Reexamine the Impacts of Education Expenditure, Capital Formation, Human Capital and Expert Labor on Malaysian Economic Growth

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Abstract: This study aims to reexamine the relationships between selected macroeconomic variables, especially the expenditure on education, on growth of Malaysian economy. Specifically, the exogenous variables in this study comprise of government education expenditure, investment, human capital and expert labor. For analysis purpose, this study adopts the time series data from 1988 until 2018. The estimated model is developed by employing ordinary least square technique (OLS). Outcome of this study discloses that human capital is the most crucial variable in elucidating Malaysian economic growth in the long term. Additionally, the study findings affirm that the government expenditure on education and capital formation are second and third outstanding variables in clarifying the economic growth in the observation time frame, respectively. Surprisingly, this particular study discovers that labor force expertise is irrelevant in influencing economic growth for Malaysia case. Consequently, the results of this study are parallel with other previous studies, especially on the roles that have been played by all variables aforementioned above. Albeit insignificant, expert labor still gives little impact to Malaysia’s economic growth at 10% confidence level. The reason being, as a high middle income country, human capital has more profound effect in promoting economic growth in Malaysia due to its ability to generate remarkably higher productivity for the nation compares to expert labor factor. For future study, further dynamic analysis is needed to prove the variables’ relationships in the short and long terms.

Key words: Economic Growth, Ordinary Least Square, Capital Formation, Government Education Expenditure, Expert Labor Force.

1. Introduction

In this millennium era, Malaysia is heavily exposed to external influences such as politics, social or economic linkages. Therefore, the identification of in-depth factors that contribute to its economic growth is necessary for its growth sustainability. Accordingly, appropriate studies have been conducted in searching the key contributing factors that can enhance Malaysian economic growth, which is in line with its pillar in Midterm Review of 11th Malaysia Plan (11MP). In fact, numerous studies have proved the impact of education on economic growth (Rambeli, Hashim, and Dayang-Affizah, 2016; Lee, 1999: Hussin, et. al, 2012; among others).

According to Ismail (1998), Malaysian economy had achieved, on average, impressive 9 percent annual rate of growth in late 1980s and early 90s. Physical capital and labor inputs were seen as major determinants of economic growth. Nevertheless, as world has become more digitalized, evolution of the division of labor is vital in generating sustainable economic growth (Yang, 1991). Thus, productivity can be enhanced through human resource development, labor force expertise and technological advancement are required in order to maintain the economic growth of a nation. It implies the development of labor force as an ongoing process to improve the quality of human capital.

Hence, in line with the government’s agenda in the Malaysian Education Blueprint (2013-2025) and Midterm Review of 11th Malaysia Plan of empowering human capital and strengthening economic growth, investment in education in producing highly educated communities is imperative to each nation. Hence, higher educational institutions play major role in producing expert labors in Malaysia (see Rambeli, Hashim and Dayang-Affizah, 2016). To illustrate, the implications of higher education role in the economy include the development of skilled human capital, advances in research and development (R&D), social development, infrastructure facilities and various job creations (Razak and Ali, 2013). As a whole, education is not merely beneficial at individual level, but it definitely has major impact on the development of the country.

Therefore, this study intends to reexamine selected macroeconomics variables, namely, government’s expenditure on education, capital formation, human capital and expert labor, in affecting Malaysian economic growth. The study aims to investigate which dominant magnitudes of these variables lead to steady growth in Malaysian economy. By using OLS approach in evaluating the impact of the macroeconomic variables,
including education spending, on economic growth, this study focuses on time series dataset ranging from 1988 to 2018. This study hopes to either strengthen previous studies or discover new evidence to enhance literature in the related fields.

2. Literature Review

Various studies of the aforesaid variables above have been available in many literature, both within and outside Malaysia (Chu, et. al. 2018; Rambeli, Hashim & Dayang-Affizah, 2016; Hashim, et. al. 2018; Korkmaz & Korkmaz, 2017; Tkachenko & Mosiychuk, 2014; among others). In general, Chu, et. al. (2018) adopt OLS fixed effects and GMM methodology in their study involving panel data of 37 developed and 22 underdeveloped and developing nations over fixed time periods. The finding discloses that the greater the productive government expenditure, the larger the economic growth in all categories of the nations. Therefore, the growth of the economy keeps increasing as long as each nation stays away from non-productive public expenditure. Furthermore, Lee (1999) demonstrates that democratization, privatization and decentralization of the education system development nationwide are needed to achieve Vision 2020. Consequently, revised education system is imperative to pursue economic growth in becoming a developed nation.

In investigating the impact of higher education human capital on the growth of African economies, Gyimah-Brempong, K., Paddison, O. & Mitiku, W. (2006) employs panel data within 40-year timeframe to estimate dynamic panel model. The particular study uncovers positive and significant relationships between higher education human capital and per capita income growth rate in African countries. Additionally, the estimated higher education human capital growth elasticity of 0.09 is twice as large as the growth impact of physical capital investment. Later, Razak and Ali (2013) employ ordinary least square (OLS) technique in finding whether higher education contributes to economic growth in Malaysia. Empirically, the study confirms the existence of a positive association between higher education and growth in Malaysian economy.

Hussin, et. al. (2012) use time series data set and employ Vector Auto Regression (VAR) method to investigate the associations between government education expenditure and economic growth in Malaysia. The findings from their study reveal that fixed capital formation, labor force participation and public education expenditure are positively cointegrated with the growth of Malaysian economy. Moreover, there is bidirectional causality from economic growth to education expenditure in the short run and vice versa. In different study, Rambeli, Hashim and Dayang-Affizah (2016) utilize Cobb-Douglas Production Function to develop Multiple Regression Linear Method. In particular, this study portrays the significance of education expenditure and capital, with the exception of labor force, on Malaysian economic growth in the long run.

Apart from that, Hashim, et. al. (2018) examine five macro variables, particularly, population, gross fixed capital formation, labor force participation, government expenditure on health and education, and their impacts on real GDP in Malaysia. By utilizing yearly time series data of 30 years and doing economic and statistical analyses, population and gross fixed capital formation have positively and significantly influenced Malaysian economic growth. Therefore, these variables are important determinants of greater economic growth. Aside from that, Boamah, J. et. al. (2018) have conducted empirical study in 18 Asian countries by employing panel data method. From their study, capital formation and labor force participation rate play positive roles in influencing economic growth at 1% and 10% level of significance, respectively. The research infers the importance of both variables to the growth of the economy.

From three different development categories of less developed and OECD countries, Petrakis and Stamatakis (2002) look into the impact of human capital on economic growth. The result from empirical cross-country data signifies that economic growth in less developed countries is primarily contingent on primary and secondary education. On the other hand, tertiary education play major role in the growth of the economy in OECD countries. Conducting study on nine Asian countries, Siddiqui and Rehman (2016) use Bayesian analysis in determining the association between human capital and economic growth. The results of the study divide the outcomes of human capital and economic growth nexus, according to South and East regions of Asia. Firstly, the outcome delineates primary and secondary education as important in affecting economic growth in East Asia. Contrastingly, in South Asia, economic growth is positively influenced by tertiary and vocational education. The reasons lie behind the contradictory result is the fact that both regions are different in their progress of education as well as their rates of growth. In addition, public education expenditure is significant factor in impacting economic growth in both Asian regions.

Korkmaz and Korkmaz (2017) focus on seven European OECD countries in their study of the relationship between labor productivity and economic growth, by using panel data analysis method. Interestingly, the finding
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unveils a unidirectional causality from economic growth to labor productivity. It plainly means that GDP Granger cause labor productivity, but not the other way around. Through panel data approach, Reza & Widodo (2013) explore education and economic growth relationships in Indonesia. The outcome show that economic growth is significantly and positively influenced education per employee. It is stated that, on average, there is 1.56% increase in growth in the economy with 1% rise in education per employee.

Tkachenko & Mosiychuk (2014) discover that the key impediment to economic growth up surge through skilled labor transformation is due to many countries take part as users in world division of labor, instead of being intellectual products inventors. The study implies that labor expertise is more beneficial in boosting nations’ growth in innovative and developed countries as compared to other developing and third world countries. The statement is further supported by Bailey and Mulder (2017). They emphasize that highly skilled workers from migrant countries are crucially important to sustain the growth of developed economies.

3. Methodology, Data and Model Specification

Inspired by the study of Rambeli, Hashim and Dayang-Affizah (2016) and Hashim, et. al. (2018), the model specification of this study is developed as follows:

The Non-Linear Cobb Douglas Model:

\[ GDP_t = \theta_0 ED^{0.01} CP^{0.02} HCP^{0.03} EXL^{0.04} e^{x_t} \] (1)

The Multiple Linear Regression Model

\[ \ln GDP_t = \theta_0 + \theta_1 \ln ED_t + \theta_2 \ln CP_t + \theta_3 \ln HCP_t + \theta_4 \ln EXL_t + \nu_i \] (2)

From equation (2), Gross Domestic Product is denoted as GDP. Notation of ED represents the government education expenditure, whereas CP is notation for capital investment in the country. Additionally, human capital and expert labor force are represented by HCP and EXL, respectively. The subscript ‘t’, is the notation for time series data employed in this study.

From the equations (1) and (2), the notation of \( \theta_0 \) is constant. Concurrently, \( \theta_i \) (i= 1, 2, 3 and 4) are the coefficients for all parameters under observation. All data are collected from the Department of Statistic Malaysia (DOSM). For analysis purposes, this study utilizes SPSS software. As aforementioned above, this study employs the ordinary least square in structuring its estimating model. As stated by Hill, Griffiths & Lim (2018) and Gujarati (2004), when the value of variance is minimum, the coefficient values produce using this approach are efficient. Thus, the results are validated and reliable for estimating, predicting and trajectory purposes.

4. Estimation Model Results

Derived from equation (2), below is the estimated model of this study;

\[ \text{GDP}_t = -1.702 + 0.327 \text{ED}_{1t} + 0.145 \text{CP}_{2t} + 1.233 \text{HCP}_{3t} - 0.002 \text{EXL}_{4t} \] (3)

\[ \text{Se} = (0.602) \quad (0.037) \quad (0.038) \quad (0.212) \quad (0.013) \]

\[ T* = (-2.830) \quad (8.920)*** \quad (3.842)*** \quad (5.818)*** \quad (-0.178) \]

\[ F* = 1344.167, \quad R^2 = 0.995, \quad R^2 = 0.994 \]

Table 1. Notation Analysis of the Level of Significance

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variables</th>
<th>Not important ((\alpha))</th>
<th>Important ((1 - \alpha))</th>
<th>(*) Notation</th>
<th>Significance Level</th>
<th>Confidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP(_t)</td>
<td>Government Education Expenditure (ED(_t))</td>
<td>1%</td>
<td>99%</td>
<td>***</td>
<td>1%</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td>Capital Formation (CP(_t))</td>
<td>1%</td>
<td>99%</td>
<td>***</td>
<td>1%</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td>Human Capital</td>
<td>1%</td>
<td>99%</td>
<td>***</td>
<td>1%</td>
<td>99%</td>
</tr>
</tbody>
</table>
Table 1 simplifies significance level analysis from the SPSS software output. Prior to performing specific formal hypothesis testing (t-test and Wald-test), initial idea on the salient variables that have an impact on GDP in the long run can be detected. From table 1, three factors are recognized to influence economic growth in the long term, viz., government expenditure on education, capital formation and human capital. Notwithstanding, the end result of this study must conform to the next hypothesis testing as displayed in Table 2. Next, the study discusses the explanation of the results obtained in Table 1. The escalation of 1% in public education expenditure (EDt) will increase Malaysia’s GDP by 0.327% at 0.01 significance level. Likewise, the augmentation of 1% in capital formation (CPt) will raise GDP of Malaysia by 0.145% at 1% level of significance. Corresponding to 99% confidence level, the 1% upsurge of human capital (HCPt) will soar Malaysian GDP by 1.233%. By the same token, the 1% surge in expert labor (EXLt) will curtail GDP in Malaysia by 0.002% at significance level of 86%.

In addition, this study adopts two statistical tests for hypothesis testing, namely, t-test and F-test (Wald-test). The purpose of t-test is to identify the significance of individual independent variable on dependent variable. Meanwhile, the Wald-test analysis is the best approach to test the independent variables combination in elucidating the dependent variable. The following Table 2 indicates the findings of t-test hypothesis testing.

Table 2. The Individual Hypothesis Test (t-test)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hypothesis Testing</th>
<th>Statistical test (t*)</th>
<th>Critical value (tα/2, n-k) and α=0.05</th>
<th>Results</th>
</tr>
</thead>
</table>
| Government Education Expenditure (EDt) | H0: β1 = 0        
H1: β1 ≠ 0             | 8.920                | 2.056                  | 8.920 > 2.056                     | Reject H0   |
| Capital Formation (CPt)    | H0: β1 = 0        
H1: β1 ≠ 0             | 3.842                | 2.056                  | 3.842 > 2.056                     | Reject H0   |
| Human Capital (HCPt)       | H0: β1 = 0        
H1: β1 ≠ 0             | 5.818                | 2.056                  | 5.818 > 2.056                     | Reject H0   |
| Expert Labor (EXLt)        | H0: β1 = 0        
H1: β1 ≠ 0             | -0.178               | 2.056                  | -0.178 < 2.056                    | Accept H0   |

Table 2 evinces the results of t-test in expounding the importance of specific variables on growth of Malaysian economy. The acceptance or rejection of H0 brings the indication whether such variables are significant or otherwise. The first aforementioned $t_1$ result of significance test designates that the value of $t^* = 8.920$, which is larger than its critical value ($t_{0.05, n-k} = 2.056$, therefore, H0 should be rejected. The statement insinuates that government expenditure on education (EDt) is a critical factor in shaping the gross domestic product (GDPt) in Malaysia at 0.05 significance level. The second aforesaid $t_2$ result of significance test denotes that the value of $t^* = 3.842$, which is greater than ($t_{0.05, n-k} = 2.056$, thus, reject H0. The outcome simply means that CP is vital in clarifying the dependent variable, GDPt, at 0.05 level of significance. The third previous $t_3$ result of significance test on human capital (HCPt) exhibits that the value of $t^* = 5.818$, which is higher than ($t_{0.05, n-k} = 2.056$, therefore, the study rejects H0. The result signifies HCPt is a crucial determinant of the dependent variable, the gross domestic product (GDPt) in Malaysia at 5% significance level. The last foregoing $t_4$ result of significance test on expert labor (EXLt) disclose that the value of $t^* = -0.178$, which is less than ($t_{0.95, n-k} = 2.056$, accordingly, the study accepts H0. The outcome shows beyond doubt that EXLt is irrelevant in explaining the dependent variable, Malaysian gross domestic product (GDPt) at significance level of 5%.

Table 3. The Wald Hypothesis Test (F-test)

<table>
<thead>
<tr>
<th>Model</th>
<th>Hypothesis</th>
<th>Statistical Test</th>
<th>Critical Value (α=0.05)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Model</td>
<td>$H_0 : \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$</td>
<td>$F^* = \frac{ESS}{df} = \frac{RSS}{df}$</td>
<td>2.98</td>
<td>1344.167 &gt; 2.98  Thus, Reject H0</td>
</tr>
<tr>
<td></td>
<td>$H_1 : \theta_1 \neq 0$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 simplifies the Wald hypothesis testing outcome. Following the Wald test statistical result table, the value of $F_\alpha, (k - 1), (n - k) = 2.98$, at significance level of 0.05, while $F^*$ equals to 1344.167. The evidence shows that $F^* > F_\alpha, (k - 1), (n - k)$, thus, $H_0$ is rejected. This condition plainly means that all independent variables used to estimate the dependent variable are good combination in explaining GDP, at 0.05 significance level. More importantly, the estimated model has also passed all diagnostic tests including Glejser test, Durbin-Watson model and Multicollinearity test (refer to Table 4, 5 and 6 in Appendix).

5. Conclusion

In a nutshell, this study has reinvestigated the determinant factors of Malaysian economic growth during particular 30-year period, 1988 until 2018. Specifically, three of four variables, government education expenditure ($EDU_t$), capital formation ($CAP_t$), human capital ($HCP_t$), are ascertained to give significant impacts on growth of Malaysian economy. Meanwhile, expert labour ($EL_t$) is deemed irrelevant in explicating Malaysia’s economic growth in this specific study. Hence, Malaysian government must put more emphasis on education, capital formation and human capital to enhance manpower quality in the country. As mentioned earlier, the government should spend more on productive spending rather than non-productive expenditure for efficient and effective development as well as enhancing Malaysia’s economic growth in facing the Industrial Revolution 4.0 challenge and become a developed country in the future.

Appendix

Table 4. Durbin Watson (DW) Test Results

<table>
<thead>
<tr>
<th>Level of Significance</th>
<th>DW</th>
<th>N</th>
<th>K</th>
<th>DL</th>
<th>DU</th>
<th>4-DL</th>
<th>4-DU</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>1.808</td>
<td>31</td>
<td>4</td>
<td>1.023</td>
<td>1.425</td>
<td>2.977</td>
<td>2.575</td>
<td>No autocorrelation problem detected.</td>
</tr>
<tr>
<td>5%</td>
<td>1.808</td>
<td>31</td>
<td>4</td>
<td>1.229</td>
<td>1.650</td>
<td>2.771</td>
<td>2.35</td>
<td>No autocorrelation problem detected.</td>
</tr>
</tbody>
</table>

Figure 1. Graphical Method using Scatterplot to Observe Heteroscedasticity Problem

Informal heteroscedasticity test can be observed from the scatterplot observation as shown in Figure 1. In order to formally test for heteroscedasticity, the study performs Glejser test (see Table 5). The specific test is carried out in order to test the existence of heteroscedasticity problem in the estimated model.

Glejser Estimated Model

$$|\hat{\mu}| = 0.195 + 0.031 ED_t - 0.002 CP_t - 0.99 HCP_t + 0.005 EXL_t$$

Table 5. Glejser Test Result for Heteroscedasticity Diagnostic Testing

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Statistical Test</th>
<th>Critical Value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ED_t$</td>
<td>$H_0$: Homocedasticity</td>
<td>1.567</td>
<td>2.056</td>
<td>The result suggest that, $1.567 &lt; 2.056$. Therefore, accept $H_0$. Hence, no heteroscedasticity problem.</td>
</tr>
</tbody>
</table>

$H_1$: Heteroscedasticity
Table 6. Multicollinearity Test Results

<table>
<thead>
<tr>
<th>Relation</th>
<th>$R^2$</th>
<th>Pearson Correlation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED, &amp; CP₁</td>
<td>0.995</td>
<td>0.848</td>
<td>0.995 &gt; 0.848; imperfect multicollinearity problem</td>
</tr>
<tr>
<td>ED, &amp; HCP₁</td>
<td>0.995</td>
<td>0.971</td>
<td>0.995 &gt; 0.971; imperfect multicollinearity problem</td>
</tr>
<tr>
<td>ED, &amp; EXL₁</td>
<td>0.995</td>
<td>0.585</td>
<td>0.995 &gt; 0.585; imperfect multicollinearity problem</td>
</tr>
<tr>
<td>CP₁, &amp; HCP₁</td>
<td>0.995</td>
<td>0.887</td>
<td>0.995 &gt; 0.887; imperfect multicollinearity problem</td>
</tr>
<tr>
<td>CP, &amp; EXL₁</td>
<td>0.995</td>
<td>0.509</td>
<td>0.995 &gt; 0.509; imperfect multicollinearity problem</td>
</tr>
<tr>
<td>EXL₁, &amp; HCP₁</td>
<td>0.995</td>
<td>0.578</td>
<td>0.995 &gt; 0.578; imperfect multicollinearity problem</td>
</tr>
</tbody>
</table>

References


