The Impact of Economic Indicators, Industrialization and Pollutant Emissions (CO₂) on Economic Development in Malaysia

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Abstract — **The main purpose of this research is to identify whether there is any relationship between economic indicators, industrialization and pollutant emissions (CO₂) on economic development in Malaysia. Economic indicators consist of government debt, health and education expenditure. This paper used Ordinary Least Square (OLS) Method to test the factors affecting the economic development. The data collection for each variable are collected from year 1980 until 2014 for 35 years in Malaysia. The result of the study shows that industrialization and pollutant emission (CO₂) have a significant relationship on economic development. Meanwhile, government debt, health and education expenditure do not have a significant relationship on economic development. These finding will help to understand the effect of independent variables towards the dependent variable (economic development).**

I. Introduction

Over the past years, the issue of the long-term rate such as the effects of government policies on the long rate has gotten researchers' attention. The economic development reflects the appreciation between prosperity and poverty of a country and its can be measured by influence of economic indicator. The standard macroeconomic policy is one of the important elements for economic growth, but other aspects of "policy" that determine all government activities are even more significant especially related to economic performance (Cooper, 1997). Previous studies have examined the causal relationship between e-commerce and R&D and determinants of economic growth on some selected country. However, the current literature does not simplify the impact very well and only focus on some country. Cisse and Kangjuan (2018) study found that industrial development has significant effect on economic growth and industrialization will go a long way in stimulating economic growth.

Education and health spending need to be emphasized and the benefit of spending have to be worthy for the citizen. Other than that, determinant of government debt for economic development become important, especially if a country experience the fiscal imbalance. Fiscal policy may persuade the output growth for moderate levels of government debt due to economic theory which is typical Keynesian behaviour. However, the rise of expected future tax will reduce the possible positive effects of government debt at high debt levels.In the eighteenth and nineteenth centuries, Adam Smith, David Ricardo and Robert Malthus come out with economic theories that can be used for other researchers or economists. For these researches, theory state by them, which is the classical

theory of economic growth can be one of the references. These theories state is temporary and will eventually return.

According to the recent news, Malaysia is facing healthy of fit levels of economic growth. Even though the world facing a global uncertainty, Gross National Income (GNI) for Malaysia rise by 51.8 per cent and 2.26 million new jobs created. In experiencing a healthy level of economic growth, there are several macroeconomic variables that are significant or insignificant towards the economic development. Besides, the expansion of the world economy gives a huge impact, particularly on the environment and economic development of the country. World globalization will lead to rapid growth in technology such as adoption of industry 4.0 and moving towards digital economy. In pursuit of national development of a country, empowerment the living standards of population, economic progress and projects run for economic development cannot be avoided.

Most people used to ignore environmental issue arising from the enactment of economic progression and industrial projects. Although, industrialization is a key factor to the wealth of a country and better living, it ultimately contributes to climate change and global warming. This scenario will lead to major problem which is pollutant emissions and it will bring greater harm to the environment. It will cause to unhealthy environment, high rate of sickness people and increasing in health expenditure of the country. As a developing country, Malaysia needs to emphasize the country development activities such as industrialization as well as achieving healthy environment. Referring to this issue, quite several researches had done to overcome the problem, however, further research need to be done for a better future living.

This study attempts to examine the impact of economic indicators, industrialization and pollutant emissions on economic development in Malaysia. The economic indicators include government debt, education and health expenditure. Carbon dioxide (CO_2) is the chosen pollutant emission that will be conducted in this research. This research basically to determine the relationship or effect of those variables towards dependent variable. In order to become a developed country, the element of economic growth, which is human capital is essential. Education and health are the main factor that represents the quality of human capital. Education is important for producing high skill workers and expertise for a country. Furthermore, health status for individual. It depends on variable such as human behaviour, environmental and economic factors which is health expenditure.

II. Literature Review

In recent years, there was a lot of studies to determine the determinant of economic development (Barro 1989, 1991; Krmendi & Meguire, 1985). Former research has readily recognized the significant role, such as government spending on economic development (Anvari & Norouzi, 2016). Within the context of economic growth theories, there are two important theories that had been discussed which are neoclassical and endogenous growth theories. Both theories stated that the combination of physical capital and human capital are the most important aspects on economic expansion (see, among others, Solow 1956; Romer 1986; Lucas 1988). Sala-i-Martin and Barro (1992) found that if government spending high automatically lead to negative impact on economic growth, meanwhile relation of government spending on economic growth are significant.

Besides, Chen and Feng (2000) had done a research on economic growth in China regarding the higher education enrollment uses the local panel data. The results state that university enrolment and trade are positively affecting the annual average rate per capita GDP. Kaldor (1970) and Cornwall (1977) have declared that industrial revolution drives the technological change in the industry, especially in the manufacturing sector and the expansion of the industrial sector is a driving force for economic growth (see Verspagen, 2000). As the economic growth, most countries will face positive effect on pollutant emission such as carbon dioxide due to use of modern technology and industrialization.

Government debt can positively affect the economy if it is used for investment – oriented projects which is infrastructure, power supply or development in another sector (Dritsaki, 2013). However, if it is employed in public and private consumption, there will be negative impact toward growth (Bank, 2013). Government debt may have a significant relationship with the economic development. Some research showed that suitable domestic policies have a great influence on rising the investment and growth in countries that have larger debt than reducing debt-servicing obligation. The relation between public debt and economic growth based on the fact, which lower economic growth, hence contribute to high rate of debt (Reinhart, Reinhart and Rogoff, 2012). Government liability has become crucial and relevance for economic growth, mainly in a framework where policy makers have to face increasing fiscal imbalances (Afonso & Jalles, 2011). Pengkas (2018), study the relationship between the debt and growth which depends on debt breaks in Greece. The increases in the government debt-to-GDP ratio are associated with insignificant effects on economic growth.

Cunningham (1993) study the connection between debt burden and economic growth for the period 1971-1987 among 16 heavily indebted countries. The results show that the development of a country's debt burden has a negative effect on the economic growth. There was a study involve year of 1970-1988 consist countries such as South Korea, Indonesia, Sri Lanka, Bangladesh, Thailand, and Philippines regarding the relationship between debt and economic development. According to Chowdhury (1994) even though there is a bi-directional relationship between debt and economic growth in Philippines and Malaysia, there is no relation between external debt and GNP growth for the five countries. Findings results find if debt approaches 100 percent of GDP, the negative correlation between economic development and debt are mainly strong (Checherita-Westphal and Rother, 2012; Cecchetti, Mohanty and Zampolli, 2011; Reinhart, Reinhart and Rogoff, 2012; Reinhart and Rogoff, 2010a,b).

Asila (2017) found that most of citizen in Malaysia has not yet reached a satisfactory and acceptable level in the field of education. Education and economic growth are one of the popular issues had been discussed and become attraction of both researchers and policy makers over the recent years. Education is one of the determinant economic growth through a qualification on human capital. For example, in terms of maintenance, training, workforce and knowledge. Expenditure on education must be fully utilized by primary, secondary or tertiary education sector for producing more expertise and highly skilled workers in a country.

Gitana and Agne ((2018), research results have revealed statistically significant relationships between education and economic growth in majority of the selected European Union countries.

Lucas (1998) analyzed the involvement of human capital in economic development. Human capital act as a proxy and an additional role to interest other factors of production. The research recommends the importance of investment in higher education which is tertiary education to produce technicians, expertise and administrative workers. Increasing on productivity of human capital through education will lead to increase in national income, gross domestic product and result in positive impact on economic development (Ifa & Guetat, 2018). The effect of expansion of research and development and the promotion of innovation new products through human capital will encourage economic growth. According to this view, human capital can be an engine of technological process, thus raising the productivity of other inputs in the production process (Jones, 1998).

The time series' method had been used to investigate existing research involve period 1965 until 1999 and the relation between public spending on education and economic development in Uganda (Musila and Belassi, 2004). It's been proven that spending on education per worker has a significant positive impact on economic development includes short and long terms. Blankenau et al. (2007) investigate the relationship between long-term education spending and economic development and the results showed positively related within a sample consists of 23 developed countries. Industrialization on production drives the growth of the economy where machine can be replacing the workforce in order to achieve productivity. At the same time, the machines require who is trained, know arithmetic, less specific human capital and more generally. Therefore, the implementation and uses of technology are negatively related to the cost of education (Zeira, 2009). Besides, Levine and Renelt (1992) found that in many of regression in estimating a large number of growth of GDP, human capital variable was not statistically significant. Other studies report that, either a negative or no relationship between education expenditure and economic development. Last but not least, there is a indirect correlation between education spending and economic development in 20 years for estimation of 43 developing countries (Devarajan et al, 1996).

Health is becoming an attention and interested factor in determining of public spending. This is because there is a fact that government spending on health expenditure may influence economic development. Other than that, several researchers stated that spending on health will encourage income equality and decrease poverty rate (Chu et al., 1995; Barro, 1991; Tanzi and Chu, 1998). Rivera and Currais (2003) come out with a logical assumption which is healthier life may influence economic efficiency for countries growth and human being. Besides, health expenditure is a determinant of health condition in a country for some specific reasons (Parkin et al.,1987). Health expenditure by the government will determine the economic development. Sharma (2018), study show the population health proxied by life expectancy exert a positive and significant effect on both real income per capita as well as growth. Besides, health expectancy and mortality rate also can be other factors to improve the health behaviour, well-being or other valuable effects as well as contribute to the growth of the economy. Some researcher argues that health is irrelevant factor when it comes to explain economic development as well influencing productivity (Rivera & Currais, 2003).

For the past year, Malaysia is one of the country that was proclaimed as a good model in becoming industrialized for other countries to emulate (World Bank, 1993). However, since late 1990s, negative deindustrialization and less on industrial deepening lead to different cast of Malaysian experience (Rasiah, Crinis, & Lee, 2015). Manufacturing is main sector that contributes to the industrialization. In the mid-1990s, Intense inflows of foreign direct investment into the manufacturing sector caused empowerment on labour

market (Ariff 1991; Rasiah 1995a). The attention of industrial policy shifted toward industrial expanding and low unemployment level because, it will provide more opportunities toward employer for creating more and better jobs (Rasiah et al., 2015). Studied found that several Asian countries have significant impact towards economic growth like China, India and Indonesia (Kniivilä, 2007).

Stimulating structure change from low value added to high value-added activities showed that industrialization is observed to drive its own growth, as well as that of the other sectors. Industrialization is an important booster for economic growth and trade openness further augments the effect of industrialization on economic growth (Opoku and Ming Yan, 2019).

Henderson et al., (2002) state that major improvements in productivity, land reform of late 1940s in South Korea and industrialization contributes to the growth of economics. There is a relationship between economic development and industrialization. Besides, other findings found that there is a negative correlation between industrial growth rate and economic development for some developing countries (Oburota & Okoi, 2017). The finding reveals that human capital, income level and industrial output have not reached the threshold needed to contribute to economic growth. The existing study result is reliable with the environmental Kuznets curve (EKC) hypothesis stated by Selden and Song (1994), Hettige, Lucas, and Wheeler (1992), Grossman and Krueger (1995), Cropper and Griffiths (1994), and Bengochea-Morancho (2004) and Martinez-Zarzoso. In theoretical, when industry growth, especially in the manufacturing sector, it will lead to diffusion of carbon dioxide emission and contribute to an unhealthy environment.

For the past year, development of economy and carbon emissions (CO_2) had been one of the interested topic to be discussed by the researchers regarding its relation. Based on the most research, the findings found that economic growth has a significant effect on carbon emissions (CO_2) especially, in China because of the rapid growth in industry (Li 2010; Meng et al. 2011; Zhang et al. 2012). Besides, Holtz-Eakin and Selden (1995) also examine the reduced-form relationship between real GDP per capita and national carbon emissions (CO_2). The data collected was from 130 countries during the period 1951-1986. On the other hand, Grossman and Krueger (1993) had used a random city-specific effect model to investigate the effect on GDP per capita on various local environmental indicators. The findings showed there is no indication that environmental quality decline with economic growth. At the same time, there is no significant correlation between economic development and carbon emission (CO_2) is indicates by several studies (Lantz and Feng 2006). Abbas and Mosoumeh (2019), investigated the nexus between economic growth and CO_2 emission which gives reasons for policy option that have to reduce emission by imposing limiting factors on economic growth as well. Further, CO_2 emission are stimulated in higher or lower levels and consequently, a potential reduction of the emissions should have an adverse influence on economic growth.

III. Methodology

This research used the secondary data which have been collected from several sources. The sources are Malaysia Energy Hub, World Bank Data and Department of Statistic. The data obtained for all variables started from year 1980 until 2014 in annual basis of 35 years. The data collected for dependent variable, economic development measured based on GDP per capita (current US$). Meanwhile, independent variables, which are government debt, education and health expenditure, are in percentage of GDP, industrialization measured based on industry growth rate and pollutant emission.

The dependent variable for this research paper is economic development in Malaysia and four independent variables were used which are government debt, education and health expenditure, industrialization and pollutant emission in Malaysia. Ordinary Least Squared method (OLS) is employed for the process of evaluating data. The data will be regressed using E-Views (Economic Views) software. E-Views, which is affected for instructional use in the areas of econometric analysis, forecasting analysis, and statistics can help to estimate multiple regression model. Besides, E-Views can be used to diagnose several tests which is checking for normality, autocorrelation, multicollinearity and heteroscedasticity problem. The hypothesis statement stated in this study recognized the connection between the dependent variable and independent variable.

IV. Findings and Analysis

This chapter interprets the result of the data referring all the model from the previous chapter. The relationship between economic development and government debt, health expenditure, education expenditure, industrialization and pollutant emissions had been examined using the Multiple Linear Regressions Model. E-views software had been used to run the data collected from related sources.

This study helps to observe the relationship between the dependent variable and all the independent variables. The results are interpreted when it has been obtained from the software. To analyse the data on finding, several tests had been run according to the previous chapter. Data must be interpreted and discussed based on the reading. Test need to be diagnosed are descriptive analysis, normality, auto correlation, multicollinearity, F- test statistic, T – test statistic and heteroscedasticity test.

Multiple linear regression is a statistical technique that uses several explanatory variables to predict the outcome of a response variable. It is used to explain the relationship between one continuous dependent variable and two or more independent variables. In this research, multiple linear regression is used to explain the relationship between independent variables on economy development. Multiple linear regression equation is derived as:

$$InGDP = \alpha + \beta 1 lnGovDebt - \beta 2 Edu\_Exp + \beta 3 lnHlth\_Exp - \beta 3 lnInd\_Grwth + CO_2 + \mu$$

Where:

InGDP	= Gross Domestic Product
Edu_Exp	= Gross domestic product
InInd_Grwth	= Industry growth rate
InGovDebt	= Government Debt
InHlth_Exp	= Population
CO_2	= Carbon Dioxide
α	= Constant
μ	= Random error term

The result of regression shows that:

$lnGDP = 11.31258 + 0.040846\ lnGovDebt\ -0.020301\ Edu\_Exp + 0.012425\ lnHlth\_Exp\ - 1.243055\ lnInd\_Grwth + 0.295655\ CO_2 + \mu$

Equation above show that expenditure on education and industrial growth rate have negative relationship with GDP while Government debt, health expenditure and pollutant emission (CO_2) have positive relationship with GDP.

Table 1: Result Of Coefficient Value

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGOV_DEBT	0.040846	0.108650	0.375941	0.7097
EDU_EXP	-0.020301	0.019077	-1.064157	0.2960
LNHLTH_EXP	0.012425	0.041515	0.299299	0.7668
LNIND_GRWTH	-1.243055	0.443033	-2.805787	0.0089
CO_2	0.295655	0.025569	11.56311	0.0000
C	11.31258	1.908204	5.928391	0.0000

R-squared	0.974155	Mean dependent var	8.277578
Adjusted R-squared	0.969699	S.D. dependent var	0.596412
S.E. of regression	0.103819	Akaike info criterion	-1.537536
Sum squared resid	0.312571	Schwarz criterion	-1.270905
Log likelihood	32.90688	Hannan-Quinn criter.	-1.445495
F-statistic	218.6139	Durbin-Watson stat	1.772482
Prob(F-statistic)	0.000000		

Dependent variable = Economic Development (GDP Per Capita)
Coefficient of Determination (R^2) = 0.974155
97.41% of the total variation of dependent variable can be explained by all the independent variables.
Adjusted (R^2) = 0.969699
96.96% of the total variation of dependent variable can be explained by all the independent variables after adjusting the degrees of freedom.

Government Debt
There is insignificance relationship between government debt emission and economic development in Malaysia at 5% because 0.7097 is greater than 0.05. There is results of Granger causality tests showed even though there is a bi-directional relationship between debt and economic growth in Philippines and Malaysia, there is no relation between external debt and GNP growth for the five countries (Chowdhury,1994).

Education Expenditure
There is insignificance relationship between education expenditure and economic development in Malaysia at 1% because 0.2960 is greater than 0.01. Levine and Renelt (1992) found that in many of regression in estimating a large number of growth of GDP, human capital variable was not statistically significant.

Health Expenditure
There is insignificance relationship between heath expenditure and economic development in Malaysia at 5% because 0.7668 is greater than 0.05. Other studied claim that health is irrelevance factor or has insignificant relationship towards economic growth (Rivera & Currais, 2003).

Industrial growth
There is significance relationship between industrialization and economic development in Malaysia at 1% because 0.0089 is less than 0.01 and studied by (Kniivilä, 2007) found that several Asian countries has significant impact on economic growth.

Pollutant Emission (CO_2)
There is significance relationship between pollutant emission and economic development in Malaysia at 1% because 0.0000 is less than 0.01. (Li, 2010) also mentioned that carbon emission has significant effect on economic development.

V. Conclusion

According the findings from the regression analysis, researcher come out with conclusion to find out the relationship between economic development and other factors which are government debt, health and education expenditure, industrialization and pollutant emission (CO_2). The studies indicate that Industrialization and Pollutant Emissions have significant affect toward economic development in Malaysia. Besides, government debt, health and education expenditure show insignificant relationship towards economic development in Malaysia as well as less influencer to the dependent variable.

In addition, 97.41% of total variation of economic development (DV) can be explained by government debt, health and education expenditure, industrialization (Industry growth) and pollutant emission (CO_2). Moreover, result for F – statistic = 0.000000 is less than 0.5 which is significant at 1% level of significance. Thus, HO is rejected and variation in economic development can be explained by at least one IV (government debt, health and education expenditure, industrial growth or pollutant emissions).

Besides for t-test, industrialization and pollutant emissions show significant relationship with Economic development, so alternate hypothesis is accepted by rejecting null hypothesis. Meanwhile, government debt, health and education expenditure show insignificant relationship with Energy Consumption by not rejecting the null hypothesis. Based on the result, there is a problem of multicollinearity found in the regression. The relationship between health expenditure and pollutant emissions are highly correlated since rising in rate of pollutant emissions will affect the country to expand more in health expenditure. So, the remedies taken is do nothing as the deletion of multicollinear variable that belong in an equation will cause specific bias

VI. Recommendation

In these studies, researcher recommends that industrialization and pollutant emissions should have been focused more as these factors can influence into determinants of economic development in Malaysia.The government has huge responsibility toward the economic activities done in a country. Activities include industrialization or urbanization need to be done follow by the law and regulation, as well as control by the authorities to overcome environmental problems. Besides industrialization will lead to positive impact to gross domestic product for a country. Government needs to ensure all the progress is running smoothly in order to increase rates of economic growth.

Meanwhile, other factors cannot be omitted as well since they still affect the economic development in Malaysia. Government debt, health and education expenditure need to be reviewed for the sake of future generations in achieving the better standard of living. Furthermore, it is recommended for the researcher to look back in every finding before make a conclusion when doing a research study. Some result may help related parties to know what need to be done in order to become a better nation. A negative result may not just give the negative impact to our country, but it may give a positive view towards the development of economy and vice versa.

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