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Relationship between Population and Economic Growth on Education Expenditure in Malaysia: ARDL Bound Testing Approach

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ABSTRACT

The motivation of the study is to analyze the impact of population and economic growth on education expenditure in Malaysia as demographic projection forecast that the percentage of population in Malaysia is increasing overtime. The used of long time series data of Malaysia from 1970 to 2013 helps us to identify the long-run relationship between population and education expenditure using ARDL bound testing approach. The result of the bound test showed that there is a stable long-run relationship between population and economic growth on education expenditure. In fact, short-term and long-term result revealed that the population and economic growth have influences education expenditure in Malaysia. Therefore, policy implication of this study showed that the increase number of population not only will impact education expenditure, but also provide a quality human capital which contributed into the economic growth.

Key Words: Population, Economic Growth, Education Expenditure, Malaysia, ARDL model.

Hubungan diantara Populasi dan Pertumbuhan Ekonomi keatas Perbelanjaan Pendidikan di Malaysia: Pendekatan Analisis ARDL

ABSTRAK

Motivasi kajian ini adalah untuk menganalisis kesan pertumbuhan penduduk dan ekonomi ke atas perbelanjaan pendidikan di Malaysia sebagai ramalan unjuran demografi yang peratusan penduduk di Malaysia semakin meningkat. Kajian ini menggunakan data siri jangka masa panjang dari tahun 1970 sehingga 2013 yang membantu kita untuk mengenal pasti hubungan antara penduduk dan perbelanjaan pendidikan dengan menggunakan analisis *ARDL*. Hasil kajian menunjukkan hubungan jangka masa panjang yang stabil antara pertumbuhan penduduk dan ekonomi ke atas perbelanjaan pendidikan. Hasil kajian jangka masa pendek dan jangka masa panjang menunjukkan bahawa pertumbuhan penduduk dan ekonomi mempengaruhi perbelanjaan pendidikan di Malaysia. Oleh yang demikian, kesan dasar kajian ini ialah dengan peningkatan jumlah penduduk, ia akan memberi kesan peningkatan ke atas perbelanjaan pendidikan dan pada masa yang sama akan meningkatkan jumlah sumber manusia yang berkualiti di samping dapat membantu pertumbuhan ekonomi.

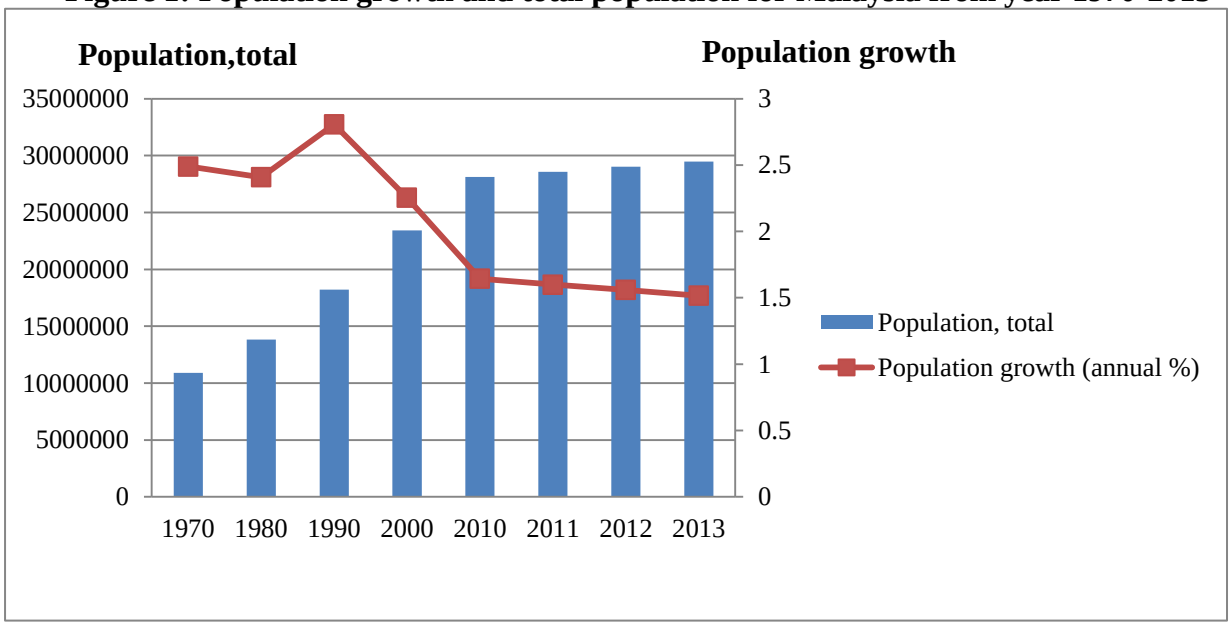
Kata Kunci: Populasi, Perumbuhan Ekonomi, Perbelanjaan Pendidikan, Malaysia, Model ARDL

INTRODUCTION

One of the important factor that will contribute to the human capital and economic development is education. The increase in population is one of the factors that increase the education expenditure. The changing of the demographic transition is well spread out the education, because of the increasing in the population ages 0-14 years. Most importantly in education is the contribution towards economies, societies and to the economic fortunes of individuals and factor of increase in poverty is illiteracy. This expenditure on education is important to economic and also well-being of the society. An increase population growth in Malaysia will demand more government expenditure on education and thus the government's role is crucial in giving the best education as well as providing good infrastructure and facilities.

The relationship between demographic factors on education had been recognized in academic and policy setting. The increase in the population number will grow the number of school age population. Malaysia's rapid population growth is likely to impede educational development either by reducing quality to maintain enrolment or by reducing the quantity to maintain educational quality. Nonetheless, Malaysia has made significant progress in education. Figure 1 shows the school enrolment rate for primary among primary students in Malaysia. An increase in total population will give impact impact on the education expenditure and at the same time increases in the labor force thus impede the economic growth. Figure 1 shows the population growth and total population for Malaysia since 1970 until 2013 with a decreasing growth and achievement of almost 3 million people in 2013 respectively.

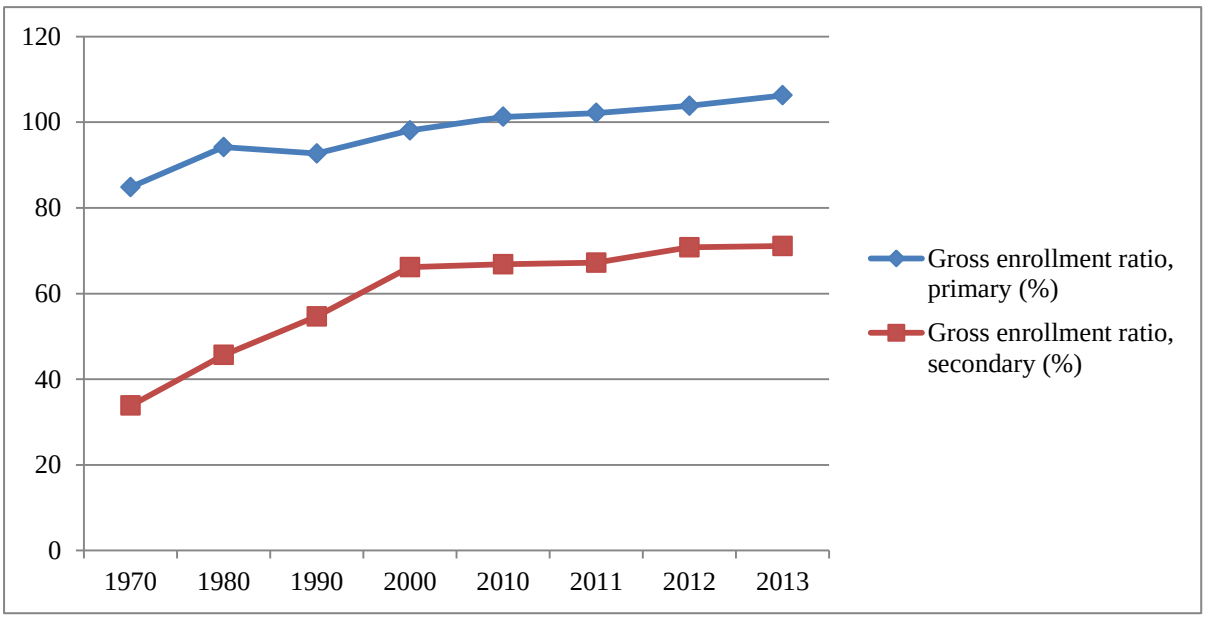
Figure 1: Population growth and total population for Malaysia from year 1970-2013



(Source: World Bank Indicator, 2017)

As the fertility rate decreases it will result in a better education because with fewer a child in the family in Malaysia and it will support the family to increase family income and help to improve their child's education. In Malaysia, primary school enrolment rate also increased and this means that Malaysia has made a progress in increasing their level of child education, especially in the first level and will increase the literacy of the population. Figure 2, shows the primary and secondary school enrolment for Malaysia, this figure shows that both in Malaysia, total primary and secondary school enrolment increase from year 1970 to 2013.

Figure 2: Primary and secondary school enrolment for Malaysia from 1970-2013



(Source: World Bank Indicator, 2017)

Generally, there are three major levels of education systems in Malaysia which are primary, secondary and tertiary. Only primary education level is compulsory in Malaysia, where multilingual public schools, private school and home educators co-exist side by side. Table 1 shows the education systems in Malaysia.In primary level include from year 1 to year 6 from age 7 to 12 years old, middle level include grade level one, from age 13 to 15 years, secondary level, include level two with age 16 to 17 years whereby vocational with tertiary as the last level, both are age vary.

Table 1: Education System in Malaysia

Education	School/ level	Grade From	Grade To	Age From	Age To	Years
Primary	Primary Year 1 to Year 6	1	6	7	12	6
Middle	Level One	1	3	13	15	3
Secondary	Level Two	4	6	16	17	2
Vocational	Vocational	Age Vary				
Tertiary	Tertiary	Age Vary				

(Source: Ministry of Higher Education, Malaysia, 2016)

As an increases in total population in Malaysia from year to year, the total education expenditure also increases with the higher cost of education, but the question is, does the population have an impact on education expenditure and does population will influence the economic growth? Thus, this paper will provide a better insight towards examining the impact of increases in population on education expenditure and economic growth in Malaysia The paper is structured as follows: Section 2 provides review or literature on related issues; Section 3 defines the variables and explains the methodology; Section 4 presents the result and the main findings; and Section 5 is the conclusion and the policy implication of the study.

LITERATURE REVIEW

Education is an investment to the future not just a consumption activity and education almost related to the investment for the human capital and this support with theory of Schultz (1987), Gary Becker (1964) and Mincer (1974) define human capital as essentially as years of schooling and Schultz concentrate on schooling and human capital and human capital as an acquisition of all skill and knowledge and one part of asset of investment. Human capital consist of the accumulation of all prior investment in education, on the job-training, health, migration and other factors that will increases productivity and earning. Human capital theory are formalised by Schultz (1987), Becker (1962, 1964). The education expenditure is an investment whereas the latter developed a theory of human capital formation and analysed the rate of return to investment in education.

Population change is the most important factor influencing education costs. There are many studies that show a correlation between population change and education expenditures. Stephan (2008) studied the impact of demography on higher education systems. The results showed that the demographic changes are only one of the factors determining student enrolment trends and cost of higher education. Canete (2011) found a relationship between population and educational development. An increase in the population growth rate increases the growth of the school age population. They found that both the public and private sector adequately responded to the continued growth of the school age population, which has a positive impact on the quality of basic education.

Government plays an important role in human capital growth by providing fund for formal schooling in many countries. There are various empirical literatures exploring the relationship between

economic growth and government education expenditure. Recent studies by Ageli (2013) examined the relationship between economic growth and education expenditure in Saudi Arabia from 1970 to 2012. He found that the growth of education can be explained by the Keynesian relations for both Oil and non-oil GDP and that causality exists in the long run. Besides that, Ejiogu et al. (2013) revealed that Nigeria's current year education expenditure increases due to the previous year's GDP but is negatively related with the gross capital formation for the period 1982 to 2011. They also found that there exists causality from GDP to education expenditure.

There are various dimension studies on the relationship between education and economic growth. Some studies found a positive relationship between education and economic growth (Afzal et al. 2010). Furthermore, Barro and Sala-i-Martin (1995) found that an increase in the average male secondary schooling will increase annual GDP growth. Jogerson and Fraumeni (1992), Aziz, Khan and Aziz (2008) and Ogujiuba and Adeniyi (2005) found that the relationship between education expenditures and economic growth is positively correlated. Other studies byTamang (2011) also found a similar result in which there is a positive relationship between education expenditures and economic growth.

Higher education is important to economic growth to produce a quality of human capital and thus affects economic growth. An increase in higher education, the percentage of industrial output, and agricultural output also increase (Lin, 2004; Bakare, 2006;Odit, Dookhan, and Feuzel, 2010). Furthermore, Okubal (2005) confirmed that an increase in the average years of schooling also helps to increase the real GDP in the short-term. According to Musila and Belassi (2004), in both a short-term and long-term estimation, increases in average educational expenditures will increase the total output. There are also studies on the Indian economy. Chandra (2010) found bi-directional causality between investment in education and economic growth; however, Pradhan (2009) found a positive relationship between education growth and economic growth both in the short-term and the long-term.

School enrolment is also one of the determinants of education expenditures. There are many studies that have found a relationship between education expenditures and the school enrolment rate. The results from Gupta et al. (2002) showed a positive relationship between education expenditures on the school enrolment rate. In addition, the increase in the size of the school-aged cohort does not increase the school expenditures, and spending per school-age child tends to be lower where the demographic burden is greater (Schultz, 1987).

Besides that, education measured by the three levels of overall enrolment that are primary, secondary and tertiary and is include human capita indicators . Education also can be sees as a proxy for child devoted time cost. In comparison with the previous works on applying time series technique such as Cheng and Nwachukwu (1997), Masih and Masih (1999,2000), Mc Nown (2003) and Narayan and Peng (2006, 2007), we increased our model specification by the three education levels consideration and first study by Farini and Muller (2012) used three level of the educational; primary, secondary and tertiary.

METHODOLOGY AND MODEL

Firstly, this study is examining the time series data where Autoreggression distribution lags (ARDL) of bound test will be used to test the integration of the variable between an exogenous and endogenous variable. This paper using time series data based on annually data set from 1970-2013. Besides that, unit root test will be used to test of the null of the non-stationary. In order to empirically analyses the long run relationship and dynamic interaction among the variables of interest, the model has been estimated by using the bounds testing (or autoregressive distributed lag (ARDL)) co-integration

procedure. In order to test the ARDL for cointegration, we use Wald coefficient test procedure. This is to determine the joint significance of the lagged levels of the variable in model (3) by obtaining the F-statistic. Narayan (2005) provide a set of critical values for the F-test for small sample estimation. The bound testing procedure is based on joint F-statistic or Wald statistic that is tested the null of no cointegration, $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_n = 0$ against the alternative $H_A: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_n \neq 0$. To apply the above approach, the model specification is:

$$LNEDU_t = \beta_0 + \beta_1 LNEDU_{t-1} + \beta_2 LNPOPT_{t-1} + \beta_3 LNGDPC_{t-1} + \beta_4 LINF_{t-1} + \beta_5 LNPRIM_{t-1} + \beta_6 LNSEC_{t-1} \quad (1)$$

where,education expenditure (*EDU),*total population (*POP),* gross domestic product per capita (GDPC), inflation rate (*INF),* primary school enrolment (*PRIM)* and secondary school enrolment (*SEC).*The model for ARDL will be;

$$\Delta LNEDU_t = \beta_0 + \beta_1 LNEDU_{t-1} + \beta_2 LNPOPT_{t-1} + \beta_3 LNGDPC_{t-1} + \beta_4 LNINF_{t-1} + \beta_5 LNPRIM_{t-1} + \beta_6 LNSEC_{t-1} + \sum_{i=1}^{k} \beta_7 LNEDU_{t-1} + \sum_{i=1}^{k} \beta_8 LNPOPT_{t-1} + \sum_{i=1}^{k} \beta_9 LNGDPC_{t-1} \sum_{i=1}^{k} \beta_{10} LNPRIM_{t-1} \sum_{i=1}^{k} \beta_{11} LNSEC_{-1} + \varepsilon_t \quad (2)$$

whereΔ denotes the first difference operator, α_0 is the intercept term, ε_t is the usual white noise residuals and the remaining variables are as defined earlier. The lagged level variables linear combination in model (3) is functional as proxy for lagged error term in standard VAR model. It measures the departure of the dependent variable from the explanatory variables in model (3) (Baharumshah et al. 2009). Most importantly, Pesaran et al. (2001) emphasize on choosing lags; where, sufficiently large lags help to deal with serial correlation problem. At the same time, small lags avoid unduly over-parameterization. In order to test the ARDL for cointegration, we use Wald coefficient test procedure. This is to determine the joint significance of the lagged levels of the variable in model (3) by obtaining the F-statistic.

EMPIRICAL RESULTS

Unit Root Test

Conventionally, the ARDL bound test for cointegration does not explicitly require the order of integration. Liu (2009) mention that the procedure also does not require the variables to be particularly integrated of order 1, *I*(1). However, it is crucial to employ the stationarity test to ensure that the variables are not integrated of order 2, *I*(2) to avoid spurious regression. The F-test critical values computed by Pesaran et al. (2001) and Narayan (2005) are assumed to be *I*(0) and *I*(1) for all variables. There are two types of unit root test namely Augmented Dickey-Fuller (ADF) test and Philips-Perron (PP) test. The unit root tests selected are ADF and Philips-Perron (PP) test on the models variables which performed at the level and first difference for both with the intercept and trend term. The result of the ADF and Philips-Perron unit root test are presented in Table 2 and Table 3.

Table 2: Result of ADF unit root test result for stationary of the variables for population, education expenditure and economic growth for Malaysia

ADF	LEVEL		FIRST DIFFERENCE	
	No trend	**Trend**	**No trend**	**Trend**
LEDU	-3.1738(2)**	-3.1984(2)**	-7.2255(0)***	-7.1409(0)***
LPOPT	-2.9191(9)***	-0.61656(9)***	-0.3282(3)*	-2.0590(3)***
LGDPC	-1.9328(0)	-2.7241(0)	-5.1394(0)***	-5.2689(0)***
LINF	-3.7870(0)***	-4.1162(0)***	-8.6686(0)***	-8.5812(0)***
LPRIM	-1.0958(0)	-2.9208(1)	-4.3259(0)***	-4.2742(1)***
LSEC	-2.4797(0)	-2.5137(0)	-5.5391(0)***	-5.7636(0)***

(Sources: Author Calculations by Eviews, 7.0)
Notes: Critical vales are presented *at 1%, ** at 5% and *** at 10% critical values of ADF statistic.The variables are defined as follows: LEDU= Education Expenditure; LPOPT= Total population; LGDPC= Gross Domestic Product per Capita; LINF= Inflation rate; LPRIM= Primary school enrolment; LSEC= Secondary school enrollment.

Table 3: Result of Philips Perron (PP) unit root test result for stationary of the variables for population, education expenditure and economic growth for Malaysia

PP	LEVEL		FIRST DIFFERENCE	
	No trend	**Trend**	**No trend**	**Trend**
LEDU	-2.5034(0)	-2.5007(0)	-2.5007(0)***	-7.1298(1)***
LPOPT	-2.4721(5)	1.3843(5)	0.14018(4)***	-1.0140(4)***
LGDPC	-1.8596(1)	-2.7345(2)	-5.0836(2)***	-5.2192(2)***
LINF	-3.7543(1)***	-4.1162(0)***	-9.1171(4)***	-9.0020(4)***
LPRIM	-1.1693(2)	-2.2388(2)	-4.2237(6)***	-4.1506(6)***
LSEC	-2.4648(3)	-2.5669(2)	-5.5425(2)***	-5.7427(3)***

(Sources: Author Calculations by Eviews, 7.0).
Notes: Critical vales are presented *at 1%, ** at 5% and *** at 10% critical values of ADF statistic. The variables are defined as follows: LEDU= Education Expenditure; LPOPT= Total population; LGDPC= Gross Domestic Product per Capita; LINF= Inflation rate; LPRIM= Primary school enrolment; LSEC= Secondary school enrollment.

Based on ADF test (Table 2), the result estimates that all the variable are stationary at first different *I(1)* except population (POPT) and inflation rate (INF). Otherwise the result for Philips-Perron test report in Table 3 estimates that only inflation rate are stationary at level *I(0)*and the others varibles are stationary at *I(1).* Thus, it can be concluded that the results of the unit root tests for all variables have unit root and the result has mixed on *I*(0) and *I*(1) variables would not be possible under the Johansen procedure. This provides a good reason to use the bound test approach, or the *ARDL* model, proposed by Pesaran et al. (2001).

Result of Autoregression Distribution Lags (ARDL)
The ARDL approach has two steps: First step is to identify the presence of the long run relationship by applying the F-statistic. Second steps are to evaluate the long-term and short-term impact among the chosen regressors of the analysis.

Result of Cointegration Relationship

Result of F-statistic is given in Table 4. From the result it shows that there is existing of a long run relationship among dependent and independent variables.

Table 4: Result of Cointegration for population, education expenditure and economic growth for Malaysia

Model	**Test statistics (F-statistic)**	
	MALAYSIA	
EDU=(POPT, GDPC, PRIM, SEC, INF)	5.8176***	
Significant Level	**Bound Critical Values**	
	I(0)	I(1)
1%	3.383	4.832
5%	2.504	3.723
10%	2.131	3.223

Note: Computed F-statistic result were presented by using Microfit 4.0. *** Existence of co-integration at 1% significant level.The variables are defined as follows: EDU= Education Expenditure; POPT= Total population; GDPC= Gross Domestic Product per Capita; INF= Inflation rate; PRIM= Primary school enrolment; SEC= Secondary school enrollment.

The result of F-statistic shows that there is co-integration and existence of the long run relationship between dependent and independent variables for the model estimation. From the estimation, result for F-statistic is 5.8176 and significant at 1 percent significant level. This indicates that, there have a cointegration between dependent and independent variable. So the next step is to estimate the long run as well as the short run coefficients of the model. The model have a cointegration between the variable, thus the null hypothesis of no cointeagration is rejected. There is indeed a cointegration relationship among the variables.

Result of Long-run and Short-run

After checking order of integration, the next step is to check long run relationship among variables and short-run estimation. The empirical result of the long-run model, obtained by normalizing on education expenditure, is presented in Table 5. The effects of population on education expenditure and economic growth are positive and significant. The selected lag length based on the estimation is ARDL (1,0,0,2,1,1). The impact of population on education expenditure is positive in long-run and short-run estimation. The result for long-run estimation is 0.1034 and 0.5600 in short-run coefficient and both are significant at 5 percent significant level. The impact in short-run is higher than in long-run estimation. It means that 1 percent increase in population will increases 0.1 percent in education expenditure for long-run and 0.56 percent in short-run. On the other hand, the result for GDPC also positive in long-run and short-run coeffcient and significant at 1 percent significant level, it means that, increases in population have a positive impact on economic growth such as increases in labor force with the better education skills. Thus the relationship between population and education expenditure have also impact on economic growth for Malaysia.

Table 5: Result of Long-run Coefficient for population, education expenditure and economic growth for Malaysia

Estimated Long-Run and Short-run Coefficients using the ARDL Approach selected based on Schwarz Bayesian Criterion		
	Long-run Coefficient	**Short-run Coefficients**
ARDL	(1,0,0,2,1,1)	(1,0,0,2,1,1)
Population	0.1034	0.5600
(LPOPT)	(1.8200)**	(1.7143)**

Gross Domestic Product per Capita (LGDPC)	0.1649 (4.9168)***	0.8947 (5.4747)***
Inflation rate (LINF)	-0.0751 (-3.3005)***	-0.1217 (-1.5841)*
School enrolment, primary (LPRIM)	3.4642 (25.3977)***	0.0018 (.38542)
School enrolment, secondary (LSEC)	-0.0639 (-0.31651)	0.0031 (2.2359)**
ecm (-1)	-	-0.5420 (-7.6747)***
R-Squared	-	.99653
S.E. of Regression	-	.2838
DW-statistic	-	.82506

Note: Long-run and Short- run results were presented using Microfit, 4.0)*** indicate significant at 1 percent, ** 5 percent and * 10 percent significance level.The variables are defined as follows: LEDU= Education Expenditure; LPOPT= Total population; LGDPC= Gross Domestic Product per Capita; LINF= Inflation rate; LPRIM= Primary school enrolment; LSEC= Secondary school enrollment.

For the control variable, inflation rate have negative impact education expenditure but significant. This means that increases in general price level will decreases the education expenditure. For school enrolment, primary enrolment has a positive relationship with the education expenditure but secondary enrolment has a negative relationship with education expenditure both in long-run and short-run coefficient. In Malaysia, the main legislation governing education is the Education Act of 1996 and by law primary education is compulsory for each child. Primary education in Malaysia begins at age seven and lasts for six years. Before progressing to secondary education, Year 6 pupils sit for the Primary School Achievement Test (UjianPencapaianSekolahRendah, UPSR). Secondary school enrolment has a negative impact on education expenditure in long-run but in short-run estimation, the relationship between secondary school enrolments is positive impact on education expenditure. This situation happen because of certain pupils not finished their study until form 5, some of them achieve the higher level only at Form 3 which pass the PentaksiranTingkatan 3 (PT3) or Lower Secondary Evaluation.

The coefficient of ECM are negative sign and significant for all model estimation. These results are confirmed that there have long run relationships between the variables. For the estimation in the model, the coefficient of ECM for population which shows high speed of adjustment from short run fluctuation to long run equilibrium in Malaysia which is 54 percent.

Diagnostic Checking

To test the stability of the model, cumulative sum of recursive residual test (CUSUM) and cumulative sum of square of recursive residuals test (CUSUMQ) proposed by Brown et al. (1975) were performed. CUSUM test is a residual test based on the cumulative sum of the residuals based on the first n-observation by updating recursively and then to be plotted against the break points. If the CUSUM plot stays within the 5 percent significant level (shows by two straight lines as a critical value lines), the estimated coefficient is stable. Similar measure also applies on CUSUMQ test which based on the square of the recursive residuals. The graphical presentation of health care expenditure for CUSUM and CUSUMQ describe on Figure 3 and Figure 4. Both graphs confirm that coefficient

over the sample period stays within the critical value lines, and then it can be conclude that the coefficient is stable. The results for diagnostic checking are report in Table 6.

Figure 3: Cumulative Sum of Recursive Residuals in Malaysia

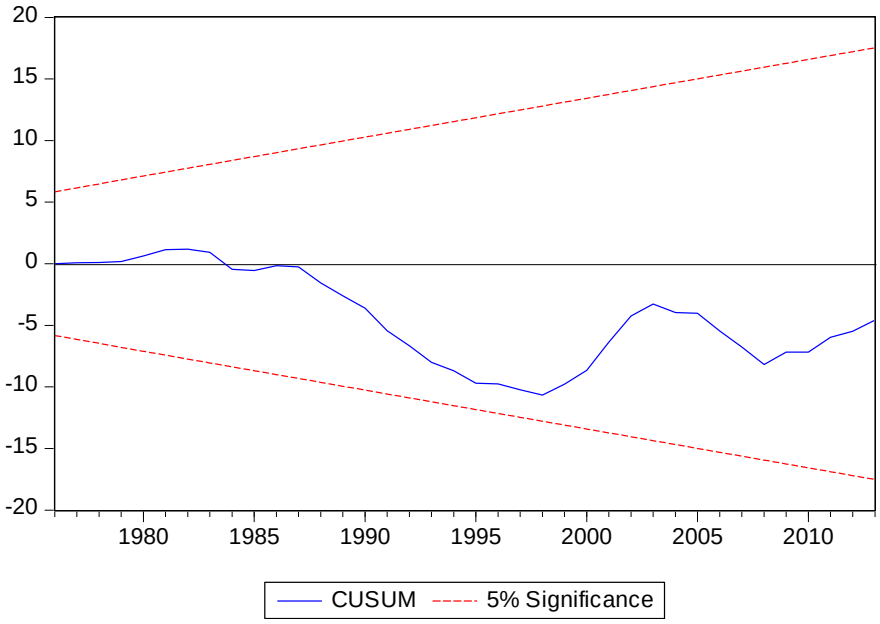


Figure 4: Cumulative Sum of Squares of Recursive Residuals in Malaysia

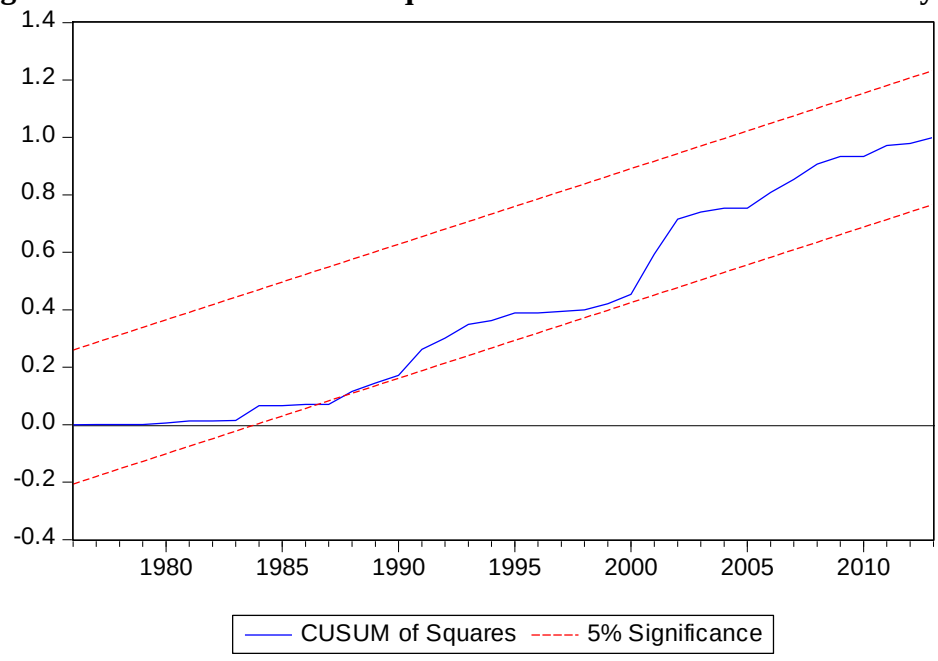


Table 6: Result of Diagnostic Checking for population, education expenditure and economic growth in Malaysia

Test Statistics	LM Version	F Version
A.Serial Correlation	14.1499***	15.2828***
B. Functional Form	16.5800***	19.6897***
C. Normality	1.9063	Not applicable
D. Heteroscedasticity	.0019476	.0018527

Note:
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values
The result of a few diagnostic testing in Table 6 indicates that there is no error autocorrelation and conditional heteroscedasticity, and that the errors are normally distributed. This evidence indicates that the relationship between variables is verified.

CONCLUSION

A population age is affects education expenditure with increase in birth rate and low fertility rate. The increase in fertility rate triggers a subsequent decrease in education expenditure, with the lower fertility per fewer children per family, is associated with more years of schooling. Smaller families can invest more in each child, which boosts measures of child quality such as health, education and cognitive ability. The relationship between fertility rate and education cost are negative. This result is similar with Becker (1960) and Becker et al. (1990) analyze the mechanism of a quality and quantity trade off of children. Becker concludes that parents decide to have a few children and spend a lot on education for each child in the economy with abundant human capital. Lord and Rangazas (2006) does not consider the quality and quantity tradeoff of children, they show the negative effects of schooling on fertility.

In conclusion, populations have a positive effect on education expenditures both in the short-term and long-term estimations. A study by Arriaga (1992) showed that the impact of population change on education costs and the demographic variables mortality, fertility, and immigration affect the cost of education. The population also significantly affects education expenditures both in the short-term and long-term estimations, for the long-term estimation. In the short-term, the coefficient is positively correlated with education expenditures. Poterba (1997) found that the rise in the proportion of elderly people is associated with a decline in education spending.

Finally, economic growth is positively related to education expenditure. In the long run, per capita income in Malaysia positively correlates with education expenditure. This result may reflect that the income effect is explained by supply side, allowing for more children for the example through health improvement and the demand side if children are a normal good, which dominates the substitutions effect of quality of a few children for many less well-endowed children in Malaysia. According to Becker’s theory, parents with a high income may desire a greater expenditure per child to obtain better child quality and therefore, have fewer children.

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