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THE IMPACT OF FEDERAL GOVERNMENT DEBT LEVELS ON PRODUCTIVITY GROWTH IN MALAYSIA

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ABSTRACT

Issues of government debt levels and productivity growth are complicated and have different aspects. Throughout the course of the recent decades the nexus between government debt levels, economic growth and productivity growth has attracted an attention of economists. In this context, this paper attempts to investigate the impact of federal government debt levels on productivity growth for Malaysia by using annual time-series data over the period of 1970 to 2012. The ARDL Bounds Test Approach is used to estimate this relationship. The empirical results show the existence of cointegration relationship between the productivity growth, federal government debt, investment, trade openness, education and population growth, in the long-run. It is also found that the government debt positively affects the productivity growth. Furthermore, manufacturing and service sectors have the greatest contribution to the total factor productivity growth as well as they are positively related to the government debt and would benefit from the increase in debt levels. Thus, the expansionary policy might boost these sectors and then the total productivity growth.

Keywords: Government Debt; Productivity Growth; Investment; ARDL; Malaysia.

Introduction

Under a cloud of increasing public debt levels, the real picture of the world economy is difficult to make certain that the fiscal policies are sustainable in economies. The significance of public debt for economic growth has become pivotal, especially when policymakers face rising fiscal imbalances. Concerning economic theory, at temperate levels of public debt, fiscal policy may stimulate economic growth within a Keynesian model behavior. However, at high levels of debt, these potential positive impacts of government debt will be reduced through expected future tax increases, falling investment and consumption, resulting in lower output growth and less employment. Unfortunately, the empirical evidence that is currently available to highlight the significance of public debt for growth of productivity is not conclusive. Recent studies observe a revival in this subject, which is supported by the deterioration of public finance in many developed and developing economies as a result of the 2008-2009 financial crises (Reinhart & Rogoff, 2010), which in response, governments issued large fiscal stimulus. Since excessive debt levels have been associated with the standard of living, business cycle and economic stability and can threaten them, understanding the relationship between government debt, productivity growth is essential for policymakers in formulating economic policies. The macroeconomic consequences of government debt accumulation in the Malaysian economy are still completely unknown. There are differences of opinions about its functions and effectiveness in developing economic activities. Since 1980, the economy has maintained open policies towards trade and investment. Therefore, Foreign Direct Investment (FDI) played a significant role in developing the economy through its contribution to the capital formation. During 1970s, the investment ratio reached its peak. However, since the Financial Asian Crisis (FAC) in 1997, the economy has experienced some form of deterioration in its net inflow of FDI due to the general regional economic environment and Japanese economic imbalances- the major investor in the region. in comparing with regional

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economies, the investment rate in Malaysia is the lowest. Therefore, this issue establishes grounds for questioning if there are other factors, such as public debt, that played a role to affect productivity growth in Malaysia, since investment is one of the major components of physical capital. This paper attempts to contribute to the literature by investigating empirically the role of government debt plays on productivity growth in Malaysia. The findings of this research will address all the underlying issues outlined in this research. Moreover, policymakers will have a better understanding of the matters linked to the research. This paper contains five sections. With this Introduction, section II provides a brief literature review. Section III presents the methodology and model specification, whereas section IV presents the empirical findings. The conclusion and policy discussion are presented in the last section.

Brief Literature Review

Many attempts have been made to explain the phenomenon of economic growth and many factors have been associated with it; like human and physical capital. This procedure has been going on since the middle of the twentieth century. One of these attempts is the Harrod-Domar model (1946). This model illustrates that economic growth is dependent on capital accumulation, which ultimately supports the concept of high debt being directly proportional to the accumulation of capital. However, the model depicts complete competition, market clearance and complete employment. In 1956, Solow-Swan put forth a neoclassical growth model in which he highlighted the impact of savings and changes in exogenous technology on the income level and physical capital accumulation. He proposed this model to check the variety of sources of output per worker, differences in the effectiveness of labor and the capital per worker. However, the conclusion of his models suggests that labor effectiveness and technical changes are helpful in increasing the growth of capital in the long run. Moreover, the whole thing could be summed up in two points i.e. (i) Pareto-efficient outcomes are caused by basic elements like resources, preferences and technology. (ii) In this case the institutions are of no significance in affecting the factor of stability.

In the past twenty years, there have been a number of researches and studies regarding the association of the economic growth, productivity growth and debt. Pattillo et al.(2004) find that the increase in the external debt would lead to reduce total factor productivity growth as well as the population growth is correlated negatively with the productivity growth. Productivity growth tends to decline as government debt increases. A research was conducted in Pakistan by Akram (2011) in order to investigate the way in which growth and investment is influenced by government debt. Autoregressive Distributed Lag (ARDL) technique was used. Data from 1972-2009 was used. It was discovered that a negative relationship exists between foreign debt and investment per capita GDP. The outcomes of the research are aligned to the existence of the Debt overhang effect. However, the crowding out hypothesis hindered confirmation as there were no considerable relationships between per capita GDP, investment and debt servicing. It could therefore be concluded that it reflects to crowd out private investment. A research conducted on a wider scope considering samples from 155 developed and developing countries, including Malaysia, from the year 1970 to 2008, Afonso and Jalles (2012), tried to investigate the linkage between growth, productivity, and government debt. Endogeneity, cross-section dependence, simultaneity, threshold effects and nonlinearities were analyzed with the help of growth equations. They discovered a negative influence of debt ratio. Regarding OECD nations, the paced up debt maturing results in increased economic growth; growth is influenced by financial crisis; growth is boosted by fiscal consolidation; high debt ratios facilitate TFP growth. Increased debt ratio by 10 per cent results in paced up growth of around 0.2 per cent (1 per cent), respectively, for the countries having economies with debt below 30 per cent and more than 90 per cent, and the threshold of endogenous debt ratio appears to be 59 per cent.

Methodology, Estimation Techniques and Model Specification

The analytical framework for our analysis is based on the neoclassical growth model. Following the inclusion of exports in the production function, the debt burden has also been introduced into the production function by (Cunningham, 1993). This is due to the important effects of public debt on capital and labor productivity. Economies with heavy debt need to outsource part of their resources to service their debt obligations having important outcomes on their resolutions concerning labor and capital employment. Thus, to identify the impact of public debt on productivity growth; firstly, TFP growth should be calculated. The underlying basic aggregate production function form can be as follows:

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$$Y = AF(L, K, D) \ldots \ldots \ldots \quad (1)$$

Where L is labor force; K is capital stock; Y is the measure of GDP; D is government debt, and A is other constant factors. According to the neoclassical growth model, an economy that seeks to increase economic growth can increase its savings that will result in the increase in investment and to a lesser extent economic growth. Many studies have been conducted on the relationship between debt and economic growth. Among these, Cohen (1993), mentions that the relationship between investment and the nominal value of debt is the “Laffer curve". He states that the expected repayment and investment start reducing once outstanding debt increases above a certain threshold level. Pattillo, Poirson, and Ricci (2004), demonstrate how high debt levels influence growth through their impacts on both total factor productivity and capital accumulation. However, we conform to the efforts of Afonso and Jalles (2012) to determine whether government debt has a role to play on economic growth by using a reduced form of debt-growth model to modified to determine such a role. To capture structure breaks, we add a dummy variable (DUM) to the model as a proxy for the economic and financial Crises. Thus, the paper specifies two model equations for Malaysia to be analyzed as below:

$$TFP_t = \beta_0 + \beta_1 TFP_{t-1} + \beta_2 LND_t + \beta_3 LNIN_t + \beta_4 LNOPEN_t + \beta_5 LNS_t + \beta_6 LNPOP_t + \varepsilon_t \ldots \ldots (2)$$

$$TFP_t = \beta_0 + \beta_1 TFP_{t-1} + \beta_2 LND_t + \beta_3 LNIN_t + \beta_4 LNOPEN_t + \beta_5 LNS_t + \beta_6 LNPOP_t + \beta_7 DUM_t + \varepsilon_t \ldots (3)$$

Where TFP_t is the Total Factor Productivity growth, TFP_{t-1} is lagged value of TFP, D_t is the government debt to GDP, IN_t is gross investment (gross capital formation), $OPEN_t$ is openness (export plus import/ GDP). POP_t is population growth and S_t is secondary education. Debt and investment are expressed as real terms by dividing them on CPI (base year is 2000=100). Finally, ε_t is the error term and $B_{0,} B_{1,\ldots\ldots,} B_6$ are coefficients. All time-series are measured in one-unit of ringgit and transferred into logarithm. The data for this study were sourced from a number of documents, namely the Penn World Table 8.0, Monthly statistical bulletin (Negara Bank Malaysia), Department of Statistics Malaysia (Negara Bank Malaysia) and World Development Indicators (World Bank).

In this paper the recently developed Autoregressive Distributed Lag ARDL Bounds testing method of Pesaran et al (2001) is employed to investigate the cointegration relationship for equations (2) and (3). Most recent studies use this technique of cointegration to test the time series of growth, investment and public debt, such as (Akram, 2011). In the context of this analysis, while we should point out that critical values of F-test (Pesaran et al 2001) are created for large samples, Narayan (2005) argue that such critical values cannot be used for small samples like the ones in this study (only 41observations). Narayan (2005) has replicated a set of critical values for the Pesaran et al (2001) cointegration procedure that is appropriate for a small sample study ranging between 30 and 80 observations. Recently, Pesaran and Pesaran (2009) updated a set of critical values for the ARDL. Since this study has a small sample, both sets of critical values of Pesaran and Pesaran (2009) and Narayan and Narayan (2005) will be used in this study to confirm the long-term co-integration relationship of our models. Finally, The ARDL technique provides valid t-statistics and unbiased estimates of the long-run model even when some of the explanatory variables are endogenous (Yue, 2010).

The ARDL approach contains two steps for estimating relationship in the long run. The first step is to examine the existence of such relationship among all variables in the equation. The ARDL method is required to estimate (m + 1)k+1 of different ARDL models in order to obtain optimal lag length for each variable, where m is the maximum number of lags to be used and k is the number of regressors in the equation. Here, we have to point out that we cannot move to the second step until the relationship is confirmed in our model. The ARDL can also estimate the error correction model (ECM) that corresponds to the selected ARDL model. According to M. H. Pesaran, Shin, and Smith (2001) , the estimation of the productivity growth equations (2), (3) can be expressed in the UECM version of the ARDL model as follows:

$$\Delta TFP_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta TDFP_{t-1} + \sum_{i=1}^{n} \beta_{2i} \Delta LND_{t-1} + \sum_{i=1}^{n} \beta_{3i} \Delta LN\, IN_{t-1} + \sum_{i=1}^{n} \beta_{4i} \Delta LNOPEN_{t-1} + \sum_{i=1}^{n} \beta_{5i} \Delta LNS_{t-1} + \sum_{i=1}^{n} \beta_{6i} \Delta LNPOP_{t-1} + \alpha_1 TFP_{t-1} + \alpha_2 LND_{t-1} + \alpha_3 LNIN_{t-1} + \alpha_4 LNOPEN_{t-1} + \alpha_5 LNS_{t-1} + \alpha_6 LNPOP_{t-1} + e_t \ldots \ldots (4)$$

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$$\Delta TFP_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta TDFP_{t-1} + \sum_{i=1}^{n} \beta_{2i} \Delta LND_{t-1} + \sum_{i=1}^{n} \beta_{3i} \Delta LNIN_{t-1} + \sum_{i=1}^{n} \beta_{4i} \Delta LNOPEN_{t-1} + \sum_{i=1}^{n} \beta_{5i} \Delta LNS_{t-1} + \sum_{i=1}^{n} \beta_{6i} \Delta LNPOP_{t-1} + \sum_{i=1}^{n} \beta_{7i} \Delta DUM_{t-1} + \alpha_1 TFP_{t-1} + \alpha_2 LND_{t-1} + \alpha_3 LNIN_{t-1} + \alpha_4 LNOPEN_{t-1} + \alpha_5 LNS_{t-1} + \alpha_6 LNPOP_{t-1} + \alpha_7 DUM_{t-1} + e_t \quad \ldots\ldots (5)$$

Where: Δdenotes the first difference operator,$\alpha_0$is the drift component, and e_t is the usual white noise residuals. On the left-hand side is the productivity growth whereas on the right hand side is parameters (α1, α2, α3, and α4) of long-run relationships. The rest of parameters (β1, β1, β3, and β4) denote the short-run dynamics of the model.

The ARDL bounds testing approach of Pesaran et al. (2001) is required to perform two steps. First, using an estimated of unrestricted error-correction models (UECM) or F-test to test for joint significance of no cointegration relationship, the null hypothesis and the alternative hypothesis of cointegration relationship of equation (3) are: (H0: β5 = β6 = β7 = β8 = 0), (H1: β5 ≠ β6 ≠ β7 ≠ β8 ≠ 0). Similarly, the null hypothesis and the alternative hypothesis of the co-integration relationship of equation (4) are: (H0: β6 = β7 = β8 = β9 = β10 = 0), (H1: β6 ≠ β7 ≠ β8 ≠ β9 ≠ β10 ≠ 0). Pesaran and Pesaran (2009) produce three sets of critical values of the F-statistics, for each level of significance which is 1 percent, 2.5 percent, 5 percent, 10 percent without intercept and without time trend, with intercept and without time trend, with intercept and with time trend respectively (Pesaran and Pesaran. 2009, Appendix B page 564). As such, it is assumed that all variables are I(0) and I(1). If the calculated F-value has exceeded the upper critical bounds value, the null hypothesis can be rejected at a conventional level of significance confirming that a cointegrating relationship exists among the variables. If the calculated F-value lies below the lower bound critical value, the null hypothesis cannot be rejected, confirming that no cointegration relationships exist among the variables. Nevertheless, if the F-value lies within the two bounds, any conclusion cannot be made. In this case, further analysis of the time series properties is required before any conclusion can be made.

Empirical Findings

In the procedure of cointegration test, it is very important to test the presence of unit root for all incorporated time series variables. For this purpose, all time-series have been subjected to the unit root test, namely, namely, Augmented Dickey-Fuller (ADF) for the levels and first differences in order to test the existence of unit roots for variables. The result s show that we cannot reject the null hypothesis of a unit root at level of significance for all the variables in level. However, all the variables appear to be stationary at the first difference of significance. Thus, the ARDL bound test method can be used for this research. According to the VAR lag length selection technique, the lag length of one has been selected, based on the smallest value of the Schwarz Bayesian Criterion (SBC). The computed F-Statistics for the significance of the lagged levels in equations (4) and (5) are (3.983) and (3.933) respectively. All of the F-statistics exceed the upper bound critical values of both B. Pesaran and Pesaran (2009) and Narayan (2004) at the 5 percent level of significance at least. Therefore, the null hypothesis of no cointegration relationship among the variables can be rejected in all two model equations. This implies that there is a long-term cointegration relationship among the variables in the estimated productivity growth model equations. The estimate long-run coefficients for equations (4) and (5) are presented in table (1) as follows:

Table 1: Long-Run Coefficients for Malaysia's Productivity Growth

Variables	ARDL (1,0,1,0,0,0)			ARDL (1,0,1,0,0,0)		
	Coefficient	Std.Error	[P-value]	Coefficient	Std.Error	[P-value]
LND	0. 2159	0. 0848	[0. 075]	0. 1873	0. 1011	[0. 074]
LNIN	0. 9295	0. 0511	[0. 079]	0. 9895	0. 0538	[0. 076]
LNOPEN	0. 2601	0. 1190	[0. 036]	0. 2891	0. 1341	[0. 039]
LNS	0. 3420	0. 1879	[0. 078]	0. 3874	0. 2096	[0. 074]
LNPOP	0. 4832	0. 2102	[0. 028]	-0. 5045	0. 2244	[0. 032]
INPT	-0.0162	0. 0085	[0. 066]	-0. 0200	0. 0104	[0. 064]
DUM		--	--	0. 0169	0. 0196	[0. 394]

Notes: (I) The dependent variable is (TFP), 41observations used for estimation from 1972 to 2012.

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In long-run, the productivity growth is significantly and positively related to the federal government debt at 10 % significance level in improving the country's productivity growth, implying that the government borrowing has been efficiently allocated to investment. This result corroborating the findings of Afonso and Jalles (2012), an increase in the TFP growth by 0.01 %, requests increase the government debt by 0.1%. By the same token, the investment and education are positively and significantly affect productivity growth, imply that an acceleration of technical progress in high-tech industries and the investment in information technology would lead to increase the TFP growth for Malaysia. While, openness is found to have positive impact on TFP growth at 5 per cent significant level, implying that the country would receive a positive impact that helps in improving the productivity growth when its economy open to the rest of the global but has to be prepared with a precaution procedure to any unexpected shock to its economy. However, population growth is negatively associated with TFP growth at 5 % significant level. On sectoral productivity growth side, the degree of effect of the government debt is different from sector to another. The manufacturing and service productivities growth are positively associated with government debt at 5 % significance level whereas the agricultural sector is negatively affected._A number of diagnostic tests are performed for functional form. The LM test for serial correlation confirmed that these models do not suffer from any serial correlation problem. Besides that, Ramsey's RESET indicates that there is no specification errors related to these models. The ARCH test did not reveal any evidence of heteroscedasticity. Furthermore, the test of kurtosis and Skewness of residuals shows that there is normal behavior of the estimated residual series. It can be seen that the error correction term is highly significant and carries the expected negative sign, which indicates that the variable will speedily return to equilibrium and a faster adjustment process. The error-correction term lie in the range from (0.77) to (0.74) in both models. This indicates that about (0.77) to (0.74) percent of the previous year's shocks adjust back to the long run equilibrium in the current year. For stability tests, The CUSUM and the CUSUMSQ tests confirm that the equations are stable and correctly specified.

Conclusion and Policy Discussion

It is concluded that the federal government debt has a positive and significant effect in explaining the TFP growth during the sample period, and it is the most effective factor in the short-term. The manufacturing and service sectors have the greatest contribution to the total factor productivity growth as well as they would benefit from increase in government debt. Thus, the expansionary policy might boost these sectors and then the total productivity growth. Yet, the government seeks to improve and enhance the productivity growth through adopting some strategies that would help to increase the capital accumulation by motivating the domestic and foreign investment and improve the management skills for employees. Restructuring the economy by shifting resources among sectors and adopting the economic development driven by the manufacturing sector, and increasing the management skills and advance technologies brought in by the international firms, help to contribute to productivity growth. Moreover, export sector also positively affects the productivity growth because of foreign competition and advantages of economic of scale. Finally, these outcomes also give further evidence of the existence of a stable long-run level cointegration relationship among the variables of the model. As a conclusion, Malaysia needs to enhance the productivity growth over time by taking some steps such as an intact management system, developing human resource, suitable technology and lastly, research and development.

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