GEOGRAFIA Online™ Malaysian Journal of Society and Space 14 issue 4 (13-26)
 e-ISSN 2680-2491 https://doi.org/10.17576/geo-2018-1404-02

Geografia
Malaysian Journal of Society and Space

Impact of education levels on economic growth in Malaysia: A gender base analysis

Nirmal Kaur Hari Singh, Lai Wei Sieng, Mohd Nasir Mohd Saukani

Centre of Sustainable and Inclusive Development, Faculty of Economics and Management, Universiti Kebangsaan Malaysia

Correspondence: Lai Wei Sieng (email: laiws@ukm.edu.my)

Abstract

Education has been recognised as a powerful tool in boosting growth and development, and is expected to propel nation towards becoming a developed and high-income country in the near future. This paper aims to examine the impact of different levels of education, namely primary, secondary and tertiary, on economic growth in Malaysia. As a step further, the education variables are analysed by gender to examine whether the impact of education differs according to gender. The study employed the Auto-Regressive Distributed Lag (ARDL) modelling in analysing the long-term and short-term effects of education levels on economic growth, covering a period of 36 years from 1980-2015. Cointegration between all education variables and economic growth are found in this study. Overall, in the short run, tertiary education is most important to growth, while both primary followed by tertiary education were seen as growth-inducing factors in the long-run. Analysis by gender shows that in the long run, it is the male's education that has a higher contribution to growth compared to the female. Meanwhile, in the short run, it is the female that has a higher contribution to growth than the male. Thus, both male and female should have equal opportunity on acquiring education. The government needs to ensure the equitable access and parity are achieved between both genders at schools. Since the education of the male has a positive and significant contribution in the long-run, special attention needs to be given to the enrolment rates of the males.

Keywords: Auto-Regressive Distributed Lag (ARDL), economic growth, education levels, gender impact, long run, Malaysia

Introduction

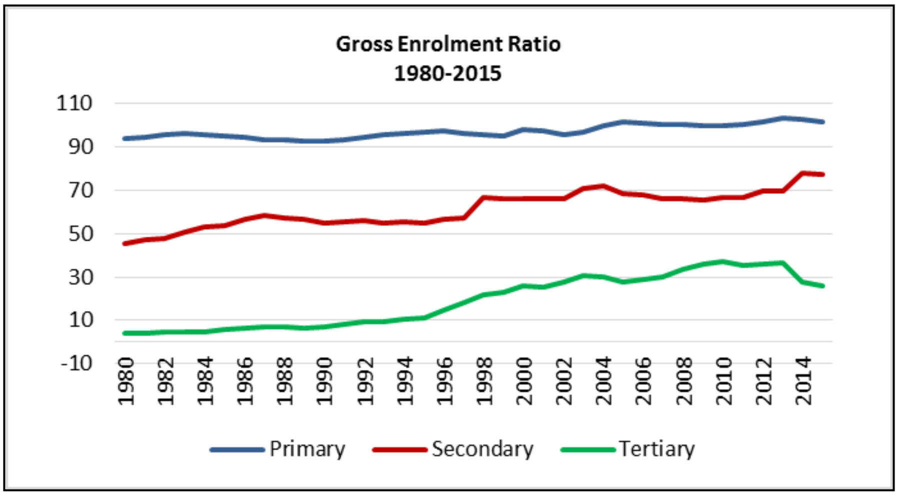
Human capital has been proven to be an important source of economic growth. According to Organisation for Economic Co-operation and Development (OECD), human capital is defined as a productive wealth that is embodied in labour, skills and knowledge. Human capital is regarded as the main element of intellectual capital which can be developed through the accumulation of knowledge, skills, experience, expertise and the ability possessed by an individual. Thus, the quality of human capital can be enhanced through continuous investment in education, training, health, knowledge, skills enhancement and experience. Schultz (1961), Becker (1964) and Mincer (1974) has proven that human capital attainment

GEOGRAFIA Online™ Malaysian Journal of Society and Space 14 issue 4 (13-26)
© 2018, e-ISSN 2680-2491 https://doi.org/10.17576/geo-2018-1404-02

has a direct relationship with the productivity of a worker which is able to further increase growth. Therefore, to produce a high quality and productive workforce that contribute to economic growth, the investment in human capital, especially through education is vital.

Malaysia has made tremendous progress in upscaling education on many fronts, including greater access to pre-school and secondary education, as well as increasing opportunities in pursuing post secondary and tertiary education (UNESCO, 2015). Recognising this, the government has been consistent in providing a large amount of allocation for developing the educational sector at all levels. Under the 2018 Annual Budget, a sum of RM61.1 billion (Budget 2010: RM30 billion) is allocated for various programmes to boost education, skills and training as well as talent development. Under the 11th Malaysia Plan (2016-2020), the government is also committed in improving the quality of the education system for better student's outcomes and institutional excellence that are needed in the final leg of Malaysia's journey towards becoming an advanced nation. Furthermore, notable achievements were seen under the 10th Malaysia Plan (2011-2015), in terms of higher enrolment rates across pre-school to tertiary levels, as well as the launching of major strategy documents such as the Malaysia Education Blueprints and Talent Roadmap 2020.

On average, the government has been investing approximately 15.5% of its total expenditure annually for the development of the education sector. Therefore, it would be pointless if this investment is not accompanied by a meaningful increasement in the enrolment rates at all levels of education, which are highly correlated with each other (Shaihani et al., 2011). Figure 1 shows the pattern of gross enrolment ratios for all levels of education from 1980 – 2015. Overall, gross enrolment for all levels of education has been increasing over the years, with primary education recorded the highest rate at 101.8% in 2015, followed by secondary education (77.6%) and tertiary education (26.1%). Primary education was made compulsory in 2003 and it has since surpassed the universal level set by United Nations Development Programme (UNDP) at 91%. Meanwhile, secondary and tertiary education also experienced expansion, following the launching of the K-Economy Masterplan and the Ninth Malaysia Plan onwards that emphasised on the importance of human capital as the prime mover in creating a first-class, competitive, resilient and innovative economy, deeply rooted in values.



Source: Education statistics, World Bank, 2017

Figure 1. Gross Enrolment Ratio at All Education Levels, Malaysia (1980-2015)

In this regard, it will be interesting to examine whether all the government's efforts, measured through increasing the gross enrolment ratio in this study, has any significant impact on economic growth in Malaysia over the years. As most studies on human capital and growth have been concentrated on cross-country analysis, there is only a handful of studies that examined the impact of education on an individual country basis, especially for Malaysia. Furthermore, this study focuses on the impact of different levels of education on economic growth as it is viewed to be more fruitful for the policy maker from the public expenditure perspective. In fact, the results of the study could be considered as a useful input in formulating an effective budget stategies where resources can be channeled efficiently. Last but not least, the study has gone a step further to analyse the impact of education on growth by gender. Although enrolment in higher education institutions has been mostly dominated by the females, however the same has not been reflected in the current labour force composition for Malaysia. According to Department of Statistics Malaysia, in 2015, the number of females in higher education institutions stood at 692,976 compared to 560,566 males. However, the labour market participation rate of the males in 2015 was higher which is at 80.6% compared to the females at 54.1%. Since past studies examined the impact of education by gender has been very limited in Malaysia, therefore, it will be interesting to see whether it is the males or females education that significantly contribute to the nation's economic growth. This analysis may also be helpful for the policy makers to realign their budget strategy towards the segments that are more impactful in generating growth.

Therefore, the objectives of this article is two-fold. Firstly, it will examine the effect of different levels of education namely primary, secondary and tertiary on economic growth in Malaysia, and determine which level of education that mostly contributed to growth both in the long run and short run. Secondly, the article will investigate whether the impact at all levels of education differs according to gender as well as determine whether it is the male or female's education that has significant contribution to economic growth in Malaysia. This article is divided into five sections namely introduction in Section 1 and literature review in Section 2. Section 3 will describe the data and methodology used in the analysis, while Section 4 contains the results and discussion. Finally, Section 5 will summarise the main findings and provide policy implication as a conclusion.

Literature review

Numerous studies in the past have investigated the relationship between education and economic growth by conducting either a cross-country examination or focusing on individual country over a period of time. The studies have also used different proxies in measuring the effect of education through human capital stock and flow measures as well as employed several methodologies and approaches. While most studies have pointed to a significant and positive relationship between education and economic growth, some have concluded otherwise, including Benhabib and Spiegel (1994), Bils and Klenow (2000), Pritchett (2001) and Abdullah (2013). Meanwhile, only a few studies focused on the impact of different levels of education on economic growth, especially in Malaysia.

Petrakis and Stamatakis (2002) who investigated the impact of education levels among three groups of countries with different stages of development found that growth effects of education differs according to the level of development. Primary and secondary education was found to be more important to less developed countries, while developed countries' growth was depended on higher education. Meanwhile, by using panel data across developed and developing countries in Asia, Keller (2006) estimated the effect of primary, secondary and higher education on economic growth, by utilising the flow measures of education, including the enrolment rates, the public expenditure and the expenditure per student. The study found that secondary enrolment is the most important in increasing the economic growth, while through both the expenditure variables, the primary education contributed significantly to the economic growth. Meanwhile, expenditures in other levels were seen to be utilized inefficiently. The study also stressed on the importance of analyzing education by levels as each levels of education is expected to affect growth differently. Attainment in primary education may be sufficient to lower fertility rates, while secondary education is said to benefit workforce in adapting computer technology, and higher education is needed for technological innovation.

Several studies have also employed the Johansen Cointegration and the Granger Causality approaches to reveal that education has a strong effect on growth. Asteriou and Agiomirgianakis (2001) used both the Johansen Cointegration and Granger Causality to examine correlation between human capital and economic growth in Greece and concluded that in the long run, Gross Domestic Product (GDP) per capita is cointegrated with all the education variables. The study found that the existence of causality between growth and all education levels, except for higher education. Using the same models, Shaari (2014) found the existence of long-term relationship between various education levels and economic growth in Malaysia from 1982-2011. Upon utilizing Pairwise Granger causality, the results indicated that secondary and no formal education have an effect on growth; while primary and tertiary do not cause growth in Malaysia. For India, Self and Grabowski (2004) employed the Granger Causality approach and found that only primary and secondary education has a strong causal impact on economic growth.

On the other hand, in Portugal, Pereira and St. Aubyn (2009) employed vector autoregression and proved that primary and secondary education have a positive and significant effect on growth, while higher education has a negative effect on economic growth using human capital stock measurement such as average years of schooling at all levels of education. Meanwhile, Zhang and Zhuang (2011) employed the Generalized Methods of Moments (GMM) method to analyse the relationship between education and economic growth in China and discovered that tertiary education to be more important than secondary and primary education in generating growth. For a study in Malaysia, Shaihani et al. (2011) examined the impact of education level on economic growth using the autoregressive distributed lag (ARDL) modelling and found that in the short run, primary and tertiary education is insignificant in explaining economic growth while secondary education was found to be positively significant. However, in the long run, only tertiary education had a positive and significant impact to economic growth. Employing the same ARDL method, Sieng and Yussof (2014) used labour force with different education backgrounds to examine the long run relationship between human capital and economic growth in Malaysia and found that workforce with secondary and tertiary education contributed significantly and positively to growth, while contribution of workers with primary education, although positive was insignificant. Meanwhile, Wen Yeow et al. (2016) used mediation analysis to examine the direct and indirect effects of education levels on economic development in Malaysia using mediators such as unemployment, fertility and technology innovation. The study found that tertiary education has the more significant and positive impact on growth through technological innovation, followed by primary education. Meanwhile, secondary education was found negatively related to economic development.

Although scarce and limited, several studies have gone a step further to examine the gender effects of education on economic growth. One of the earliest study done by Self and Grabowski (2004) found that it was the female education at all levels that have the potential in generating economic growth in India, while the male contribution was only strongest at the primary level. Similarly, Tansel and Gungor (2013) examined the gender effects of education by using province level data for Turkey and found that the female education have a positive and significant effect on labour productivity, while the impact of male education was somewhat limited. For Asia, Mukherjee (2015) explored the relationship between expanding female education and the participation of women in paid employment in Japan, China and India and found that despite increased access to education, women chose not to participate in the labour market due to several factors, including social discouragement. Khan (2016) also examined the impact of female human capital on economic growth in Pakistan from 1972 – 2012 and revealed that in the long run, there was a positive and significant relationship between female and economic growth, while in the short run, the relationship seemed positive but insignificant. On the contrary, the empirical analysis done by Pegkas and Tsamadias (2017) to test the impact of male and female higher education on Greece's economic growth found that no long run cointegration between enrolment rate of male and female with higher education, physical capital investment and growth in Greece, while in the short run, the effects of both genders were found to be insignificant to growth.

Data and methods

This study conducted an empirical analysis on the following variables, namely real Gross Domestic Product per worker (GDP), obtained by dividing GDP with total labour force which was used as a proxy for economic growth; Gross Fixed Capital Formation per worker (GFCF) in constant prices, obtained by dividing GFCF with total labour force, used as a proxy for physical capital; as well as Gross Enrolment Ratio (GER) for three levels of education, namely primary, secondary and tertiary, which are also broken down by gender (male and female), representing the flow of human capital measurement. The GER consists of total individuals enrolled in each level, which is stated as a percentage of total population of individual appropriate age at each levels, based on UNESCO's classification of age group appropriate with its education level. There are cases where the GER may exceed 100% due to the inclusion of over-aged and under-aged students due to early or late school entrance and grade repetition.

Data for GDP, GFCF and total labour force were sourced from the National Accounts of the DOSM, while the GER were obtained from the World Development Indicators, World Bank. Annual time series data for a period of 36 years from 1980 – 2015 were used, firstly, to examine the impact of all three levels of education on economic growth in Malaysia in the long run and short run. Secondly, in order to determine whether it is the male or female education that has a significant contribution to growth, the education variables were regressed separately by gender. Both the GDP and GFCF variables are inlcuded in all equations; consistent with the basic neoclassical production function where human capital is an additional input (Pegkas, 2014). Prior to conduct the analysis, all the data were transformed into the following linear logarithmic form with three equations as below:

$$lnGDP_t = \alpha_0 + \alpha_1 lnGFCF_t + \alpha_2 lnGTP_t + \alpha_3 lnGTS_t + \alpha_3 lnGTT_t + \varepsilon_t \qquad \textbf{(Model 1)}$$

$$lnGDP_t = \alpha_0 + \alpha_1 lnGFCF_t + \alpha_2 lnGMP_t + \alpha_3 lnGMS_t + \alpha_3 lnGMT_t + \varepsilon_t \qquad \textbf{(Model 2)}$$

 e-ISSN 2680-2491 https://doi.org/10.17576/geo-2018-1404-02

$$lnGDP_t = \alpha_0 + \alpha_1 lnGFCF_t + \alpha_2 lnGFP_t + \alpha_3 lnGFS_t + \alpha_3 lnGFT_t + \varepsilon_t \quad \textbf{(Model 3)}$$

Where GDP_t is per worker real gross domestic product; $GFCF_t$ is per worker gross fixed capital formation; and GTP, GTS, and GTT represent general gross enrolment ratio for primary, secondary and tertiary education, respectively, for Model 1; GMP, GMS and GMT represent the male gross enrolment ratio for primary, secondary and tertiary education for Model 2; and GFP, GFS and GFP represent the female gross enrolment ratio for primary, secondary and tertiary education for Model 3; with ε_t as the stochastic error term for all equations.

Unit root test

The unit root test was conducted to check the stationarity of time series data, mainly to avoid spurious regression as it is common for unit root and non-stationarity problem to occur in macroeconomic time series data. A time series data is said to be non-stationary if the mean and variance are time dependent, while it is stationary if the mean and variance are time independent. In this study, the stationarity of all the dependent and independent variables are examined using the Augmented Dickey-Fuller (ADF) test and Akaike Information Criterion (AIC), where data series of each variable are tested for the presence of unit roots and the order of integration for each level and first difference is also identified. The p-value was used to determine the acceptance or rejection of the null hypothesis. If the p-value is less than 0.05, reject H0 and vice-versa. The hypothesis for the ADF is as follows:

H0: There is a unit root in the series (not stationary)
Ha: There is no unit root in the series (stationary)

Autoregressive distributed lag (ardl) cointegration test

Next, estimation for all three models were conducted using the ARDL approach to integration. This approach is choosen as the ARDL modelling has many advantages due to its flexibility. This method can be used regardless if the variable are I(1) or I(0) or a mix of both and also it avoids the issue of endogeneity in the model. It can simultaneously estimate long-run and short run components in the model as well as is statistically more significant in determining the cointegration relationship for small sample size models (Afzal et al., 2010, Sehrawat and Giri, 2015).

Estimation using the ARDL cointegration test involves three steps. Firstly, the study employs the ARDL Bounds Test to examine the long-run cointegration relationship between the variables as suggested by Pesaran, Shin, and Smith (2001). All three long-run equations are estimated using the ordinary least squares (OLS) technique to examine the presence of long-run relationship between the variables. The presence of cointegration was traced by restricting all estimated coefficients of lagged level variables equal to zero. Hence, the hypothesis is:

H0: $\beta1 = \beta2 = \beta3 = \beta4=0$ (no cointegration)
H1: $\beta1\neq \beta2 \neq \beta3 \neq \beta4 \neq 0$ (there exist cointegration)

© 2018, e-ISSN 2680-2491 https://doi.org/10.17576/geo-2018-1404-02

Estimation for Bound Test:

$$\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{n} \boldsymbol{b}_i \Delta lnGDP_{t-i} + \sum_{i=0}^{n} \boldsymbol{c}_i \Delta lnGFCF_{t-i} + \sum_{i=0}^{n} \boldsymbol{d}_i \Delta lnGTP_{t-i} + \sum_{i=0}^{n} \boldsymbol{e}_i \Delta lnGTS_{t-i} + \sum_{i=0}^{n} \boldsymbol{f}_i \Delta lnGTT_{t-i} + \lambda_1 \Delta lnGDP_{t-1} + \lambda_2 \Delta lnGFCF_{t-1} + \lambda_3 \Delta lnGTP_{t-1} + \lambda_4 \Delta lnGTS_{t-1} + \lambda_5 \Delta lnGTT_{t-1} + \mu_t$$

Where Δ is the first difference operator, a_0 is the intercept, u_t is the white noise term and *t* is time trend. The test utilises the value of F-statistics, where according to Pesaran (2001), if the computed F-statistics is less than the lower bound critical value, I(0), we do not reject the null hypothesis of no cointegration. However, if the computed F-statistics is the greater than the upper bound critical value, I(1), we reject the null hypothesis, implying the existence of long-term integration between the variables. However, if the computed F value falls within upper and lower bound critical values, then the result is inclusive. Once the long-run cointegration is established, the next step in the ARDL approach involves the estimation of the long run models, as below:

$$\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{p} \boldsymbol{\alpha_1} lnGDP_{t-1} + \sum_{i=0}^{q} \boldsymbol{\alpha_2} lnGFCF_{t-i} + \sum_{i=0}^{r} \boldsymbol{\alpha_3} lnGTP_{t-i} + \sum_{i=0}^{s} \boldsymbol{\alpha_4} lnGTS_{t-i} + \sum_{i=0}^{t} \boldsymbol{\alpha_5} lnGTT_{t-i} + \mu_t$$

The final step involves obtaining the short run dynamic parameters by estimating an error correction model (ECM), as specified below:

$$\Delta lnGDP = \alpha_0 + \sum_{t=1}^{n-1} \boldsymbol{\alpha_1} \Delta lnGDP_{t-1} + \sum_{t=0}^{n-1} \boldsymbol{\alpha_2} \Delta lnGFCF_{t-i} + \sum_{t=0}^{n-1} \boldsymbol{\alpha_3} \Delta lnGTP_{t-i} + \sum_{t=0}^{n-1} \boldsymbol{\alpha_4} \Delta lnGTS_{t-i} + \sum_{t=0}^{n-1} \boldsymbol{\alpha_5} \Delta lnGTT_{t-i} + \boldsymbol{\alpha_6} EC_{t-1} + \mu_t$$

Where $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ *and* α_5 are short run dynamic coefficients, while EC is the speed of adjustment coefficient towards achieving long run equilibrium after a short run shock. The aim of running this model is to ascertain how long does it takes for a shock in the economy to be corrected back to long run equilibrium through adjustments in the short run. To ensure the goodness of fit of the ARDL model, diagnostics and stability test are also conducted. The diagnostic test examined serial correlation, functional form, normality and heteroscedasticity, while the structural stability test is conducted by employing the cumulative residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ).

Results and discussion

Table 1 shows the results of the unit root test based on the Augmented Dickey-Fuller (ADF) Test conducted. The results indicate that most variables, except Gross Enrolment Ratio for Total Primary (lnGTP) and Male Primary (lnGMP), are not stationary at their level. However, all variables are stationary at their first difference at 1% and 5% significant levels for both intercept and intercept with trend. Therefore, the null hypothesis is rejected, indicating the series are stationary either in the order of I(0) or I(1).

Table 1. Results of the Stationarity Test: The ADF Test

Variables	Level		First Difference	
	Intercept	Intercept + Trend	Intercept	Intercept + Trend
lnGDP	-0.474051	-3.148477	-6.525092***	-6.422346***
lnGFCF	-0.884465	-2.393777	-5.215641***	-5.133215***
lnGTP	-0.196605	-3.629733**	-5.308229***	-5.376171***
lnGTS	-1.282217	-2.490777	-5.752802***	-5.666471***
lnGTT	-1.710700	0.899975	-3.486712***	-3.949625**
lnGMP	-0.069970	-3.305014*	-5.612076***	-5.765997***
lnGMS	-0.938032	-2.295506	-5.784332***	-5.697986***
lnGMT	-2.014386	1.146032	-2.014386***	-4.897685***
lnGFP	-0.830410	-3.122567	-5.014824***	-5.020596***
lnGFS	-1.640431	-2.588890	-5.503036***	-5.448280***
lnGFT	-2.574078	1.081335	-3.880602***	-4.743681***

Note: The asterisk (***, **, *) indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% significance level. These values are generated by E-VIEWS output based on Mackinnon (1996).

Next, the ARDL approach to cointegration is employed. The results of the F-statistics produced by the ARDL Bounds Test estimation is shown in Table 2. The critical values, stated in the upper part of the table, are obtained from the Narayan Table. The bounds test evidence rejects the null hypothesis as the value of computed F-statistics are higher than the upper bound critical values at 99% confidence level and, thus confirms the existence of long-run cointegration relationship between all variables in all the three models. The optimal lag is chosen at lag 2 for all three equations based on the highest value of F-statistics as well as the diagnostics test performed.

Table 2. Results of the bounds test for cointegration analysis

Critical value bounds of the F-statistic: intercept and no trend						
k	90% level		95% level		99% level	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
4	*2.460*	*3.460*	*2.947*	*4.088*	*4.093*	*5.532*

Model	Optimal Length	F-Statistics	Results
Model 1	2	5.884042***	Cointegrated
Model 2	2	6.298322***	Cointegrated
Model 3	2	6.159876***	Cointegrated

Critical values are sighted from (Narayan, 2005) table. K is the number of regressors. *, ** and *** shows the F-statistics value at the upper bound at 90%, 95% dan 99% level of significance.

Subsequently, the long-run elasticities for all three models are obtained using the ARDL approach and AIC. According to Table 3, in the long-run, all variables contribute significantly to economic growth, except for total, male and female secondary education.

© 2018, e-ISSN 2680-2491 https://doi.org/10.17576/geo-2018-1404-02

Table 3. Results of the long-run ARDL Model Estimation

Model 1 (2,2,1,0,0)		**Model 2 (2,2,1,0,0)**		**Model 3 (2,2,1,1,0)**	
Dependent Variable: GDP_t					
$GFCF_t$	-0.19319** (-2.0770)	$GFCF_t$	-0.37614** (-2.6317)	$GFCF_t$	-0.53082*** (-4.1864)
GTP_t	3.9213*** (3.8759)	GMP_t	6.1019*** (3.9159)	GFP_t	5.0982*** (3.9985)
GTS_t	0.51662 (1.2526)	GMS_t	1.0504 (1.6047)	GFS_t	0.22754 (0.57206)
GTT_t	0.43397*** (5.3775)	GMT_t	0.58987*** (4.1653)	GFT_t	0.46284*** (4.8724)
Constant	-18.2715*** (-3.3679)	Constant	-30.4574*** (-3.6036)	Constant	-22.1529*** (-3.3740)

Note: Figures in parentheses are t-ratios, while *, **, *** indicate significance level at 10%, 5%, 1%, respectively

ARDL Model Diagnostics Tests					
$\bar{R}$	0.99675	$\bar{R}$	0.99637	$\bar{R}$	0.99646
χ^2_{Auto}	0.17577 [0.675]	χ^2_{Auto}	0.051841 [0.820]	χ^2_{Auto}	0.13292 [0.715]
χ^2_{Norm}	1.3848 [0.500]	χ^2_{Norm}	2.0155 [0.365]	χ^2_{Norm}	1.8264 [0.401]
χ^2_{Hetero}	0.0036471 [0.952]	χ^2_{Hetero}	0.001161 [0.973]	χ^2_{Hetero}	0.34148 [0.559]
χ^2_{RESET}	0.75809 [0.384]	χ^2_{RESET}	2.3207 [0.142]	χ^2_{RESET}	0.44254 [0.506]

Note: Figures in parentheses are probability values. Serial Correlation: LM Test, Model specification: RAMSEY Reset Test, Normality based on skewness and kurtosis of residuals, and Heteroscedasticity: LM Test

Overall, it can be concluded that in the long-run, the primary education has a significant positive contribution to economic growth followed by tertiary education, consistent with the findings of Shaihani et al. (2011); Wen Yeow et al. (2016); as well as Zhang and Zhuang (2011), while secondary education is found to have a positive but insignificant effect on growth. The highly significant and positive impact of primary education to growth in Malaysia augurs well with the government's effort in making the primary education is compulsory for all people since 2003 and providing a free education wherever possible. Meanwhile, the effect of GFCF per worker is found to be statistically significant with a negative influence on economic growth. This negative relationship could probably be explained by the labour intensive nature of the manufacturing and services sectors which resulted in higher capital usage that increased the capital labour ratio, thus resulted in decreasing in growth (Noor et al., 2011 and Hussin et al., 2013).

When analyzing by gender, although the contributions of both the male and female are highly significant and positive to economic growth, however, the findings indicated that it is the primary and tertiary education of the male that have significantly higher contribution to economic growth compared to the female. As shown in Table 4, a 1% increase in the male's gross enrolment ratio in primary and tertiary education levels will raise economic growth by 6.1% and 0.6%, respectively, compared to 5.1% and 0.5% contribution by female enrolment in the same category. Nevertheless, secondary education for both male and female is positive but, the result is insignificant in influencing the economic growth. The diagnostic test for

Serial Correlation, Model specification, Normality and Heteroscedasticity were also performed. All the models are qualified the above mentioned diagnostic tests as shown at the lower part of Table 3. Table 4 shows the coefficients in the short run.

Table 4. Error correction representations for ARDL Model according to AIC

Model 1 (2,2,1,0,0)		**Model 2 (2,2,1,0,0)**		**Model 3 (2,2,1,1,0)**	
Dependent Variable: ΔGDP_t					
$\Delta GFCF_t$	0.51136*** (7.5667)	$\Delta GFCF_t$	0.46418 *** (6.0300)	$\Delta GFCF_t$	0.46012*** (5.8315)
$\Delta GFCF_{t-1}$	0.31376*** (2.8235)	$\Delta GFCF_{t-1}$	0.33248** (2.7786)	$\Delta GFCF_{t-1}$	0.29911** (2.2704)
ΔGTP_t	0.11233 (0.13813)	ΔGMP_t	-0.068998 (-0.080266)	ΔGFP_t	0.25074 (0.29843)
ΔGTS_t	0. 30042 (1.3972)	ΔGMS_t	0.50962* (1.9791)	ΔGFS_t	0.59664** (2.1653)
ΔGTT_t	0.25236*** (5.3775)	ΔGMT_t	0.28618*** (5.5256)	ΔGFT_t	0.26097*** (4.9933)
Constant	-10.6251*** (-3.8333)	Constant	-14.7769*** (-4.6247)	Constant	-12.4910*** (-3.6927)
ECM_{t-1}	-0.58151*** (-5.6887)	ECM_{t-1}	-0.48517*** (-4.6374)	ECM_{t-1}	-0.56385*** (-5.0068)

$$\text{Model 1: } \Delta GDP_t = -10.6251 + 0.51136\Delta GFCF_t + 0.31376\Delta GFCF_{t-1} + 0.11233\Delta GTP_t + 0.30042\Delta GTS_t + 0.25236\Delta GTT_t - 0.58151\varepsilon_{t-i}$$

$$\text{Model 2: } \Delta GDP_t = -14.7769 + 0.46418\,\Delta GFCF_t + 0.33248\Delta GFCF_{t-1} - 0.068998\,\Delta GMP_t + 0.50962\Delta GMS_t + 0.28618\,\Delta GMT_t - 0.48517\varepsilon_{t-i}$$

$$\text{Model 3: } \Delta GDP_t = -12.4910 + 0.46012\Delta GFCF_t + 0.29911\Delta GFCF_{t-1} + 0.25074\Delta GFP_t + 0.59664\Delta GFS_t + 0.26097\Delta GFT_t - 0.56385\varepsilon_{t-i}$$

In the short run, the results indicated that overall, besides GFCF, only tertiary education is significant and contributes positively to growth. Nevertheless, analysis by gender shown that it is the secondary and tertiary education of both male and female that significantly and positively contributes to GDP. Secondary education of the females is seen to be more significant to growth than the male, where a 1% increase in female secondary education will increase GDP by 0.6% as compared to 0.5% of male. As for tertiary level, it is the male education that contributed more to the economic growth at 0.29% compared to female at 0.26%. Therefore, it can be concluded that, in the short run, it is the education of the females that contributed more to growth than the males. This result is consistent with the government's continuous efforts in enhancing the contribution of women in the economy through increasing participation in the workforce and promoting greater inclusiveness in the labour market as well as with the findings of Sehrawat and Giri (2015).

© 2018, e-ISSN 2680-2491 https://doi.org/10.17576/geo-2018-1404-02

However, the primary education for all three models are found to be insignificant to the economic growth, with total and female having a positive relationship, while primary education of the male is found to be negatively related to growth. This is consisted with Romer (2001) who noted that primary education has an indirect long-term effects of an economy and therefore it might not have any short run impact. However, primary education is the first and basic education, fundamentally very important for the attainment of the next two levels of education (Pegkas, 2014). Next, the coefficient of the error correction term ECM_{t-1} is the speed of adjustment coefficient, reflecting how fast the economy can return to equilibrium following a shock. It must be significant and have a negative sign that shows convergence in the short run model. For Model 1, the ECM_{t-1} is -0.58151 and at 1% significant level, implying that following a shock in the regressors, GDP will take 1.72 (1/0.58151) or approximately 1.7 years to reach equilibrium again. For Model 2, the ECM_{t-1} is -0.48517, whereby subsequent a shock in the explanatory variables, GDP will take about 2 years (1/0.48517), and for Model 3, it will take about 1.7 years (1/0.56385) to reach equilibrium again.

Finally, the stability test is employed for all three models to check the stability of the long-and short-term parameters. It is observed that the plot of graphs for both CUSUM and CUSUMSQ for all models lie within the 5% critical bounds. This imply that the estimated model is stable and correctly specified with no systematic change observed at 5% significance level.

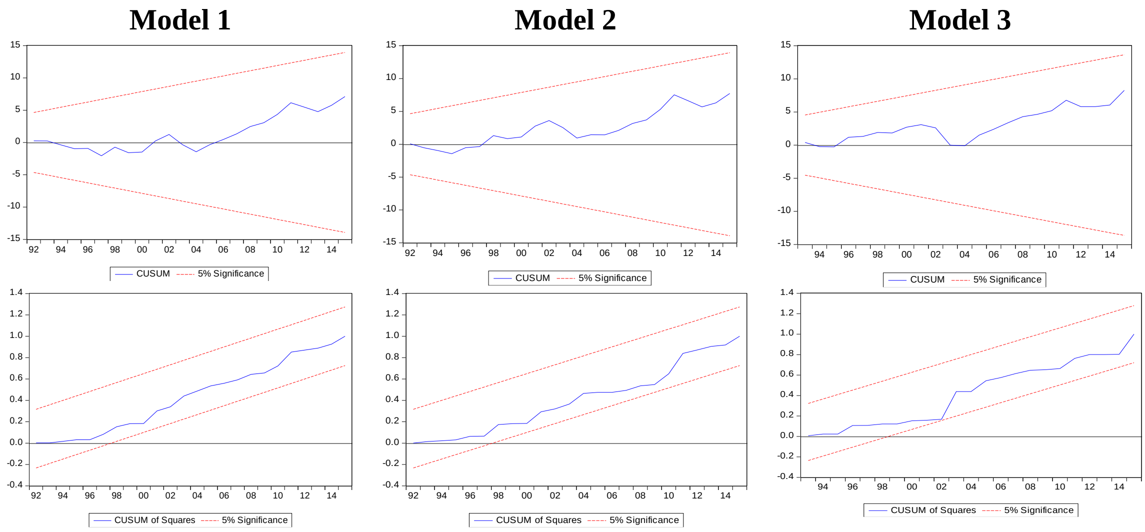


Figure 2. Results of the stability test for all models

Conclusion

This paper analyses and estimates the long-run and the short run impact of primary, secondary and tertiary education on Malaysia's economic growth for the period 1980 to 2015, based on the basic neoclassical production function model where human capital is treated as an additional input. Gross enrolment ratio at all levels of education and by gender was used as a proxy to measure human capital. Irrespective of the types of modelling and proxies used, there wasa strong evidence in existing literature that proves the significance of education in contributing to economic growth, and this has been inline with the findings of the present study. Empirical analysis in this study shows that in the long-run shows that the primary and tertiary education are the important contributors to growth while for the short run, only tertiary education has a positive and significant effect on growth. In terms of gender, the results demonstrated that in the long-run, it was the male education at primary and tertiary levels that has a higher contribution to economic growth. Meanwhile, in the short run, besides tertiary, secondary education was also found to be a significant and positive contributor to growth. Secondary education of the female is seen to be more significant to growth than the male, while at tertiary level, it is the male education that contributed more to growth compared to the female. Therefore, in the short run, the overall impact of the female is found to be greater than the male. Overall, the analysis by gender indicates that in the long-run, it is the male education that has higher effect on economic growth, while in the short run, the impact of female education is found to be greater.

Based on the results, the government should develop a policy to make secondary education compulsory for all as the impact is found to be insignificant to growth. This measure will not only result in higher completion rate at the secondary level, but encourage more students to pursue higher education at tertiary level, thus increasing the enrolment rate for tertiary education that has both positive and significant impact on GDP growth in the short and long-run. With this measure in place, economic growth emanating from human capital could be further enhanced and augmented through positive externalities and spillover effects on other sectors of the economy, in line with the endogenous growth theory. Besides, on improving gender-based outcomes, the government needs to ensure the equitable access and parity are achieved between both genders at schools. Since the education of the male has a positive and significant contribution in the long-run, special attention needs to be given to the enrolment rates of the males. The measurement to ensure that more males who graduated from primary school continue to pursue secondary as well as tertiary education must be enforced as the tendency of males to drop out is higher than the females in Malaysia. As for the females, the government must continue their efforts to encourage more females to participate and remain in the workforce, especially after marriage and child-bearing age. This measure can be promoted through creating a conducive working environment, expanding a flexible working arrangements in the private and public sectors, providing an affordable and quality childcare centre as well as increasing the number of women in decision-making and entrepreneurship roles. Although the study has achieved its objectives, there exist some limitations that can be considered for future research. Fistly, the current study employed variables that represent the flow of human capital and due to unavoidable circumstances, variables representing the stock of human capital could not be included. Secondly, the study did not take into account the possible existence of structural break, especially during the 1997/98 Asian Financial Crisis and 2008/2009 Global Financial Crisis, when conducting the unit root test which must be taken as a word of caution as it may mislead the results. Therefore, further research by using extensive variables and incorporating structural break in the test of unit root is required.

References

Abdullah, A. J. (2013). Education and economic growth in Malaysia: The issues of education data. *Procedia Economics and Finance, 7*, 65-72. https://doi.org/10.1016/S2212-5671(13)00219-0.

Asteriou, D., & Agiomirgianakis, G.M. (2001). Human capital and economic growth: Time series evidence from Greece. *Journal of Policy Modeling*, *23*(5), 481-489. https://doi.org/10.1016/S0161-8938(01)00054-0.

Becker, G.S. (1964). Human capital. *The Journal of Human Resources*, *2*(1), 97-104.

Benhabib, J., & Spiegel, M.M. (1994). The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics*, *34*(2), 143-173. https://doi.org/10.1016/0304-3932(94)90047-7.

Bils, M., & Klenow, P.J. (2000). Does schooling cause growth? *American Economic Review*, *90*(5), 1160-1183. https://doi.org/10.1257/aer.90.5.1160.

Hussin, F., Ros, N.M., & Noor, M.S.Z. (2013). Determinants of economic growth in Malaysia 1970-2010. *Asian Journal of Empirical Research*, *3*(9), 1140-1151.

Keller, R.I.K. (2006). Education expansion, expenditures per student and the effects of growth in Asia. *Global Economic Review*, *35*(1), 21-42.

Khan, M.K. (2016). Contribution of female human capital in economic growth: An empirical analysis of Pakistan (1972-2012). *Quality and Quantity*, *50*(2), 709-728. https://doi.org/10.1007/s11135-015-0172-6.

Mincer, J. (1974). The human capital earnings function. *The Human Capital Earnings Function*, *I*, 83-96.

Mukherjee, S.S. (2015). More educated and more equal? A comparative analysis of female education and employment in Japan, China and India. *Gender and Education*, *27*(7), 846-870.

Noor, Z.M., Isa, N., Said, R., & Jalil, S.A. (2011). The impact of foreign workers on labour productivity in Malaysian manufacturing sector. *International Journal of Economics and Management*, *5*(1), 169-177.

Pegkas, P. (2014). The Link between educational levels and economic growth : A Neoclassical approach for the case of Greece. *International Journal of Applied Economics*, *11*, 38-4.

Pegkas, P., & Tsamadias, C. (2017). Are there separate effects of male and female higher education on economic growth? Evidence from Greece. *Journal of the Knowledge Economy*, *8*(1), 279-293. https://doi.org/10.1007/s13132-015-0286-z.

Pereira, J., & St. Aubyn, M. (2009). What level of education matters most for growth?. Evidence from Portugal. *Economics of Education Review*, *28*(1), 67-73. https://doi.org/10.1016/j.econedurev.2007.12.001

Pesaran, M.H., Shin, Y., & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326. https://doi.org/10.1002/jae.616.

Petrakis, P.E., & Stamatakis, D. (2002). Growth and educational levels: A comparative analysis. *Economics of Education Review*, *21*(5), 513-521. https://doi.org/10.1016/S0272-7757(01)00050-4.

Pritchett, L. (2001). Where has all the education gone? *The World Bank Economic Review*, *15*(3), 367-391. https://doi.org/10.1093/wber/15.3.367.

Romer, D. (2001). *Advanced Macroeconomics*. McGraw-Hill Education.

Schultz, T. W. (1961). Investment in human Capital. *The American Economic Review*, *51*(1), 1-17. https://doi.org/10.2307/1818907.

Sehrawat, M., & Giri, A. (2015). Does female human capital contribute to economic growth in India ? An empirical investigation. *International Journal of Social Economics*. *44*(11), 1506-1521. https://doi.org/10.1108/IJSE-10-2015-0272.

Self, S., & Grabowski, R. (2004). Does education at all levels cause growth? India, a case study. *Economics of Education Review*, *23*(1), 47-55. https://doi.org/10.1016/S0272-7757(03)00045-1.

Shaari, M.S. (2014). Education-led economic growth in Malaysia. *SOP Transactions On Economic Research*, *1*(1), 27-32.

Shaihani, M.A.L., Haris, A., Ismail, N.W., & Said, R. (2011). Long run and short run effects on education levels: Case in Malaysia. *International Journal of Economic Research, 2*(6), 77-87.

Sieng, L.W., & Yussof, I. (2014). Human capital accumulation and economic growth in Malaysia - Investigating the long run nexus. *Jurnal Ekonomi Malaysia*, *48*(1), 155-165. https://doi.org/10.17576/JEM-2014-4801-13.

Tansel, A., & Gungor, N.D. (2013). Gender effects of education on economic development in Turkey. *Koç University-TUSIAD Economic Research Forum Working Papers*, *40*(6), 794-821. https://doi.org/10.1108/JES-10-2012-0140.

UNESCO. (2015). Malaysia National Education for All Review Report. *World Education Forum*, 1-128.

Wen Yeow, C., Chan Yeap, H., Mei Chan, P., Chui Fang, T., & Xiao Jun, T. (2016). Myths about education and economic growth in Malaysia: A mediation analysis, Final Year Project, UTAR. 1-96.

Zhang, C., & Zhuang, L. (2011). The composition of human capital and economic growth: Evidence from China using dynamic panel data analysis. *China Economic Review*, *22*(1), 165-171. https://doi.org/10.1016/j.chieco.2010.11.001.