REVISITING THE EFFECT OF GOVERNMENT EDUCATION EXPENDITURE ON ECONOMIC GROWTH IN MALAYSIA: USING DISAGGREGATE APPROACH

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ABSTRACT

This study aims to estimate the effects of education expenditure on economic growth in Malaysia, using annual data from 1980 to 2012. The Malaysian government has invested a lot on the education, however, it appears that the innovation, productivity and technology advancement are not improving as expected in order to produce a better-educated labour force for accelerating the economic growth. Therefore, there is need to re-examine the effect of government education expenditure on economic growth. This study also takes a closer look at the effects of levels of education on economic growth. The finding indicates that there is a positive effect exists between the economic growth and federal government development in the long-run. This study also reported the existence of a positive effect between the levels of education and economic growth in the long-run. The empirical findings of Granger causality based on the error-correction model estimate indicates unidirectional causality runs from economic growth to development education expenditure. This study also reports the unidirectional causality runs from the economic growth to secondary and tertiary levels of attainment. The role of government expenditure on education and levels of education, especially the secondary and tertiary education level seems to be very important and significantly explains economic growth of Malaysia. Therefore, this study suggests that the government should make investments in education, especially in quality inputs such as teaching and learning process, skills and technology aspects in order to create higher skilled human capital, which leads to the skilled labor force, later leads to the better economic growth which is in line with the national aspiration to become a high income economy by the year 2020. High income economy ones can be achieved if we have a highly skilled human capital in the entire field.

Key Words: education expenditure, levels of educational attainment, economic growth, granger causality, Malaysia.

ABSTRAK

Kajian ini bertujuan untuk menyiasat kesan daripada perbelanjaan pendidikan terhadap pertumbuhan ekonomi di Malaysia dengan menggunakan data tahunan dari 1980 hingga 2012. Kerajaan Malaysia telah menambah peruntukan untuk sektor pendidikan bagi setiap tahun, walau bagaimanapun, ia kelihatan bahawa inovasi, produktiviti dan kemajuan teknologi tidak bertambah baik seperti yang diharapkan dalam melahirkan tenaga kerja yang berpendidikan lebih baik untuk mempercepatkan pertumbuhan ekonomi. Oleh itu, terdapat keperluan untuk mengkaji semula kesan kerajaan perbelanjaan pendidikan terhadap pertumbuhan ekonomi. Kajian ini juga mengambil pendekatan yang lebih dekat dalam menyiasat kesan tahap persekolahan ke atas pertumbuhan ekonomi. Hasil kajian ini menunjukkan bahawa terdapat kesan positif di antara pertumbuhan ekonomi dan perbelanjaan pembangunan kerajaan persekutuan ke atas pendidikan dalam jangka masa yang panjang. Kajian ini juga melaporkan kewujudan kesan positif di antara tahap pendidikan dan pertumbuhan ekonomi dalam jangka masa panjang. Hasil kajian empirikal Granger berdasarkan VECM mendedahkan bukti sebab akibat satu arah berjalan dari pertumbuhan ekonomi ke perbelanjaan pendidikan pembangunan bagi Model 1. Hasil dapatan empirikal Granger berdasarkan VECM, bagi Model 2, menunjukkan bahawa terdapat bukti sebab akibat satu arah dari pertumbuhan ekonomi ke tahap persekolahan menengah dan tahap pendidikan tinggi. Peranan perbelanjaan kerajaan terhadap pendidikan dan tahap persekolahan, terutama sekali peringkat menengah dan pengajian tinggi seolah-olah menjadi sangat penting dalam menjelaskan pertumbuhan ekonomi Malaysia. Oleh itu, kajian ini menunjukkan bahawa kerajaan perlu membuat pelaburan dalam pendidikan, terutamanya dalam input yang berdasarkan kualiti seperti proses pengajaran dan pembelajaran, kemahiran dan aspek-aspek teknologi bagi melahirkan modal insan yang berkemahiran tinggi yang mampu melahirkan tenaga buruh yang mahir, kemudian membawa kepada pertumbuhan ekonomi yang lebih baik yang selaras dengan aspirasi negara untuk menjadi ekonomi yang berpendapatan tinggi menjelang tahun 2020. Status negara yang berpendapatan tinggi boleh dicapai sekiranya kita mempunyai modal insan yang berkemahiran tinggi dalam semua bidang.

Kata kunci: perbelajaan pendidikan, tahap kemasukan persekolahan, ekonomi, granger, Malaysia.

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INTRODUCTION

1.0 Government Spending on Education and Economic Growth

Most of the recent studies on endogenous growth theory generally agree that human capital has a significant impact on economic growth. The human capital accumulated by the education has a potential to be broader and more sustainable due to the increase in the productivity and technology advancement (Lucas, 1988; Romer, 1990; Maitra and Mukhopadhyay, 2012; Jalil and Idrees, 2013). Further, human capital is an important element of growth, improving and complementing government's development policies with a number of positive externalities that generated along with the increase in the private returns. However, formation of the human capital requires spending on education (Maitra and Mukhopadhyay, 2012). Education can be measured as the number of enrolments and levels of education, expenditure on education and training as well as the years of schooling (Lucas, 1988; Barro, 1991; Pritchett, 2001).

In other words, government spending on education contributes to the human capital, which will promote to the technological progress and later promotes the economic development. Besides that, the neoclassical growth theory expounded by Mankiw et al. (1992) shows that by considering the human capital as an additional input in Solow model, human capital has a potential impact on the level of economic growth.

According to the human capital theory, formal education is an investment in human capital and it is necessary to increase productivity of the population (Olaniyan & Okemakinde, 2008; Zivengwa et al., 2013). Education is the most needed criteria to enroll in any kind of job field. Therefore, it is a set of skills that required by employers when hiring employees. Workers are upgrading their skills and value through training and experience that mold them to succeed in the marketplace. It is the most important factor of wealth creation in many nations.

Wye and Ismail (2012) have noted that a country has to invest more in education to boost human capital that capable to produce workers who are able to remain competitive in the labour market. In this regard, education attainment is believed to have a positive relationship in creating job opportunity where a higher education attainment leads to higher achievement in the labour market (Bowen and Finegan, 1996; Wye and Ismail, 2012: Zivengwa et al., 2013). Therefore, most of the developed and developing countries around the world focus on the enhancement of the educational sector (Hussin et al., 2012).

For a developing country like Malaysia, it has no exceptions in improving and promoting its educational system in order to be a world class economy and at the same time to be a high income nation by 2020. Malaysian government's commitment in developing its educational sectors at all levels can be shown clearly. This is can be seen in the expenditure on education each year. The amount being spent and allocated for education has increased since 1990 and reflects the importance given to education by the Malaysian government (Economic Planning Unit, 2013). The

Malaysian government has taken upon itself to provide education to its citizens as an initiate to increase the educational attainment of its labour force.

One of the Malaysian government's strategies in developing its educational sector is EduCity Iskandar Malaysia which is located in Johor (Iskandar Investment, 2012). Malaysian government had spent a lot of money in order to build the EduCity Iskandar Malaysia with the aim of developing talent in the region and as a boost for catalyst of change. Further, the EduCity Iskandar Malaysia is a fully integrated hub education which recognized by the Entry Point Project (EPP) under the National Key Economic Area (NKEA) with the aspiration that stimulates the Malaysian economy (Iskandar Investment, 2012).

Taking the contrary view, even though, the Malaysian government has increased the allocation for the education sector, but we are far lacking behind in producing desired human capital compared to other Asian countries such as Singapore, Japan, Taiwan and China (Malaysia Productivity Corporation (MPC), 2014). Table 1.1 reports the results of the Global Competitiveness Index in comparison with Malaysia. The Global Competitiveness Index, referred as a measurement scale which evaluate the productivity and efficiency of countries (World Economic Forum, 2012, p. 15).

From the Table 1.1, one can easily conclude that we are trailing behind the high performing education system when compared to other East Asian countries. Even though, the relative rank achievement of the Malaysian government appears to

be upgrading from the year 2011 to 2014 but the absolute score value is not showing a significant increase when compared to 2013 and 2014.

Table 1.1: The Global Competitiveness Index

Country	GCI 2014-2015 N=144		GCI 2013-2014 N=148		GCI 2012-2013 N=144		GCI 2011-2012 N=142	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Switzerland	5.70	1	5.67	1	5.72	1	5.74	1
Singapore	5.65	2	5.61	2	5.67	2	5.63	2
United States	5.54	3	5.48	5	5.47	7	5.43	5
Finland	5.50	4	5.54	3	5.55	3	5.47	4
Germany	5.49	5	5.51	4	5.48	6	5.41	6
Japan	5.47	6	5.40	9	5.40	10	5.40	9
Hong Kong	5.46	7	5.47	7	5.41	9	5.36	11
Netherlands	5.45	8	5.42	8	5.50	5	5.41	7
United Kingdom	5.41	9	5.37	10	5.45	8	5.39	10
Sweden	5.41	10	5.48	6	5.53	4	5.61	3
Taiwan, China	5.25	14	5.29	12	5.28	13	5.26	13
Malaysia	5.16	20	5.03	24	5.06	25	5.08	21

Source: Malaysia in the Global Competitiveness Report 2014-2015, Malaysia Productivity Corporation (2014) and the Global Competitiveness Report 2012-2013, World Economic Forum (2012).

Notes: Score based on 1 to 7 range/counting. N indicates the number of countries that participate in the Global Competitiveness Index (GCI).

However, the increase in size of education expenditure could be a sign to the belief that education is able to increase the income and the lifetime earnings of an individual. Knowledge enrichment, mastering and the ability to develop new technologies, as well as the advantage and competitive edge of being able to offer high value-added human capital highly depends on the education attainment by its citizens which play an important role in achieving National development agenda and contribute to the country's economic development.

1.1 Government Expenditure on Education and Economic Growth in Malaysia

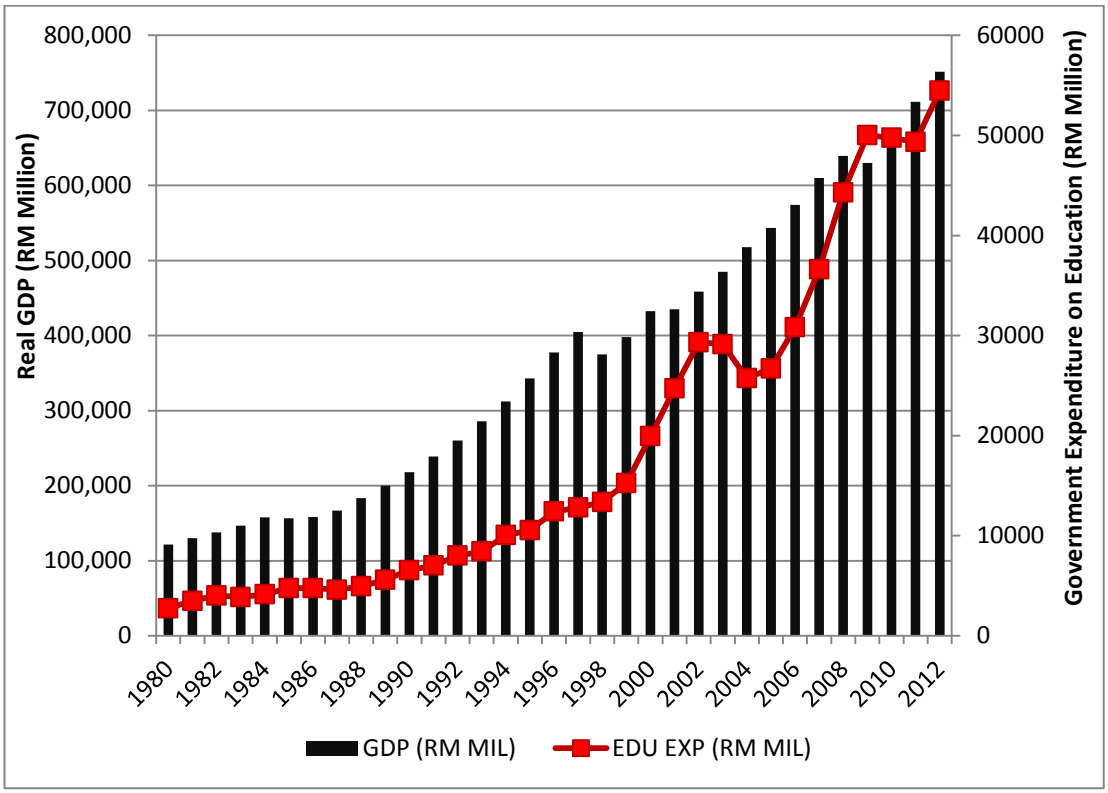
Figure 1.1, indicates the trend of real GDP and government expenditure on education from 1980 to 2012 in Malaysia. Figure 1.1, shows an interesting trend: the government expenditure on education and the real GDP appears to have almost a similar trend over the whole period from 1980 to 2012. There are several hiding reasons behind the trend changes between real GDP and public education expenditure. First, during the year 2009 the Malaysian government had expanded the investment on public spending by introducing the two economic stimulus packages in order to reduce the impact of global economic downturn Malaysian Plan aspiration (Bank Negara Malaysia, 2009, p. 17).

Second, the allocation of the educational assistance programs and scholarships for students at all levels of education was increased RM6.8 billion[1]in 2009 to RM7.3 billion in 2010 (Ministry of Finance, 2010). In 2011, Malaysian government spent 3.8 per cent of its GDP on education (World Bank, 2013). The government's public spending on basic education, as a percentage of GDP appears more than twice compared to the other ASEAN countries (3.8 per cent versus 1.8 per cent) (World Bank, 2013, p. 64). Meanwhile, the federal government's expenditure on education, as a percentage of GDP in 2011 is accounted as 1.6 percent higher than the Asian countries such as South Korea, Hong Kong, Japan and Singapore (Ministry of Education, 2012, p. 25). Therefore, the trend of public education expenditure in the year 2009, 2010 and 2011 is high compared to other years.

[1] See Ministry of Finance (2009, p. 89) for details.

On the other hand, Figure 1.1 also indicates a partial result where the trend of real GDP and education expenditure movement appears to be positive. From this, one can easily conclude that there is a positive relationship between government spending on education and economic growth in Malaysia.

Figure 1.1: Government Expenditure on Education and Real Gross Domestic Product (GDP) at constant 2005 in Malaysia from 1980 to 2012



Source: World Economic Outlook Database, International Monetary Fund (2014) and Fiscal and Economic Data, Ministry of Finance Malaysia (2014).
Notes: Government expenditure on education value appears after including the GDP deflator value in order to get the inflation adjusted value. Both values are adjusted for inflation.

Even though, the trend of economic growth and education expenditure seems to be working in tandem, it appears that the education expenditure over the years failed to increase the innovation, productivity and technology advancement in producing better-educated labour force to accelerate the economic growth. From this one can conclude that investment in education might not bring a significant effect

towards the economic growth. Therefore, the present study is planned to examine the effect of education expenditure on economic growth in Malaysia.

1.2 Problem Statement

Education is considered as the most direct way to help a large number of people to be out of poverty by creating job opportunities (Babalola, 2011). Traditionally, education plays a vital role in creating a higher skilled worker who is rich in knowledge, mastering and the ability to adopt and develop new technology which will promote higher productivity in the labour market and better economic growth for a country (Serban, 2012). Malaysia started the education expansion through the New Economic Policy (NEP) implementation during the year 1970's (Economic Planning Unit, 2013). This is due to the NEP objectives where the education was set as a key determinant in reducing the poverty and re-structures the society to mitigate the socioeconomic imbalance within the ethnic group in Malaysia (Economic Planning Unit, 2013).

The Malaysia Ministry of Education has consistently received high budget allocations since independence (Ministry of Education Malaysia, 2013). In 2011, Malaysian government spent 3.8 per cent as a percentage of GDP on education (World Bank, 2013). This amount is relatively higher than most of the countries such as South Korea, Japan, Australia and United Kingdom (Ministry of Education, 2013, p. 42). However, we are still far lacking behind in producing desired human capital in terms of knowledge enrichment, mastering and the ability to develop new

technology compared to other East Asian countries such as Singapore, China, Japan and Taiwan (refer Table 1). The problem is, government spending on education seems to be inefficient and ineffective in producing desired human capital which later promotes the economic growth. Therefore, the present study intends to reveal the causal links between the government expenditure on education and economic growth.

Despite that, previous studies on the relationship between government expenditure on education and economic growth present mixed results. Most of the empirical studies in this area have supported the endogenous growth theory which sets the public policy as an instrument to modernize the economic growth (Lucas 1988; Rahman, 2011; Maitra and Mukhopadhyay, 2012). Besides that, the preliminary studies on the impact of education expenditure on growth focused on the aggregate values of government expenditure measures. Thereafter, the preliminary studies started to consider the effects of the components of government expenditure and found out that spending on education to be most significant (Poot, 1999). However, the acceptances of this statement were not meant to be fully accepted. In this sense, this study is an attempt to answer whether the increases allocation of education expenditures is desirable to promote economic growth or not.

The research problem of this study is, most of the previous studies are focused on the effect of the education expenditure on economic growth as a whole rather than examine the effect of the development and operating education expenditure separately on economic growth. This is because of development and operating education expenditures are not homogeneous and thus, adding up these two

components as one might lead to aggregate bias. Therefore, this study intends to deal with the education spending rather than the aggregate level of government education expenditure in order to distinguish its impact on growth via human capital. For the Malaysian case, to the best of my knowledge, there is no agreement in the previous studies regarding the federal government development expenditure and federal government operating expenditure, specifically in education expenditure. Therefore, this study aims to answer the question as to whether the government operating and development expenditure in education influence the Malaysian economic growth.

Previous studies, like Baldacci et al. (2003), Ismail and Selvaratnam (1999), Hussin et al. (2012), Maitra and Mukhopadhyay (2012) point out the importance of investment in human capital in general. All these studies figure out that the education in particular as a means to attain the economic growth of a nation. The problem is, educational attainment is divided into three different levels, such as primary, secondary and tertiary, where there is a lack of research done, even among the existing literature. From this, one can conclude that there is a lack of research to identify the benefits of levels of school attainment to economic growth. The educational levels determine the depth of knowledge. Therefore, it is considered as an essential tool in order to determine the extent of human capital in a country. To the best of my knowledge, there is no agreement in the previous studies regarding to the uses of a historical series of disaggregated data of education in order to examine the levels of educational attainment on the Malaysian economic growth. This study is an attempt to fill this gap.

In 2012, Malaysia had achieved nearly universal enrollment at the primary level at 96.4 per cent (World Bank, 2013). Besides that, the literacy rate has been raised from 91 per cent in 1995 to near universal literacy of 94.1 per cent in 2012 (World Bank, 2013). However, the performance of Malaysian students in the Program for International Student Assessment (PISA) 2012 shows a poor ranking compared to the other East Asian countries such as Shanghai, Singapore, Hong Kong, Taiwan and Korea (The Star, 2013). The PISA compares the Mathematics, reading and Science skills of secondary students around the world. Therefore, the present study intends to shed some light on the causal connection between levels of educational attainment, especially at primary level of education, and the economic growth.

To accomplish this task, the three different levels of educational attainment along with the economic growth in the context of a single country case are applied. Employing the time series data for a single country, rather than employing a larger sample of countries, is another feature of the present study. In view of the fact that the education policies may not to be homogeneous for all the countries in which countries around the world are differ from one another at different stages of the development.

Furthermore, each country around the world differs in the way they finance their educational system. Generalizing the results for all countries will lead to the wrong policy suggestion, and at the same time, the historical time series analysis is more beneficial for the growth dynamics analysis (Jalil and Idress, 213; Al-Yousif, 2008; Pritchett, 2001). Besides that, most of the studies that relate to human capital is

based on cross-country studies (see for example Temple, 1999; Barro, 2001; Krueger and Lindahl, 2001; Pritchett, 2001; Hojo, 2003; Alam et al., 2010; Vu et al., 2012) with a few country specifying time series studies (see for example Abhijeet, 2010; Al-Yousif, 2008; Babalalo, 2011; Sankay et al., 2010; Solaki, 2013; Tamang, 2011; Yildirim et al., 2011).

As mentioned above, there are very few studies focusing on the country specifying time series studies in examining the impact of human capital on economic growth. Theoretically, we know that investment in human capital will spur the economic growth but we do not know how it will work in the practical world. Therefore, the present study is an attempt in testing the education-growth nexus on the country basis. For this purpose, Malaysia is chosen.

Hence, this study adopts a closer look not at correlations but examining the effect of development and operating education expenditure on economic growth in Malaysia. Moreover, this study also takes an in-depth look at the causal nexus between different levels of educational attainment and economic growth and vice-versa.

1.3 Research Questions

The issues raised in the problem statement have provoked a series of questions by carrying out this study in attempting to provide answers.

i) is there any short-run and long-run relationship between the government education expenditure (development and operating education expenditure) and economic growth?

ii) what is the impact of government education expenditure (development and operational) on economic growth?

iii) does the different levels of educational attainment promote economic growth?

1.4 Objectives of the Study

1.4.1 General Objective

The general objective is to re-visit the impact of government education expenditure on economic growth in Malaysia.

1.4.2 Specific Objectives

In addition, specifically, the objectives of this study are to:

i) examine the short-run and long-run the relationship between government education expenditure (development and operational) and economic growth

ii) investigate the causality relationship between government education expenditure (development and operational) and economic growth

iii) estimate the impact of different levels of educational attainment such as primary, secondary and tertiary on economic growth

iv) estimate the effect of development and operational education expenditure on economic growth

1.5 Significance of the Study

The significance of the study is divided into three aspects: policy, practical and theoretical contribution.

Firstly, the present study is intends to recommend the policy makers for mobilizing the existing resources in the education sector of Malaysia which creates a long-term sustainable policy in the near future. Besides that, there should be a proper diversification of funding resources, since this study has the implication on economic growth. For instance, Malaysian government can implement more efficient and effective policy towards investment in education, especially in development and operation in order to experience the usefulness of the investments towards the education sector. This will lead to a better policy implementation and allow the government to allocate wise spending on education. In this sense, our government is able to avoid the ineffective and inefficient spending on education which previously leads to unfavorable results in producing the desired human capital (refer Table 1.1).

In other words, we can identify the government incentives in implementing policy and scheme to encourage Malaysians to actively engage in the learning process in various educational fields. This result will motivate the government to improve or better up the existing policy and policy structure. Certainly, effective and stable policy planning, viable public service and professional institutions are considered as a must and prerequisite for growth. As a result, Malaysia can experience the excellence of education at all levels and

probably able to produce as well as mold the desired level of human capital from the investments.

Next, identifying causal interplays among the three different levels of educational enrolment and economic growth in Malaysia is claimed as another significant element. If common patterns of causality resulted in education expenditure and economic growth, then the involved economies have the prospect to invest more in the education sector by knowing which level of education is really meant in the growth of the nation. Besides that, the present study also can identify whether the benefits of the government education expenditure are noticeable in short-run or long-run. As a result, this study could provide confirmation between the variables (a proxy for human capital) and economic growth which has a different pattern. Hence, this study will reveal the impact of education expenditure, at the different levels of educational attainment on economic growth.

Furthermore, it will be the roadmap to the Malaysian governments to deepen the needs to invest in education sector, specifically in identifying an appropriate level for the education expenditure. Governments should emphasize on the three different levels of educational enrolment and economic growth mechanism. This is will be a very important task to identify the importance of the three different levels of educational enrolment in order to better up the quality of human capital. Later, this will help us to achieve a benchmark in PISA and Trends in International Mathematics and Science Studies (TIMMS) as well as the Global Competitiveness Index. In this sense, it will enhance the confidence to gain the future earnings in

terms of added-value of human capital and adopting high technology innovation in order to promote the lucrative growth.

The theoretical contribution of this study is by including the valuable inputs such as development and operating education expenditure which is not homogeneous at all. If the present study do not take into account the federal government development expenditure on education and operational expenditure on education, then it will lead to the aggregation bias. In order to avoid the aggregation bias problem, the present study includes both the development education expenditure and operational education expenditure by the federal government.

The possible constructive finding may deliver pragmatic evidence with comprehensive features and knowledge to national leaders, economists and people. Hence, further work in this field would benefit by putting more effort in these directions with variables alongside frequency of dataset to obtain specific and accurate findings with extra significance measures. However, if the results show a weak interdependence, then the future researchers should carry out in the development of new techniques to compare the impacts of government education expenditure on economic growth in Malaysia.

1.6 Scope and Limitations of the Study

This section contains two parts: the scope and limitations of the study. Firstly, this study focuses on the effect of federal government development and operating education expenditure on economic growth as well as the effect of three different levels of educational enrolment on Malaysian economic growth which covers over the period from 1980 to 2012.

Secondly, there are some limitations in this study. The number of observations limits the study where the availability of the dataset on the selected variables is not large. For an example, the number of observations is less than 35 years. Other than that, it is difficult to find data on various levels in education and its spending on the levels since there are no direct sources to extract the data. Choosing an appropriate variable for the study is quite challenging.

1.7 Organization of the Study

The following Chapter Two employs the theoretical issues and review of selected empirical studies based on the impact of education expenditure on economic growth. Thereafter, Chapter Three present a very concise description of methodology in which describes the theoretical consideration, model specification, variables and data sources. While, Chapter Four demonstrates the result of the empirical analysis with explanations and Chapter Five concludes this study as well as provides some policy recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Basically, economic growth theories and models are sought out to describe or explain and predict how the economies develop over time, identification of obstacle to growth by government through corresponding development policies that can be enhanced, sustained and accelerated.

As this study emphasizes on the effect of the government education expenditure on economic growth and the impact of the three different levels of educational attainment on economic growth, the present study reviewed literature along with studies that related to the methods and the reviews in this section for their principal of findings as it is important to relate the essential issues faced by a country and how it could relate to this study. This chapter begins with few brief reviews on education expenditure and economic growth to understand the theory of demand for education and its relationship of the human capital, then proceeding to the historical trends and current macroeconomic evidence to examine the relationship of education expenditure on economic growth.

This chapter is divided into three sections whereby Section 2.1 appraises the theoretical background, Section 2.2 discover the empirical reviews on the impact of

education spending on economic growth and followed by Section 2.3 which focuses on critical review of research gaps.

2.1 Theoretical Background

The nexus between human capital and economic growth has been an interesting study for several decades, both in macroeconomics and microeconomics literature. Based on macroeconomic aspect, the above statement is tested mainly with two approaches and they are widely known as neoclassical growth models of Solow (1956) and endogenous growth models of Lucas (1988), Romer (1990), Mankiw et al. (1992).

The early works of Solow (1956), neo-classical growth model, reports that economic growth not only explained by the increases in the labor and capital alone, but also identifies the contributions of the production factors such as labour and capital as well as the increase in the technical progress to growth rate. However, in the Solow (1956) neoclassical growth model of human capital is not connected to the technical change as stated in Lucas (1988).

Neoclassical growth theory is often claimed to be the 'ineffectiveness' policy, and this is because of the theory that emphasize on the production (such as new technologies) and human capital development and its focusing on factors within the model rather than depending on external factors (Babalola, 2011). On the other hand, endogenous growth model gives importance to the need for government and private

sector institutions and markets, which creates innovation to actively provide incentives for individuals to become inventive (Babalola, 2011). Endogenous growth economists such as Lucas (1998) and Mankiw et al. (1992) identified that the central role of knowledge as a determinant of growth for any nation. The theory predicts the positive externality and spillover effects of a high value-added knowledge based economy to the development and maintenance of a competitive advantage across the world (Lucas, 1988; Mankiw et al. 1992; Babalola, 2011; Yildirim et al., 2011).

Following the earlier work of Uzawa (1965) and Lucas (1988), many theories have been established in order to explain the process of human capital accumulation through the investment made in education, both public and private. Uzawa (1965) found out that an individual's productivity relied on how much time she or he dedicates to education.

Lucas (1988) treats education as an input for human capital accumulation. Furthermore, education is treated as another factor of production besides labour and physical capital. Later, his findings indicate that progress in education enrolment of the labour force has a significant impact on production, which later promotes to the economic growth which is in line with Mankiw et al. (1992). He also points out that one of the important factors for economic growth is the growth rate of human capital, which depends on the amount of time devoted by individuals to acquire skills.

The above theories of human capital and economic growth provide a clear picture about the human capital's key indicator variables, and how the human capital affects the economic growth. For an example, some of the appropriate variables for

education could be figured out and the education is one of the human capital's key indicators. Besides that, earlier studies by Lucas (1988) provide further insights on how to derive a model based on economic theory. Hence, the present study applies the model introduced by Lucas (1988) and uses the education expenditure and three different levels of educational attainment as a proxy of human capital.

Mankiw et al. (1992) extend the neoclassical growth model of Solow (1956) by augmenting the production function with physical capital and human capital as the basic determinants input of growth. Mankiw et al. (1992) conducts an empirical analysis on Organisation for Economic Co-operation Development (OECD) countries, using cross-sectional Ordinary Least Squares (OLS) method. It is find out that the secondary enrolment have a significant impact on economic growth.

It would have been useful if Mankiw et al. (1992) adopts an adequate measure of human capital in their study, especially when dealing with economic growth in OECD countries (Murthy and Chien, 1997). Mankiw et al. (1992) themselves acknowledge the need for employing an appropriate measure of human capital (refer Mankiw et al. 1992, p. 419). As highlighted by Mankiw et al. (1992, p. 419), the measure of human capital like primary and higher education are ignored.

Murthy and Chein (1997) propose a better measure of human capital by re-estimating both the Augmented Solow model (which includes physical capital, human capital) and full extended Solow (1956) model (incorporates physical capital, human capital and technological advancement). Their empirical findings report the fully extended Solow model demonstrates a higher convergence rate when

transitional dynamics are taken into the account for the OECD economic growth. Further, their empirical results demonstrate that in transitional dynamics, policy leads to greater investment in human capital, increased savings and also trade policy will allow the OECD countries to converge at the highest rate.

Barro (1991) focus on the effects of human capital on growth based on the cross-country datasets which covers more than 100 countries[2] during the post-1960 era to find the "empirical regularities". He emphasizes on the initial level of GDP, initial levels of human capital such as primary and secondary school attainment rates and apart from that, he also uses fertility rates and investment ratios by employing cross-sectional Ordinary Least Squares (OLS) method for the regression purpose. His empirical results report the existence of a positive relationship between education variables and economic growth.

The preliminary studies which deal with the human capital and economic growth by using a larger sample of countries, like Barro (1991) and Mankiw et al. (1992), uses an inappropriate regression method that is OLS. It might have been helpful if they employed panel regression instead of using OLS. This is because of the OLS estimation method is not an appropriate technique since it will underestimate the true variance, statistical values (t-statistic) which will look too good, and often reject the null hypothesis when it is true and the OLS estimation method is not suitable for parameter estimation (Reddy, 2011, p. 289).

[2] Barro (1991) used Pen World Tables Data.

The endogenous growth model by Romer (1990) claims that the creation of new ideas in the form of knowledge was gained from activities like Research and Development (R & D) requires highly skilled labour as the most important input for human capital. In other words, knowledge that gained from the creation of ideas is a direct function of human capital. Therefore, investment in human capital promotes to physical capital growth, which later leads to economic growth.

From this, one can point out that education and economic growth is not a direct and one way process, but it is a two way process where there is no one to one existence relationship between education and GDP. This is because their effects are influenced by some other economic and non-economic variables such as physical capital growth, labour force, foreign direct investment and health. This is in line with Romer (1990) and Islam et al. (2007).

2.2 A Review of Empirical Studies of the Impact of Education on Economic Growth

Education is considered as a one of the most crucial elements than others in promoting human capital. The high growth rate always accompanied by higher levels of educational attainment, are witnessed by the experience of many countries' development paths. In this sense, the impact of education spending on economic growth has been addressed in the literature by scholars and researchers from various perspectives.

Hussin et al. (2012) conduct a study on the effect of education expenditure and economic growth in Malaysia by employing an Aggregate Production Function model using annual data from 1970 to 2010. They reveal that economic growth has a significant positive long-run relationship with the government spending on education, labour force participation and fixed capital formation. The estimation evidence proved that there is a bidirectional causal relation between education expenditure and economic growth.

Ismail and Selvaratnam (1999) find out that 1 per cent increase in the literacy rate would increase output growth of Malaysia by 7.215 per cent. Further, the percentage of educational expenditure on vocational and technical education and government spending on tertiary education contributes positively to the GDP for the period 1970-1990.

In the case of Malaysia, it reveals the need to use the disaggregated data on education. The investment in education by development expenditure and operating expenditure[3] on economic growth is not being thoroughly investigated. A clear understanding of disaggregated data, especially for education expenditure is very essential for identifying the factual effects of education on economic growth. Further, using the aggregate measure of education is subjected to the aggregation bias. Therefore, the present study is an attempting to fill this gap.

Literature on Turkish economy shows mixed responses. Yildirim et al. (2011) demonstrates that there is no bidirectional causality occurs since the causality is running from the real GDP per capita to public education expenditures. They conclude that the public education expenditures do not lead to economic growth in Turkey. On the contrary, the empirical findings of Mercan and Sezer (2014) confirm the impact of education expenditure on economic growth is positive and significant where an additional increase in education expenditure (Turkish Lira, TRY) tends to increase the economic growth by 0.30 per cent (Turkish Lira, TRY). They suggest that more resource allocation on education, especially higher education will have a positive effect on the economic performance of Turkish by increasing the transfer opportunities of knowledge production and sharing as well as the manufacturing process from the universities.

In a different study, Barro (2001) investigate the role of education in terms of quality and quantity in promoting the economic growth by utilizing simultaneous equation model with three-stage least squares on panel data which includes 100

[3] The Federal Government allocations are divided into two and they known as development expenditure and operating expenditure. Refer Economic Planning Unit (2015) for further details.

observed countries over three ten-year periods, from 1965 to 1975, follows by the year 1975 until 1985 and from the year 1985 until 1995. His study indicates that the growth is positively links to the starting level of average years of school enrolment of male adults at the secondary and higher levels. The impact of growth insignificantly relates to the years of school attainment of females at the secondary and higher levels and the same result goes to the male schooling at primary level.

Based on Barro (2001), the secondary and higher education in selected countries indicates that there is a significant impact on output growth of the nation. From this, one can conclude that there is gender discrimination where female's participation in secondary and tertiary education are lower than male's.

Hojo (2003) took a cross-country data set by utilizing the cross-country regression with two steps Generalized Method of Moments (GMM) procedure and find out that the average years of secondary schooling and the secondary school attainment ratio positively correlate with higher productivity levels. His empirical findings are completely different from other researchers. This is because of the empirical evidence shows that the effect of education on economic growth is not clear and difficult to measure.

A study by Abhijeet (2010) concludes that the existence of the bidirectional relationship runs from public education expenditure to Indian's economic growth and vice-versa. Interestingly, Tamang (2011) find out that 1 per cent increase in physical capital per labour will increase the GDP per labour by 0.28 per cent, while one per cent increase in government expenditure on education per labour will lead to a 0.11

per cent increase in GDP per labour. From here, one can conclude that the education expenditure per labour have a lesser influence on GDP compared to the physical capital per labour. Therefore, he concludes that investment in education is expected to promote the economic growth of India, but the rate of return will be low.

Research on Greece economy indicates almost similar results. Research by Solaki (2013) on Greece's economy point out the real GDP per capita is positively affected by the changes in primary, secondary and tertiary education levels and educational expenditure in the long run. Besides that, there is a causality direction runs from tertiary education, public education expenditure to real GDP per capital is in line with Pegkas and Tsamadias (2014). In contrast, there is a reverse causality runs from real GDP per capita to primary education and secondary education. However, she concludes that empirical evidence supports the existence of a unidirectional causality runs from human capital to Greece's economic growth.

The above findings contradict with the study by Benhabib and Spiegel (1994). Benhabib and Spiegel (1994) examine the role of human capital in economic development by employing a cross-country data. Surprisingly, the empirical evidence shows that there is a weak correlation between education and economic growth. However, their empirical results report that the levels of educational attainment and economic growth for wealthiest countries find to be statistically significant but there is no correlation between the change in attainment and economic growth in a large sample (Temple, 2001).

The study by Pegkas and Tsamadias (2014) is noteworthy which combines the two issues in Greece over the period 1960 to 2009 by adapting Mankiw, Romer and Weil (1992) model in order to estimate the relationship and effect of higher education on economic growth. The empirical findings reveal the existence of unidirectional causal in the short-run and the long-run, running from higher education and physical capital investments to economic growth. Further, they find out that higher education is an important and significant impact on economic growth of Greece.

In the meantime, Maitra and Mukhopadhyay (2012) explore the role of public spending on education and health sector promotes the growth in 12 countries in Asia and Pacific. Results based on the causality test within the VECM analysis, mixed and varied across the countries where the education spending has a positive impact on economic growth in the case of Bangladesh, Fiji, Kiribati, Maldives, Nepal, Singapore, Sri Lanka, Vanuatu and Tonga. On the other hand, the impact of healthcare spending on GDP indicates a positive and significant result in the case of Bangladesh, Nepal, Philippines, Singapore and Sri Lanka. In contrast, spending on education have a negative impact on economic growth of the Philippines since two-period lagged education expenditure has some growth-retarding effect. Meanwhile, health care spending has a negative impact on GDP of Kiribati, Maldives and Vanuatu.

It will be useful if using a time series data of a single country (instead of using a larger sample of countries) in the analysis. This is due to the fact that the effectiveness of education policy in promoting growth is heterogeneous for different

countries. Each country has its own socioeconomic conditions. Hence, generalizing the results generated from a data of all countries, to a single country, will lead to the wrong policy suggestion.

Teles and Andrade (2008) inspect the relationship between government expenditure on basic education and economic growth in UNESCO countries by employing the overlapping-generations model. The empirical result shows that public spending on education have a negative relationship on economic growth because of the public spending on basic education may not lead to the further accumulation of human capital.

Literature on the Nigerian economy has mixed reactions. Sankey et al. (2010) reports that government spending on education does not impact positively on economic growth in Nigeria. In contrast, Babalola (2011) work suggests that education and economic growth have a long-run relationship and conclude that there is a unidirectional causality runs from economic growth to education and not vice-versa. Awe and Ajayi (2010) confirm that more than 60 per cent of the variation in economic growth is explained by the values of human capital investment in Nigeria. Therefore, they suggest that the government should increase the budgetary allocation to the education and health sector since the human capital has a strong impact on the Nigerian economy.

Blankenau and Simpson (2004) provides in-depth analysis of the work of an endogenous growth model with a simple overlapping generation model of growth in analyzing the relationship between public education expenditure and economic

growth in 55 countries. They discover that the relationship between public education expenditure and growth is non-linear due to the other determinants of growth, which negatively affected by the general equilibrium adjustment. Hence, they conclude that the sign of the relationship relies on the level of government spending, tax structure and the parameters of production technologies.

A study conducted for the Iranian economy by Khorasgani (2008) confirms the investment in higher education has a strong dynamic effect on economic growth after the physical capital. Meanwhile, expenditure on research does not contain significant effect on the Iranian economy. In this sense, one per cent increase in higher education stock tends to increase real output by 0.198 per cent in the short-run and 0.314 per cent in the long-run. The study confirms a positive and significant effect of higher education on economic growth.

The studies consider mankind progress, especially in the past three decades where it shows a positive and significant impact on economic growth in China (Huang et al., 2009). Further, the result based on impulse response function shows that higher education attainment has a serious lagging effect on growth. Additionally, the improvements in higher education should not only focus on expanding the size, but the country should also improve the structure of higher education.

Islam et al. (2007) provide evidence that the multivariate causality approach reports the existence of bidirectional causality running from GDP to education expenditure. Their study also identifies the relationship between income and education in helping each other to grow.

A study by Temple (1999) inspect the correlation between human capital and economic growth by employing aggregate cross-country data. He notes that the simple cross-country regressions do not capture an effect of human capital. This is due to the effect of human capital could be hidden by a small number of unrepresentative countries where the human capital accumulation has less or no effect at all. Therefore, he eliminates the smallest and poorest countries from the estimation. The estimation results support the output growth where it positively correlates with the change in educational attainment.

Stengos and Aurangzeb (2008) find out that the secondary school attainment, especially the male attainment rates contribute a significant impact on economic growth in Pakistan. On the contrary, female secondary school attainment rates do not affect the economic growth. However, there is a strong significant impact runs from females primary school attainment rates to the economic growth. Their study shows that secondary education has a greater impact on economic growth compared to other levels of education and concludes that education has a positive impact on the economic growth in Pakistan; their findings similar with Jalil and Idrees (2013). Further, Jalil and Idrees (2013) highlighted that the human capital in Pakistan has a limited social resources, therefore the government should allocate all levels of education in order to improve the performance of the economy.

The above study stresses the importance of disaggregated data on the different levels of educational attainment instead of using the average number of years of schooling to see the effect of levels of education attainment on economic

growth. Hence, the present study is motivated by the need to take into consideration the effects of levels of educational attainment on economic growth in Malaysia.

The literature on the Pakistani economy has mixed results where a study by Afzal et al. (2011) examines the cointegration by and causality between education and economic growth by employing time series data from 1970-1971 and 2008-2009[4]. The study by Afzal et al. (2011) differ from the previous researchers like Stengos and Aurangzeb (2008) and, Jalil and Idrees (2013) where the education variable is measured by 10 different indicators of education. Their empirical analysis shows the existence of bidirectional causality between education and economic growth. At the same time, the bidirectional causal relation between all levels of education and economic growth in the case of bivariate framework. Interestingly, their empirical findings reveal that the economic growth does not influence the important factor of education such as university education, higher education, including professional education and education expenditure which in contrary with Stengos and Aurangzeb (2008).

A different study by Vu et al. (2012) report the impact of vocational education on economic growth is greater than the effect of university education. This is because of university education demands higher cost where the opportunity cost of attending university is the increasing of real income induced by the economic growth. Their findings support the current development theory where education promotes economic growth, later the growth increase education as per capita income rises.

[4] Afzal et al. (2011) employed Autoregressive Distributed Lag (ADRL) model of cointegration and Toda and Yamamota (1995) of Augmented Granger Causality Approach.

A review by Burja and Burja (2013) is noteworthy because it combines all the possible indicators of human capital accumulation. The employment rate of individuals with tertiary education has a negative impact on GDP growth rate where a fall in the employment rate of persons with tertiary education leads to lowering the economic growth rate by -0.51 per cent. For Romania, the employment rate of individuals with tertiary education and the growth rate of real labour productivity per hour worked has positively influenced the economic growth. In the case of Romania, since the influence of these factors is so direct, therefore, they suggest that in order to have excellent people's access to employment, productivity need to be raised and the economy need to be progressed as Romanian government has to do some improvement in the general formation of workforce and increase the number of people gaining the highest professional qualifications.

Al-Yousif (2008) investigates the nature and direction of the relationship between education and economic growth within six Gulf Cooperation Council (GCC) countries such as Saudi Arabia, Kuwait, United Arab Emirates (UAE), Oman, Bahrain and Qatar by utilizing annual data. Later, the study supports the existence of bidirectional causality which runs from human capital to economic growth in the case of Qatar and UAE. On the other hand, the unidirectional causality between the two variables in the case of Kuwait, Saudi Arabia, Oman and Bahrain.

Despite of several researches indicating the nexus between education expenditure and economic growth, some studies have expressed that there is no significant relationship between these two variables. For example, Pritchett (2001) emphasizes on the effect of educational outcome on economic growth by employing

cross-country data find out that there is no effect of any education variables on economic growth. This finding is consistent with another influential study by Benhabib and Spiegel (1994), where there is no correlation between education variable and economic growth. This is due to the measurement error in the education variables which leads to an estimated impact on education biased toward zero (Glewwe et al., 2014).

However, Benhabib and Spiegel (1994) give the reasons behind the measurement errors which do not lead to the desired results. Firstly, the uses of the instrumental variable methods, with another determine of the stock of human capital[5]. Meanwhile, the second measure that he employs is based on the data used by the Barro-Lee (1993) which indicate that the instrument is invalid due to its correlation with the measurement error with his education variable (Benhabib and Spiegel, 1994, p. 147). Secondly, he argues that school quality and years of schooling should be positively correlated. This will not control the school quality which overestimates the impact of years of schooling. He also comes out with three possible explanations for the impact of schooling on economic growth output that varied across countries[6].

On the other hand, Krueger and Lindahl (2001) examine the impacts of microeconomics (change in years of schooling) and macroeconomics (across countries initial average years of schooling) on economic growth, where finds there is little. They find out that the initial education and change in education have significant and positive impacts on GDP per capita, where 50 per cent increase in the

[5] See Pritchett (2001) used data from Nehru, Swanson and Dubey, 1995.
[6] See Pritchett (2001, p. 387) for details.

secondary school enrollment rate lead to 1.5 per cent rise in the economic growth. Similarly, a 100 per cent rise in primary school enrollment rate leads to 1.25 per cent of economic growth.

2.3 Critical Review of Research Gaps

A number of reasons may explain the above current literature on the nexus between education expenditure and economic growth which are summarized in the following statements. First, much of the recent literature focus on more than one country study and this may lead to generalization of the problem where the nature of the relationship between educational expenditure and economic growth cannot be generalized across countries. Therefore, studies on countries that are similar in their socio-economic conditions by utilizing annual data will improve our understanding of the relationship between education and economic growth.

Previous studies also often related to the use of aggregate data on education which is likely to cause aggregation bias (as reported by Jalil and Idrees, 2013). Therefore, the use of disaggregate education data will provide the actual effects of education on economic growth[7]. The present study uses a disaggregated education data instead of using aggregate data like education expenditure as a whole. For this reason, the present study chose the federal government development expenditure on education and federal government operating expenditure on education.

[7] See Jalil and Idrees (2013) for details.

Another problem that might arise if the present study choose the sum value of both federal government development and operating expenditure on education is that it will lead to aggregate bias problem. This is because both the federal government development expenditure and operating expenditure on education is heterogeneous and hence both expenditure on education cannot be combined as a total education expenditure.

Another weakness in most of the preceding study is the use of labour force participation as a variable (for example Hussin et al., 2012; Ismail and Selvaratnam, 1999; Jalil and Idress, 2013; Sankey et al., 2010). This is because of labour force participation will lead to a bias problem where labour force participation includes both skilled worker and unskilled worker without taking into account the education level. There is less research on educational levels, such as primary, secondary and tertiary, even if there are studies on it, but it failed to test the level of endogeneity. Therefore, this study is an attempts to fulfill the gap.

The simple application method like OLS is an inappropriate tool to analysis the cross-country growth regression, and it may lead to the heterogeneity problem (as mentioned by Temple, 1999; Barro, 1991). Thereafter, OLS estimator suffers from the omitted variable bias and inconsistent result in evaluating the relationship between education and economic growth compared to other regression method. Besides that, many of the previous studies indicates that the OLS measurement tool as a weak empirical findings. In this sense, the present study will employ a standard time series analysis, such as unit root test to test stationary property, followed by Cointegration test, Vector Error Correction Model (VECM) to test the long-run

relationship between the variables and Granger causality test in order to estimate the causal linkage between the dependent and independent variable.

As a conclusion, some of the previous literature reviews are related and support by their findings with each other. Traditionally, human capital theory believes that one's educational achievements will lead to job opportunities and job creations as well as improves individuals' standards of living. However, some researchers are arguing and critique other researchers' findings. Besides that, they also use a variety of methods and variables to test their variable reliability. Much of this study has examined the different ways in which through human capital is believed to influence the economic growth. Certainly, most of the studies produce different types of results and implications where the impact of education expenditure is varies widely across countries. Therefore, the results of the previous studies are inconclusive.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter focus on the discussion of the research methodology that will be employed in this study by using econometric techniques in order to examine the impact of government education expenditure on economic growth as well as the impact of different levels of educational attainment on economic growth in Malaysia. Thereby, this chapter is designed as follows where in Section 3.1 narrates the theoretical and conceptual framework, Section 3.2 empirical model, followed by Section 3.3 hypotheses development, Section 3.4 is about the research design, and then Section 3.5 explains about the operational definition, finally Section 3.6 is about the justification of the model and in Section 3.7 explains the data description of the study.

3.1 Theoretical and Conceptual Framework

3.1.1 Theoretical Framework

The impact of education on economic growth has been investigated since the early 1960's by the Chicago school of economics, which develop the theory of human capital (Schultz, 1961). The education expenditure has been justified in the endogenous growth theory (Lucas, 1988; Romer, 1990). Based on the endogenous

growth model, the technological progress increases the productivity and accelerate the economic growth, that can be figured within the model thru the human capital formation (Maitra and Mukhopadhyay, 2012). The present study will adapt the Lucas (1988) Growth Model in which output is generated through the production function and the form is

$$Y = AK^{\alpha}(uh)^{1-\alpha}(h_a)^{\gamma} \quad (1)$$

The equation (1) indicates a production function, where

Y = Output (GDP), A = Total Factor Productivity or the level of technology, K = Physical Capital, uh = Fraction of time spent to produce the productive activity and human capital while h_a = Average human capital in the economy. The federal government development expenditure on education and the federal government operating expenditure on education, and educational attainment such as primary attainment, secondary attainment, tertiary attainment are proceeding as human capital inputs.

These human capital inputs promotes the output through either direct accumulation (uh) or the existing stock of knowledge (h_a), which promotes to innovation and later promotes the economic growth (Lucas, 1988; Mankiw et al., 1992; Maitra and Mukhopadhyay, 2012). Assumed that if $\gamma > 0$, then the production function is associated with increasing returns to the scale. Hence, productivity growth is endogenized in human capital inputs (Maitra and Mukhopadhyay, 2012).

Therefore, the federal government development and operating education expenditures and educational attainment (primary, secondary, tertiary) may contribute to the output growth of the economy via the human capital formation.

Then, we can state the relationship between output and education expenditure and educational attainment (primary, secondary, tertiary) in the following way:

$$Y_t = AE_t^{\alpha} EA_t^{\beta} \varepsilon_t \quad ; \quad \alpha, \beta > 0 \tag{2}$$

Equation (2) indicates a Cobb-Douglas production function, where

Y_t = GDP, A = Total Factor Productivity or the level of technology, E_t = Government development and operating expenditure on education, EA_t = (primary, secondary and tertiary) attainment, α and β = shares of the government education expenditure and educational attainment, t = time, and ε = error term.

Equation (2) is the econometric model to define the impact of education expenditure on economic growth in Malaysia. Since the equation (2) is a non-linear model, therefore the parameter values for A, α, β and γ are unable to directly estimate. Consequently, we are taking the natural logarithm model into the production function. The production function becomes linear as follows:

$$ln\, Y_t = C + \alpha\, ln\, E_t + \beta\, ln\, EA_t + ln\, \varepsilon_t$$

Where $C = In\, A$ is a constant term and others remain the same. From the above equation, we need to differentiate with respect to "t" and we have (based on the prior work by Maitra and Mukhopadhyay, 2012):

$$\dot{Y}_t = \dot{A} + \alpha \dot{E}_t + \beta \dot{EA}_t + \vartheta_t \tag{3}$$

where $\dot{Y}, \dot{E}, \dot{EA}$ are stands for output growth, growth of federal government development and operating education expenditure and educational attainment as well as $\vartheta_t = \frac{1}{\varepsilon_t}\frac{d\varepsilon}{dt}$. The equation (3) explains that the output growth depends on the growth of development and operating education expenditure and educational attainment. However, Maitra and Mukhopadhyay (2012) mention that the

relationship between output growth and education expenditure is usually not instantaneous. Based on the equation (3), it may be estimated in this way:

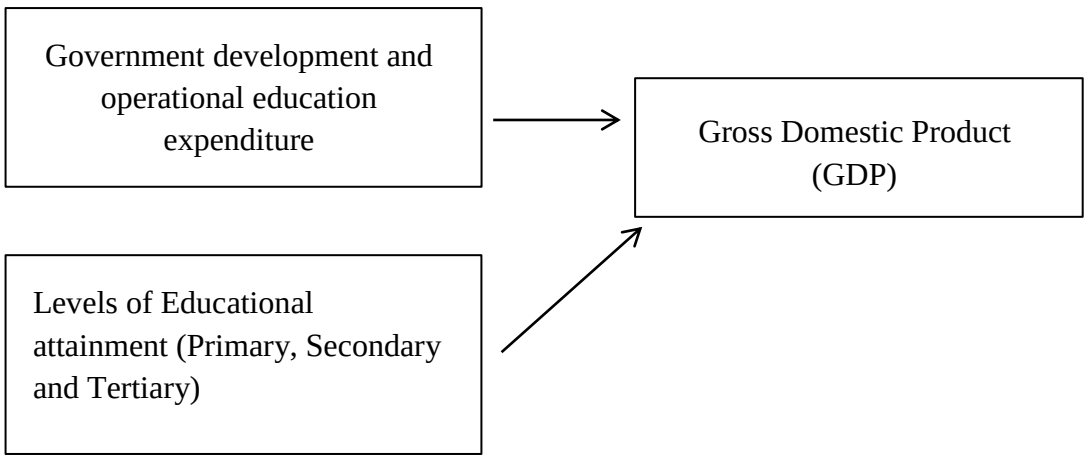
$$\dot{Y}_{t-1} = \dot{A} + \alpha_1 \dot{E}_{t-i} + \beta_1 \dot{EA}_{t-i} + \vartheta_t \quad (4)$$

where $\dot{E}_{t-i}$, $\dot{EA}_{t-i}$ (i=1, 2, 3, …, k) are lagged series of $\dot{E}_t$ and $\dot{E}A_t$ respectively.

3.1.2 Conceptual Framework

This study emphasizes on the influence of education expenditure on economic growth, measured through the education expenditure reaction that potential effect on the GDP. Figure 3.1 depicts the effect of education expenditure on economic growth in Malaysia. Since education expenditure and educational attainment are one of the education indicators, then the government development education expenditure and operational education expenditure, as well as the different levels of educational attainment (such as primary, secondary, tertiary) which used as an exogenous factor that capture the effects on GDP in Malaysia. Therefore, GDP is treated as the dependent variable.

Figure 3.1: The effects of Government Education Expenditure on Economic Growth



3.2 Econometric Model

The earlier work of Lucas (1988) on endogenous growth model draws inspiration for the present study. The theoretical model adaptation in this study was based on the production function where the human capital presents as an independent factor of production and can be represented in production function with constant returns to the scale. However, in this section by keeping in view the theoretical connection existent among GDP, development expenditure on education (DEV), operational expenditure on education (OPR), and educational attainment such as primary (PRI), secondary (SEC) and tertiary (TER), the following models have been specified as:

GDP = f (DEV, OPR) **(A)**

GDP = f (PRI, SEC, TER) **(B)**

One might wonder why there are two models instead of having one model and why the present study differentiating between the variables like education expenditure (investment in education) and educational attainment in our analysis. This is because the present study suspect that education expenditure and educational attainment variables, construct to be highly collinear. Therefore, the present study performs the simple correlation matrix test to sort out the problem. The test results indicate that the educational expenditures and educational attainment variables are highly collinear at each level and for this reason it is not meaningful to put them into the same equation. This statement can be proved by observing the correlation coefficients as given in Table A (refer **Appendix A**).

In the previous study, researchers have been testing various functional forms in order to capture the relationship between education expenditure and economic growth. They found out that the most appropriate functional form is a log linear form for the variables GDP, DEV, OPR, PRI, SEC and TER. This statement in line with previous researchers such as Afzal et al. (2011), Pengkas and Tsamadias (2014), Jalil and Idrees (2013), Babalola (2011), Khorasgani (2008), Ismail and Selvaratnam (1999). The log linear for the variables are as specified:

$$ln\ \text{GDP} = \beta_0 + \beta_1\ ln\ \text{DEV} + \beta_2\ ln\ \text{OPR} + \varepsilon \qquad \textbf{(Model 1)}$$

$$ln\ \text{GDP} = \beta_1 + \beta_2\ ln\ \text{PRI} + \beta_3\ ln\ \text{SEC} + \beta_4\ ln\ \text{TER} + \varepsilon \qquad \textbf{(Model 2)}$$

Where *ln* is the natural logarithm; GDP is used as a proxy to measure the economic growth; DEV and OPR (education expenditure) are one of the key indicators of education that used as a proxy to measure human capital; educational attainment such as PRI, SEC and TER also used as a proxy to measure human capital development thru increase in the labour force, later will lead to economic growth; β_0 is the intercept and ε is the error term.

3.3 Hypothesis of the Research

There are two hypotheses were carried out in order to examine the relationship between independent variable and dependent variable. The hypothesis are expressed as below.

Hypothesis 1

$\boldsymbol{H_0}$: Government development and operational education expenditure do not affect GDP.

$\boldsymbol{H_1}$: Government development and operational education expenditure affect GDP.

Hypothesis 2

$\boldsymbol{H_0}$: Educational attainment does not affect real GDP.

$\boldsymbol{H_1}$: Educational attainment affects real GDP.

3.4 Research Methodology

This study examines the effect and relationship between the federal government development expenditure on education, the federal government operational expenditure on education and GDP as well as to test the effect and relationship between different levels of educational attainment and GDP. There will be three main tests to be applied before examining the degree of causality. Firstly, unit root test such as Augmented Dickey Fuller (ADF) unit root test and Phillips-

Perron (PP) unit root test will be carried out in order to test the stationarity of the time series. Secondly, Johansen and Juselius (JJ) Cointegration test will be used in order to evaluate whether the variables are cointegrated or not. After that, Vector Error Correlation Model framework (VECM) to detect the effect of education expenditure on GDP as well as the effect of educational attainment on GDP. Granger causality test will be used to find the short-run and long-run relationship in government expenditure on education and GDP. The same method will be used to detect the relationship between educational attainment and GDP.

Although, many of the previous studies employed the OLS estimator as a method to analysis their model, but the OLS estimator is suffering from the omitted variable bias[8] and inconsistent result in evaluating the causal relationship between the variables. Hence, we can indicate that the conventional regression tool like OLS estimator gives a weak (poor) empirical findings compared to the other regression method such as dynamic models, Autoregressive Distributed Lag (ADRL) model, error correction model (ECM) and so on.

In light of the objectives of the study, the present study used the times-series modelling such as unit-root test, cointegration test and then followed by Vector Error Correction Model test which becomes appropriate (Islam et al., 2007; Al-Yousif, 2008; Stengos and Aurangzeb, 2008; Huang et al., 2009; Awe and Ajayi, 2010; Maitra and Mukhopadhyay, 2012; Mercan and Sezer, 2014). In order to investigate the causal links between education expenditures and GDP as well as the causal

[8] See Barro (1991) and Temple (1999) for details.

relationship between different levels of educational attainment and GDP, the Granger (1988) causality test approach is applied.

3.4.1 Unit Root Test

The stationary and non-stationary of a time series should be determined first before proceed with other tests. Therefore, unit root tests must be applied to determine whether the time series are stationary or not. It is important to find out whether the time series is stationary or not, this is because of stationary in the regression model assumed as the root of standard inference procedure while non-stationary in the regression model is invalid for the standard result.

There are a few procedures that can be used to determine whether the unit root is exist or not, and they are Dickey-Fuller Generalized Least Squares (DF-GLS), Philips-Perron (PP), Augmented Dickey-Fuller (ADF) and so on. In this study, the standard unit root tests such as the Augmented Dickey-Fuller (ADF) test and Philip-Perron (PP) test will be applied to test the presence of a unit root in the series.

The hypothesis under the Augmented Dickey-Fuller (1979) unit root test:

H_0 : The variable is non-stationary

H_1 : The variable is stationary

The null hypothesis, represent that the series has a unit root and it is non-stationary. While, alternative hypothesis implies that the series is a trend and stationary and there is no unit root exist over the sample period. We can clarify this

statement by observing at the test critical value and t-statistic of ADF. If the test critical value is bigger than the t-statistic of ADF value, then do not reject the null hypothesis and there is a presence of a unit root in the series. If the test critical value is lesser than the t-statistic of ADF value, then we can reject the null hypothesis of the variable is non-stationary. Further, the same rejection rule is applied for the Phillips-Perron (1988) test.

The Phillips-Perron (1988) test will consider the following regression model

$$x_t = \mu + \beta x_{t-1} + u_t \qquad (t = 1, 2, \dots, T) \tag{3.0}$$

where u_t denote as the innovation term. To test a unit root, the regression t-statistic for the null hypothesis ($H_0: \beta = 1$), denoted by t_β, is adjusted nonparametrically to account for possible serial correlation in u_t (Chueng and Lai, 1997).

3.4.2 Cointegration Test[9]

Johansen and Juselius (1990) Cointegration test will be utilized in order to investigate the long-run relationship between education expenditure (development and operational) and GDP (Model 1). The same method is applicable for the long-run relationship between different levels of educational attainment and GDP (Model 2). Besides that, before applying this method the optimum lag order (k) must be determined via vector autoregression (VAR), in order to apply in each cointegration test. Let us consider the following VAR model[10]:

$$\mathbf{Z_t} = \boldsymbol{\delta} + \boldsymbol{\Pi_1 Z_{t-1}} + \cdots + \boldsymbol{\Pi_k Z_{t-k}} + \boldsymbol{\varepsilon_t}, \qquad \boldsymbol{t = 1, 2, 3, \dots, T} \tag{3.1}$$

[9] Multivariate regression analysis utilized by Hussin et al. (2012), Yildirim et al. (2011), Sankay et al. (2010), Maitra and Mukhopadhyay (2012), Babalalo (2011), Alam et al. (2010) and Al-Yousif (2008).
[10] See Islam et al. (2007) for details.

where Z_t is a $(n \times 1)$ vector of time series variable; δ is a $(n \times 1)$ vector of intercept terms; Π is a $(n \times n)$ matrix coefficients; ε_t is a $(n \times 1)$ vector of error terms for t = 1,2,3,…,T; ε_t is an unobservable zero mean white noise vector process (serially uncorrelated or independent), k is the number of lags. Furthermore, Johansen and Juselius (1990) multivariate procedure used to the determine the number of cointegration vectors which depends on the use of two likelihood ratio (LR) tests. The two likelihood ratio (LR) tests include the Trace (T_r) test and the maximum eigenvalue (L-max) test.

a) Likelihood Ratio Trace Test[11]

The likelihood ratio trace test is expressed as:

$$T_{trace} = -T \sum_{i=q+1}^{p} \log(1 - \widehat{\lambda_i}) \quad (3.2)$$

where T is the number of valid observations for estimation use; and $\widehat{\lambda_i}$ is the largest estimated eigenvalue. The test hypothesis is as follows:

H_0 : Number of cointegrating vector is less than or equal to r.

H_1 : At most r cointegrating vectors ($r = 0, 1, 2, \dots, p$).

b) Maximum Eigenvalue

The maximum eigenvalue test is defined as:

$$\lambda_{max} = -Tlog(1 - \widehat{\lambda_{r-1}}) \quad (3.3)$$

Where the T is the number of valid observations for estimation use and $\widehat{\lambda_{r-1}}$ is the largest estimated eigenvalue at $r - 1$.

[11] Maximum likelihood method used by Hussin et al. (2012), Yildirim et al. (2011), Maitra and Mukhopadhyay (2012).

H_0: $r = r_0$

H_1: $r = r_0 + 1$

The maximum eigenvalue test is more powerful than the Trace test (Johansen and Juselius, 1990).

3.4.3 Granger Causality Test

After stationarity and cointegration of the variables determined, the Granger causality test will be used to examine whether the lag of one variable significantly affects another variable by using standard F-tests. Moreover, once cointegration is detected, Granger causality must be conducted in a vector error correction model (VECM), in order to avoid misspecification problems (Granger, 1988). Furthermore, Granger (1988) explains that there is a causal link at least one direction in which variables cointegrated with each other. On the other hand, the analysis also can be conducted in a standard first difference vector autoregressive (VAR) model. As mentioned by Lau et al. (2010, p. 34):

> *VECM is a special case of VAR that imposes cointegration on its variables, where it allows us to distinguish between short run and long run Granger causality. The relevant error correction terms (ECTs) must be conducted in the VAR to avoid misspecification and the omission of the important constraints.*

Moreover, the variables that have been identified for their cointegration relationship shall proceed to the Granger Causality test to determine their causal relationship. Let us consider the following VEC model:

$$\boldsymbol{\Delta Z_t = \delta + \Gamma_1 \Delta Z_{t-1} + \cdots + \Gamma_{k-1} \Delta Z_{t-k} + \Omega V_{t-1} + \varepsilon_t} \quad (3.4)^{12}$$

where Z_t is a $(n \times 1)$ vector of variable; δ is a $(n \times 1)$ vector of intercept terms; Γ is a $(n \times n)$ matrix coefficients; ε_t is an independently and identically distributed (*i.i.d*) with zero mean; k is the number of lags; V_{t-1} is the lagged level of EC term and Δ is the difference operator.

In this study, the Granger Causality test will be applied to examine the existing of the causality relationship between development and operational education expenditure on economic growth (Model 1). The same procedure is applicable for the Model 2. At the same time, the Granger causality test will adapt in order to reveal the causal relationship between the levels of educational attainment on economic growth. The cointegration test is based on the following Vector Error Correction Model (VECM).

For Model 1:

$$\Delta lnGDP_t = \alpha_{12} + \sum_{i=1}^{p} \beta_{11i} \Delta lnDEV_{t-i} + \sum_{j=1}^{q} \beta_{12} \Delta lnOPR_{t-j} + \Pi_1 ECT_{t-1} + \varepsilon_{1t} \quad (3.5)$$

$$\Delta lnDEV_t = \alpha_{22} + \sum_{j=1}^{q} \beta_{21j} \Delta lnGDP_{t-k} + \sum_{i=1}^{p} \beta_{22i} \Delta lnOPR_{t-j} + \Pi_2 ECT_{t-1} + \varepsilon_{2t} \quad (3.6)$$

[12] Adapted from Islam et al. (2007).

$$\Delta lnOPR_t = \alpha_{32} + \sum_{k=1}^{o} \beta_{31k} \Delta lnGDP_{t-k} + \sum_{k=1}^{o} \beta_{32i} \Delta lnDEV_{t-i} + \Pi_3 ECT_{t-1} + \varepsilon_{3t} \quad (3.7)$$

where, Δ = First difference operator, ECT_{t-1} = Error correction term of lag length (lagged one period), Π_1, Π_2, Π_3 = short-run coefficients of the error correction term (speed of adjustment parameters), ε_{1t}, ε_{2t}, ε_{3t} = the statistical noises. The speed of adjustment parameters is needed in the analysis of the error correction model. This is because of a higher value of the parameter will shows the higher speed of adjustment of the model from short-run disequilibrium to long-run equilibrium (Maitra and Mukhopadhyay, 2012 and Islam et al., 2007).

If the rejection of the equation (3.5), (3.6) and (3.7) are made simultaneously, this implies that there is the bidirectional causal relationship between development education expenditure, operational education expenditure and GDP. If equation (3.5), (3.6) and (3.7) failed to reject the null hypothesis simultaneously, this implies that there is no causal relationship between federal government development education expenditure, federal government operational education expenditure and GDP.

For Model 2:

$$\Delta lnGDP_t = \eta_1 + \sum_{i=1}^{m} \gamma_{\gamma i} \Delta lnPRI_{t-i} + \sum_{i=1}^{m} \gamma_{\gamma i} \Delta lnSEC_{t-i} + \sum_{i=1}^{n} \gamma_{\gamma i} \Delta lnTER_{t-i} + \mu_1 ECT_{t-1} + \omega_t \quad (3.8)$$

$$\Delta lnPRI_t = \eta_2 + \sum_{i=1}^{m} \gamma_{ei} \Delta lnGDP_{t-i} + \sum_{i=1}^{m} \gamma_{ei} \Delta lnSEC_{t-i} + \sum_{i=1}^{n} \gamma_{ei} \Delta lnTER_{t-i} + \mu_2 ECT_{t-1} + \vartheta_t \quad (3.9)$$

$$\Delta lnSEC_t = \eta_3 + \sum_{i=1}^{m} \gamma_{ji} \Delta lnGDP_{t-i} + \sum_{i=1}^{m} \gamma_{ji} \Delta lnPRI_{t-i} + \sum_{i=1}^{n} \gamma_{ji} \Delta lnTER_{t-i} + \mu_3 ECT_{t-1} + z_t \quad (3.10)$$

$$\Delta lnTER_t = \eta_4 + \sum_{i=1}^{m} \gamma_{ni} \Delta lnGDP_{t-i} + \sum_{i=1}^{m} \gamma_{ni} \Delta lnPRI_{t-i} + \sum_{i=1}^{m} \gamma_{ni} \Delta lnSEC_{t-i} + \mu_4 ECT_{t-1} + \varepsilon_t \quad (3.11)$$

where, Δ = First difference operator, ECT_{t-1} = Error correction term lagged one period, μ_1, μ_2, μ_3, μ_4 = short-run coefficients of the error correction term (speed of adjustment parameters), ω_t, ϑ_t, z_t, ε_t = statistical noises.

If the rejection of the equation (3.8), (3.9), (3.10) and (3.11) are made simultaneously, this implies that there is the bidirectional causal relationship between primary school attainment, secondary school attainment, tertiary education attainment and GDP. If equation (3.8), (3.9), (3.10) and (3.11) failed to reject the null hypothesis simultaneously, this implies that there is no causal relationship between the primary school attainment, secondary school attainment, tertiary education attainment and GDP. When cointegration is absent, the standard first difference vector auto regressive (VAR) model will be adapted for both of the models (Lau et al., 2010).

According to Gujarati and Porter (2009), the Granger causality test is very sensitive to the number of the lags used in an analysis and the causal direction may also depend critically on the number of lagged terms which have been used. As a result, the proper lag profile on the basis of Akaike Information Criteria (AIC) procedure will be determined in this study.

3.5 Operational Definition

Earlier studies have been employing a variety of measures to represent education indicators. These include average years of schooling, public expenditure on education and the enrollment rates of primary, secondary and tertiary, literacy rate, ratio of education expenditure per worker. However, this study employed the levels of education attainment such as primary, secondary, tertiary and for the following reasons.

Generally, schooling enhances the economic performance through three channels. First, it promotes labour productivity thru the acquisition of knowledge and skills. Secondly, it allows the acceptance of current technology. Thirdly, it encourages innovation and assists in the creation of new knowledge. Meanwhile, the primary and secondary education is suitable for productivity enhancement and the high school education is a prerequisite for the adoption of technology advancement. Higher education is able to produce people with the ability to innovate and expand the boundaries of knowledge.

As Malaysia aspires to become a high income nation by 2020, education is an essential requirement for the widespread development of technology-based production systems that accelerate economic growth. Besides that, industrialized economy also promotes to the economic performance. Therefore, the level of secondary education is required to adopt the technology for the production, which relies heavily on industrial performance.

Considering the relatively increasing level of education in Malaysia and the fact that the next desirable stage of development in Malaysia is a high income nation through the industrialization, therefore the most suitable level of education should be identified. On the other hand, education expenditure also considered as an important tool in molding the high value added human capital which boosts the economic growth. Then, the education development expenditure and operating expenditure on education has to be examined in order to identify the impact in promoting economic growth.

In general, we expect that every graduate from the any level of education, capable with the required knowledge and skills derivable from such level. Despite, this is not a frequent case, especially for the developing countries. Therefore, the quality of education to be an element to be considered. As earlier mentioned, the quantity of education (levels of education and completion) is a prerequisite condition in driving towards the development.

On the other hand, the quality of education assists as an ample condition in promoting the development. Even though, both of the quality and quantity can be pursued at the same time, rationality commands the appropriate condition that can be obtained before the essential condition. Hence, this study focuses on the quantity of education. Since the data on measures of quality of education does not cover much of the period under review.

Table 3.1 shows that the variables to be used in this study, the definitions and their sources.

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Table 3.1: Variables descriptions and sources

S/no	Variable	Description and Measure	Sources of Data
1	GDP	GDP at current price (in RM Million).	Department of Statistics Malaysia (DOS).
2	OPR	Federal government operating expenditure on education (in RM Million).	Ministry of Finance Malaysia (MOF).
3	DEV	Federal government development expenditure on education (in RM Million).	Same as above.
4	PRI	Primary school enrollment (in numbers).	Department of Statistics Malaysia (DOS).
5	SEC	Secondary school enrollment (in numbers).	Same as above.
6	TER	Public university enrollment (in numbers).	Same as above.

Source: Compiled by Author.

For the purposes of this study, we use the GDP at current price instead of using the GDP at constant price because of all the variables of education in current price. Therefore, the present study chose the GDP at current price. Besides that, as earlier mentioned the GDP is a proxy used to measure economic growth.

3.6 Data Description

Taking into consideration of the objectives of the study, the time series data on GDP, federal government development expenditure on education and federal government operating expenditure on education, different levels of educational attainment such as primary, secondary and tertiary has been used in Malaysia context for the period from 1980 to 2012.

Data were taken from different issues of "Public Finance" and "National Accounts". Specifically, the data on federal government development expenditure on education and the federal government operational expenditure on education were obtained from the Time Series: Public Finance reported by the Ministry of Finance Malaysia (MOF) website. The data of GDP were denoted in national currency (RM Million) at current price. Data on GDP were acquired from the National Accounts reported by the Department of Statistics Malaysia (DOS).

Moreover, the development and operational education expenditure data were denoted in national currency (RM Million). On the other hand, data on educational attainment (primary, secondary and tertiary) were utilized from the Ministry of Education, Malaysia reported by the Department of Statistics Malaysia (DOS)[13] and it is expressed in number of students.

[13] Data on levels of educational attainment (primary, secondary and tertiary) obtained upon request from the Department of Statistics, Malaysia.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter has been divided into two parts where the first part presents the results of descriptive statistics and it is followed by the results of the empirical analysis of the study.

4.1 Numerical and Graphical Descriptive Statistics

This section is divided into two parts: numerical and graphical descriptive statistics analysis.

4.1.1 Numerical Descriptive Statistics Analysis

Descriptive analysis or statistics plays an important role in data cleaning or evaluation, policy analysis, and it also provides a clear picture of the situation under study. A range of descriptive statistics for the education expenditure and economic growth, as shown in Table 4.1. The average value of GDP is RM326131.9 million, while the government development expenditure on education is RM4114.6 million and followed by the operational education expenditure indicates RM14678.7 million.

Moreover, 0.11 per cent of GDP is spent for the operational education expenditure while 0.05 per cent of GDP is spent for the development education expenditure. Table 4.1 also presents the standard deviation value which is widely known as a unit free measure of variability.

Table 4.1: Government Expenditure on Education and Economic Growth Descriptive Statistics

	GDP	**DEV**	**OPR**
Mean	326131.9	4114.6	14678.7
Median	253732	2091	10360
Maximum	941237	12436	47040
Minimum	53308	558	2228
Std. Dev.	270022.4	3783.1	13264.2
Skewness	0.87	0.93	1.09
Kurtosis	2.53	2.46	2.91
Jarque-Bera	4.49	5.10	6.49
Probability	0.11	0.08	0.04
Covariance	52.33	91.94	90.36
Observations	33	33	33

Notes: The correspondence between government education expenditure as well as economic growth indices and respective figures: GDP = Gross Domestic Product; OPR = Government operating education expenditure; DEV = Government development education expenditure.

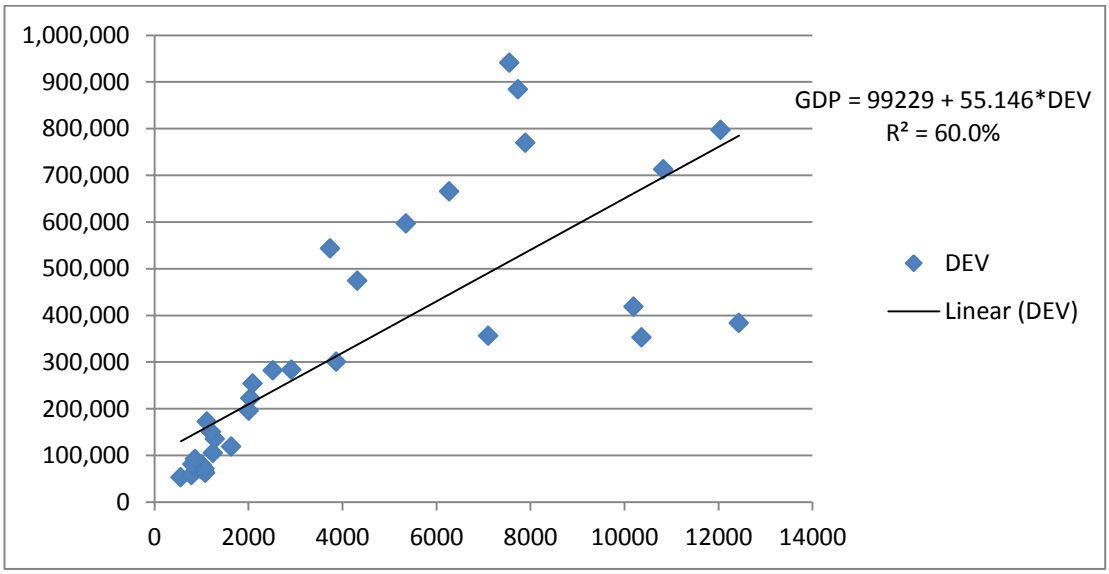
Based on the covariance results in Table 4.1, the variability of government development expenditure on education is considered as the highest compared to other variables from 1980 to 2012. The positive skewness apparent in the government education expenditure and GDP implies that the distribution of the series (around the mean) has a long right tail, large values and positive side.

4.1.2 Graphical Descriptive Statistics Analysis

Figure 4.1 and 4.2 presents the scatter plots for the government expenditure on education and economic growth. The scatter plot with the linear regression line is fitted in order to visualize the degree of association with the dependent and independent variables.

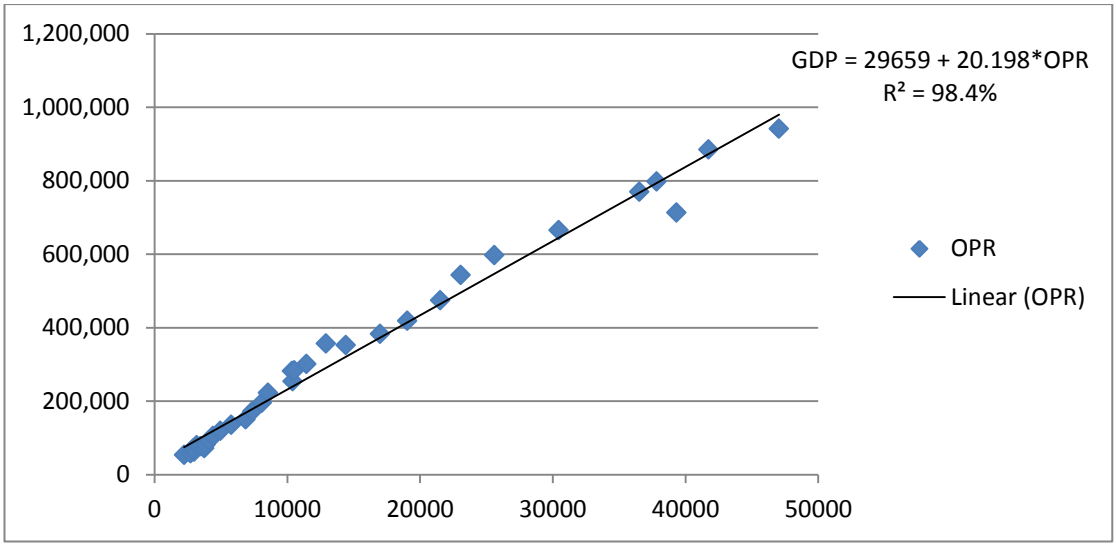
The graphical presentation of GDP and the government development expenditure on education relationship appears to be weak (see Figure 4.1). This is due to the inconsistent investment made by the federal government towards the educational development during the period from 1980 to 2012. The value of R^2 is not really close to the 100 per cent and it appears in moderate value. The value of R^2 = 60 per cent is the changes of GDP that explained by the changes in the government development education expenditure.

Figure 4.1: Scatter Plot of GDP and Government Development Expenditure on Education



Meanwhile, the relationship between the GDP and government operating expenditure on education is positive. The value of R^2 = 98.4 per cent, is close to 100 per cent and considered as a high R^2 value. The 98.4 per cent is the changes of GDP that explained by the changes in the government operating education expenditure. As illustrated in Figure 4.2, one can conclude that the government operating education expenditure has a strong relationship with GDP in terms of regression line fit and R^2 compared to Figure 4.1.

Figure 4.2: Scatter Plot of GDP and Government Operating Education Expenditure

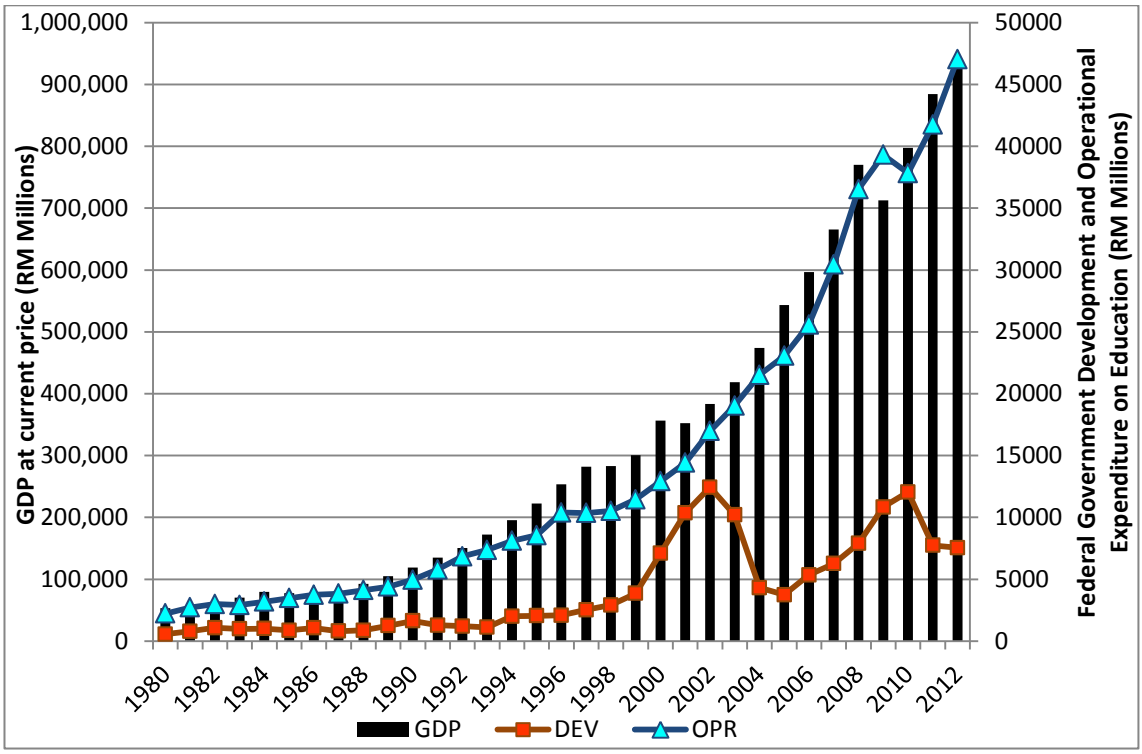


Moreover, the regression analysis for GDP and the federal government development expenditure on education as well as GDP and government operating education expenditure results show that the p-value is equal to 0.00 which is a good result and very useful in predicting the economic growth (see **Appendix B and C**).

The combination of one dependent variable and two independent variables, visible in Figure 4.3. On the other hand, Figure 4.3, partially explains the positive relationship between GDP and government expenditure on education. The GDP trend

line has been described in the earlier chapter (see Chapter 1: Government Expenditure on Education and Economic Growth in Malaysia). However, the trend line of federal government development education expenditure and federal government operating education expenditure indicating a little bit differently. In this sense, there is some reason behind the changes in the trend line.

Figure 4.3: GDP, Federal Government Development and Operating Expenditure on Education in Malaysia from 1980 to 2012



Source: National Accounts, Department of Statistics Malaysia (2014) and Fiscal and Economic Data, Ministry of Finance Malaysia (2014).

Therefore, the present study explores the reason behind the changes in those trend lines which is not fully explained in the previous chapter. The Malaysian government invests more on the education sector, especially in operating the education rather than the development. In 1999, there was a high investment made by the government on education. At this time, the country was attempting to recover from the global ASEAN financial economic crisis. However, the government

allocation for education sector was not affected by the crisis. This is because of the Malaysian government feels that spending on education today is an investment in the future. In 2002, the basic education in Malaysia faces dramatic changes were the subjects of Science and Mathematics taught in English. The Ministry of Education Malaysia starts to implement the changes in both subjects in 2003. For this reason, in 2003, the subjects of science and mathematics are taught in English in primary and secondary schools (Pillay, 2003). Higher education, all subjects taught in English and therefore there was no changes.

Soon, the federal government development expenditure on education and operational expenditure on education is dropped from 2003 to 2004 due to the mild recession. In 2004, Ministry of Education (MOF) has been divided into two ministries and they are known as the Ministry of Education and Ministry of Higher Education, Malaysia (MOHE)[14]. Previously, the Ministry of Education in charge of all matters related to education. Thereafter, the Ministry of Education Malaysia is responsible for the pre-school, primary and secondary school. Meanwhile, the Ministry of Higher Education Malaysia is responsible for higher education. This fact shows that after 2003, the expenses of higher education and school expenditure on pre-school, primary and secondary listed separately. However, the Ministry of Education and Ministry of Higher Education were merged into a single Ministry of Education in 2013.

As shown in Figure 4.3, the government expenditure on education has declined in 2004. Just right after the country recovered from the recession,

[14] Adopted from the Ministry of Higher Education, Malaysia (2014) official portal.

investments in education began to increase until 2009. However, in 2011 it shows a downward trend and after that it shows an increasing trend. From the data plotted in Figure 4.3, it appears that the federal government development expenditure on education and operating expenditure on education is moving along with GDP. From this graphic illustration, one can claim that Figure 4.3 partially answered objectives set where the government spending on education has a positive relationship with GDP. However, we should take into consideration that the value of the primary vertical axis amount is different compared to the value of secondary vertical axis amount. Therefore, the present study finds out that the expenditure on education in the certain periods is high compared to the GDP performance as shown in Figure 4.3.

4.2 Econometric Analysis and Results

This section represents the empirical results and discussion of this study based on the Augmented Dickey-Fuller (ADF) test, Philip-Perron (PP) test, Johansen and Juselius (1990) Cointegration test, Granger Causality and Vector Error Correlation model (VECM) test. The overall empirical illustrations are based on GDP, federal government development expenditure on education, federal government operating expenditure on education and different levels of educational attainment in Malaysia from 1980 to 2012.

4.2.1 Stationary Tests and Non-stationary

The selected variables under investigation must be a stationary series in order to do the integration and vector autoregressive (VAR) test. For this purpose, we perform the standard unit root test such as Augmented Dickey Fuller (ADF) test and Phillips-Perron (PP) test. Table 4.2 presents the computed results of unit root test that organized accordingly to a selected series at level and upon first differencing. The types of tests employed in the models are μ, drift term and τ, both drift and deterministic term respectively. The test statistics of results are arranged in two parts, as shown in Part A, level and Part B, the first difference. Both the ADF and PP tests examine the null hypothesis of a unit root against the stationary alternative.

In general, the ADF and PP tests are adopting different methods of controlling for higher order serial correlation when testing for a unit root (Nouman and Khan, 2014). The ADF test is valid if the series in the AR(1) process. Later, the assumption of white noise disturbances ε_t is violated if the series is correlated at high order lags (Kurihara and Tomimura, 2012; Nouman and Khan, 2014). On the other hand, Phillips and Perron (1988) suggests that a nonparametric method is to control for higher order serial correlation in a unit root (Kurihara and Tomimura, 2012; Shrestha and Chowdhury, 2005).

The PP test makes a nonparametric correction to the t-ratio of the α coefficient and therefore, the serial correlation does not affect the asymptotic distribution of the test statistic (Kurihara and Tomimura, 2012). In this sense, the test is robust where unspecified autocorrelation and heteroskedasticity in the disturbance

process of the test equation (Shrestha and Chowdhury, 2005; Kurihara and Tomimura, 2012).

Table 4.2: Results of Unit Root Test

	Test Statistics			
	ADF		PP	
	t_μ	t_τ	τ_μ	τ_τ
	A: Level			
lnGDP	-0.213(0)	-2.202(0)	-0.207(2)	-2.329(1)
lnDEV	-0.773(2)	-3.336(1)	-1.248(5)	-2.205(4)
lnOPR	0.281(0)	-3.219(1)	0.885(15)	-1.971(6)
lnPRI	-1.761(8)	3.513(7)	-2.262(3)	2.444(0)
lnSEC	-1.067(5)	-0.801(5)	-1.672(4)	-1.143(4)
lnTER	-1.431(0)	-1.950(0)	-2.070(11)	-2.023(4)
	B: First Differences			
ΔlnGDP	-5.165(0)**	-5.073(0)**	-5.150(2)**	-5.052(2)**
ΔlnDEV	-4.259(1)**	-4.179(1)**	-4.168(13)**	-4.030(12)**
ΔlnOPR	-3.890(2)**	-3.939(2)**	-5.216(10)**	-6.602(20)**
ΔlnPRI	2.026(8)	-1.066(8)	-2.249(2)	-3.652(0)**
ΔlnSEC	-2.537(4)	-2.706(4)	-3.866(3)**	-4.044(3)**
ΔlnTER	-4.806(0)**	-4.854(0)**	-4.933(11)**	-6.197(16)**

Notes: All variables are in natural log. The t, τ and η statistics are for ADF and PP. The subscript μ in the model allows a drift term while τ allows for a drift and deterministic trend. Asterisks (**) and (*) indicates statistically significant at 5 per cent level and 10 per cent level. Figures in parentheses are the lag lengths and the lag lengths are determined by automatic selection. The Δ denotes first difference operator.

As shown in Table 4.2, each of the series holding a non-stationary behaviour when the variables are defined in level for the ADF test and PP test. However, the ADF test reject the null hypothesis of the series at first difference (expect primary and secondary education enrolment variables). Meanwhile, for the PP test statistics at first difference indicates that all series contain a stationary behaviour. In other words, PP tests successfully reject the null hypothesis at 5 per cent significance level for each series.

Overall, the unit root test, especially for PP test, it fully supports the hypothesis for each examined variable are stationary and there is no unit root after

attempting the first difference. Plotting the time-series data will give a clear picture whether the series contains trend or not (refer **Appendix D**). Based on the results (refer **Appendix D**), the present study found out that all the natural variables are having structural breaks. In order to overcome this problem, the present study performs the test of the unit root hypothesis in the null against the alternative of a deterministic trend with a one-time exogenous and endogenous structural break (Ghosh, 1999).

Traditionally, if the series are not stationary at first difference, then the series is needed to proceed for the second difference. Indeed, the results for the PP test indicates that all data series are stationary at first difference; it means that all the variables are integrated of order one, *I*(1) in which allow us to proceed with the Johansen and Juselius cointegration analysis.

4.2.2 Cointegration and Hypothesis Testing Results

Before estimating for the existence of any cointegrating relationship between the variables using the Johansen and Juselius cointegration procedure, it is necessary to identify the dynamic specification of the VAR model which is known as lag orders (k). The lag orders (k) can influence the number of cointegrating vectors and the shape of the impulse function. For this purpose, the multivariate generalisation of Akaike Information Criteria (AIC) procedure were adopted to determine the appropriate lag length of vector autoregressive (VAR) model and this in line with Islam et al. (2007), Hussin et al. (2012), Stengos and Aurangzeb (2008), Pengkas and Tsamadias (2014), and Rahman (2011).

As earlier discussed in Chapter 3, we have two models where:

$ln\ \text{GDP} = \beta_0 + \beta_1\ ln\ \text{DEV} + \beta_2\ ln\ \text{OPR} + \varepsilon$ (**Model 1)**

$ln\ \text{GDP} = \beta_1 + \beta_2\ ln\ \text{PRI} + \beta_3\ ln\ \text{SEC} + \beta_4\ ln\ \text{TER} + \varepsilon$ (**Model 2)**

In this sense, the multivariate generalisation suggests VAR(4) for Model 1 while VAR(2) for Model 2 (refer **Appendix E**).

Johansen and Juselius (1990) cointegration tests used in this study to test for the long-run equilibrium between dependent and independent variables. The Johansen and Juselius (1990) cointegration test procedure employs two likelihood ratio (LR) test statistics to determine the number of cointegration vectors. It is widely known as trace test and the maximal eigenvalue (λ-max) test.

For the Johansen and Juselius (1990) cointegration test, the estimation procedure assume that there is an intercept and no trend in the vector autoregressive (VAR) estimation. Generally, the null hypothesis of no cointegration vector ($r = 0$) and at least one cointegration vector ($r \leq 1$) for both trace and maximum eigenvalue tests may reject at the 5 per cent and failed to reject at 5 per cent for more than one cointegrating vector. This indicates that there is only one cointegrating vector (Pegkas and Tsamadias, 2014). Hence, the results of the Johansen and Juselius cointegration test results are presented in Table 4.3.

Based on Table 4.3, the present study found out that the null hypothesis of no cointegration vector (r = 0) was rejected at the 5 per cent significance level for both models. Further, the results of trace test and maximum eigen value test were the same which implied the presence of one cointegration vector. Lau et al. (2010)

reported that reject the null hypothesis of no cointegration showed that the estimated variables are do not drift apart and share the common stochastic trend in the long run. From this statement, the present study found out that both models reject the null hypothesis of no cointegration and claimed that the three variables for Model 1 and four variables for Model 2 do not drift apart and share a common stochastic trend in the long run. On the basis of the Johansen and Juselius cointegration test results, the present study can conclude that there exist a unique cointegration relationship is emerge for both of the models over the period 1980 to 2012.

Table 4.3: Johansen and Juselius Cointegration Test Result

Model 1					
		k = 4; r = 1			
Null	Alternative	λmax		Trace	
		Unadjusted	95percent C.V.	Unadjusted	95percent C.V.
r = 0	r = 1	43.598**	21.132	54.490**	29.797
r ≤1	r = 2	8.970	14.265	10.892	15.495
Model 2					
		k = 2; r = 1			
Null	Alternative	λmax		Trace	
		Unadjusted	95percent C.V.	Unadjusted	95percent C.V.
r = 0	r = 1	38.470**	27.584	60.958**	47.856
r ≤1	r = 2	11.670	21.132	22.487	29.797

Notes: Asterisks (**) denote statistically significant at 5 per cent level. The *k* is the lag length and *r* is the cointegrating vector(s). Chosen r: number of cointegrating vectors that are significant under both tests.

Johansen and Juselius (1990) cointegration test only informs that the variables possess long-run relationship but fails to indicate the direction of causality. Hence, the present study proceeds to Vector Error-Correction Model (VECM) approach for both Model 1 and Model 2 because the variables cointegrated. Further, once cointegration is detected, then the Granger causality must be conducted in VECM to avoid the problem of misspecification[15].

[15] This discussion is adopted from Granger (1988).

4.2.3 Causality Analysis for Model 1 and Model 2

Having detected that the variables cointegrated and then the Vector Error Correction Model (VECM) method can be adopted. Further, the lagged residuals from the Johansen and Juselius Cointegration regression with the appropriate number of lags that were used previously for both models included in the structure of the Granger Causality test. The VECM passes through the diagnostic tests for residual serial correlation [Lagrange Multiplier (LM) test] and normality test (refer **Appendix F and G**) for both models.

The long run equation for both models are:

Model 1: $\ln\widehat{GDP}_{t-1} = 3.759 + 0.381\ln DEV_{t-1} + 0.606\ln OPR_{t-1}$

Std error	(0.047)	(0.051)
t-stat	[8.032]	[11.821]

Model 2: $\ln\widehat{GDP}_{t-1} = -8.418 + 0.736\ln PRI_{t-1} + 0.130\ln SEC_{t-1} - 1.352\ln TER_{t-1}$

Std error	(0.529)	(0.445)	(0.204)
t-stat	[1.390]	[0.292]	[-6.627]

All variables are positively significant at 5 per cent for Model 1 while for the Model 2, the estimated long run equation indicates that tertiary education enrolment is significant at 5 per cent level.

In other words, the Granger Causality test is applied based on VECM to distinguish the short-run and long-run granger causality for each examined variable for Model 1 and Model 2. Table 4.4 indicates that there is a strong evidence of short-run and long-run granger causality among the estimated models. The long-run Granger causality relationship has been determined by the ECT value for each

examined variable. The present study note that the DEV and OPR variables found to be endogenous for Model 1 while the SEC and TER variables found to endogenous for Model 2. This is shown in the DEV, OPR, SEC and TER equation where the ECT is statistically significant and suggesting that these variables solely bears the brunt of short-run to bring about the long-run equilibrium.

Table 4.4: Granger Causality Results based on Vector Error Correction Model (VECM)

Model 1					
Dependent Variable	**χ^2 −statistics (*p*-value); k=4**			**ECT**	
	ΔlnGDP	ΔlnDEV	ΔlnOPR	**Coefficient**	**t-ratio**
ΔlnGDP	-	1.754 (0.781)	1.749 (0.782)	0.049	0.224
ΔlnDEV	18.394 (0.001)**	-	10.671 (0.031)**	2.961	5.250**
ΔlnOPR	6.993 (0.136)	15.577 (0.004)**	-	-0.260	-2.086**

Model 2						
Dependent Variable	**χ^2 −statistics (*p*-value); k=2**				**ECT**	
	ΔlnGDP	ΔlnPRI	ΔlnSEC	ΔlnTER	**Coefficient**	**t-ratio**
ΔlnGDP	-	3.013 (0.222)	0.405 (0.817)	1.277 (0.528)	0.100	0.526
ΔlnPRI	6.564 (0.038)**	-	0.176 (0.916)	0.004 (0.998)	-0.014	-0.3112
ΔlnSEC	9.225 (0.001)**	3.087 (0.214)	-	3.383 (0.184)	0.090	2.167**
ΔlnTER	14.948 (0.001)**	6.815 (0.033)**	0.550 (0.759)	-	0.522	4.929**

Notes: All variables are in natural log.The χ^2-statistic tests the joint significance of the lagged values of the independent variables, and the significance of the error correction term(s). Δ is the first difference operator. Figures in parentheses are the *p*-values. Asterisks (**) indicate statistically significant at the 5 per cent level. The *k* is the lag length.

Moreover, the *t*-statistic on the lagged residual is statistically significant for Model 1 and Model 2 in which supporting the cointegration results reported earlier. The present study note that the ECT coefficient is used to measure the speed of the temporal adjustment to long-run equilibrium. Hence, the magnitude of the coefficient shows the speed of adjustment towards the long-run path.

Specifically, for Model 1, the coefficient of ECT for OPR is 0.026, which indicates that the OPR has a speed of adjustment of 26 per cent. Hence, it will require approximately 38 years for back to the equilibrium. While for Model 2, the coefficient of ECT is 0.090 for the SEC and for the TER is 0.522, which shows that the SEC and TER has a speed of adjustment of 9 per cent and 52 per cent, respectively. From this, one can suggest that the SEC and TER need approximately about four quarters and 11 quarters adjust to long-run equilibrium due to short-run adjustments. This result is in line with prior expectations for the current study. The findings of the Model 1 provide evidence that the benefits of development education expenditure and operating education expenditure only noticeable in the long-run, which is in line with the result found by previous studies like Hussin et al. (2012), Babalalo (2011), Khorasgani (2008).

On the other hand, the null hypothesis of GDP does not cause (in Granger causality sense) PRI, SEC and TER is easily rejected at the 5 per cent significance level {(GDP→PRI), (GDP→SEC) and (GDP→TER)} for Model 2. This finding appears to support the Lucas growth model (1988) where he mentions that human capital might be continually increased even without the any increase in educational attainment. This is because he believes that public body of knowledge and human capital accumulation can add value to human capital increases even though human capital of individuals are decay over time. Therefore, human capital can continue to increase even when the educational attainment has stopped increasing and thus continuing the possible growth. In this sense, continuing growth is possible to encourage an increase in educational attainment as reported in Table 4.4 short run granger causal relationship.

Further, the short-run analysis would be sensitive towards the changes in the development education expenditure and operating education expenditure which is driven by the increased GDP. Hence, for Model 2, unidirectional causal relationship between GDP and PRI exist; GDP and SEC exist; GDP and TER exist; the unidirectional causal relationship between PRI and TER exist while for Model 1, bidirectional causality running from OPR to DEV and vice-versa; unilateral causality running from GDP to DEV of Malaysia exists.

The directions of causal relations from Table 4.4 can be summarized graphically as below (Table 4.5):

Table 4.5: Flow Diagram of Causality Linkages

Model 1		
GDP	→	DEV
DEV	→	OPR
Model 2		
GDP	→	PRI
GDP	→	SEC
GDP	→	TER
PRI	→	TER

Notes: All variables are in natural log. The arrow → shows the unidirectional causality.

CHAPTER FIVE

CONCLUSION, IMPLICATIONS AND RECOMMENDATIONS

5.0 Introduction

The first section in this chapter will summarize the findings of the study. The second section discusses appropriate policies that will be implemented by the government. Finally, the chapter ends with recommendations for areas of further research.

5.1 Conclusion

The objective of this study is to set up to revisit the effect of government education expenditure on economic growth. Indeed, the present study finds out that there are two types of spending on education by federal government and they are known as federal government development and operating expenditure on education. Federal government spending on education for the development level and operational level are two different expenditure and they differ in the way they allocate the investment in education. Hence, generalizing the results may lead to wrong information or policy suggestion.

One of the major research issues in government spending on education is the question of where the investment goes, since our performance in the past several

years in the Programme for International Student Assessment (PISA), the Global Competitiveness Index (GCI), Trends in International Mathematics and Science (TIMES) and Times Higher Education Asia University Rankings (THE) shows poor rankings and we failed to place in the list of top ten countries. From this, one can claim that investment in education is inefficient and ineffective in producing desired human capital, which later promotes the economic growth of the country. Hence, this study set out to determine the causal linkage between the federal government development expenditure on education, federal government operating expenditure on education and economic growth. Moreover, along with this, the impact of different levels of education on economic growth is investigated.

This study has shown that there exists a unique cointegration relationship for the variables of the federal government development expenditure on education, different levels of educational attainment like primary, secondary and tertiary (as shown in the estimated Model 1 and Model 2). On the basis of our empirical results, it also finds out that there is a unilateral causality running from the GDP to federal government development expenditure on education, in the short-run (Model 1). The results of estimate VECM suggest that the benefits of development education expenditure and operating education expenditure on economic growth is only noticeable in the long-run. This finding is consistent with the Khorasgani (2008), Babalalo (2011), Afzal et al. (2011), Pegkas and Tsamadias (2012), Jalil and Idrees (2013), and Hussin et al. (2012).

For the Model 2, the empirical results of Granger Causality based on VECM framework also report the existence of unidirectional causality running from GDP to

primary attainment; GDP to secondary attainment; GDP to tertiary attainment in the short-run. It is also shown that the effects of secondary and tertiary education attainment on GDP are only noticeable in the long-run.

The empirical findings of the present study suggest that the educational attainment of secondary and tertiary education is quite important in determining economic growth of Malaysia. In fact, the majority of Malaysia's workforce and working people basically graduated with an educational level of secondary and tertiary education. Typically, a large number of persons employed has secondary education attainment compared with other levels of education[16].

Our findings on secondary education attainment is consistent with Jalil and Idrees (2013), Stengos and Aurangzeb (2008), and McMahon (1998), using data of-different countries: the secondary education level is fundamentally important to the successful export-oriented production and manufactured goods. Moreover, the tertiary educational attainment that the present study has identified, is promoted to the knowledge enrichment, mastering and the ability to develop new technologies. These findings suggest that more involvement in education is expected to produce positive externality such as a reduction in crime level and leads to the welfare participation or more informed political decisions.

As a conclusion, this study confirms the long-run relationship: between government expenditure on education (development and operation) and GDP; between the different levels of educational attainment (of secondary and tertiary) and

[16] See http://www.statistics.gov.my/dosm/uploads/files/3_Time%20Series/Labour%20Force%20Survey%20Time%20Series%20Data%2C%201982%20-%202012/TABLE14.pdf for further details.

GDP. The role of government expenditure on education, secondary and tertiary education level seems to be very important and significantly explains economic growth of Malaysia.

5.2 Implications and Recommendations

Based on the reported empirical results and findings, one can suggest that the federal government development and operational education expenditure do not contribute towards the economic growth in the short-run. However, the federal government development and operational education expenditure show a significant effect towards the economic growth after the lag of 4 years. Meanwhile, for Model 2, the role of secondary and tertiary educational attainment towards economic growth seems to be very important and significantly explain the economic growth in the long-run.

Based on the results of this study, it recommends that the government should expand the number of students at the secondary and tertiary education as both secondary and tertiary educational attainment leads to economic growth. Therefore, the economic growth can be further accelerated. From this, one can suggest that this will leads to further education and development.

From the policy point of view, it is important to remark that the spending on human capital investment must be emphasized over the time. The primary educational attainment also needs to be given priority, because of primary education

contributes as an input to all levels of higher education. Viewing from the unidirectional Granger causality running from the primary level of education to tertiary education.

Further, this study indicates that the impact of education expenditure on GDP growth is not instantaneous. Federal government development and operating expenditure on education is a time-consuming process to exert appreciable impacts on economic growth. In this sense, government expenditure on education and different levels of educational attainment initially leads to the development of human capital in which ultimately transforms itself in the form of economic growth. Therefore, it is important for a developing country like Malaysia to be persistent in allocation of resources for the development of the education, especially in quality inputs such as teaching and learning process, skills and technology aspects in order to create high skilled human capital, which leads to the skilled labor force, later leads to the export-oriented production and manufactured goods, hence leads to the better economic growth, which is in line with the national aspiration to become a high income economy by the year 2020. In addition, spending on education should be focused on the needs of quality rather than quantity approach.

More research is needed to further explore on the other determinants of growth, including the educational variables. Hence, the present stud concludes that the sign of the relationship between economic growth and education relies on the level of government spending, tax structure, physical capital and the parameters of production technologies. In addition, further experiments are needed to estimate on the effects of education quality in promoting economic growth.

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