

## An Empirical Study of The Linkage Between Education and National Output in Malaysia

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### Abstract

This study embarks on an investigation into the linkage between education and national output in Malaysia. Annual time series data on real gross domestic product (GDP), expenditure on education, fixed capital formation and labour force were collected from 1985 to 2018 and the Autoregressive Distributed-Lag (ARDL) method is applied in this study. The results of this study reveals that capital formation and education can cause higher national output in the long run. However, labour force does not have any connection with national output in the long run. Besides, the results also show short-run relationships. It is found that only capital formation has an influence national output in the short run but labour force and education do not have any effect on national output in Malaysia. Therefore, the government needs to increase its expenditure on education to boost national output. Other than that, the government must take other initiatives to increase expenditure on education.

**Keywords:** education, national output, ARDL

**JEL classification:** I2, I230, I250

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### 1. Introduction

In Malaysia and other countries, national output is important because it gives information about the size of the economy and the performance of the economy. Real GDP growth is usually used as an indicator of the economy's overall health. Thus, it also reduces poverty which allows households to enjoy more goods and services if national output increases. An increase in national output can drive the number of unemployed people to drop. This is because higher national output can result in higher demand for goods and services. Hence, firms will create more job opportunities and employ more workers. As a

result, employment will increase. Knowledgeable and skilled human capital is of utmost importance as it can increase productivity. This suggests that human capital referring to labour force that has higher education can prompt higher national output.

Human capital with high skills and education can influence productivity. It is undeniable that education than can have better human capital can thus increase national output (Abidin *et al.* 2018). Higher education can cause economic development. This is because human capital with high education are more competitive and competent. Therefore, it is important for firms

or employees to invest in education. Nickolas (2019) mentioned that investing in human capital though education can reap more benefits than investing in physical capital such as machines. Several factors, namely education, capital and labour force, which can influence national output have been identified. Therefore, this study delves into the inextricable linkage between education and national output in Malaysia.

Government expenditure on education encompassing spending on education institutions. This sector has become the government's priority, compared to other sectors. In this study, an issue emerges when government expenditure on education is low and thus it may affect the quality of education in Malaysia. The quality of education is highly dependent on the amount of government spending on education. The quality of education encompasses primary, secondary and tertiary levels. National output might be dampened due to low quality of our education system. Therefore, the government needs to increase expenditure by focusing on the quality as it can affect national output (Bosworth & Collins, 2003; Ciccone & Papaioannou, 2005).

Figure 1 shows data on government expenditure on education in percentage from between 2010 and 2018. In 2010, government expenditure on education stood at 4.97%. It was partially supported by the implementation of the second stimulus plan of RM5 billion in the half of the year. The increase in the expenditure was aimed at improving rural infrastructure and urban public transport, as well as improving public education and health services. In year 2015, government expenditure on education increased by 4.98%. This shows a small increase due to the fact that the government emphasised on many sectors such as rural and urban public transport infrastructure and health. In this year, the government allocated RM3 billion in the education sector. Other than that, government expenditure on education increased rapidly to 19.74% in 2018. The government spent the money for the TN50 generation to increase government expenditure on education. In order to achieve

this objective, around RM50 million was needed. The TN50 had four components: one for science, technology, engineering and mathematic, second for IT modules, third for upgrading 2000 classes to smart classrooms and the other one for raising cultural quality for a top level.

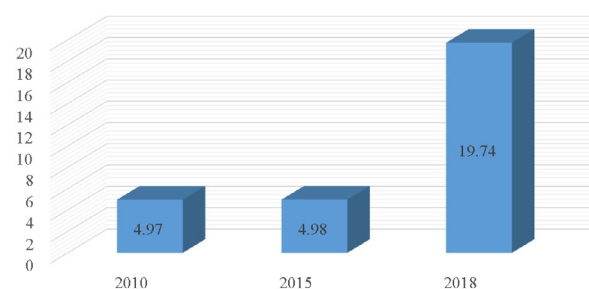


Figure 1: Government expenditure on education (%), 2010-2018

Source: World Bank

## 2. Literature Review

Numerous studies have been done to delve into the linkage between education and national output and most found there is an inextricable linkage between the two indicators such as Mercan and Sezer (2014), Trabelsi (2018), Mallick *et al.* (2016). Various methods have been used by previous studies. Some of them employed the ARDL approach. For example, Mercan and Sezer (2014) carried out research on the linkage between government expenditure on education and national output. The study was conducted in Turkey. Data ranging from 1970 to 2012 were collected and the results disclosed that higher expenditure on education can result in higher national output. Trabelsi (2018) conducted research using the OLS method using the growth model. The study found that if the nation has poor education quality and is optimistic and meaningful about the standard of educational quality then the outcome is unfavorable and statistically important. Mallick *et al.* (2016) also performed an analysis on economic development in major Asian countries through education spending. The variables used were real GDP and public spending on education. The OLS method was used and the study found a comprehensive

connection between spending on education and economic development in all the countries and there are strong consequences for long-term national output for educational investment in human capital.

The OLS method is widely used by previous studies. Tabar *et al.* (2017) also used the method to examine the linkage between government expenditure on education and national output. The study was conducted in Iran. Data on GDP which represents national output, expenditure on education which represents education, labour and capital stock that represents capital were analysed in the study. The results showed that there is a long-run relationship between education and national output.

Mekdad *et al.* (2014) explored the association between education and national output in Algeria. Data on GDP to indicates national output. Government expenditure on education to indicate education were used in the study and the OLS method also employed. The findings proved the positive linkage between education and national output. Ramli *et al.* (2016) also employed the same method to examine the linkage between education and national output in Malaysia. The same variables were addressed in the study. The results confirmed that education is inextricably related with national output. Donou-Adonsou (2019) extended the study by including technology in the model specification. The study on Sub-Saharan Africa was conducted to analyse data ranging from 1993 to 2015. Internet and mobile phone were the proxy for technology. The results showed that education and technology particularly the internet can cause higher economic development.

Hussin *et al.* (2012) employed the VAR method to examine the linkage between education and national output in Malaysia. Data on government spending which specifies education, gross fixed capital formation and labour force were analysed. Capital formation and labour force were treated

as control variables. The findings revealed that education can result in higher national output in the long run. In addition, labour productivity can result in long-run economic sustainability.

Kouton (2018) argued the linkage between education using government expenditure as a proxy, and national output in Africa. The study added other important variables that can determine national output, such as life expectancy, money supply and consumer price index. The ARDL approach was used in the study and the findings suggested that there is no connection between education and national output in Africa.

### 3. Methods

This study examines the linkage between expenditure on education and national output in Malaysia. Several tests will be conducted in this study, namely unit root, bound, short-run and long-run tests. The Autoregressive Distributed Lag (ARDL) approach will be employed in this study. Secondary data were collected for 34 years ranging from 1985 to 2018. GDP which represents national output is treated as a dependent variable. Government expenditure on education, labour and capital are treated as independent variables. Capital and labour are control variables. Data were extracted from the World Bank and Department of Statistics, Malaysia. The model specification is as follows:

$$GDP_i = \beta_{0i} + \beta_{1i} Edu + \beta_{2i} K + \beta_{3i} L \quad (1)$$

Where GDP is national output, EDU is government expenditure on education, K is gross capital formation and L is labour force. All the variables will be transformed into the logarithms. This study uses the ARDL approach. The advantage of using this approach is that the order of integration can be at I(0) or I(1) or mixed. Other than that, it can be used for small sample size of data to estimate long-term and short-term relationship. The long-run ARDL estimation for this study is as follows:

$$\Delta \text{LNGDP}_t = \alpha + \sum_{i=1}^n \beta_{1i} \text{LNGDP}_{t-i} + \sum_{i=1}^n \beta_{2i} \text{LEdu}_{t-i} + \sum_{i=1}^n \beta_{3i} \text{LK}_{t-i} + \sum_{i=1}^n \beta_{4i} \text{LL}_{t-i} + \alpha_1 \text{LNGDP}_{t-1} + \alpha_2 \text{LEdu}_{t-1} + \alpha_3 \text{LK}_{t-1} + \alpha_4 \text{LL}_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta \text{LNGDP}_t = \alpha + \sum_{i=1}^n \beta_{1i} \text{LNGDP}_{t-i} + \sum_{i=1}^n \beta_{2i} \text{LEdu}_{t-i} + \sum_{i=1}^n \beta_{3i} \text{LK}_{t-i} + \sum_{i=1}^n \beta_{4i} \text{LL}_{t-i} + \delta \text{ECT}_{t-1} + \varepsilon_t \quad (3)$$

Where  $\Delta$  is the first difference operator, equation (2) is an ARDL model. The Akaike Information Criterion (AIC) is used to select the lag and then, the error correction model (ECM) test is conducted to see the short-run relationship between independent variables with dependent variables. Engel and Granger (1986) stated that if the data are integrated in the long run than any interruption to the imbalance is temporary and can be shown by the Model Error Correction (ECM) in Equation 3.

#### 4. Results And Discussion

The results of the unit root test are reported in Table 1. The results show that based on intercept at level, LNGDP, LNEDU, LNK and LNL are not significant. For intercept at first difference, the results show that all of the variables are significant. For intercept with trend at level, the results show that GDP, EDU, K and L are not significant. For intercept with trend at first difference, the results show that all of the variables are significant.

Table 2 shows the results of the bound test. The null hypothesis states that the F-statistic falls below the lower bound. Thus, if the F-statistic exceeds the upper bound, the null hypothesis is rejected, which means that there is a co-integrating relationship. Based on Table 2, the results show that null hypothesis of no co-integration is rejected at the 1% significant level, given that the F-statistic value is 11.6955 which is greater than the upper bound.

Table 3 shows the results of the long-run ARDL estimation. The result shows that capital has a positive relationship with national output in the long run. This suggests that if there is a 1% increase in capital, national output will

increase by 0.9085%. These findings are in line with Van der Eng (2009) that capital can increase national output in Indonesia. The results also show that government expenditure on education has a positive relationship with national output in the long run. This suggests that if there is a 1% increase in government expenditure on education, national output will increase by 0.5559%. This implies that an increase in human capital would lead to an increase in economic growth, which is in accordance with the theoretical belief in the long run. These results is also consistent with the findings of previous study by Abidin et al. (2018) that the human capital would be more dominant in contributing to the economic growth. Besides, labour does not have any significant relationship with national output in the long run in Malaysia.

Table 4 shows that the results of the short-run ARDL estimation. Based on the table, capital has a positive and significant relationship with national output in the short run. This suggests that if there is an increase of 1% in capital, national output will increase by 0.2029%. The other variables, namely labour and education do not have any significant relationship with national output in the short run in Malaysia.

The result of the diagnostic tests are reported in Table 5. The result of all diagnostic tests consisting of Jacque-Bera Normality Test, Breusch-Godfrey Serial Correlation Test, Breusch-Pagan Test and Heteroskedasticity are not significant. The F-statistic for Ramsey RESET Stability reveals that is significant at 10%. The results indicate that the model is good to explain the effect of education on national output in Malaysia.

**Table 1: Unit Root Test**

Variables	Intercept		Intercept and Trend	
	Level	First Difference	Level	First difference
LNGDP	-1.6989	-4.8760***	-1.4294	-5.3856***
LNEDU	-1.7652	-2.9467*	-1.4179	-3.0231
LNK	-1.4319	-5.3554***	-1.8648	-5.4465***
LNL	-0.6003	-5.6296***	-3.6958	-5.5482***

Note: \* and \*\*\* represent significance at 10%, 5% and 1%, respectively

**Table 2: Bound Test**

F-Statistic		
11.6955***		
Significant Level		
Critical value	Lower bound	Upper bound
10%	2.72	3.77
5%	3.23	4.35
1%	4.29	5.61

Note: \*\*\* represent significance at 1%

**Table 3: Long Run Estimation of Economic Growth (3,3,3,3 ARDL)**

Long Run ARDL Estimation			
Variable	Coefficient	T-Statistic	Probability
LNK	0.9085***	4.2117***	0.0008***
LNL	-0.0495	-0.1060	0.9170
LNEDU	0.5559**	2.5737**	0.0212**
C	4.3482*	1.9687*	0.0677*

Note: \*, \*\* and \*\*\* represent significant at 10%, 5% and 1% level respectively

**Table 4: Short Run Estimation Results (3,3,3,3 ARDL)**

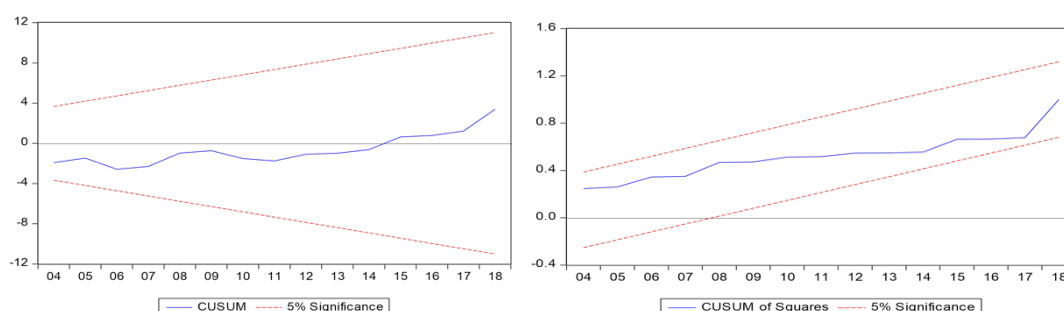
Short Run ARDL estimation			
Variable	Coefficient	T-Statistic	Probability
D(LNK)	0.2029***	8.6086***	0.0000***
D(LNL)	0.1436	1.1485	0.2688
D(LNEDU)	0.0110	1.3840	0.1866
C	0.6090**	2.6562**	0.0180 **
ECT (-1)	-0.1401***	-3.8829 ***	0.0015***
R <sup>2</sup> = 0.999817	Adj. R <sup>2</sup> =0.999633	DW=2.571370	

Note: \*\*\* and \*\* are significant at the 1% and 5% significance levels, respectively.

**Table 5: Diagnostic Test**

Test Statistic	F-Statistic
Jarque-Bera	1.5417(0.4626)
Breusch-Godfrey Serial Correlation	1.8184(0.2012)
Heteroskedasticity Test	0.4581(0.9291)
Ramsey RESET Stability	4.1487*(0.0610)

Note: The number in bracket ( ) are p-values and \* shows a significance level of 10%



**Figure 2: CUSUM and CUSUM of Square**

The consistency of the model can be confirmed by the cumulative total of recursive residual (CUSUM) and the cumulative number of residual squares (CUSUMSQ) graphs (see Figure 2). The stability achieved when the two graphs are plotted within the lines. It is concluded that the model is stable.

## 5. Conclusions

It is important to determine whether there is a relationship between education and national output in Malaysia. This is because government spending on education will go down the drain if it does not reap any benefit. This study employs the ARDL method to analyse data from 1985 to 2018. First, a unit root test has been conducted and the results show that all of the variables are stationary at first difference. Then, the ARDL can be proceeded. A bound test has been performed and the results show that there is a co-integrating relationship between the variables. The results of a long-run estimation show that there are long-run relationships between education and national output, and capital and national output. The results of a short-run estimation indicate that only capital can influence national output

while the other variables, namely education and labour do not have any effect on national output. Therefore, these findings are of utmost importance in formulating the right policy. The government needs to increase the country's expenditure on education as it help boost national output in the long run. The facilities in school should be improved and the subsidy should be increased to ensure that sustainable development can be achieved through human capital with high education.

## 6. Future Scope

This study still need to be pursued in order to obtain more conclusive findings due to the limitations encountered in conducting this study. Therefore, there are several suggestions that can be emphasized by future researchers if they wish to continue their research in this area. One of the suggestions that can be found, further research should be done using different method such as panel data analysis. Besides that, the study more focused on Malaysia and may need to be more comprehensive by comparing the Asian groups countries such as high-income, medium income and low-income countries.

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