

## Determinants of Real GDP in Malaysia

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### Abstract

Every country around the world has regarded its Gross Domestic Product (GDP) growth as extremely vital in order to pursue continuous development and advancement needed for its nation. Thus, this paper aims to examine the relationships between five macro variables, particularly, population, gross fixed capital formation, labor force participation, government expenditure on health and education, and real GDP in Malaysia. Accordingly, this study employs annual time series data from 1987 to 2016. The analysis is then explained in terms of two categories, economic and statistical criteria. The findings reveal that population and gross fixed capital formation are positively related to GDP. Therefore, they are important factors in explaining higher GDP. Meanwhile, the other factors do not essentially contribute to GDP growth and negatively related to each other, respectively. Based on the result, other variables should be added in the future so as responsible parties and authorities could have taken steps or implement strategies to ensure the stability economic growth are achieved. In addition, future study should touch on the econometric criteria such as OLS regression and Granger causality study into its discussion for more elaborate and in-depth findings.

**Keywords:** Gross domestic product (GDP); Gross fixed capital formation; Labor force participation; Government expenditure; Macro variables; Malaysia.



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### 1. Introduction

The level of development in every nation varies from one country to another country in the world. Specifically, some countries are known as developed countries, while others are considered as developing countries and under-developed countries. The given categories of the nations in which they are in, depend on their abilities to generate income for their countries. Gross Domestic Product is known as a key indicator to measure income performance of a nation.

GDP is defined as the market value of all final goods and services produced in an economy annually. The value of GDP can be changed by other macroeconomic components such as consumption, investment, government purchases and net export. Likewise, population, gross fixed capital formation, labor force participation, government expenditure on health and education can also be main factors that contribute to different values of GDP throughout the years.

GDP can be divided into real GDP and nominal GDP. For this particular study, we use real GDP, which is an inflation-adjusted measure for the value of all goods and services. Undeniably, healthy and well-educated human capital will assist the country to boost its economy and production. Consequently, it will increase the national income and become a competitive country along with other nations.

This situation infers that government expenditure on health and education are vital for a nation's well-beings. For instance, the government can provide some training to improve the workers' knowledge and skills or even offer

workers to participate in international exchange programs in advanced countries for them to enhance or learn new skills. Besides, government must also take steps to increase and sustain health literacy among its people. Education sector, in particular, can play major role in promoting health literacy among school age children by integrating health into and across educational curriculum areas. This matter has shown interrelated relationship between these two components.

This study lacks literature review that put all variables mentioned earlier in one study to see their impact on real GDP. Furthermore, most journals conduct their studies overseas, instead of focusing on Malaysia. Therefore, the main objective of this study is to examine the impact of these four variables, namely, population, gross fixed capital formation, labor force participation and government expenditure on health and education, on real GDP. Besides, this study tries to identify the most and least important factors that influence real GDP in Malaysia.

## 2. Literature Review

Various studies are done to look at the effects of macroeconomic variables on real GDP. [Raja Aziz and Azmi \(2017\)](#) use Ordinary Least Square (OLS) and Augmented Dickey Fuller (ADF) analyses on yearly time series data to study the impact of inflation, foreign direct investment (FDI) and female labor force participation (LFP) on GDP growth. They discover that only FDI and Female LFP have direct impact on GDP growth whereas inflation does not contribute to GDP growth.

Meanwhile, [Havi \(2013\)](#) extend the variables involving physical capital, labor force, foreign direct investment, foreign aid, consumer price index (CPI), government expenditure (G) and military rule, which are significant determinants of growth in real GDP per capita in Ghana in the long run. In short run, however, only FDI and G affect growth in real GDP per capita in the short run. Other than that, [Boldeanu and Constantinescu \(2015\)](#) highlight that main factors ranging from macroeconomic variables, such as public expenditure, openness and foreign direct investment as well as non-economic variables, can determine GDP growth.

Apart from that, [Esmail and Shili \(2017\)](#) come out with totally different variables that contribute to the emerging China economy. They observe that agriculture, industry, trade, FDI and employment rate play major roles in affecting GDP growth in China's economy. In addition, [Lee and Hong \(2012\)](#) analyze 12 developing economies to see the projection of Asian economy by 2030. They notice that there has been robust growth in capital accumulation. Though education and total factor productivity remain limited, they believe that policy reform in education, property rights and research and development (R&D) will get these countries back on track with rising GDP growth.

According to [Dewan and Hussein \(2001\)](#), they notice that labor force, investment in both physical and human capital, low inflation and open trade are necessary for economic growth. They further conclude that, based on their empirical study on 41 middle-income developing countries, nations with strong fundamentals in macroeconomics tend to grow faster compare to those without them. On the other hand, [Tran \(2011\)](#) identifies physical capital, R & D, exports and inflations as the main drivers of GDP growth per capita. Nevertheless, she finds out that only physical capital has an effect on genuine progress in South Korea. Furthermore, [Guo and Zhang \(2013\)](#) propose government expenditure to be made in order to encourage enterprises' investment.

Aside from that, [Dritsakis \(2006\)](#) infer, through their cointegration test in Greece, that there is a unidirectional causal relationship between exports and gross fixed capital formation and between FDI and economic growth, respectively. However, there seems to be no causal relationship between GDP per capita and export as well as gross fixed capital formation. Despite controversial causality direction, [Baizrakhmanov \(2014\)](#) stresses that correlation between GDP, GDP per capita and population is positively strong. Meaning that population has the influence to affect GDP per capita in Japan and Singapore.

On the contrary, [Szarowská \(2011\)](#) confirms the cyclical development of total government spending on GDP whereby nearly 85% of total spending comes from 5 areas, namely, social protection, economic affairs, health, general public services and education. Furthermore, she also proves that there is a long run relationship between GDP and total government spending in Czech Republic using Johansen cointegration test.

In another study in Algeria, [Boussalem \(2014\)](#) verify the long run relationship between government spending on health and economic growth despite unconfirmed health-led growth hypothesis.

[Ongo and Vukenkeng \(2014\)](#) disclose that capital formation positively affect economic growth while labor force negatively affect economic growth in CEMAC sub-region. Meanwhile, [Shahid \(2014\)](#) states that capital formation, labor force and economic growth have both short run and long run relationship in Pakistan.

Additionally, [Shuaib and Ndidi \(2015\)](#) emphasize about the significant relationship between capital formation and economic development in Nigeria. The growth rate of national income is directly related to saving ratio and capital formation. They recommend the government to improve economic development by encouraging savings, creating conducive investment climate and at the same time, improve its infrastructural base of the economy to boost capital formation for sustainable growth.

In their survey, [Islam \(2016\)](#) show the positive relationship between education and economy growth as well as positive relationship between human capital and economy growth in Malaysia. Thus, higher education demonstrates skillful and productive workers. Hence, the effectiveness of education input should be increased for better education quality. [Mohd Hussin \(2012\)](#) indicate that GDP has a positive long run relationship with the fixed capital formation, labor force participation and government expenditure on education. Better education standards definitely will improve the efficiency and productivity of labor force and affect the economic development in the long run.

Moreover, [Pradhan \(2010\)](#) illustrates that health spending is both a cause and a consequence of increased economic growth in 11 OECD countries. The lack of health spending may constrain the economic growth in these

countries. The study also confirms the existence of bidirectional causality between health spending and economic growth, both in the short run and long run. Hence, the policy to increase health spending will likely stimulate economic growth in the OECD countries. Additionally, Bakare and Olubokun (2011) reveal positive relationship between health care expenditure, gross capital formation, labor force and economic growth in Nigeria. Both studies results support the view that healthy spending is a critical factor to economic growth.

Becker (1999) incorporate both positive and negative effects of population on productivity. Population may reduce productivity due to traditional diminishing returns from more intensive use of land and other natural resources. However, larger population encourages greater specialization and increased investment in knowledge. Therefore, the net relation between greater population and per capita income depends on whether the inducement to human capital and expansion of knowledge are stronger than diminishing returns to natural resources.

The empirical findings done by Ugochukwu and Chinyere (2013) suggest that capital formation and stock market have positive and significant impact on economic growth in Nigeria in the long run. While, both inflation rate and interest rate has a negative impact on economic growth in Nigeria. Kakar (2011) in their study indicate that capital stock and labor force participation are key variables that affect the economic development of Pakistan along with education in the long-run.

In contrast, Ebiringa and Chalse-Anyaogu (2012) insist that government expenditure should spend more on health sector, education, telecommunication and security since they are significant and have positive impact on the economic growth. Healthy population is essential to growth of a nation.

### 3. Methodology

#### 3.1. Model Accuracy

The accuracy of a model is depending on the following properties: 1) A good model should be compatible with what is found in economic theory. 2) A good model should be able to explain the actual situation. 3) The estimated parameters should appropriate to represent the actual parameters of a model structure. 4) A produced model that is produced should be able to predict the dependent variables. 5) A good model should represent a simple link in the economy. In conclusion, the more satisfied the above properties of a model, the better the model will be.

In forming the regression model, independent variables relating to the dependent variable should be included in a theory. Meanwhile, the model specification covers the model functions and equations. This study employs annual time series data from 1987 to 2016.

#### 3.2. Model Formation

The function of the factors that affect real GDP in Malaysia can be developed as follows:

$$GDP_t = f(Pp_t, Capital_t, Labour_t, Education_t, Health_t)$$

#### 3.3. Model Specification

Based on theories and findings of previous studies, we will be able to determine that the sign and size of the desired parameters. This particular study aims to see whether the identified key factors affect real GDP in Malaysia. All data are obtained in various forms. As a result, there is a difference unit for each variable that has been set either as dependent or independent variable. Thus, all the data in each variable were Ln for budgeting purposes and to avoid problems in the model specification. Here is a Multiple Regression Model for factors that affect the real GDP in Malaysia which is applicable with the OLS, namely:-

$$GDP_t = \beta_0 + \beta_1 Pp_t + \beta_2 Capital_t + \beta_3 Labour_t + \beta_4 Education_t + \beta_5 Health_t + \varepsilon_t$$

#### 3.4. Economic Criteria

When establishing a model, researcher must ensure that the model has met economic criteria. As mentioned earlier, a model is based on theory and the findings of previous studies and is usually represented on the sign and the size of the parameters of the relationship. As it is known that the coefficient is fixed for a particular model (e.g. elasticity, the marginal propensity to consume (MPC), the suits and the like). In economic theory, coefficients, sign and its size define the conditions imposed on the coefficients of the Propensity for example Suits (KMS) must be between 0 and 1 or  $0 < KMS < 1$ .

##### 3.4.1. Elasticity

Elasticity is intended to look at the effect on the dependent variable,  $Y_t$  (which is real GDP) when there is an increase or decrease in the value of the independent variables,  $X_t$  (which are Pp, Capital, Labour, Education and Health). Here is the method used to calculate the normal value of elasticity model as follows:

$$X_t, \text{ elasticity to } Y_t = \frac{dY_t}{dX_t}$$

The same method is used to calculate the elasticity for all variables. According to economic criteria, researchers will establish the best model and meet that criteria.

This study can be summarized as follows:

$$GDP_t = f(Pp_t, Capital_t, Labour_t, Education_t, Health_t)$$

where

real GDP in Malaysia (GDPr), population in the year t (Pp<sub>t</sub>), gross fixed capital formation in year t (Capital<sub>t</sub>), labour force participation in year t (Labour<sub>t</sub>), the government expenditure on education in year t (Education<sub>t</sub>) and the government expenditure on health in year t (Health<sub>t</sub>).

### 3.5. Statistical Criteria

A model should meet statistical criteria besides economic criteria. Statistical criterion is the second most important criterion after the economic criteria. It is to see whether the parameters used in a model are estimated and determined by statistical theory. We will be able to see the relationship of each variable that the existed correlation is not perfect because there is a random element of the stochastic variable that has a certain probability distribution. Statistical criteria commonly used is the coefficient of determination (R<sup>2</sup>) and the standard deviation.

The coefficient of determination (R<sup>2</sup>) is used to express the percentage change in the independent variables in a model can explain the change in the dependent variable. While, the standard deviation of a parameter determines the amount of mistakes being made compare to actual parameter. The larger the standard deviation value, the less precise a model of the actual situation and vice versa. An estimated parameter should be rejected if it is found that the sign is contrary to what is found in the economic theory although the degree coefficient of determination has high or low standard deviation.

### 3.6. Significant Test – T-Test

Tests of significance is used for the purpose of testing whether these important independent variables in explaining the dependent variable at a certain confidence level. For example at 95% confidence level. Formula t statistics is:-

$$t_s = \frac{(b_2 - \beta_2)}{Se(b_2)} \quad \text{or,} \quad t^* = \frac{(\beta - \beta)}{Se}$$

When  $Se(b_2)$  is the estimator to real  $Se(b_2)$ , according to t statistic, the rule of decision making are as follow:-

Reject  $H_0$ , when  $|t| > t_{\frac{\alpha}{2}, n-k}$

Accept  $H_0$ , when  $|t| \leq t_{\frac{\alpha}{2}, n-k}$

Based on the greater value of  $t^*$  compare to the value of  $t_{\frac{\alpha}{2}, n-k}$ , it will reject  $H_0$  and this shows that the independent variables are important in explaining the dependent variable at certain confidence level. Conversely, if

the value of  $t^*$  is smaller than the value  $t_{\frac{\alpha}{2}, n-k}$ , then it will accept  $H_0$ . Accepting  $H_0$  means that independent variables are not significant in explaining the dependent variable.

### 3.7 Significant Test – F-Test

F-test is used to see whether this model matches well/good or bad/not good. The well/good model will give a greater  $F^*$  value than the value of F critical at  $\alpha$  significance level, degrees of freedom  $k-1$  and  $n-k$  where n is the number of observations and k is the number of parameters in the model. Model that is bad/not good indicates that the variables are not important determinants to be used in the model. The formula is as follows:-

$$F = \frac{ESS / df}{RSS / df}$$

Where,  $df$  = Degree of freedom

$$F = \frac{k-1}{n-k}$$

Or,

Where,

k = Number of parameters in the model  
n = Size of the sample

$F^*$  can be obtained from the SPSS output that is given in the table ANOVA (Analysis of Variance). By using the F-test, we can reject  $H_0$  if  $F^*$  is larger than  $F_{\frac{\alpha}{2}, k-1, n-k}$ . Instead if  $F^*$  is smaller than  $F_{\frac{\alpha}{2}, k-1, n-k}$  we cannot reject  $H_0$ . Value  $F_{\frac{\alpha}{2}, k-1, n-k}$  can be obtained from Table F.

## 4. Results and Discussion

For the economic criteria, elasticity values for each independent variable on the dependent variable of the model estimation are as follows:

Variable	Formula	Calculation
Pp	$\mu = \hat{\beta} \cdot \left(\frac{\bar{X}}{\bar{Y}}\right)$	$\mu = 3.636 \cdot \left(\frac{16.9823}{22.0600}\right)$ = 2.7991
Capital	$\mu = \hat{\beta} \cdot \left(\frac{\bar{X}}{\bar{Y}}\right)$	$\mu = 0.257 \cdot \left(\frac{20.6850}{22.0600}\right)$ = 0.2410
Labor	$\mu = \hat{\beta} \cdot \left(\frac{\bar{X}}{\bar{Y}}\right)$	$\mu = -0.54 \cdot \left(\frac{16.0877}{22.0600}\right)$ = -0.4004
Education	$\mu = \hat{\beta} \cdot \left(\frac{\bar{X}}{\bar{Y}}\right)$	$\mu = -0.02 \cdot \left(\frac{17.5047}{22.0600}\right)$ = -0.0167
Health	$\mu = \hat{\beta} \cdot \left(\frac{\bar{X}}{\bar{Y}}\right)$	$\mu = -0.03 \cdot \left(\frac{16.0547}{22.0600}\right)$ = -0.0269

According to economic theory, which is shown by elasticity, the relationship between population and real GDP in Malaysia is positive. When population increases, the real GDP in the country will also increase. For every 3.636 percent increase in population will increase 2.7991 percent of GDP in Malaysia.

Using the same theory, the relationship between the gross fixed capital formation with the real GDP in Malaysia is also positive. When gross fixed capital formation increases, the real GDP in the country will also increase. For every 0.257 percent increase in gross fixed capital formation will increase 0.2410 percent of GDP in Malaysia.

Contrastingly, the relationship between labor force participation and the real GDP in Malaysia is negative. When the labor force participation decreases, the real GDP in the country will also decrease. For every 0.549 percent decrease in labor force participation will decrease 0.4004 percent of GDP in Malaysia.

In addition, the relationship between the government expenditure on education and real GDP in Malaysia is negative. When the government expenditure on education decreases, the real GDP in the country will also decrease. For every 0.021 percent decrease in government expenditure on education will decrease 0.0167 percent of GDP in Malaysia.

Lastly, the relationship between the fifth independent variable, government expenditure on health with the dependent variable, real GDP in Malaysia is negative. When the government expenditure on health decreases, the real GDP in the country will also decrease. For every 0.037 percent decrease in government expenditure on health will decrease 0.0269 percent of GDP in Malaysia.

### Statistical Criteria

Significant test- T-Test

$$\ln \text{GDP} = -35.191 + 3.636 \ln \text{Pp} + 0.257 \ln \text{Capital} - 0.549 \ln \text{Labour} - 0.021 \ln \text{Education} - 0.037 \ln \text{Health}$$

Variable	Hypothesis	Statistical Test, t*	Critical Value	Result
Pp	$H_0: \beta_1 = 0$ $H_1: \beta_1 \neq 0$	4.699	2.060	Reject $H_0$
CAP	$H_0: \beta_1 = 0$ $H_1: \beta_1 \neq 0$	3.076	2.060	Reject $H_0$
LAB	$H_0: \beta_1 = 0$ $H_1: \beta_1 \neq 0$	-0.916	2.060	Accept $H_0$
EDU	$H_0: \beta_1 = 0$ $H_1: \beta_1 \neq 0$	-0.429	2.060	Accept $H_0$
HEA	$H_0: \beta_1 = 0$ $H_1: \beta_1 \neq 0$	-0.854	2.060	Accept $H_0$

For the population, it shows that the value of t\* is larger than the value of critical value. Its statistical test is 4.699 and it is greater than critical value, 2.060. So, hypothesis null ( $H_0$ ) is rejected. This means that population is an important factor to real GDP.

For the gross fixed capital formation, its statistical value is 3.076 and its critical value is 2.060. This result indicates that statistical value is bigger than the critical value. So,  $H_0$  is rejected. It can be concluded that gross fixed capital formation is also an important factor to real GDP.

Besides, labor force participation's statistical test is -0.916 and its critical value is 2.060. It demonstrates that statistical test for this independent variable is smaller than its critical value. So,  $H_0$  is accepted. As a conclusion, labor force participation is not an important to real GDP.

In addition, government expenditure on education's statistical test is smaller than its critical value. This means that  $T^* = -0.429$  is smaller than 2.060.  $H_0$  is accepted. Government expenditure on education is also not an important factor to real GDP.

As for government expenditure on health, its statistical test also is smaller than its critical value which is  $t^* = -0.854$ .  $H_0$  is also accepted in this variable. To sum up, government expenditure on health is not an important factor to real GDP.

### Significant Test- F-Test

In this table, the critical value is 2.76 while its statistical test,  $F^*$  is 322.582. So, its  $F^*$  is larger than its critical value. Since  $F^* > F_{\alpha, V_1, V_2}$ ,  $H_0$  is rejected.

Model	Hypotheses	Statistical Test	Critical Value	Result
General Model	$H_0: \alpha_1 = \alpha_2 = 0$ $H_1: \alpha_1 \neq 0$	$F^* = 322.582$	2.76	Reject $H_0$

## 5. Conclusion

In a nutshell, based on the results, it is suggested that the policy makers should pay more attention on its higher population and capital formation to boost its economic growth. Despite unimportant factor of education spending, higher population should be accompanied with more educated and capable labor force and educational reform to ensure the nation grows in the right direction, that is, better economic performance. Besides, capital formation can be accumulated through the attraction of foreign direct investment attraction to invest in Malaysia as well as the technology advancement for and maximize the capital productivity maximization. These should be done in our effort to escalate real GDP.

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