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Article

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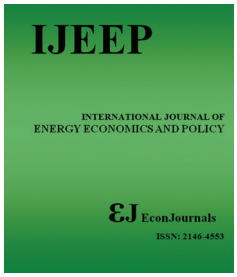

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The Impact of Healthcare Expenditure and Healthcare Sector Growth on CO_2 Emission using Dynamic Panel Data System GMM Estimation Model during COVID 19 Crisis

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ABSTRACT

As huge consumers of water and energy, healthcare sector have a significant environmental impact. The healthcare sector is accountable for answering countless the most dangerous effects of climate change and pollution, deadly environmental emissions and other greenhouse gases itself. This study aims to observe empirically the effect of healthcare expenditure and heath sectors growth on CO_2 during Covid 19 outbreak in Malaysia. As the world has awakened to the potential risks of Covid 19, there has been a massive effort to add capacity to the healthcare system rapidly. In Malaysia, apart from stressing the need for the public to strictly adhere to the Movement Control Order (MCO), the government an immediate boost in funding for healthcare services through initial stage fiscal policy response to Covid 19 outbreak. This research used Dynamic Panel Data Model also known as longitudinal study. This study explained Dynamic Panel Data System GMM Estimation model is fitting to interpret the outcome, indicate healthcare expenditure and healthcare growth on Covid-19, inflation rate and unemployment rate have significant relationship with CO_2 emission. Empirical findings suggest that CO_2 emissions policies reforms are required to channelize healthcare sector growth to a more government spending resulting from fiscal policy designed by the government of Malaysia. The regulators of other countries should pull out CO_2 emissions policies to achieve sustainable economic growth and health sector growth development. The results provide important information to allow comparisons of the health-care sector with other economic sectors in Malaysia and the global healthcare sector in terms of CO_2 emission. In particular, the results are intended to contribute to the understanding of the CO_2 emission of national healthcare systems so that policymakers, especially in low-income and middle-income countries, can develop relevant CO_2 emissions mitigation policies.

Keywords: Covid-19, Fiscal Policy, Healthcare Expenditure, Healthcare Sector Growth, CO_2 Emission, Dynamic Panel Model, Malaysia
JEL Classifications: E31, Q41, Q57

1. INTRODUCTION

In developed countries, healthcare sector have been estimated to contribute around 3% to 8% of national greenhouse gas emissions, 8% in the USA and 3% in the United Kingdoms, although more robust analyses including other countries need to be undertaken. Nowadays, the Government's immediate priority was to reduce the Covid 19 epidemic from continue to spread. Malaysia declared an amount of RM53 billion coronavirus stimulus package to help Movement Control Order (MCO) associated businesses and citizens survive the crisis. The Health Ministry of Malaysia will receive a distribution amounting to RM500 million and the government will allocate additional RM1 billion to obtaining hire medical experts and equipment to combat Covid 19. Many

Medical specialists notify of a serious shortage of health capitals and shortage of funding for healthcare services resulting from the increasing cases of Covid 19 and can could put lives at highest risk in Malaysia. Recognizing front liner healthcare sacrifices, the Government will allocate the special stipend ranging from RM400 to RM600 monthly till the epidemic ends. In addition, the Government also decides to extend a special stipend of RM200 monthly to police, military, civil defence customs and RELA members that are directly involved in imposing the MCO. Total of 169,000 numbers of front liners are estimated to advantage from this allowances.

Furthermore, the insurance sector will create a special allocations to cover the costs acquired for screening test of up to RM300 per person and takaful medical certificate to undertake the test at private hospitals and laboratories as initiated by Ministry of Health (MOH) amounting of RM8 million. Lastly, insurance and takaful companies will provide a 3 month deferment on premiums by contributors that affected by the pandemic. Meanwhile in Wuhan, China, the shortage of protective medical supplies and lack of knowledge about COVID-19 were the main factors causing the large number of healthcare workers to contract the virus in the early stages of the outbreak in Wuhan, China. However, 31 medical teams involving of more than 42,000 nurses and doctors were sent to Wuhan to fight the outbreak.

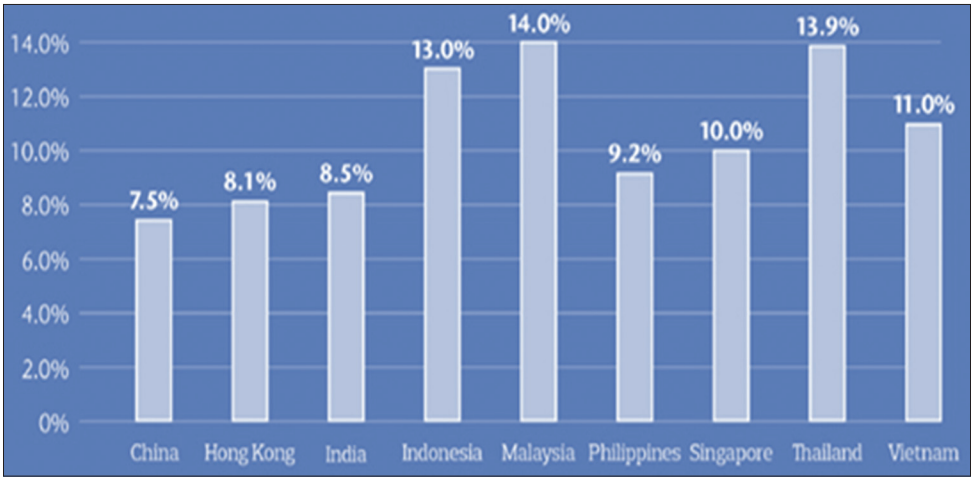
Healthcare benefits cost growth increasing during Covid-19 because of shortage of medical supply. Thus, a lot of government spending on healthcare expenditure was acquired to put in stimulus package focused on healthcare industry. This has appropriately focused spending on providing acute-care capacity, ventilators, and stocks of other critical medical materials, such as personal protective equipment. Theory from Keynesian and Endogenous growth theories have pointed out that fiscal policy plays a vital role in raising speed of economic development. Most of the previous literature on the relationship between economic sector growth and government spending has determined that government spending can influence sector growth positively through various ways. Figure 1 shows that the government spending can increase healthcare sector growth by providing public goods that are reflecting major component of aggregate demand. Moreover, many of literatures relating on this issue and the relationship between government spending and economic growth is still not clear. Baffes and Shah (2013) was first try to determine the relationship between different types of government spending and military sector growth. The findings shows that the elasticity with veneration to human resource capital and infrastructure are highest and lowest respectively. The research concludes that high sector growth in the world economy can be achieved through investing more in human resource development and less in military and other non-development activities. Knack and Keefer (1995) and Keefer and Knack (1997) views that government spending on a strong enforcement of contracts, legal system for the protection of rights and dispute settlements are helpful in raising sector growth. According to Asghar et al. (2011), the resources allocated to health sectors and education increasing the healthcare sector growth and government should introduce policies for encouraging private sector to invest more in health and education.

1.1. CO_2 Emission and Healthcare Sector in Malaysia

Figures 2 and 3 demonstrate that the total amount of Carbon dioxide (CO_2) emission emitted by industries in Malaysia within the year 2006 to 2019. It appears that CO_2 emission throughout the observation period is very volatile. It had seemed that the 1st 4 years indicated a dramatic dip in the emitted amount of CO_2 by which from 2005 to 2007 the amount plummeted from 125,374 .730kt to as low as I 07,934.478kt a drop for 13.9%. However, from 2008 onward the graph showed a gradual increment, yet with few slip backs but only slightly. From the year 2006-2019, the graph show that CO_2 emission soared by 27% that is an increment of 28,782 .283kt followed by a slight drop of merely on 2002. It is assumed that economic growth contributes to industrial development by which industrial development plays a vital role regulating in the emission of CO_2. It may have a direct or an indirect effect to the environmental degradation both positive and negative. Poveda and Martinez (2013) stated that the development trends and CO_2 emission in three of the countries they explored differs. Colombia: A developing country, Germany and Sweden: both developed countries showed that an increase in economic indicator does not promise an increase to CO_2 emission.

Hospitals consume energy to provide power medical equipment, lighting, supply heating heat water and air conditioning. They also produce waste from both waste water and single-use disposable supplies. Hospitals consume more energy than other nonresidential buildings per square meter of floor space, in part because of their continuous operation. This study can be supported by Adom et al. (2012), long run Vector Error Correction causality test were performed to identify the direction the variable runs amongst each other. From this study, the result of and pollution in Malaysia depending on the variables, each has its own effects on the others. The result showed that the causality direction is running from healthcare sector and CO_2 emission to government expenditure. This study proves that government expenditure is significantly affected by CO_2 emission and sectors, all in contributions to pollution. This study clearly stated that the variance decomposition analysis results revealed that economic growth contributes largely to changes in future carbon emission in Senegal and Morrocco. The result from the empirical studies showed that we had achieved the purpose of this study where most of the result indicated that economic growth indeed had positive effects on pollution. However, CO_2 emission is not the only means of pollution healthcare sector output, on the other hand would come from healthcare sectors. In a contradictable study to the one mentioned above, Chemiwchan (2012) said that since 30 years ago, key industrial pollutants in the developed world have reduced their emission levels, however the emission level in developing countries are increasing. The study also stated that there are substantial variation of industrial pollutants in emission intensities considering the time frame and countries explored. Zhang et al. (2013) suppo11ed by finding out that large proportions of water waste pollution comes from export embodied industrial emission. This study uses three distinguished variables upon relating it with the researcher's topic of interest. Such variables and its trend in Malaysia will then be explained further. In additions, Dialysis consumes 120-800 L of fresh water per treatment, depending on the type (clinic vs. home) and duration of the therapy session.

Figure 1: Health care benefit cost growth in 2020



Source: Aon's 2020 global medical trend rates report

Figure 2: Malaysia CO_2 emission

Source: Trading Economics (2020)

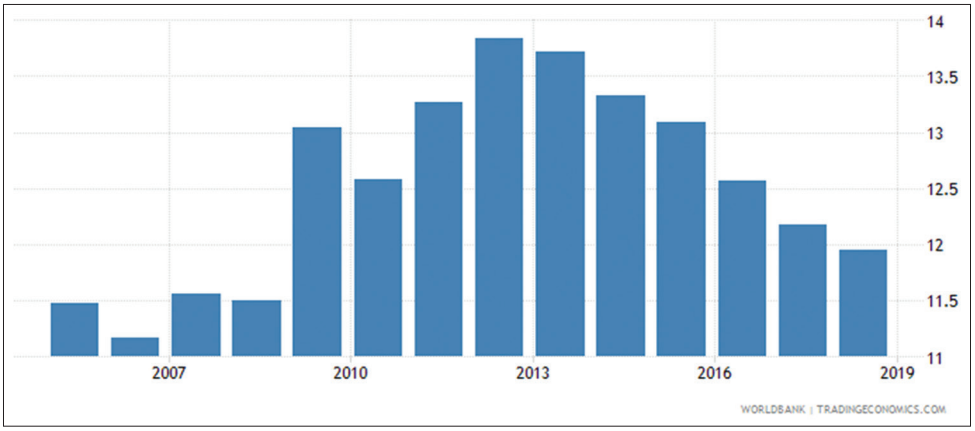
Much of that water is discarded in the reverse osmosis process that creates the dialysis fluid, and it is known as reject water. It is essentially bacteria free, with pH, turbidity, and electrolyte characteristics not unlike those of municipal and industrial water supplies. Recycling of reject water for gray water uses for example, irrigating lawns or flushing toilets—has been advocated and has been tried in some settings. Recycling reject water is estimated to be less costly than generating fresh water through reverse osmosis of sea water. Finally, indirect energy and environmental impacts are associated with their purchasing activities.

2. LITERATURE REVIEW

Healthcare benefits cost growth increasing during Covid 19 because of shortage of medical supply. Thus, a lot of government spending was acquired to put in stimulus package focused on healthcare industry. This has appropriately focused spending on providing acute care capacity, ventilators, and stocks of other critical medical materials, such as personal protective equipment. Theory from Keynesian and Endogenous growth theories have pointed out that fiscal policy plays a vital role in raising speed of economic development. Most of the previous literature on the relationship between economic sector growth and government spending has determined that government spending can influence sector growth positively through various ways. Figure 3 shows that the government spending can increase healthcare sector growth by providing public goods that are reflecting major component of aggregate demand based on Aon's 2020 Global Medical Trend Rates Report. Moreover, many of literatures relating on this issue and the relationship between government spending and economic growth is still not clear. Baffes and Shah (2013) was first try to determine the relationship between different types of government spending and military sector growth. The findings show that the elasticity with veneration to human resource capital and infrastructure are highest and lowest respectively. The research concludes that high sector growth in the world economy can be achieved through investing more in human resource development and less in military and other non-development activities.

Knack and Keefer (1995) and Keefer and Knack (1997) views that government spending on a strong enforcement of contracts, legal system for the protection of rights and dispute settlements are helpful in raising sector growth. According to Asghar et al. (2011), the resources allocated to healthcare sectors and education increasing the healthcare sector growth and government should introduce policies for encouraging private sector to invest more in health and education. Regarding to the variables, it is assumed that economic growth affects the emission of CO_2. Hence, the researches were done as to relate economic growth and CO_2 emission. Adom et al. (2012) conducted a research in Ghana,

Figure 3: Malaysia GDP from healthcare sector



Source: Trading Economic Trading Economics (2020)

Senegal and Morocco using three related methods of Bounds Co-integration approach, Toda and Yamamoto granger causality test followed by variance decomposition analysis. The idea was to probe into the short - run causal relationship and long - term equilibrium relationships between CO_2 emissions, technical efficiency. Industrial structure and economic growth of the three mentioned African countries. The result indicated the existence of multiple long - run relationships for Ghana and Senegal yet a one - way long - term equilibrium relationship for Morocco. The final result of their study showed that economic growth plays a large role of contributing to changes in future carbon dioxide emissions in Senegal and Morocco whereas in Ghana it is technical efficiency.

In the meanwhile, employing the co-integration analysis, Piaggio and Padilla (2012) conducted a paper that studies the relationship between CO_2 emissions and economic activity of 31 countries: 28 OECD and the remaining are China, Brazil and India from 1950 to 2006. Each country's long run relationships were estimated by which functional equality, certain parameters, as well as the turning points whenever appropriate are rejected. The result confirms the need to consider differences among countries in the relationship between air pollution and economic activity in order to avoid void estimations and conclusions. In 2013. Burnett et al. (2013) used vector error correction model as their empirical specification to analyses the potential misspecification of energy consumption as a controlled variable as well as analyzing the relationship of the carbon Kuznets curve. The study they had done suggested that emission intensities are what affected by economic growth instead of absolute emission as often claimed by past studies.

Based on a past research by Anderson and Karpcstam (2013). By which their paper analyses the determinants of energy and carbon intensity as ell as scale effects for ten economies; 8 developed economics and two emerging economies from 1973 to 2007. In this paper, it is evident that emission over the long - terms arc affected by climate policy on capital accumulation rather than in short - terms. There are differences between short - terms and long - term s results as such. The growth on productivity reduces only energy intensity whereas real oil price reduces both energy and carbon intensities. Despite revealing that carbon tax itself in inadequate to dissociate emission from economic growth, it is somewhat deemed as a vital policy tool to reduce emissions with regards to the real oil price effect. Anderson and Karpcstam (2013) whom conducted a research on 11 distinguished countries namely Austria, United States, Belgium, Sweden, Canada, Republic of Korea, Chile, Japan, Denmark. Ireland and France on the basis of a graphical hypothesis Kuznets Curve, proved that the effect of economic growth on CO_2 is positive. The results showed the effect of economic growth on CO_2 is negative before it reaches the threshold value of economic growth and that the disproportionality only existed in these countries during 2000 to 2007 as an inverse Kuznets U - shaped curve. However, it proves to contradict once the countries have reached the threshold value therein: the effect of economic growth on CO_2 is positive.

Adom et al. (2012) employed the macro economic analysis taking emission data from the energy information administration where coefficient upon GDP data were calculated on both longitudinally and cross - sectionals, conducted a paper purposely to show how close the linkage of equivalent emission and economic development is over time as well as across countries. The links of energy to output to pollution: the conversion factor is estimated between economies over time and is claimed presently too high, ascertaining a global climate change. The technical consequence were that it is very hard to coordinate the global environment, subject to the combination of weak governance upon making policies and implementations, not forgotten the gigantic nature of the PD game. IL is claimed that focusing on conversion factors would be a good mean of stabilizing CO_2 emission as the paper exhibited the clear and Juggernaut type connections of both energy economic and output CO_2 emission. These comprehensive literature reviews related to this topic of interest prove evidence upon variations towards the causality relationship that exists between government expenditure, CO_2 emission and manufacturing output. Most of past literatures had studied on tJ1e relationship of these variables, however separately. Most studies employed the unit root test, co - integration test, and granger causality test in their approach of examining the relationship between the three variables in various nations including the Asian countries. European countries. OECD countries and African countries. This study, on the other hand will focus on these three variables specifically and simultaneously. The methodology utilized in this research is the Unit Root Test Johansen co- integration. Vector

Error Correction Model (VECM) and Granger Causality as these mentioned methods were frequently used by previous studies. All of these models will then be explained in the next chapter.

3. METHODOLOGY AND RESULTS

3.1. Model Specification

For this study, the explanation of interrelations between healthcare expenditure and growth, inflation rate, interest rate and unemployment rate are using the approach of production function. This approach is already extended by Cobb-Douglas which is he developed the production framework to understand and explore more about the linkage between those independent variables: (Rashid and Razak, 2017) Healthcare growth, healthcare expenditure, inflation rate, interest rate and unemployment rate. Specifically, the following extended by Cobb-Douglas is the production function:

Model 1

$$Y=EK^{\alpha}E^{\lambda}L^{\beta}e^{u}$$

Model 2

$$Y=HK^{\alpha}E^{\lambda}L^{\beta}e^{u}$$

The function is explained about the Y is energy consumption, while E, K and L is stand for real income, capital stock and labor force respectively. While the term E and H is refers to the healthcare expenditure and healthcare growth e is the error term. α, λ, and β are the production elasticities which are stands for real income, capital stock and labor force. After Cobb-Doughlas technology have been restricted to ($\alpha+\lambda+\beta=1$), constant returns to scale could be gained. In this research, the model is revived the Y (CO_2 emission) into the healthcare expenditure and healthcare growth to be endogenously affected by all independent variables (inflation rate, interest rate and unemployment rate) (Adam and Miroslawa, 2011).

Model 1 Healthcare Expenditure and CO_2 Emission

$$CO_2 = f(HE, INF, INT, UNP)$$

Model 2 Healthcare Sector and CO_2 Emission

$$CO_2 = f(HG, INF, INT, UNP)$$

Healthcare expenditure and healthcare growth is logarithmic value which is the dependent variable for this research. Healthcare expenditure and Healthcare growth that is being measured in this research is being taken from five Asia region Country which is Indonesia, Philippines, Thailand, China and Malaysia. While "HE" refer to healthcare expenditure on healthcare sector, "INF" is inflation rate, "INT" is interest rate and lastly, "UNP" refer to unemployment rate. All variables data are collected in selected developing country in Asia region.

Based on the theoretical and empirical review that have been presented, all the relationship can be specified as follows:

Model 1: Healthcare Expenditure and CO_2 Emission

$$CO_2\ Emission_t = \beta^1 HE_t + \beta^2 INF_t - \beta^3 INT_t - \beta^4 UNP_t + C_t$$

Model 2: Healthcare Sector and CO_2 Emission

$$CO_2\ Emission_t = \beta^1 HG_t + \beta^2 INF_t - \beta^3 INT_t - \beta^4 UNP_t + C_t$$

Based on the equation, the positive sign of "HE" shows that there is a significant value of CO_2 emission towards healthcare expenditure and Healthcare growth. It is shown that if healthcare expenditure and healthcare sector is increase, then the CO_2 emission will be increase. In this case, the relationship between the CO_2 emission with healthcare expenditure and HG can have a positive relationship. The elements of healthcare expenditure do have relationship with FDI and the healthcare growth. Government policies in the healthcare sector supported by political instability and poor environment for investment in the country have affected the CO_2 emission (Chingarande, 2012). The positive sign of "INF" which is actually present the inflation rate that affecting CO_2 emission in selected Asia country. The inflation that happened is a continual rise in price level where it is the index of all prices in the economy. And this phenomena will be called "inflation" when the price level increment happened in term of ongoing rising. This situation also is actually showing the short run aggregate supply shifting up while aggregate demand remains constant, where the price level will increase. Inflation phenomena has been hypothesized by many researchers and practitioners in order to change and enhance the economic growth of countries (Rashid and Razak, 2017). However, there are so much literature on the impact of inflation rate itself. For example, (Li, 2006) argues that the existence and nature of the inflation-economic growth nexus is one of the most significant macroeconomic controversies. Furhermore, Omankhanlen (2011) said that inflation has been hypothesized to distort the tax system which would in turn discourage investors for the long run due to money illusion. On the other hand, Obiamaka (2011) stated that despite of the consensus among many researchers and practitioners on the negative relationship between inflation and CO_2 emission, inflation itself could have a positive impact on CO_2 emission and in turn growth provided that it does not exceed a certain threshold. Moreover, the last positive sign of 'UNP' represent unemployment rate.

The unemployment rate is actually the percentage of people in a country who are able to work but not working. In a normal situation, when the economy of a country is showing a positive growth, the unemployment rate should be decrease. However, if the situation that happened is vice versa, it will lead to the higher unemployment rate and decrement productivity of CO_2 emission. According to Irpan (2016) researchers in Malaysia has studied the factors leading to decrease unemployment rate by to reduce CO_2 emission.

4. CO_2 EMISSION POLICY ON COVID 19

Unlike the global financial crisis in 2008, and the Asian financial crisis in 1997, Covid 19 crisis is a public health crisis first, and an economic crisis second. Following this, economists generally agree

that economic policy should focus mainly on bolstering public health efforts in handling the pandemic whilst ensuring the welfare of the poorest and businesses. For Malaysia, the RM20 billion stimulus package announced in early stage of this outbreak is a good start and already comprises several of the actions proposed. This study concludes that the government should allocate more resources to the social sectors for raising productivity. Health is another major form of human capital. Many studies have shown the existence of positive relationship between health and economic growth. Improvement in health status leads to an increase in life expectancy that means more opportunities for workers to work more and earn more income. Equal and proper delivery of health care services is considered to be highly important in achieving health related objectives of healthcare expenditure. Expenditures on human capital may have positive impact on economic growth. Law and order situation in a country strongly affects the living conditions of the people. Sound law and order situation protects individual and property rights, attracts FDI and provides strong incentives to the domestic investors to invest (Alola, 2019). This boosts economic activity and generates employment opportunities for the people. Healthcare expenditure on law and order and sector growth may be positively or negatively related to each other. This implies that healthcare expenditure spending on human capital and community services should be given much emphasis for promoting health sector growth in Malaysia (Kinoshita and Campos, 2003).

For this purpose, effective policies are needed to formulate and implement for promoting human capital formation and economic and community services in Malaysia. The government should curtail its expenditure on subsidies as it is inflationary in nature and creates some other economic and social problems in the country which hamper the process of economic growth (Chingarande, 2012). The government should reallocate and prioritize its expenditure on law and order for achieving success in eliminating law and order situation faced by the demand on the health system that can prevent health systems from being overwhelmed, mortality from Covid 19 will be significantly lower (Yavas and Malladi, 2020). A more practical and perhaps more immediate concern is how mounting energy scarcity, increasing energy costs, and societal pressures to reduce emissions might actually pose a threat to the delivery of health services. Health facilities depend on energy to operate and energy costs have been shown to contribute to health care price inflation. Also, the plastics commonly used in medical equipment and medical supplies require petroleum feedstock. Understanding the energy consumption and emissions associated with health services is important not only to identify opportunities to minimize their environmental impact, but also to facilitate their adaptation to a low-carbon economy especially during Covid 19 crisis. Managing CO_2 emissions is managing energy consumption, and vice versa. It is a win–win proposition.

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