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Impacts of Public Debt on Economic Growth: Evidence from ASEAN countries

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This paper examines the relationship between public debt and economic growth by using a panel dataset of 10 countries in Southeast Asia over the period 1990-2010. Using two-way fixed effects model, the paper reports that gross public debt and domestic public debt are negatively correlated with economic growth; on the other hand, external public debt has a positive correlation with per capita GDP growth. The relationship between public debt and economic growth is linear, and no evidence of non-linear relationship is found in this study. Moreover, the paper shows that the Asia financial crisis 1997-1998 had negatively influenced economic growth of ASEAN countries, after controlling public debt and other growth factors. Population growth also has negative effects on growth, while investment does positively affect economic growth.

1. Introduction

Through the period from 1990 to 2010, the total debt of 10 countries in Southeast Asia (Cambodia, Vietnam, Thailand, Laos PDR, Myanmar, the Philippines, Malaysia, Singapore, Brunei Darussalam, and Indonesia) had increased significantly (World Bank, 2014). Since the economy needs intensive investment from the private and public sectors, the government should play a vital role in providing infrastructure projects for economic development. Over more than 20 years, both total amount of external public debt and domestic public debt increased dramatically for these countries. However the proportion of public debt in terms of percentage of GDP has decreased gradually because GDP amount of the member countries of Association of Southeast Asia Nations (ASEAN) has increased dramatically over the period 1990-2010. Most of the money borrowed from international and domestic markets was invested into transportation, education, health care, and other necessary systems.

Borrowing money from foreign sources such as other governments or international organizations as well as domestic markets can create a momentum for economic growth, especially for developing countries. On the other hand, continued borrowing by emerging countries will lead to an increase in public debt stock and cause some difficulties for the economy such as high debt service and pressure to raise taxes in the future. The question about the impact of public growth on the economy has been studied by many economists and policy makers. However, the various pieces of research have specific approaches whose results are rather not consistent. Clements et al. (2003) find non-linear correlation and a critical threshold of debt that if the debt level is lower than 50% GDP at face value, 20-25% of GDP for net present value or 100-105% export for present value of external debt, debt has positive effects on growth. Nevertheless, if the debt level is higher than this threshold, it will have a negative impact on economic growth. Kumar and Woo (2010) find that public debt and economic growth have a non-linear relationship: On average, an increase in public debt per GDP by 10 percent point leads to a decrease in economic growth around 0.2 percent point in one year. However, with countries having a high level of public debt (over 90 percent of GDP), government debt tends to have a significantly negative impact on real per capita GDP growth. This decline of economic growth may happen since higher initial debt causes lower investment and slowdown in productivity growth of labor.

Pattillo, Poirson, and Ricci (2011) suggest the nonlinear relationship between debt and growth with the Laffer curve. They test a nonlinear relationship between public debt and economic growth, reporting that through factor accumulation and total factor

productivity, public debt can indirectly influence growth. On average, doubling debt in the high debt countries will reduce growth by one percentage point. In contrast, debt in low debt level countries tends to have positive impacts on total factor productivity and, on average, negative but not significant effects on capital.

It is then necessary to have a better method to calculate the level of public debt in general and a safe rate for public debt against GDP in particular, which is consistent with the recommendations by international organizations such as World Bank, IMF, and ADB. In the Southeast Asia region, in 1999, there were three countries in Heavily Indebted Poor Countries (HIPC) list: Laos, Myanmar, and Vietnam. However, these countries have been off of the HIPC list since 2012. Myanmar and Cambodia currently are low-income economies; Vietnam, Indonesia, Laos PDR, and the Philippines are lower-middle-income countries; Malaysia and Thailand are upper-middle-income economies; finally, Brunei Darussalam and Singapore are high-income economies (World Bank, 2015). Countries that are off of the group of low-income countries who have not received support from international organizations as much as the low-income counterparts have to borrow more from the international as well as domestic markets to continue maintaining its public investment for development, which will, as a consequence, lead to higher public debt stock and debt service in the future.

Public indebtedness has strong influences on the country's credit worthiness and the perspective of investors. Given this, especially for developing countries, the question of whether or not high public debt level is good for economic growth should be a

pressing one. And, if it is not, then what would be an appropriate threshold of external debt threshold? How appropriate is it to set the baseline at such levels for public debt? What is the appropriate threshold level of public debt that would have negative impacts on economic growth? These are critically important issues that this research attempts to address.

There are a lot of studies examining the relationship between public debt and economic growth. Most of these studies focus on a wide range of countries such as developing courtiers, low-income countries, European countries, etc. However, there are not many studies on the ASEAN public debt situation. One study by the IMF finds the threshold for public debt of Vietnam; however, none of the other studies have found a threshold level for external public debt in Vietnam and explained why the Vietnamese government set up the baseline for external debt in the projected period. Given the context that by 2015 the ASEAN Economic Community (AEC) is the target of regional economic integration, the macroeconomic policies of all members should be consistent. Debt blueprint is one of important necessary guidelines that will guide ASEAN nations to reach the consensus of AEC. Therefore, studying the public debt issue in ASEAN is very relevant in that it will help member's governments integrate a debt policy for AEC in the near future.

The objectives of the current study include the followings: (a) to discover the accurate relationship between public debt and economic growth in ASEAN countries; (b)

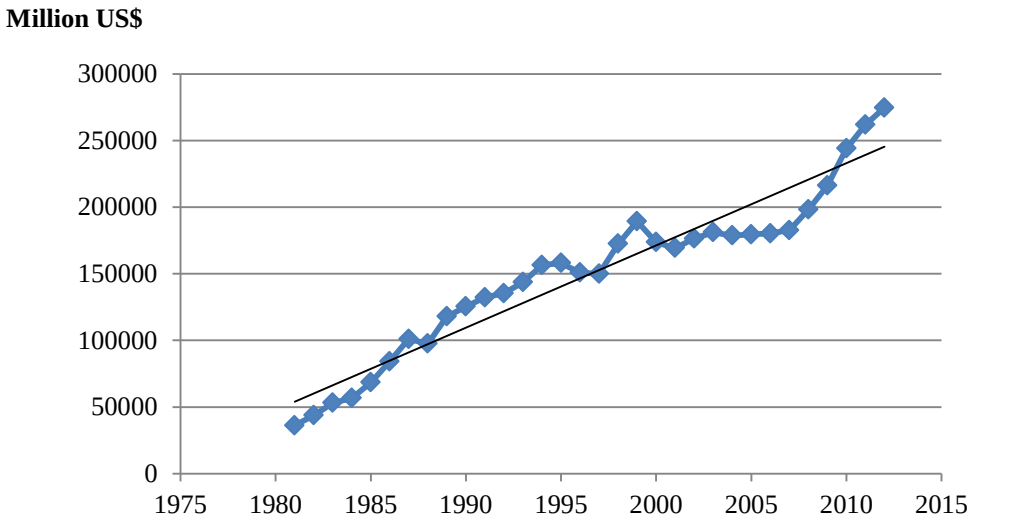
to find the appropriate threshold level of public debt beyond which economic growth will decline if there is a non-linear relationship between public debt and growth in ASEAN.

The paper proceeds as follows. After 1- Introduction, Section 2 describes the trends of public debt of ASEAN countries over the last 20 years. The the paper provides the related literature on the debt-growth relationship, describes data and methodology, Section 5 reports and interprets analytic results. Finally, with conclusion, the paper suggests some recommendations for public debt management policies in ASEAN.

2. Public debt management in ASEAN

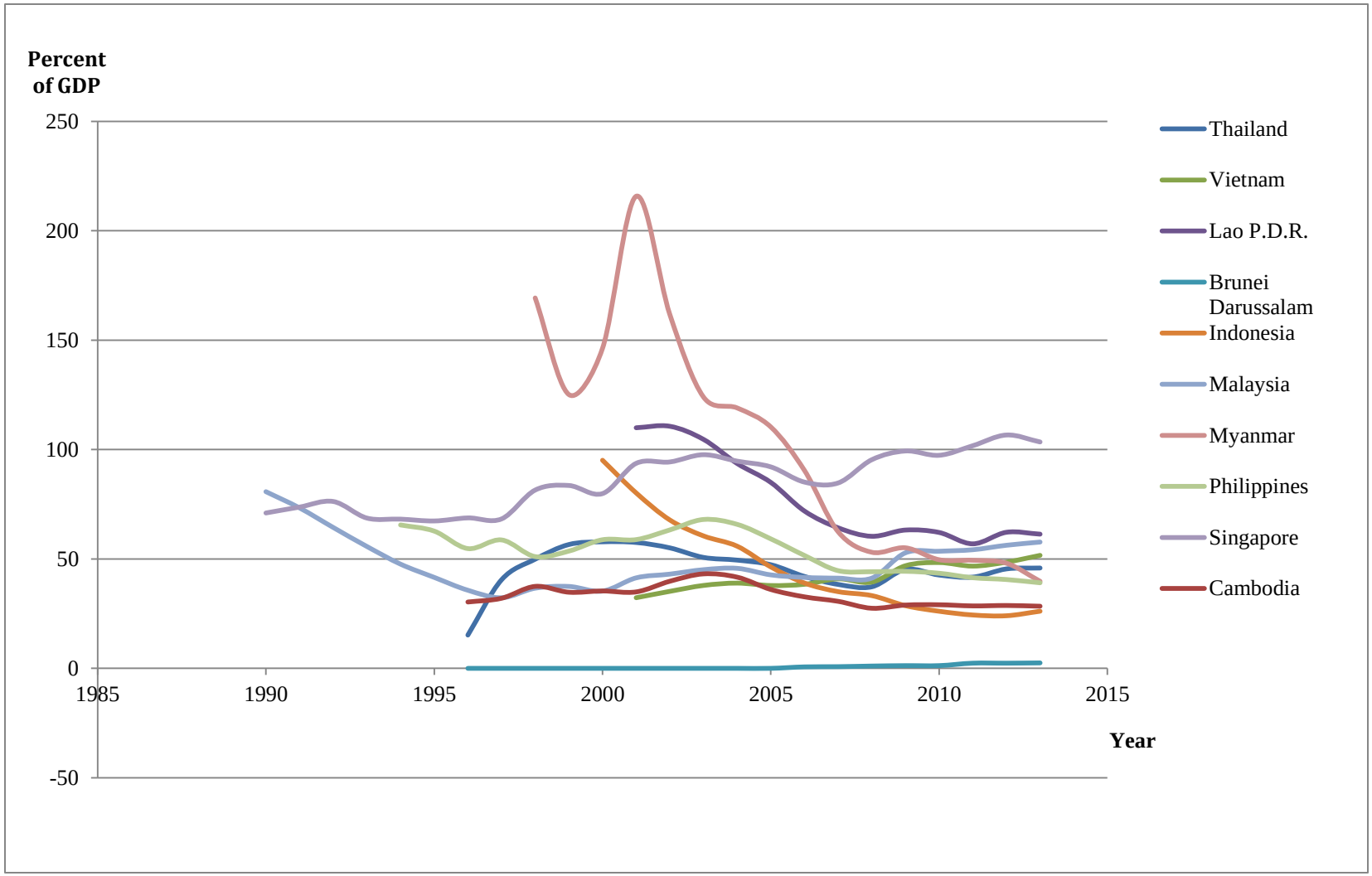
Most of countries in the ASEAN region are developing countries; these countries need more intensive investment into infrastructure system. That is the main reason why over the past 30 years, the amount of public debt of all ASEAN countries rose dramatically (CIA, 2010). According to CIA (2013), in 'The World Factbook 2013-14', Singapore has no external public debt; all public debt in Singapore is from domestic financial market. In addition, external public debt was estimated to equal zero in Brunei Darussalam (CIA, 2010). Therefore, the total external public debt for all ASEAN countries has approximately equaled to total external public debt of eight countries as the following data in the chart shows (not including Singapore and Brunei).

Figure 2.1 External Public Debt of ASEAN



Source: The World Bank Indicator, 2014

Figure 2.2 Total Public Debt to GDP



Singapore has been the country which had the highest ratio of public debt to GDP in ASEAN, followed by Lao PDR and Malaysia for the recent years. Brunei Darussalam has been the country which has had lowest level of public debt to GDP ratio in comparing with other nations and had no external public debt. While the ratio of total gross public debt to GDP in most of countries was decreasing, the amount of gross public debt in general and external public debt increased significantly over 30 past years. However, the ratio of public debt to GDP has declined to the moderate level except Laos PDR, Singapore, and Brunei Darussalam.

2.1 Lao People's Democratic Republic

Lao PDR is presently one of the lower-middle-income countries in Asia. The public debt policy performance of Lao PDR was classified to the medium category (IMF, 2013b). The indicative thresholds for public external debt in this country are 40 percent of GDP, 150 percent of exports, and 250 percent of revenues. The ratios of external public debt and publically guaranteed (PPG) debt to GDP were significantly higher compared to other lower-income countries in Asia. Both domestic public debt and external public debt rose significantly over past 30 years. In particular, domestic debt increased from 8.9 percent of GDP in 2011 up to 15.8 percent of GDP in 2012. The total of external debt and domestic debt was at 61.8 percent of GDP in the end of 2012, up from 56.2 percent a year earlier. Most of governmental borrowing was spent into financing big public infrastructure projects. In 2013, compensation in the public sector increased sharply, which led to a strong increase in government expenditures and fiscal

deficit. In FY 2015, the Lao PDR government tries to contain wage bill and reduce spending in capital projects. Its policy dependent indicative threshold is 40% for present value of external public debt to GDP ratio and the real number was lower than this number (IMF, 2013b). According to the report of IMF staffs (2013b), the external public debt of Lao PDR was closer to safety level; however, the public debt to GDP ratio under pressure of external economic shocks, higher borrowing cost and currency devaluation could be pushed beyond stainable threshold level.

2.2 Vietnam

Vietnam has just been in the World Bank's group of lower-middle-income economies since 2009. Through the period from 1981 to 2012, the total debt of Vietnam had increased significantly. In 1981, the public debt which Vietnamese government borrowed from foreign sources was 25.6 million USD; over the next 32 years, its debt climbed to nearly 40 billion USD in the end of 2012 (World Bank, 2014). This rise was reflecting of previous deficit, easy fiscal stance and output gap. Presently, the public debt level in Vietnam has been lower than the maximum level of 65 percent of GDP that the National Assembly has been imposed. With current policies of Vietnamese government, the public debt level is projected to increase to 60 percent of GDP. Although external public debt and public debt have been under the thresholds which are prescribed by the Vietnamese government, the current government debt level has reached to the level that requires attention since domestic debt has been increasing rapidly. The interest rate for domestic public debt was very high compare with external debt; that issue would lead to higher interest cost. The government guaranteed state owned enterprises (SOEs) for about

5 percent of GDP (IMF, 2014e). This amount is also accounted into public and publicly guaranteed (PPG) debt, which is called public debt in general. The need of restructuring SOEs has been considered seriously for several years to reduce the risk of high debt due to ineffective investment of these enterprises.

2.3 Cambodia

Cambodia is one of the low-income economies in Asia (World Bank, 2015). Public debt in Cambodia has been at a low level of debt distress risk for recent years. In Cambodia, domestic debt currently remains at a negligible level, just small amount of bonds that were issued in the early 2000s and some governmental claims with no interest. At the end of 2012, total external public debt of Cambodia stood up at 32 percent of GDP. The ratio of debt to GDP has been increased since 2008 from 27 percent of GDP, partly reflecting the slowdown of world economy and large disbursement from bilateral borrowings in the period of 2011-2012 (IMF, 2014a). Ministry of Economy and Finance has established one specific department to manage the public debt issue with the level of liabilities and risks. The Cambodian authorities assert that over the medium term, they will maintain the ratio of debt to GDP below 30 percent. They also argue that they have no plan to issue the domestic debt until 2018.

2.4 Thailand

The Thai government has issued the policy to keep the level of public debt under 50 percent of GDP, which is a stable threshold for the stability of the economy against potential shocks. The downward trend of GDP since the 2000s except for a strong

increase in FY2009, the lower government revenue caused by tax cut for fuel, the increased borrowing for water projects, and government guarantee for SOEs' loans have pushed up the level of public debt in FY 2012. At the end of 2012, total public sector debt of Thailand was about 45.4 percent of GDP, in which external debt accounted for 36.4 percent of GDP. In general, external public debt of Thailand has still remained at stable level under medium stress scenarios. The authorities are going to balance the central government budget by 2017 and keep the level of public debt at average level which is lower than 50 percent of GDP (IMF, 2013d).

2.5 Indonesia

Though Indonesia is one of the lower-middle-income economies, total central government debt of Indonesia at the end of 2012 was quite low, around 24.5 percent of GDP (IMF, 2013a). Over the period from 2007 to 2012, its total public debt to GDP had reduced a third from 35 percent of GDP to 24.5 percent, while at the same time government deficit has widened but no more than 3 percent of GDP in a year according to the fiscal rule of the government. On the other hand, external debt amount has risen rapidly in the past five years. In addition, both external debt and public debt were projected to rise slightly but remain at reasonably low level. Indonesia has undertaken several reforms impressively over the last decade in public debt management by development and publication of debt management strategy and the establishment of Debt Management Office (DMO). This office manages all issues related to public debt in Indonesia and then recommend to the government important policy to control the debt level. Moreover, the Ministry of Finance and Bank Indonesia has promoted closer

collaboration to control the official liquidity and loan cost to conduct better debt management.

2.6 Malaysia

Malaysia is one of the two upper-lower-income countries in ASEAN (World Bank, 2015). The government of Malaysia sets up the limitation for federal debt at 55 percent of GDP. Public debt has increased significantly in some previous years and reached 54.6 percent of GDP at end-2012 reflecting fiscal stimulus and decline in revenue due to weakened oil prices (IMF, 2013c). Malaysia has had spending priorities to reduce the level of public debt gradually against the cases of declining revenues and increasing necessary spending. Government gross debt has sharply risen over the past years reflecting the primary deficit and deep falling of oil price. The debt borrowed by the SOEs has increased in recent years and was expected to increase in the medium term.

2.7 Myanmar

Together with Cambodia, Myanmar is a low-income country in ASEAN, according to World Bank's groups (World Bank, 2015). The country needs a lot of support of international organizations and foreign countries to develop infrastructure. Public debt of Myanmar in the fiscal year 2012-2013 was about 48 percent of GDP, in which domestic debt accounted for 22.8 percent of GDP and external debt accounted for 24.6 percent of GDP (IMF, 2014b). Myanmar government has been undertaking a policy to keep the level of deficit lower than 5 percent of GDP per year to maintain the debt sustainability. It was not easy to collect debt information of Myanmar several years ago.

2.8 The Philippines

Though the Philippines is a lower-middle-income country of the World Bank's group, public debt of the Philippines was at a moderate level, about 39 percent of GDP at the end of 2013 since the economy developed rapidly and had some primary surpluses (IMF, 2014c). Public debt in percent of GDP has been declining recently, which demonstrates that the government attempted to create the fiscal space for financial priorities. In general, the government debt in the Philippines has been at a sustainable level that would not bring much risk to the economy.

2.9 Singapore

According to 'The World Factbook 2013-14' (CIA, 2013), Singapore has not officially had external public debt. Total gross debt has been rising gradually, and reached 106 percent of GDP in the fiscal year 2011-2012 (IMF, 2014d). Even though its public debt level is currently highest among ASEAN countries, the risk of debt unsustainability is quiet low, compared to others in ASEAN since the gross government assets are bigger than the total amount of governmental borrowings. The Singapore government issues debt as a tool to promote domestic capital markets and to support investment for mandatory saving programs.

2.10 Brunei Darussalam

Brunei is a small country, with its economy dependent much on exporting crude oil and natural gas. Public debt in this nation has been quite low, approximately zero percent of GDP for long history, with zero external debt as well (CIA, 2010). Brunei

Darussalam is one of the countries with highest income per capita in ASEAN, and has always large amount of surpluses, which is around 40-50 percent of GDP (IMF, 2013b).

In general, most of ASEAN members have had their own particular policies to maintain public debt at reasonable levels such as limitations for public debt to GDP ratio in Vietnam, Thailand, and Laos PDR, etc., or limitations for budget deficit in Myanmar. Since the AEC will be established in 2015, public debt management policies within ASEAN members should be consistent and unified. The member countries need to support each other in debt management and in promulgating debt policies that will not negatively influence the others.

3. Review on public debt and economic growth

3.1 Positive Effects on Economic Growth

In many theoretical models, the reasonable public debt level is expected to have a positive impact on the growth of the economy. In traditional neoclassical models, average public debt would create good environment for government to have high reputation to borrow more for public spending, and increase transitional growth because of low risk level of default. The lenders will be willing to lend if they have enough information about the total debt of debtors to decide if they have ability to repay (Eaton, 1993). The debtors need to maintain their reputation to continue borrowing to finance their public expenditure and investment (Bulow & Rogoff, 1989).

In principle, the governmental borrowings help to finance the public goods that will create more welfare and promote economic growth. There are three ways to finance the spending of government: taxation, debt, and printing money (Gill & Pinto, 2005). According to Gill and Pinto (2005), public debt may be a best choice for government to finance its expenditure due to the following reasons. Firstly, public debt seems to be equitable for current tax generations because it allows the government to pay for investments that would bring benefit for future generations in long periods. They should pay for benefit which they will receive from today borrowings in the future by their tax. Secondly, public debt allows the government to be more proactive in emergency spending needs while increasing or lowering tax rate will lead to losses in effectiveness and uncertainty of the economy. Thirdly, printing money with huge excessive amount

could cause high inflation which hides information about real price and affects investment negatively. However, most theoretical models do not suggest a direct link between public debt and economic growth.

3.2 Negative Effects of Public Debt on GDP Growth

Robert Barro (1979) suggests that to achieve debt sustainability, the government needs to raise taxes because a high public debt level can lead to higher cost of servicing debt and higher amounts of tax in the future to finance it. There are two approaches of impacts of high public debt level on growth: political economy considerations and debt overhang theories. Alestina and Tabellini (1989) argue that the over-borrowing can accompany low economic growth due to capital flight when the cost of high debt services cannot be internalized. A high accumulated external debt may lead to the government instability in developing countries; then, capital flight is considered as insurance when the capitalists are facing the politico- economic uncertainties.

Debt overhang theories focus on two main aspects: investment and fiscal policies. Firstly, a large amount of debt stocks would lower the economic growth through reducing investment channel. Since public debt will be larger than repaying ability of the country in the future, the country has to spend a bigger part of output to finance the debt services. Therefore, the return from investing has to confront higher marginal tax and investment into the country is discouraged (Krugman, 1988). Investment is the main channel which is focused on in the debt overhang theories about impacts of high public debt level on economic growth.

Any activities related to cost in the future and require a part from output to service them will be discouraged, since the money from investing will be taxed away by lenders (Corden, 1989). Besides, the investors are always afraid of the risk of default when the government does not have timely policies to control the level of public debt when it is so high. As the result of reduction in investor's expectation, the volume of investment will be smaller; therefore, the economy will have not enough necessary resources to develop. Another implication is that it will be difficult for the government to conduct the macroeconomic policies or economic reforms due to high public debt, as it has to pay more attention to inhibit the increasing level of debt or debt repudiation. Poor macroeconomic policy environment will influence the efficiency of investment with a negative effect on economic growth.

In addition, debt overhang theories focus on the fiscal aspects as the fundamental problem of debt. With the heavy accumulated debt stocks, there is a general expectation that the government will have to spend more on debt service. Therefore, the share of productive public investment will be reduced or the government has to choose increase some kinds of tax rate like inflation tax, for instance (Agénor & Montiel, 1996). In general, public debt may influence to economic growth through investment volume or the effectiveness of investment including the government investment and private investment from both domestic and foreign investors.

Another explanation for the negative effect of debt to the outcome of the economy is likely because of the uncertainty caused by high debt level that the government has to

spend more to finance the debt service. High debt causes the risk for investment because one part of return in the future will be taxed to cover the cost of debt service. Amount of investment into the country depends much on the investment environments, in which investors see the risk and returns clearly. Once the investors realizes the uncertainties of the place where they will invest, they will continue choosing to keep money with them rather than investing into that place (Serven, 1997). In the environment with high uncertainty, the investors prefer investing into the area with quick returns by trading activities rather than in the high risk areas, long terms and irreversible investment. As a result of uncertainty, the misallocation of investment will happen with lowering efficiency in total capital accumulation. This reason suggests that high public debt level relates to low growth through the efficiency of investment and capital accumulation.

3.3 Non-linearity of the Effect of Public Debt on Growth

There is a small part of literature arguing that public debt may have non-linear effects on the economy when combining elements of positive and negative impacts. In these theories, the main channel through which debt has a nonlinear relationship with growth is investment. These nonlinear effects may be adjusted by productivity. Cohen (Cohen & Sachs, 1986; Cohen, 1991; Cohen, 1992) suggests an endogenous growth model in which capital accumulation plays an important role to drive economic growth. According to Cohen, at the low level of public debt, the country has more opportunities to access the capital flow from domestic investors as well as international financial market due to low risk of debt reputation. These chances lead growth to become higher because the country has capital sources from borrowing to invest. After a period of

favorable borrowing, the country's economic growth will be lower due to the cost of debt service is increasing significantly. However, the country can still control the reduction of growth or even make it higher by stopping borrowing from the international market. If the country is not able to have better ability to have an optimal rescheduling policy, debt overhang effects will influence negatively on growth.

Moreover, the high level of public debt is related to the problem of capital flight (Calvo, 1998). In the relationship between debt and economic growth, higher debt creates the tax burden to the country, and if the economy cannot grow fast to get enough resources to repay a certain amount of debt, the government needs to still increase the level of debt. Due to these negative effects, return on investment will be lower, and thus the investors will become hesitant to invest into the heavily indebted country. The countries that have low level of debt will get the opposite effects on growth.

Finally, the nonlinear impacts of public debt level on economic growth can be explained by the models of debt Laffer curve. Sachs (1989) was the first person introducing the concept of debt Laffer curve through the idea of debt overhang which points to the losses of efficiency due to high level of debt. Debt overhang theories may be good, but do not explicitly explain the causality of debt to growth. These theories can be extended and the debt Laffer curve can be explained under the Laffer curve about the causal relationship between public debt and economic growth (Pattillo, Poirson, & Ricci, 2002). The debt Laffer curve argues that on the left or "good" side of the curve, along with an increase in the face value of debt service, there is also an increase in debt

repayment; on the other hand, on the right or wrong side of the curve, with a higher face value, debt will lead to reduction in expected repayment. The peak of the curve is the critical point where debt stock can have a negative effect on investment, and productivity, which requires larger cost to trade off with the future benefits. This point may also indicate the level of debt stock at which public debt starts to have a negative effect on growth. Again, the level of public debt may have nonlinear effects on growth under the view of the debt Laffer curve, in which higher debt services will be financed by the distorted taxation which will hinder the investment environment, with lower efficiency and productivity.

3.4 Empirical Literatures about Effects of Public Debt on Growth

Clements, Bhattacharya, and Nguyen (2003) choose the relationship between the external debt and growth as well as the channels through which external debt influences GDP growth to study. They use data of 55 low-income countries over the period of 1970-1999. The authors use two models to examine this relationship and find out the main channels through which debt influences growth. The models are fixed effects and system of general method of moments (SGMM). The result gives some ideas to support the debt overhang hypothesis. If the debt level is lower than a specific threshold around 50% GDP for face value of debt, 20-25% of GDP for net present value or 100-105% export for present value of external debt, the growth will increase. However, if the debt level is higher than this threshold, the growth will be decreased. The research shows that the debt

can influence growth through investment and efficiency of resource use (Clements, Bhattacharya, & Nguyen, 2003).

Dreger and Reimers (2013) argue that the relationship between debt and growth is non-linear. They also find a threshold that if debt will influence negatively growth if it is higher than the threshold. But the threshold depends on the macroeconomic condition. The study is conducted by collecting data from 12 EURO members, Denmark, Sweden, UK, Turkey, US and Japan with total 18 countries. The research uses the panel regression and fixed effect model. The dependent variable is real per capita GDP growth and independent variables are population growth, openness, investment rate, real interest rate, and the debt to GDP ratio (Dreger & Reimers, 2013) .

Similarly, Pattillo, Poirson, and Ricci (2011) suggest the non-linear relationship between debt and growth with the Laffer curve. The authors use a panel data of 93 developing countries over the period 1969-1998. The result is that the average impact and marginal impact of debt become negative at the specific thresholds. For example, the threshold is identified based on the percent of GDP and export around 35-40% and 160-170%, respectively. And, in the end, the work also shows that the investment is not the main channel through which debt affects economic growth (Pattillo, Poirson, & Ricci, 2011).

Chechrita-Westphal and Rother (2012) use a cross sectional sample in 12 countries of EURO area over the periods of nearly 40 years (1970-2008) in the test of the relationship between the government debt and growth by using the quadratic equation

based on debt. The important estimation technique is fixed effect to reach unbiased results for linear and nonlinear models. Besides, the authors also use the system GMM, IV and 2-SLS as estimators for their research. Another important part in testing the effects of debt on growth is robustness checking by using the restricted samples and year dummies together with controlling the relevant variable such as private debt. The results of this study show the channels through which effects of public debt on growth are nonlinear are the total factor productivity, private saving, and public investment. The shape of relationship between public debt and growth is U-shape (concave) with the turning point around 90-100% of GDP. This threshold is the average for 12 countries and confidence area may go to lower level as 60-70% of GDP (Checherita-Westphal & Rother, 2012).

Poirson, Pattillo, and Ricci (2004) test the nonlinear relationship between external debt and economic growth and its results suggest that through factor accumulation and total factor productivity, the debt can influence to growth indirectly. The data covers 61 developing countries from 1969 to 1998. The estimation methodologies are simple OLS, instrumental variables, fixed effects, differenced and system GMM to build up spline regression. On average, doubling debt in the high debt countries will reduce the growth 1 percent point. In contrast, debt in low debt level countries tends to have positive impacts on total factor productivity and on average negative effects on capital but not significant (Poirson, Pattillo, & Ricci, 2004).

Singh (1999) discusses the relationship between domestic debt and growth in India over the period 1959-1995. This study finds the negative impact of domestic debt on economic growth by using the cointegration test and Granger causality. This research is written from the viewpoint of Ricardian hypothesis about the effect of domestic debt and growth (Singh, 1999). The topic about public debt's effect on growth is also discussed under the perspective of multiple regimes by Kourtellos, Stengos, and Tan (2013). The research uses the data from 82 countries and a dataset of 10-year period panel in 1980-1989, 1990-1999, and 2000-2009. Their empirical analysis adopts structural threshold regression (STR) and Solow growth model which includes variables such as population growth, average investment to GDP ratio, secondary schooling, and policy variables such as openness, inflation rate, and size of Government. The findings show that in countries with Low-democracy regime, higher public debt leads to lower economic growth; in countries with High-democracy regime, public debt does not have significant effect on GDP growth (Kourtellos, Stengos, & Tan, 2013).

Reinhart and Rogoff (2010) examine the relationship between economic growth, inflation, and external debt in 44 countries (20 advanced economies and 24 emerging market economies) through the period of two hundred years. The research's finding shows that if public debt is higher than threshold of 90% of GDP, there is a negative impact of debt on growth. However, when it is blower than the threshold, the relationship between debt and economic growth will be weak. This study focuses on the total public and external debt beside the private debt. The dependent variables are economic growth

and inflation. The debt is measured by the ratio of gross debt per GDP (Reinhart & Rogoff, 2010).

Kumar and Woo (2010) explore the impact of a high level of public debt on economic growth in the long–run. Data used in this paper is taken from developed and developing countries in the period of nearly 40 years 1970-2007. The authors explore the non-linear relationship between government debt and growth, and the threshold level of public debt. Besides, this paper also discovers the channels through which debt's impact can be valid on economic growth. To check the robustness of results, the authors use the additional variables together with the main variables such as real GPD per capita, initial government debt, log of average years of secondary schools in population, trade openness, the initial government consumption share, investment's relative price, inflation, fiscal deficit, population size, banking crisis. Kumar and Woo (2010) divide public debt into four levels: below 30% of GDP, from 30-60% of GDP, from 60-90% of GDP, and higher than 90% of GDP. The authors consider various estimations to test the relationship between debt and growth such as OLS, FE, robust regression between estimator (BE), and system GMM (SGMM). This paper solves the endogeneity problem by using lagged methods in first differences regression models by overlapping five-year periods. Running single cross-country regression is also helpful to evaluate impact of debt on growth for longer time periods. The findings of this paper show that public debt and economic growth have a non-linear relationship: on average, a public debt per GDP ratio increase by 10 percent point leads to a decrease around 0.2 percentage point of economic growth per year. However, for the countries having high level of public debt

(over 90% of GDP), the government debt has a significant negative impact on real per capita GDP growth. This decline of economic growth may happen since higher initial debt causes lower investment and slowdown in productivity growth of labor (Kumar & Woo, 2010).

Mencinger, Aristovnik, and Verbic (2014) address the question arising about the relationship between high public debt and growth. They use data set taken from 25 sovereign countries in the EU to discover the non-linear and concave effects of public debt on growth. By dividing, the sample into two sub-groups: 'old" members who joined EU in the period of 1980-2010 and "new" members who was EU member states in the period of 1995-2010. The authors apply the fixed effects panel regression to solve heterogeneity and endogeneity problems which cause the biasness. The results show that impacts of public debt are significantly non-linear on economic growth. Further, the authors suggest debt-to-GDP turning point where public debt starts to have negative effects on growth, is between 80-90% of GDP for "old" members and 50-54% of GDP for "new" members (Mencinger, Aristovnik, & Verbic, 2014).

Panizza and F. Presbitero (2014) argue a negative relationship between public debt and growth. However, there is no evidence on the causal effect on growth of public debt after using robustness tests. They test the negative causal effects of public debt on growth by using the instrumental variable approach and fix effects for OECD countries. Finally, they conclude that impacts of debt on growth are not clear and there is not

enough evidence to drive to conclusion about the causal link between public debt and growth or in other words this link does not exist (Panizza & Presbitero, 2014).

4. Data and methodology

4.1 Data Description

The study uses the panel regressions for 10 ASEAN countries, including Laos PDR, Myanmar, Malaysia, Thailand, Vietnam, the Philippines, Indonesia, Cambodia, Brunei Darussalam, and Singapore. The data are taken from various sources to examine the potential relationship between public debt and growth, most of which are from the World Economic Outlook (WEO) database which is reported by the IMF staff. The data for some variables such as GDP, population and its growth, total investment, gross national savings, inflation rate, and general government gross debt and current account balance were collected from WEO. Data for external public debt is from International Debt Statistics (IDS) of the World Bank for the period from 1990 to 2010. The data on trade openness were calculated by summing up export and import data which were collected from the World Development Indicators (WDI) maintained by the World Bank. The data for per capital GDP growth were also taken from WDI of the World Bank. The data for of the index of human capital for persons for ASEAN countries were obtained from the Federal Reserve Economic Data (FRED) of the Federal Reserve Bank of St. Louis.

The main objective of this study is to examine the impacts of public debt including gross public debt, external public debt and domestic debt on GDP growth.

Since there are 10 countries and 21 year (1990-2010) to be cover, the data are organized as time series cross-sectional panel. This complete data set would consist of more than two hundred observations. However, the number of observations is less than that due to some missing values for some variables for certain countries. The descriptive statistics is presented in the following table for all variables and a brief description of each of these variables will be provided in a subsection that follows.

Table 4.1. Summary Statistics

Variables	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Per capita GDP Growth	200	3.77	3.95	-14.38	13.22
Gross public debt	154	52.95	35.49	0	215.76
Initial income per capita	202	5,957.82	9,698.05	95.86	46,566.87
External public debt	202	41.82	80.61	0	330.32
Domestic public debt	154	26.74	33.98	-47.56	144.66
Population growth	210	1.84	0.83	-1.48	5.32
Total investment	176	24.96	9.31	1.18	46.91
Gross national savings	180	27.38	12.43	2.44	61.81
Human capital	189	2.23	0.4	1.61	2.97
Inflation rate	202	10.68	23.36	-26.32	191
Trade openness	201	122.57	94.41	0.31	439.66
Current Account Balance	202	1.92	16.11	-21.03	71.90

4.2 Model

To explore the linear specification of relationship between public debt and growth, whether it is negative or positive, the study uses the growth model of Pattillo, Poirson and Ricci (2011):

$$y_{it} = \alpha_{it} + \beta_{it} X_{it} + \gamma D_{it} + \varepsilon_{it}$$

In above model, y_{it} represents dependent variable, per capita GDP growth; X_{it} is a set of control variables; D_{it} is the set of debt variables; *i* indicates country; and *t* denotes time (year). In this model, ε is error term and α is constant number. Control variables are population growth, inflation rate, the openness of the economy, the index of human capital per person, gross savings, and total investment. The main explanatory variables are gross public debt, external public debt and domestic public debt.

To further examine the potential non-linear relationship between public debt and growth, Pattillo, Poirson and Ricci (2011) use quadratic model:

$$y_{it} = \alpha_{it} + \beta_{it} X_{it} + \gamma D_{it} + \delta D^2_{it} + \varepsilon_{it}$$

Where δ, α, β and ε are unknown parameters which will be estimated by using fixed effect estimator. By using this quadratic model, the study will estimate the average marginal effect of debt on growth or critical threshold for public debt $D_{it.}$ Over this threshold level, public debt starts to change the side of impact on economic growth.

$$\frac{\partial y}{\partial D} = \gamma + 2\delta D$$

Therefore, when $\frac{\partial y}{\partial D}$ = 0, D will equal -γ/2δ. The level of (-γ/2δ) is the turning point of the effect of debt, at which the effect changes the direction of impact on growth.

Since the main target of this study is to discover the impact of debt on growth, per capita GDP growth is the dependent variable used in the model of study. According to the previous research about the effects of public debt on growth, real per capita GDP growth was used to measure economic growth. For example, Clements, Bhattacharya, and Nguyen (2003), Dreger and Reimer (2013), Pattillo, Poirson, and Ricci (2011), Kumar and Woo (2010) test the model of growth in relationship with public debt, in which per capita GDP growth is the variable that needs to be explained. The second important variable is public debt variable, which is measured in percentage of gross domestic product (GDP) such as the gross public debt to GDP ratio, the external public debt to GDP ratio, and the domestic public debt to GDP ratio. They represent the public debt policy, including fiscal policies, of ASEAN member governments.

There are some control variables in the model, according to the literature such as initial income per capita, investment, population growth, human capital, openness, current account balance, gross national savings, and inflation rate. Initial income is expected to have a negative effect on the growth in the conditional convergence framework (Pattillo, Poirson, & Ricci, 2011). Obviously, investment has influenced directly per capita GDP growth; it creates more jobs and products for the economy. However, population growth may have negative or positive effects on per capita growth. The human capital variable is measured by the index of human capital per

person[1](Feenstra, Inklaar, & Timmer, 2013), which denotes the average years of schooling (Barro & Lee, 2013) and returns of education (Psacharopoulos, 1994). The earlier studies used the secondary school enrollment rate (Clements, Bhattacharya, & Nguyen, 2003; Pattillo, Poirson, & Ricci, 2002; Kumar & Woo, 2010). After Barro and Lee (2013) introduced the new data set of educational achievement, the school enrollment rate and the literacy rate are becoming not as adequate measurements of human capital stock as an input of production as the index of human capital per person.

Trade openness is calculated by summing up export and import amounts as a percentage of GDP. Openness is considered as an important factor promoting productivity by exchanging knowledge and efficiency addition (Pattillo et al., 2011). Openness is expected to have positive effect on growth. Inflation represents the stability economy and effectiveness of macroeconomic policies. Inflation is expected to have negative relationship with per capita growth. Gross national savings and current account balance as shares of GDP reflect the ability of governmental management. These variables, reflecting economic management capacity of ASEAN governments, are expected to have positive coefficients.

[1] Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2013), "The Next Generation of the Penn World Table" available for download at www.ggdc.net/pwt

Table 4.2. Correlation Coefficients

	Per capita growth	Gross public debt	External public debt	Domestic public debt	Initial income per capita	Population growth	Total investment	Human capital	Gross national savings	Trade openness	Current Account Balance	Inflation rate
Per capita growth	1.00											
Gross public debt	0.42***	1.00										
External public debt	0.13*	0.43***	1.00									
Domestic public debt	0.20**	0.71***	-0.33***	1.00								
Initial Income per capita	-0.22***	-0.09	-0.44***	0.37***	1.00							
Population growth	-0.26***	-0.15*	0.07	-0.00	0.32***	1.00						
Total investment	0.16**	-0.14	-0.40***	0.08	0.04	0.04	1.00					
Human capital	-0.31***	-0.09	-0.60***	0.42***	0.56***	0.10	0.05	1.00				
Gross national savings	-0.20**	-0.30***	-0.62***	0.31***	0.76***	0.15**	0.45***	0.61***	1.00			
Trade openness	-0.05	0.13	-0.41***	0.52***	0.71***	0.32***	0.25***	0.51***	0.66***	1.00		
Current Account Balance	-0.42***	-0.46***	-0.45***	-0.01	0.72***	0.20***	-0.22***	0.57***	0.72***	0.32***	1.00	
Inflation rate	0.02	0.49***	0.47***	0.21***	-0.22***	0.14*	-0.36***	-0.36***	-0.41***	-0.25***	-0.19***	1.00

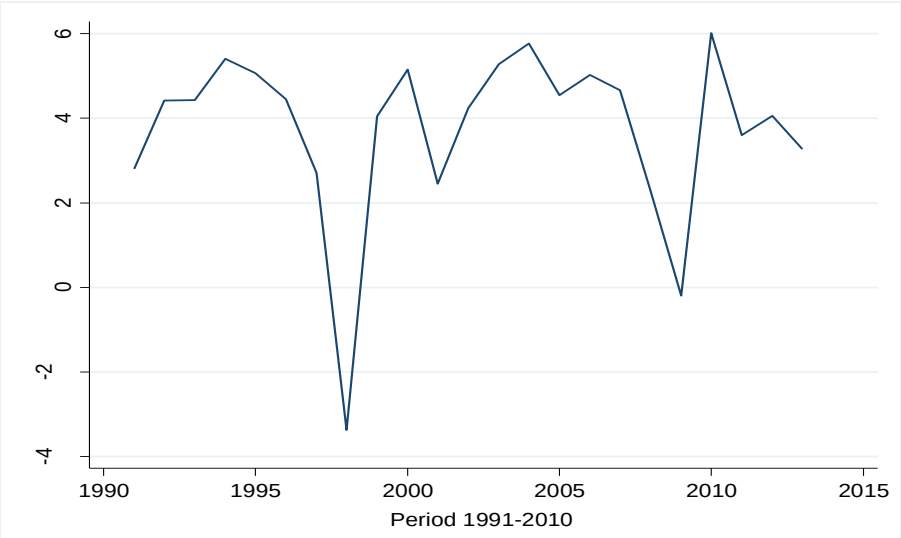
Note: This table displays all pairwise correlation coefficients, levels of significance: *** 1 percent, ** 5 percent, * 10 percent

5. Empirical results

5.1 Linear Relationship between Public Debt and Growth

The panel data are used to estimate impacts of public debt on economic growth. Firstly, to choose the appropriate model in investigating the relationship between public debt and growth in ASEAN, the study used the Hausman test with null-hypothesis that random effects (RE) model is consistent. The p-value reported in Hausman test is 0.0000, which is lower than 5%. Therefore, the study rejected using the estimation of random effects (RE) and accepted that the fixed effects (FE) model is appropriate estimation. It means that the error term is correlated with the regressors. Over the past period, there were several shocks happening in ASEAN such as Thailand financial crisis from July 1997 and the international financial crisis from 2008 beginning in America.

Figure 5.1.Trend of Average Per Capita GDP Growth of ASEAN



In 1998 and 2009, the average per capita GDP growth was -3.4% and -0.2%, respectively in recession. Therefore, the research used two-way FE model by adding the time effect variables set to examine more correctly relationship between debt and per capita GDP growth. Figure 5.1 reveals that ASEAN had large fluctuation in per capita growth in 1998 with the main reason derived from devaluation of Thai baht leading to currency crises and

3

instabilities of Thailand, the rest of ASEAN such as the Philippines, Indonesia, Malaysia, and other Asia countries such as South Korea and Hong Kong (Lauridsen, 1998). The global crisis triggered by American housing price crisis in 2007 then expanded to other areas from Europe to Asian countries. This crisis may have influenced the Asian area, making the stock market lose point and difficult to access international capital flow (James et al., 2008). As the results, these instabilities of global economy had negatively associated with economic growth in South East Asia countries.

The model used to examine the linear impacts of public debt on growth with time effect variable set is two-way FE model. The following table reveals the results of testing the equation (1) that gross public debt have negative effect on per capita GDP growth at 10% of significance (Table 5.1). With a one percentage point increase of GDP of gross public debt will lead to a reduction of nearly 0.05 percentage point of per capita GDP in growth. Domestic public debt also has had negative linear correlation with per capita GDP growth (Table 5.1). When domestic public debt rises by one percentage point GDP, per capita GDP growth will decrease about 0.07 percentage points. Domestic public debt to GDP ratio of ASEAN on average was 28.25% over the period of 1990-2010. With limited money resource flow within its members, it is difficult for ASEAN countries to borrow and create domestic capital resource for development.

Table 5.1 Regression Results of Linear Relationship between Public Debt and GDP growth

Variables	**Gross public debt (1)**	**External Public debt (2)**	**Domestic public debt (3)**
Gross public debt	-0.0496154*	-	-
External Public debt	-	.0311808**	-
Domestic debt	-	-	-.0735991**
Initial per capita income	0.0002422***	.0000892	.0002339***
Population growth	-1.38481***	-1.289819**	-1.587147***

Total investment	0.5326253***	.2336817***	.6324403***
Gross national savings	-0.3737337**	-.0496978	-.4569353***
Current account balance	0.3672449**	-.0080799	.4338222***
Human capital	-6.343106	-11.08645	-11.70237
Inflation rate	0.0403537	-.0801271**	.0498492
Trade openness	-0.003777	-.0129883	.0020702
R-squared	0.2200	0.2233	0.2233

Note: Levels of significance: *** p< 1 percent, ** p< 5 percent, * p< 10 percent. Time dummies are not reported. (1) refers to the model where the debt indicator is gross public debt to GDP ratio; (2) refers to the model with external public debt to GDP ratio as the debt indicator; (3) refers to the model with the domestic public debt to GDP ratio.

The results of examining linear model show that external public debt has statistically significant positive impact on GDP growth. As external public debt increases by one percentage point, GDP growth will increase by about 0.03 percentage points. It is reasonable because most of ASEAN members have low level of external public debt to GDP ratio. Over the period of 1990-2010, the trend of average external public debt rate to GDP of ASEAN had declined gradually from 93.56% in 1990 to 18.48% in 2010. An increase in external public debt will create more capital resource for development in the condition that most of ASEAN member are developing countries demanding money to promote infrastructure.

As can be seen in the above results, the negative impact of gross public debt mostly was caused by negative effects of domestic public debt. In the previous empirical studies, the negative relationship between domestic public debt and economic growth was examined by the Singh (1999) with data of India over the period 1959-1995. Moreover, the negative relationship between public debt and growth was also found by Kourtellos, Stengos, and Tan (2013) by using data of Low-democracy regime countries. The new study by Panizza and F. Presbitero (2014) shows that public debt negatively correlated with growth by using the fix effects for OECD countries; however, there is not enough evidence to conclude that public debt has causal link with economic growth. Since the results suggest the negative link

between gross public debt and per capita GDP growth which was mainly decided by negative relationship between domestic public debt and GDP growth, it is necessary to separate external public debt and domestic public debt when discussing about the correlation of public debt and growth. Some other empirical research shows that external public debt has positive effects on economic growth at reasonable debt level. For example, Clements, Bhattacharya and Nguyen (2003) found that when external debt is lower than a threshold 50% GDP, an increase in external debt will improve per capita growth. In the similar way, Reinhart and Rogoff (2010) argue that lower than the threshold around 90% GDP, external debt has positive correlation with growth. In ASEAN, average level of external public debt is still at low level; thus, external debt is positively correlated with growth. Only results from examining relationship between gross public debt and growth in general may not correctly represent correctly impacts of different sources of debt on economic growth. In particular, the study is showing that a negative effect of domestic public debt on growth was eliminated by positive effect of external public debt on growth. Consequently, the government may not have motivation to borrow more money from outside its capital market.

5.2 Non-linear Relationship between Public Debt and Economic Growth

As stated in the previous chapter and the last section, to test the non-linear impacts of public debt on growth, the study added the debt indicator, which is the squared public debt to GDP ratio, with the time effect variables in the model.

Table 5.2 Regression Results regarding Non-linear Relationship between Public Debt and Growth

Per capita GDP growth	Gross public debt (1)	External public debt (2)	Domestic public debt (3)
Gross public debt to GDP ratio	.1214356	-	-
External public debt to GDP ratio	-	.0319121	-
Domestic public debt to GDP ratio	-	-	-.0715837*
Gross public debt to GDP ratio_squared	-.0015105*	-	-
External public debt to GDP ratio_squared	-	$-2.18x10^{-06}$	-
Domestic public debt to GDP ratio - squared	-	-	-.0000433
Initial per capita income	.0003104***	.0000886	.0002398**
Population growth	-1.712247***	-1.290274***	-1.598647***
Total investment	.6118163***	.2336575**	.632123***
Gross national savings	-.4654466***	-.0490608	-.4613465**
Current account balance	.4238786**	-.0084346	.4333298**
Human capital	-8.832874	-11.06022	-11.55245
Inflation rate	.0262386	-.0800171**	.0473583
Trade openness	-.0010798	-.012964	.0019801
R-squared	0.3202	0.3261	0.2228

Note: Levels of significance: *** p< 1 percent, ** p< 5 percent, * p< 10 percent. Time dummies are not reported. (1) refers to the model where the debt indicator is gross public debt to GDP ratio; (2) refers to the model with external public debt to GDP ratio as the debt indicator; (3) refers to the model with the domestic public debt to GDP ratio.

As seen in Table 5.2, the squared term of gross public debt to GDP ratio has had statistically significant negative impacts on the growth of per capita GDP at 10% of significance. On the other hand, the variable of gross public debt to GDP ratio was not statistically significant. Therefore the study rejected the non-linear relationship between gross public debt and per capita GDP growth. The results were illustrated in the Table 5.2 show that external public debt and domestic pubic debt has no non-linear correlation with per capita GDP growth. Similar with the results from the previous section , domestic public debt has negative impacts on per capita GDP growth at 10% of significance with coefficient of minus 0.07 (Table 5.2). However, this table is not showing the effect of variable gross public debt to GDP, external public debt to GDP ratios on growth clearly.

Most of the previous studies suggest the non-linear relationship between debt and economic growth. For example, Clements et al (2003), Dreger and Reimers (2013), Pattillo, Poirson and Ricci (2011), Reinhat and Rogoff (2010), Kumar and Woo (2010), Mencinger, Aristovnik and Verbic (2014) indicate the turning points of public debt which over these levels, public debt will change direction of impact on growth from positive to negative. In despite of these previous, the study's findings show that there is no non-linear relationship between public debt and growth in ASEAN sample even though gross public debt to GDP squared has significant coefficient on growth at 10 percentage level of significance.

Furthermore, the control variables such as initial per capita income, population growth, investment, gross national savings and current account balance have significantly affected economic growth. In particular, an increase in population will reduce economic growth of ASEAN. Most of ASEAN members are developing countries with the high speed of population growth. As seen in results, the issue of increasing population will bring difficulties to these countries, prevent economic growth. Investment positively influences

economic growth at 1% of significance. That is a motivation of ASEAN governments to borrow more money from international market to finance for public investment and attract greater private investment. Investment creates more jobs, increases GDP per capita then promotes growth. In these models, initial per capita income has not had significant economic effect on per capita GDP growth. Inflation rate has negative correlation with economic growth; current account balance also has positive effects on economic growth which was shown in Table 5.1 and Table 5.2. In the period of Asian financial crisis 1997-1998, the ASEAN nations had high level of inflation and average per GPD growth was at lowest level which was -3.4 in recession. Furthermore, high inflation increased the risk of returns of investment; therefore over the financial crisis, a lot of capital flight happened. Lower investment lowered economic growth.

Moreover, in both linear model and non-linear models, the year of 1998 statistically influenced economic growth. It means that in 1998, the growth of ASEAN countries was influenced by very big financial shocks from the Asia financial crisis 1997-1998. Over period 1997-1998, there was a financial crisis which started from Thailand, then going onto other countries such as the Philippines, Indonesia, Malaysia, etc. Negative significant coefficient on the dummy of 1998 represented for the financial crisis of Asia 1997-1998 which had negatively influenced economic growth in ASEAN area. Similarly, the study used the dummy variable for year of 2007 and 2008. However, the results from examine effects of global crisis 2007-2008 on ASEAN economic growth was not statistically significant.

In general, gross public debt and domestic public debt to GDP ratios have negatively correlated with per capita GDP growth while external public debt has positive linear effects on economic growth. Gross public debt in ASEAN is the total of domestic public debt and

external public debt. Non-linear correlation of all gross public debt, external public debt and domestic public debt with economic growth was not found in the research.

6. Discussion and conclusion

Over the last two decades from 1990s, total public debt in ASEAN has increased significantly. However, the overall ratio of public debt to GDP has decreased to a moderate level. This issue may be an important factor leading to economic growth of ASEAN members over the period 1990-2010. Since low levels of public debt to GDP will attract more investment into the country, GDP growth will increase as a consequence.

This study has provided empirical evidence about the relationship between public debt and economic growth for a panel of 10 ASEAN countries, in addition to an overview of their debt management policies. Methodologically, the paper used fixed effects model with time dummies to estimate the impacts of the debt to GDP ratio on per capita GDP growth. The results, based on two-way FE model, suggest a linear relationship between public debt and growth. There is no evidence on non-linear correlation of public debt and growth for ASEAN over the period of 1990-2010.

The research's findings show that gross public debt and domestic public debt have negative correlation with economic growth, while external public debt is positively correlated with growth. The results also suggest that there is a positive relationship between investment and economic growth, a negative relationship between population and growth. Inflation has negative impacts on growth.

While all countries in the ASEAN area are trying to control external public debt at reasonable levels, with Singapore and Brunei no external public debt, domestic public debt is the more important factor to which should be paid more attention. Since an increase in of the domestic debt to GDP ratio will lead to a decrease in per capita GDP growth, ASEAN governments should balance domestic debt with GDP. If GDP level increases faster than the

speed of domestic debt, they can borrow more money from domestic markets to finance public investment.

Developing countries often depend much on external borrowing. External public debt may play a crucial role in creating financial source for development and promoting economy. As seen in the results that external debt to GDP has a positive coefficient on the growth model, therefore, an increase in external debt to GDP ratio will lead to increase in growth, while controlling other factors. In the condition that most of ASEAN members are developing countries (eight out of 10 countries) requiring more resource for infrastructure development, external borrowing seems to be an effective method to finance such developmental efforts.

ASEAN members also need to control the speed of population growth because it has a negative impact on growth in general. Population growth creates abundant labor force supplying for the labor market. However, in low-income and lower-middle-income countries such as Cambodia, Myanmar, Vietnam, Laos PDR, the Philippines, and Indonesia, abundant labor may mean more serious unemployment issues and social problems, which can negatively influence economic growth.

In the case that AEC is going to be established in coming times, debt issue should be an important aspect that needs to be considered carefully and specified in a particular policy. Data on public debt should be given full attention among international organizations such as IMF and World Bank. It is necessary to have a close link between the governments of ASEAN and international organizations providing information on public debt.

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