

Overall, comparing the result of this study to previous literature, some are supportive and complementary to our finding, but some are contrasting. The contrasts, however, are due to different samples, different variables and methodology. For example, [Sen et al. \(2007\)](#) for a panel of six Asian countries including China, India, South Korea, Indonesia, Philippines and Thailand (1982-2002) and using a GMM estimation technique found external debt has moderate negative

Effect on GDP growth. A noticeable critique of their paper is the inclusion of two indices of external debt (namely, external debt to GDP and external debt to export) simultaneously in the model - which is not correct.

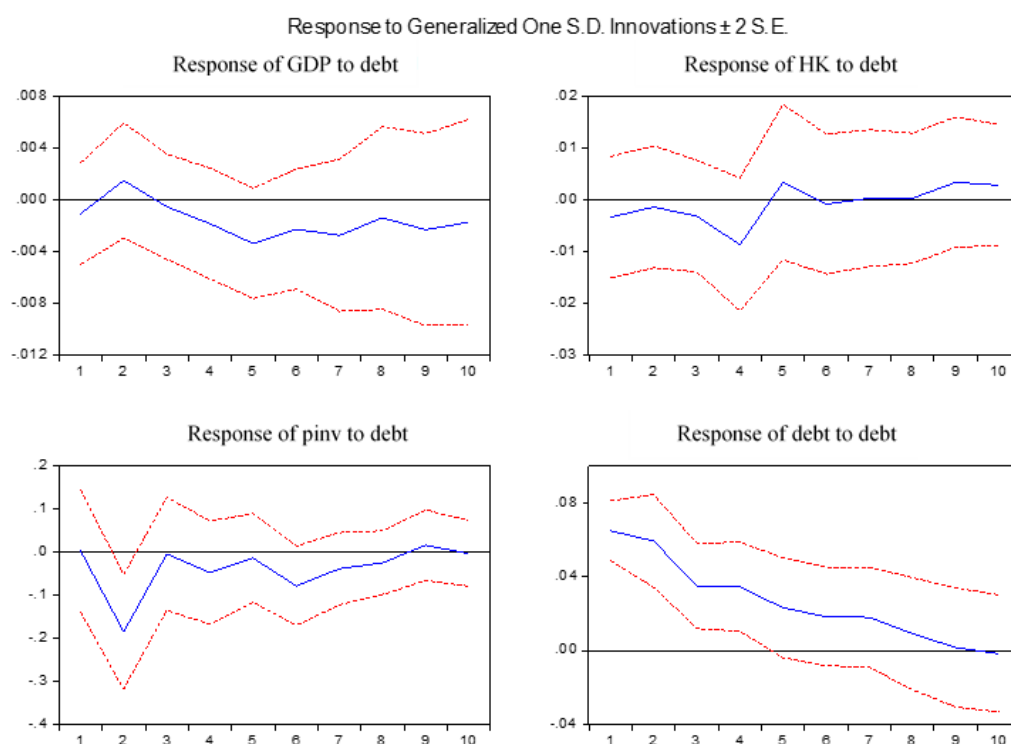


Figure 3: Response of Government Debt, Private Investment, Per Capita Output and Human Capital Stock to a Generalized 1 SD Innovation in Government Debt, Indonesia, 1985-2019.

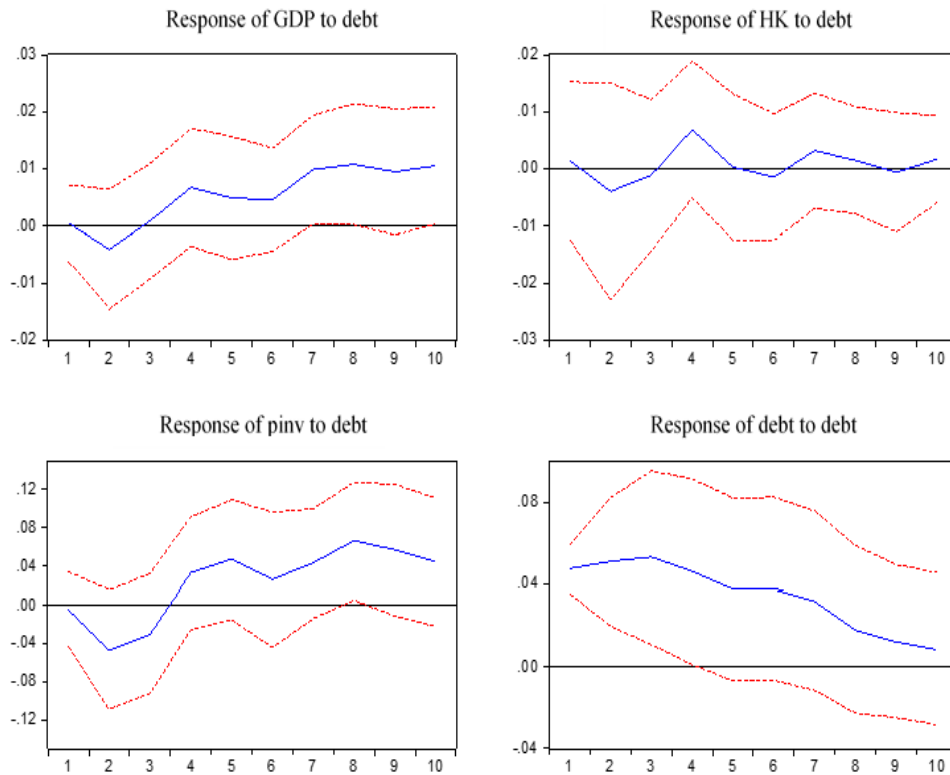


Figure 4: Response of Government Debt, Private Investment, Per Capita Output and Human Capital Stock to a Generalized 1 SD Innovation in Government Debt, Malaysia, 1985-2019

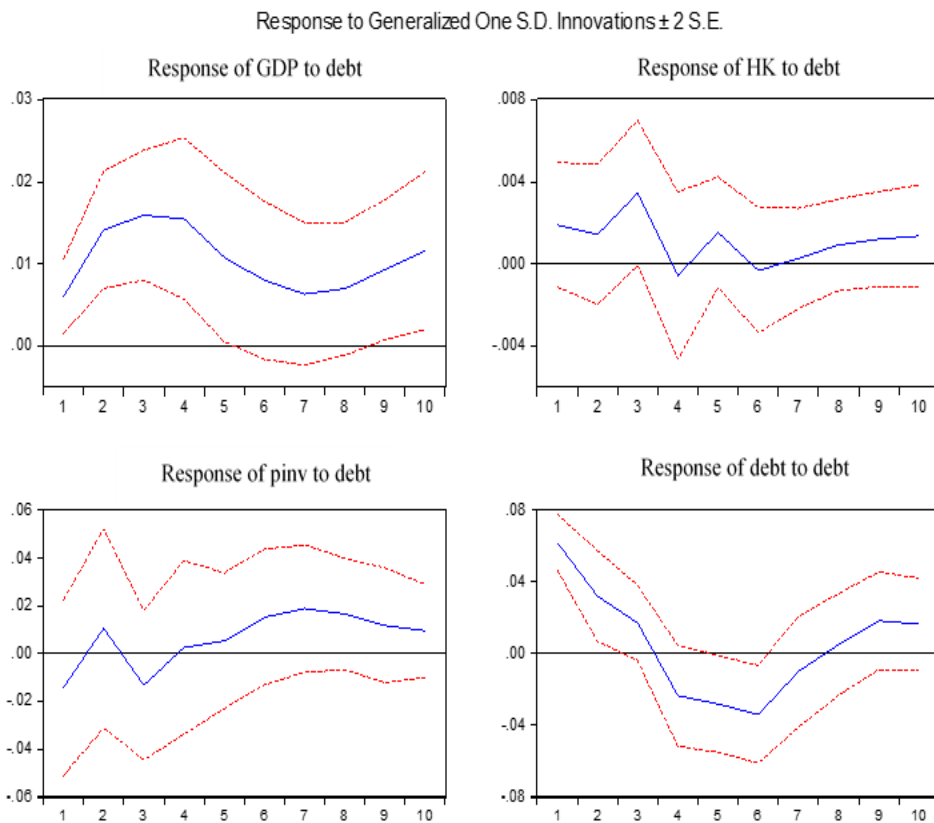


Figure 5: Response of government debt, private investment, per capita output and human capital stock to a generalized 1 SD innovation in government debt, Philippines, 1985-2019

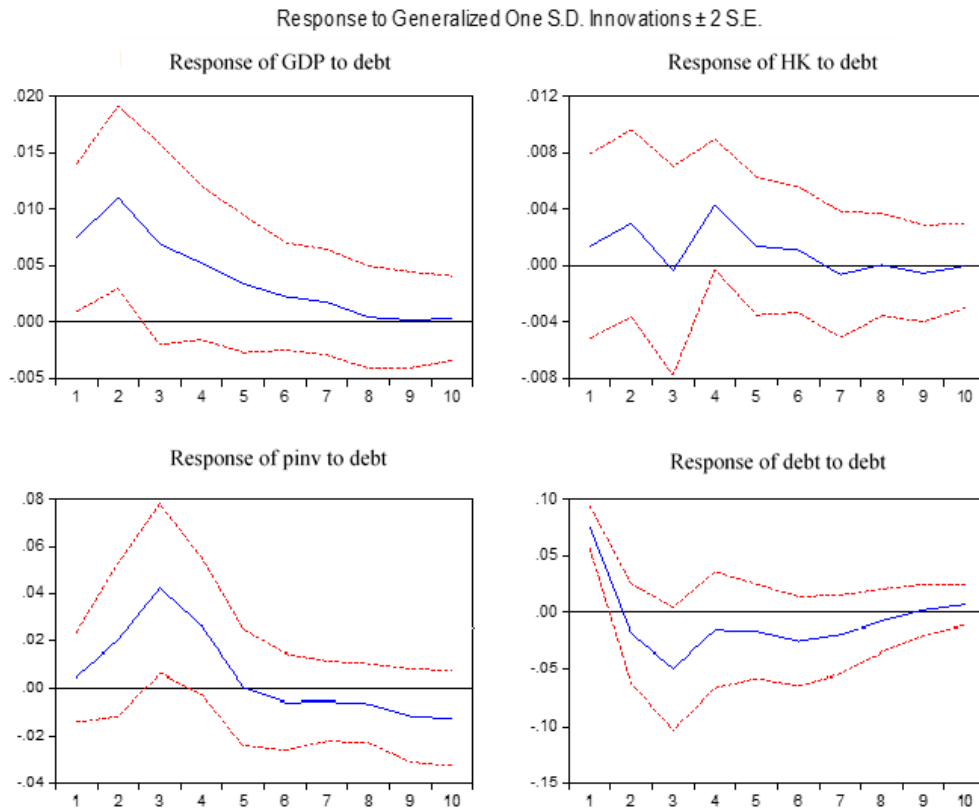


Figure 6: Response of Government Debt, Private Investment, Per Capita Output and Human Capital Stock to a Generalized 1 SD Innovation in Government Debt, Thailand, 1985 -2019

Evidence against nonlinear model specification

To check the validity of linear modelling assumption, Figure 7 shows the GDP per capita equation’s residual of the VAR model vs initial government debt, for Indonesia, Malaysia, The Philippines and Thailand, respectively from left to right. There is no linear or nonlinear pattern evident in these scatterplots. Moreover, the correlation of the paired data is close to zero, that verifies the linear modelling assumption was appropriate. The correlations from left to right consists of -0.028, 0.000, 0.122, 0.011. If the scatterplots showed a strong linear relationship among debt and the VAR residuals it meant that true model specification had to be nonlinear.

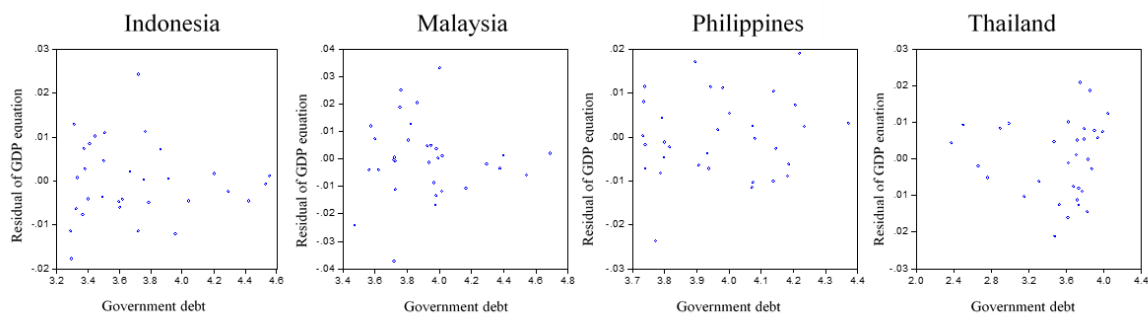


Figure 7: Scatterplot of VAR Residuals (GDP per capita equation) Versus Initial Debt for Indonesia, Malaysia, The Philippines and Thailand, Respectively from Left to Right

Further Discussion

Overall, the result shows that government debt does not cause GDP in the long run. Along this line, the response of GDP to debt shock was insignificant in Indonesia, Malaysia and Thailand although the response of GDP to debt shock was negative, positive and positive, respectively. Similar to this study's findings, other studies that support unidirectional causality from GDP to debt not vice versa include [Kepma and Khan \(2016\)](#) and [Lof and Malinen \(2014\)](#). Exceptionally, in The Philippines, debt causes GDP at 1% significance, and the GDP response to debt shock is positive and significant as well. The overall insignificant outcome of this study may suggest that the positive and negative effects of the government debt offset each other in Indonesia, Malaysia and Thailand or in other words, the government debt has been hovering around the optimal level.

In addition, Apart from the theories that explain the effect of government debt on economic growth, there could be several economic factors influencing the debt-growth relationship in each individual country such as macroeconomic factors, debt regime and fiscal management, the nature of debt evolution and accordingly the exit strategy.

In Indonesia, the government debt burden which is at some episodes huge did not significantly impair output growth, private investment or human capital. Empirical studies suggest the importance of fiscal management and other macroeconomic policies on the outcome of debt-growth relationship. Indonesia is known for using prudent fiscal policy that act as economy anchor ([Blondal et al., 2009](#)) and wise macroeconomic management in order to pursue economic growth. More importantly, the insignificant result in case of Indonesia could be attributed to the nature of debt evolution. A large part of the huge debt stock which was accumulated since 1997-1998 crisis was not due to government expenditure but due to government bank bailout. Another cause of it was exchange rate depreciation that increased the external debt obligation in terms of domestic currency. Had to exit from this debt burden Indonesia's government well managed to do so, by utilizing several major revenue resources other than tax revenue; such as, sale of equity since some government bailout was in exchange of capital share (ref). The debt reduction effort can be observed since 2000. As earlier mentioned, without imposing higher tax burden government managed to considerably reduce its debt over the course of 12 years (2000-2012). After this period government debt is increasing from near 23% in 2012 to 30.5% in 2019.

In Malaysia, public debt accumulation is mainly due to government development expenditure. Therefore, it is expected that in the long run the spill-over effect raise the economic growth specially in boom cycles. The response of output growth in this study is increasingly positive but not significant. Beside well macroeconomic and debt management, the insignificant result could be due to the debt regime of Malaysia. Major of the debt observations in Malaysia is within 30-60% range and the average debt of Malaysia in the sample period (1985-2019) is 55.51% GDP. Meaning that on average the debt is kept near to the self-imposed debt ceiling of the country which is 55% GDP. In that sense, in current range of government debt - *ceteris paribus* - no statistically significant impact to economic growth was found.

In Thailand, although no causality was detected from government debt to GDP, the impulse-response result suggest some economic stimulation in the short run. Knowing that Thailand's government use countercyclical fiscal policy in face of economic downturn, the positive growth response supports Keynesian prediction and the successful use of fiscal expansion policy in stimulating the economy in the short run. The response of debt to debt shock also shows that debt reduction is made fast. This could in turn, be attributed to fast economic re-

covery. Given high investment rate and human capital level in Thailand, The primary purpose of its government in using fiscal deficit could be short term economic stimulation (ref).

For the Philippines the results shows government debt shock in a moderate debt regime can contribute to GDP growth. Similar evidence for positive causality (Keynesian effect) was found in Ferreira (2016) in a panel of 28 EU countries especially after the outbreak of global financial crisis; and Abbas and Christensen (2010a) who concluded that a moderate noninflationary debt level has a generally positive impact on economic growth. However, it is necessary to treat this finding with caution because there is concerns beneath the surface of this good result. In previous section evidence was interpreted as the Philippine economy is debt-driven. Meaning that time to time rise in fiscal deficit is used to push up the economic demand and therefore, output growth based on Keynesian fiscal multiplier effect. Although this policy is recommended in certain periods of low demand, it is not advisable to be used frequently in the long term, as it can further economic fluctuation. In addition to that, government debt does not show to improve important growth factors such as private investment and human capital stock despite the need to accelerate physical and human capital accumulation in the Philippines. In sum, it is likely that government debt was not used effectively and productively in the right time and in development areas to support sustainable output growth.

Conclusion

Although the overall empirical evidence based on panel studies, suggest negative relationship between debt and output growth, or some found evidence of nonlinearity, this study attempts to shed more light on the issue by focusing on single emerging economies with overall moderate debt regime. Using a number of time-series econometrics techniques such as Toda-Yamamoto Granger causality test, this study concludes that there is unidirectional causality from GDP to government debt in three ASEAN countries, namely, Indonesia, Malaysia and Thailand. Only in The Philippines the result support a bidirectional relationship, while debt cause GDP at 1 percent level but GDP cause debt at 10 percent significance level. Furthermore, the result from generalized as well as Cholesky impulse-response analysis of the multivariate VAR model verified above causality conclusions. Given this result, it can be inferred that the fiscal and debt regime implemented since 1985 have been generally well-managed. So that, no negative effect on GDP is evident. Although expectations of statistically significant positive effect on GDP found support only to a limited extent.

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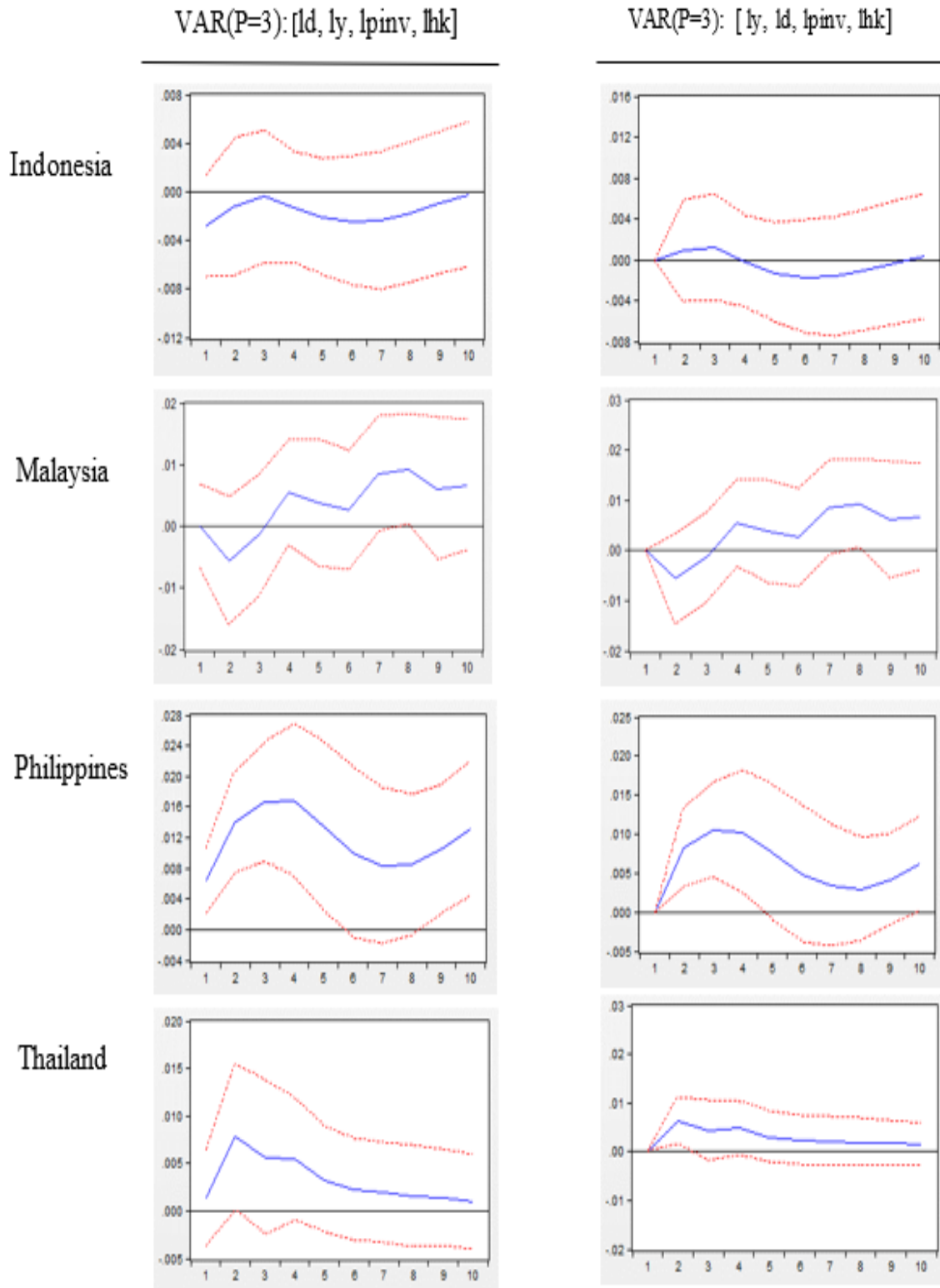
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Appendix A

Response of GDP per capita of ASEAN-4 countries to a Cholesky 1 SD innovation in government debt within two alternative models: VAR model ordering [ld, ly, lpinv, lhk] on the left column vs. [ly, ld, lpinv, lhk] on the right.



Appendix B

Summary statistics of the endogenous variables of the model.

Table 1B: Descriptive Statistics - Growth Model Variables- Indonesia

	GDP Per Capita (Rupiah)	Debt (%GDP)	Privat Investment (%GDP)	Human Capital (Years)
Mean	21,267, 411	44.99	15.29	5.03
Median	20,351, 471	40.26	16.47	4.69
Maximum	33,570,451	95.22	22.91	7.5
Minimum	12,603,729	25	0.99	3.23
S.D	5,814,605	19.46	5.64	1.49
Observations	30	30	30	30

Table 2B: Descriptive Statistics - Growth Model Variables- Malaysia

	GDP Per Capita (Rupiah)	Debt (%GDP)	Privat Investment (%GDP)	Human Capital (Years)
Mean	18,038.5	56.16	11.750	7.982
Median	18,264.8	48.57	10.569	8.035
Maximum	27,661.48	109	24.80	10.3
Minimum	9,713.85	32.3	4.98	5.052
S.D	5,320.75	21.77	5.20	1.43
Observations	30	30	30	30

Table 3B: Descriptive Statistics - Growth Model Variables - The Philippines

	GDP Per Capita (Rupiah)	Debt (%GDP)	Privat Investment (%GDP)	Human Capital (Years)
Mean	22,062.69	57.68	16.010	7.32
Median	22,391.46	58.8	15.979	7.5
Maximum	33493.73	79.2	19.331	8.3
Minimum	11944.47	41.9	12.754	6.21
S.D	6,438.6	10.06	1.54	0.67
Observations	30	30	30	30

Table 4B: Descriptive Statistics - Growth Model Variables - Thailand

	GDP Per Capita (Rupiah)	Debt (%GDP)	Privat Investment (%GDP)	Human Capital (Years)
Mean	88,643.59	36.78	19.71	5.14
Median	85,552.16	39.57	17.76	4.65
Maximum	134,938.9	57.16	32.36	7.65
Minimum	40,214.96	10.74	6.19	3.26
S.D	27,959.3	13.39	7.42	1.5
Observations	30	30	30	30