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Abstract

This study focuses on the macroeconomic, environmental, and socioeconomic determinants that would bring an impact on the healthcare. The ASEAN countries' economic growth, carbon emissions, urban population, and energy consumption are hypothesized to be correlated with healthcare expenditure. This study aims to investigate the impact of each factor affecting healthcare expenditure in these six ASEAN countries. The study looks into six ASEAN countries, i.e. Indonesia, Philippines, Thailand, Malaysia, Singapore, and Brunei Darussalam for the period of 2010-2014. A panel data analysis was conducted to meet the objectives of this study. To test the stationarity of the data, panel unit root tests including Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test were conducted. Next, Poolability F-test, Hausman test and Breusch-Pagan Lagrange Multiplier test had been carried out in order to select the best estimation model out of the three models which are Pooled Ordinary Least Square (POLS), Fixed Effect Model (FEM) and Random Effect Model (REM). Both ADF test and PP test suggested that all the variables were in stationary at second differencing with trend and without trend at the significance level of 1%. The following results of Poolability F-test, Hausman test and Breusch-Pagan Lagrange Multiplier test revealed that REM is the best estimation model to be applied in this study. Based on the REM findings, there is a negative relationship between economic growth at 1% significant level and HE that does not reflect Wagner's Law in the context of this study. The finding of an insignificant relationship between carbon emission and HE at 1% significant level also does not reflect the Social Capital Theory which suggests that poor environmental quality and subsequent health damages lead to higher government health spending. The conclusion of this study had inferred that both economic growth and urban population have a negative significant impact towards healthcare expenditure in countries where private healthcare services, especially those located in urban centres, play important roles in complementing public healthcare services in serving the population. Meanwhile, carbon emission and energy usage are found insignificant to healthcare expenditure.

Keywords: Demographic factors; Healthcare expenditure; Socioeconomic factors; Southeast Asia; Urban.

1. Introduction

Infectious diseases such as Severe Acute Respiratory Syndrome (SARS) outbreak (2002-2004), the global spread of Influenza A H5N1 outbreak (2005), H1N1 pandemic outbreak (2009), and COVID-19 outbreak have proven that infectious diseases pose a general threat to the "just-in-time" global economy. In the European Union countries, public spending on health per capita and the level of socio-economic development are closely related as reported by Peña-Sánchez et al. (2021). In China, the government's healthcare expenditure percentage was the most important factor for satisfaction with the health system, and the results further suggest that the priority of satisfaction for healthcare resources has shifted on the national level from economic affordability to more intensive "people-centered" services during recent years (Peng et al., 2021). On the other hand, the South Asian countries have below world average public health expenditure (Rasul et al., 2021). For instance, the Balance of Trade in Pakistan always remains negative which means it spends more on imports and earns less from exports that it affects spending on public health (Anwar, 2016; Tahir et al., 2015).

According to Sagarik (2014), the social protection has become an important public policy issue because the level of globalization has grown rapidly among ASEAN countries. ASEAN countries occupy about 9% of the world's population, which is around 600 million people, with Indonesia having the largest population and Brunei Darussalam having the smallest population in 2019 (See Table 1).

Table 1. Total Population of ASEAN 6 Countries in Year 2019

Country	Total Population
Indonesia	270,625,568
Philippines	108,116,615
Thailand	69,625,582
Malaysia	31,949,777
Singapore	5,703,569
Brunei Darussalam	433,285

(Source: World Bank Databank, 2020)

However, differences are seen in each country's health spending as shown in Figure 1. Thailand marked the highest domestic HE while Indonesia marked the lowest domestic HE which was 2.79% and 1.07% of GDP respectively in 2014. Singapore's total health-care expenditure in 2016 was lower than that of most other high-income countries (Tan et al.,

2021). Nevertheless, Singapore residents enjoy one of the world's highest life expectancies with an average annual healthcare expenditure of about 4% of GDP in the last decade (Wong et al., 2021).

Based on the International Monetary Fund World Economic Outlook figures, ASEAN's combined GDP has tripled to US$2.5 trillion from 2000 to 2014 which accounts for 3.2% of the world's economy. Figure 2 shows the trend of the GDP per capita for ASEAN 6 countries over 15 years from 2000 to 2014. There was a fluctuating line trend for Singapore and Brunei Darussalam while the other 4 ASEAN countries remained quite stable throughout the 15 years. In addition, Singapore had the highest GDP per capita among them in 2014, followed by Brunei Darussalam which had $57,562.531 and $41,726.784 GDP per capita respectively. On the contrary, Philippines had the lowest GDP per capita with an amount of $2,959.65 in 2014.

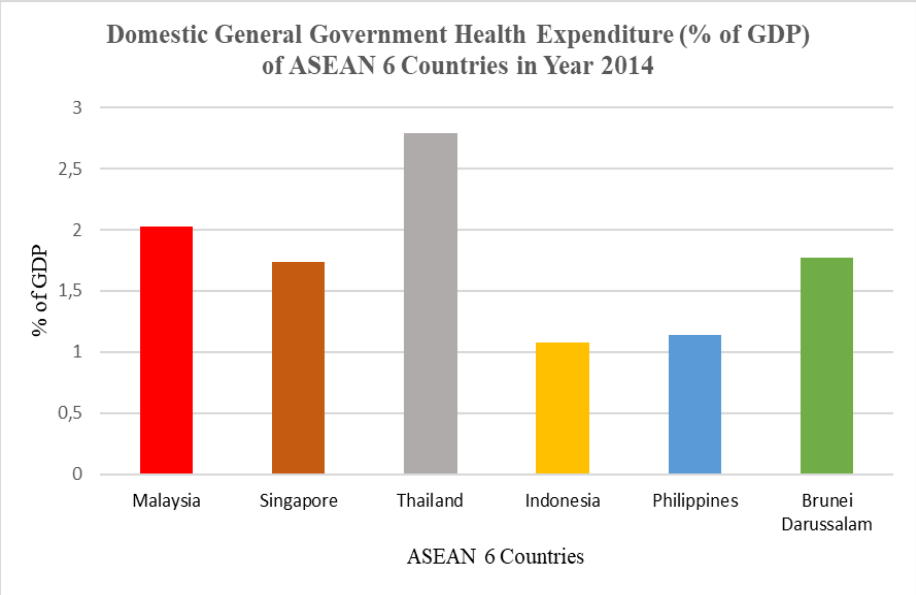

Figure 1. Domestic general government health expenditure (% of GDP) of ASEAN 6 countries in year 2014 (Source: Adapted from World Bank Databank, 2020)

In this regard, high-income countries have a higher GDP per capita as compared to middle-income countries. Dincer and Yuksel (2019) reported that the level of economic growth has become an important indicator of HE and they will affect each other significantly. Besides, Atilgan et al. (2017) also identified that HE will influence the economic development. Different GDP per capita in every country means that HE will differ, and the

difference is still significant even though there is a similar level of economic development in each country.

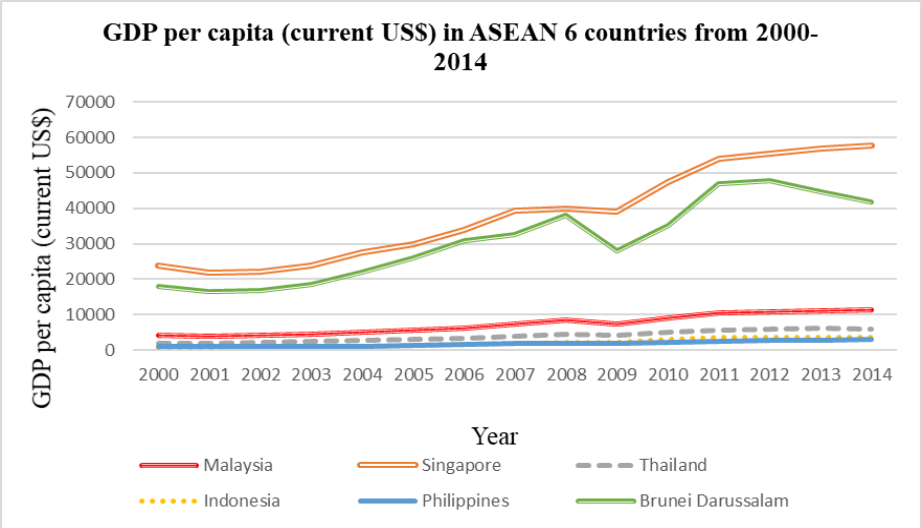

Figure 2. GDP per capita (current US$) in ASEAN 6 countries from 2000 to 2014 (Source: Adapted from World Bank Databank, 2020)

Chen et al. (2019) deduced that CO_2 emission has caused serious health problems and brought a heavy economic burden to healthcare in various countries. Figure 3 illustrates the CO_2 emissions in ASEAN 6 countries from 2000 to 2014. Indonesia, being one of the largest emitters of greenhouse gases countries in the world ranked the highest CO_2 emissions among 6 ASEAN countries while Brunei Darussalam with a remarkably lower CO_2 emission ranked the lowest among all. A similar study conducted by Apergis et al. (2018) has illustrated that the impact of CO_2 emissions on healthcare was generally stronger for states that spend higher amounts on HE. Therefore, Renewable energy promotion policies will not only improve the quality of life but might also help governments by reducing their healthcare expenditures (Taghizadeh-Hesary & Taghizadeh-Hesary, 2020)

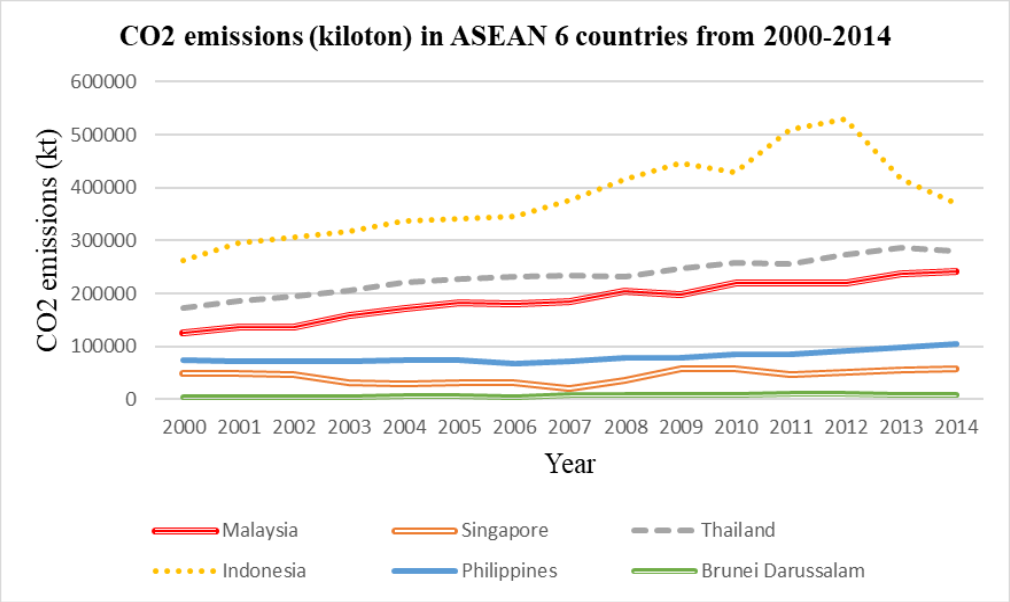

Figure 3. CO_2 emissions (kiloton) in ASEAN 6 countries from 2000 to 2014
(Source: Adapted from World Bank Databank, 2020)

According to The World Bank Group (2020), urbanization is the movement of people from rural areas to urban areas, with the aim of substantially improving their standard of living. Figure 4 depicts the movement of urban population growth for ASEAN 6 countries over 15 years from 2000 to 2014. The graph clearly shows a fluctuation in the urban population growth in Singapore. From 2001 to 2003, the urban population growth had dropped from 2.697% to -1.475%, followed by a slight rise in the urban population growth from 2004 onwards and reached a peak in 2008 at 5.322%. Conversely, Thailand, Malaysia, and Indonesia had experienced a slight fall percentage in the urban population growth annually within the year 2010 to 2014. In 2014, Indonesia stated the highest in urban population growth at 2.611%. Cetin and Bakirtas (2019) claimed that there is more evident to see the consequences of rapid urbanization in developing countries than developed countries in aspects like economic, health and environmental aspects.

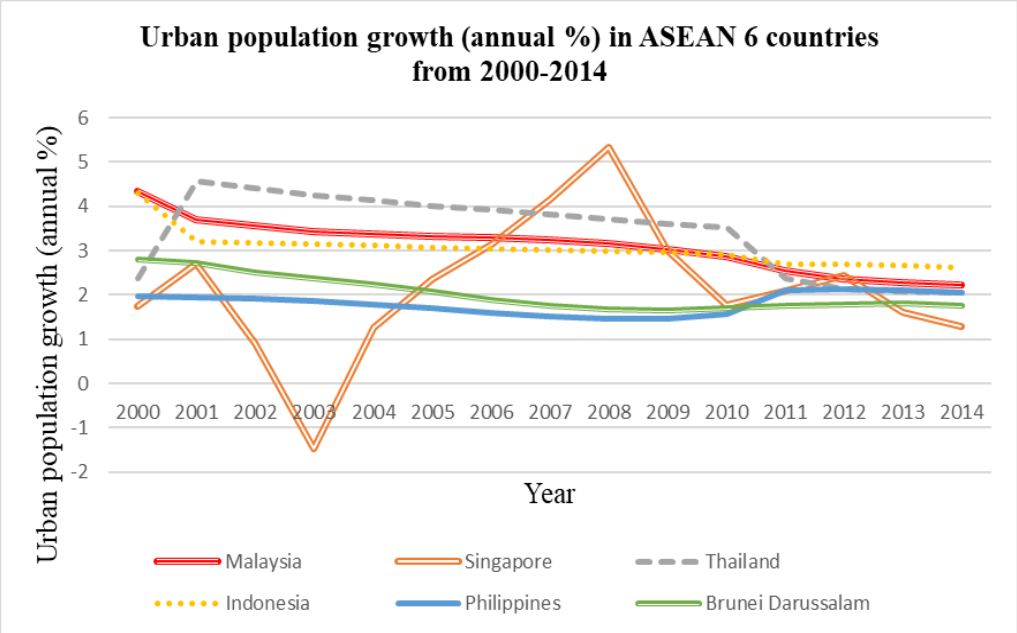

Figure 4. Urban population growth (annual %) in ASEAN 6 countries from 2000 to 2014 (Source: Adapted from World Bank Databank, 2020)

As one of the largest economic alliances, ASEAN's cumulative GDP has reached more than USD3.11 trillion. The strong economic growth has proliferated the energy demand by 70% compared to the energy demand in 2000 and ASEAN currently accounts for 5% of the total global energy demand (Liu & Noor, 2020). Figure 5 illustrates the trend of energy use per capita in ASEAN 6 countries from 2000 to 2014. There was a fluctuation in Brunei Darussalam and Singapore while the other 4 ASEAN countries remained quite steady over a 15-year period. In 2014, Brunei Darussalam had the highest demand for energy use per capita at 8673.08898; Philippines had the lowest demand for energy use per capita at 474.29788. Brunei Darussalam is considered as one of the countries in the world with a remarkably high demand for energy services, that potentially leads to an increase in HE. Similar studies conducted by Ahmad et al. (2021), Akbar et al. (2020), Haseeb et al. (2019) & Khandelwal (2015) concluded that a rise in energy consumption will lead to an indirect impact to HE.

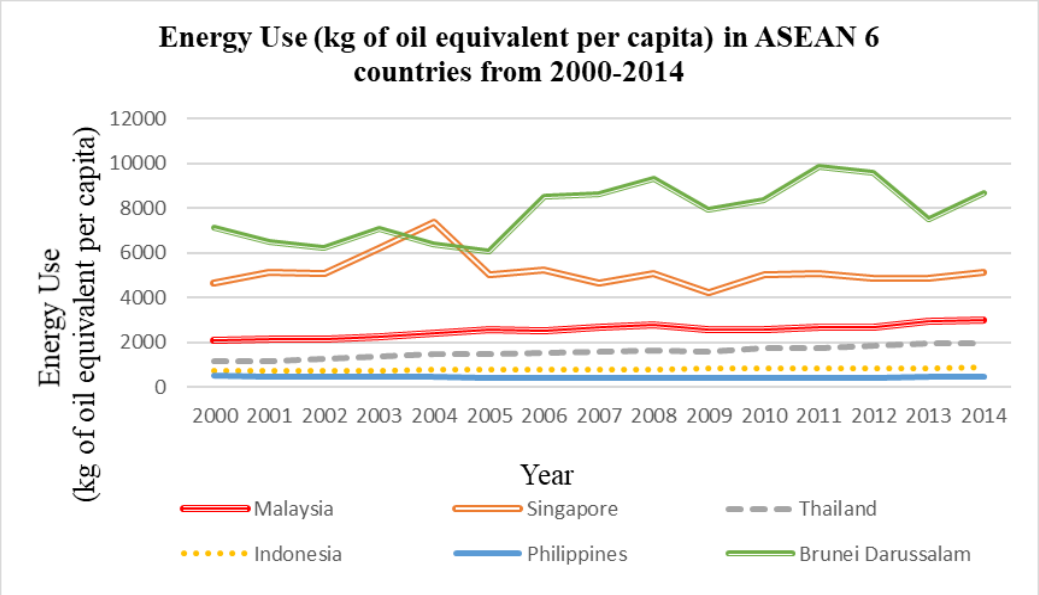

Figure 5. Energy Use (kg of oil equivalent per capita) in ASEAN 6 Countries from 2000 to 2014. (Source: Adapted from World Bank Databank, 2020)

As a country becomes more prosperous and develops, the government will begin to focus on improving the welfare of the people, in the form of housing subsidies, education and childcare assistance, energy and utility subsidies, and healthcare services. Most of the studies that analyzed the effect of the determinants towards HE are mainly carried out in European countries, Arab countries, and some Asia countries (Barkat et al., 2019). As different countries have different socioeconomics groups, it would be interesting to explore into the issues regarding the HE between ASEAN countries and countries in another region. However, the previous studies about HE in ASEAN was the lack of consideration about the macroeconomic status of the countries (Mattsson et al., 2017). In other words, different HE in different countries might because each country has its own formulation of policies and healthcare system based on their economic factor at that time. Energy usage is also a hot topic to discuss as it is at the core of many sustainable development goals, and it is crucial to see how energy usage will affect healthcare services and expenditures in the country (Kroll et al., 2019).

Primarily, the motive was to find out the determinants of healthcare expenditure (HE) in the chosen 6 ASEAN countries (Indonesia, Philippines, Thailand, Malaysia, Singapore and Brunei Darussalam). Besides, this study is paramount as governments will be able to perceive which one of the determinants stated above is the most notable affecting HE, and which one takes appropriate actions to solve the issues. Apart from that, this study contributes by

enabling more policymakers in ASEAN to implement efficient policies. Meanwhile, it is important for ASEAN countries need to adopt a good health financing system and have a proper allocation of government HE to accomplish the Sustainable Development Goals (SDG) which consist of three fundamental elements, namely economic growth, environmental protection, and social inclusion (Bustreo, 2015). Lastly, this study is particularly beneficial for the selected 6 ASEAN countries since it can provide a clear picture for the economists and researchers on which variables are playing key role on this issue.

Wagner's Law, also known as Wagner's hypothesis, was introduced by Adolph Wagner in 1893. Furthermore, he also highlighted the fact that the upsurge in government economic activity corresponds to private economic activity when there is economic development (Kesavarajah, 2012). Three reasons have been put forward by Wagner to support the "law of increasing state activity." Firstly, as nations grow, modernization and industrialization will cause an expansion of traditional functions. Besides, the population density might give rise to higher public expenditure. Thirdly, it is inescapable that states would entail more public expenditure when nations are getting more advanced (Lamartina & Zaghini, 2011). Sagarik (2014) mentioned that the main idea of Wagner's law specifies that the rising demand for public facilities because of urbanization, industrialization and rising population density will cause the public expenditure to escalate as a share of GDP. Wagner's Law has received some criticisms from other economists.

However, the critic has been proven wrong since most economies would roughly follow the trending pattern in the public expenditure as stated in Wagner's Law (Jaén-García, 2018). Moreover, Antonis et al. (2013) found that the intensification of state activities is a systemic constituent of economic development, indicating that Wagner's Law is at least plausible for economies that are in their beginning stage of development. Based on the research of Eisavi et al. (2019), the results indicate a positive causal relationship between GDP and health spending; deducing that Wagner's Law is relevant to be used to explain the relationship between them.

Social Capital Theory (SCT) asserts that human capital is developed and aggregated with social relationships being the resources that lead to the outcome (Machalek & Martin, 2015). In this study, SCT is adopted to link the environmental variables with population health with healthcare expenditure (HE). It has been justified that an uplift in social capital would bring about an improvement of environmental protection as well as a decline in energy consumption (Wang et al., 2020). One of the main sources of air pollution comprise the use

of electrical energy produced in power plants which entails the burning of fossil fuels, eventually generating carbon emissions (Arroyo & Miguel, 2019). Subsequently, Jerett et al. (2003) also stated the fact that the costs of environmental contamination include an increase in HE.

Nowadays, Healthcare Expenditure (HE) has become an important input for the health production function in every country. The study of Grigoli and Kapsoli (2013) mentioned that improving the efficiency of HE is a need all across the globe. According to Ahmad et al. (2021), the health expenditures growth has a bidirectional positive causal linkage with CO_2 growth and GDP growth. However, urbanization tends to reduce HE on health services as urban centers have adequate health infrastructure. In addition, the effect of economic growth and CO_2 emissions on HE has been explored by Ahmad et al. (2021) and Gövdeli (2019). Based on the results of the regression conducted, a positive significant relationship was found within CO_2 emissions and HE, indicating that an increase in HE is caused by an increase in CO_2 emissions. Wulandari et al. (2021) found that inequalities exist between rural and urban areas utilizing access to antenatal care (ANC) in the Indonesia and Philippines.

Cetin and Bakirtas (2019) empirical results indicated that an increase in urbanization has induced the HE. According to OLS Regression, it showed that urban population has a positive impact on HE (Abbas & Hiemenz, 2013). The results manifested that energy consumption has a significant positive impact on HE in the short-run which means that a rise in energy consumption will positively influence HE, but it will insignificantly affect HE in the long-run (Ahmad et al., 2021; Akbar et al., 2020; Haseeb et al., 2019; Khandelwal, 2015). Some researchers who explored that carbon monoxide emissions are statistically significant positive, but there is no impact on HE (Narayan & Narayan, 2008). Moreover, after Akbar et al. (2020) conducted the SEM technique, the results revealed that CO2 emissions show a direct impact on HE, while energy consumption has an indirect impact on HE.

Gövdeli (2019), Rezaei et al. (2016) and Zaman et al. (2017) stated that GDP is directly and positively correlated with HE after the times series analysis was undertaken. The results are similar to the previous study which believed that an increase in GDP may bring a significant increase in the financial health budget for Pakistan (Piabuo & Tieguhong, 2017). The results generated showed a long-run relationship between the independent and dependent variable. Besides, a bidirectional causality exists between these two variables. Thus, not only that HE will cause an impact to the economic growth but any movement in the economic growth will have impact on HE (Piabuo & Tieguhong, 2017). The study of Ahmad et al.

(2021) has discovered that bidirectional positive causal linkage with the gross domestic product (GDP) growth and HE growth. HE is stated as an investment in human capital whereas it could help to make more revenues for the country and eventually lead to an increase in GDP (Eryigit et al., 2012).

In recent years, research on the relationship between environmental pollution and HE has become a topical issue in economic literature (Govdeli, 2019; Saida & Kais, 2018). Carbon emissions not only reduce the level of overall environmental health, yet also bring huge health costs in regard of the HE of the society (Ullah et al., 2019). A similar study conducted by Balan (2016) concluded that the decline in environmental quality will have a negative impact on human health and lead to higher demand of HE. Jebli et al. (2003) stated that a higher level of CO_2 had led to an increase in the HE of an economy. Most studies have also confirmed that carbon emissions tend to drive HE largely (Chen et al., 2019; Ullah et al., 2019). Meanwhile, Saida and Kais (2018) aimed to investigate the relationship between environmental quality and HE by using the ARDL method, VECM, Unit root tests, and panel cointegration test to analyze the elasticity both in the short-run and long-run. Yazdi and Khanalizadeh (2017) showed that CO_2 emissions have a statistically positive significant effect on HE. Generally, many studies found that CO_2 emissions will significantly and positively affect HE (Chen et al., 2019; Govdeli, 2019; Yazdi & Khanalizadeh, 2017; Zeng & He, 2019). Besides, soeveral researchers used the ARDL approach to investigate the effects of CO_2 emissions on HE in the short term and long term (Apergis et al., 2018; Haseeb et al., 2019; Saida & Kais, 2018).

Most of the previous studies have concluded that urbanization has a positive impact to HE. Kouassi et al. (2017) stated that by applying the FE estimator and common correlated effects (CCE) analysis, a prominent level of urbanization has a positive impact on HE in a long-run relationship. Cetin and Bakirtas (2019) proved a positive relationship between the effect of urbanization on HEs by using GMM estimators. A similar statement was made by Samadi and Rad (2013) as they revealed that citizens living in the urban region have more access to the healthcare providers like clinics, hospital, and health centers. Citizens will use healthcare services more frequently which causes an increase in HE (Mulyanto et al., 2019). Rezaei et al. (2016) pointed out that healthcare is a necessity and an increase in urbanization will increase the healthcare demand and supply as well. Contrastingly, some researchers found that urbanization has a negative impact on HE. Abbas and Hiemenz (2011) and Pan and Liu (2012) concluded that high level of urbanization has a negative impact on HE. Bhattacharya

and Bhattacharya (2021) stated that The model of private hospitals in the metro cities cannot be transplanted to the Tier 2/3 cities since the ratio between the doctors, paramedic staff, nurses and other support staff requires to be modified. Moreover, Lee et al. (2014) perceived that urbanization has no significant effect on HE.

Ahmad et al. (2021), Akbar et al. (2020), Haseeb et al. (2019), and Khandelwal (2015) found out the significant and positive impact of energy consumption on HE. Akbar et al. (2020) showed that energy consumption would have a statistically significant and positive influence on pollutant emissions, as researchers found out that the use of non-renewable energy in the manufacturing sector has led to an increase in toxic emissions. The statement is supported by Mujtaba and Shahzad (2021), Yahaya et al. (2016), and Yazdi and Khanalizadeh (2017) as excess energy consumption released high levels of carbon monoxide, causing environmental pollution and thus significantly affecting the government HE. However, Narayan and Narayan (2008) investigated that carbon emission was statistically positive but there was no impact on HE. Conversely, SO_2 and NO_2 caused by energy usage due to the burning of fossil fuels showed a negative sign with high significant statistics.

After reviewing the literature reviews and theories, a framework will be proposed. The Wagner's Law is applied in the study of Eisavi et al. (2019) to justify the relationship between GDP and health expenditure (HE) where a positive causal relationship is proven. In this study, the proposed conceptual framework illustrates the relation between the explanatory variables and dependent variable respectively as illustrated in Figure 6.

The hypotheses of this study are as follows:

H1: Economic growth has a significant impact on the healthcare expenditure of ASEAN countries.

H2: Carbon emission has a significant impact on the healthcare expenditure of ASEAN countries.

H3: Urban population has a significant impact on the healthcare expenditure of ASEAN countries.

H4: Energy consumption has a significant impact on the healthcare expenditure of ASEAN countries.

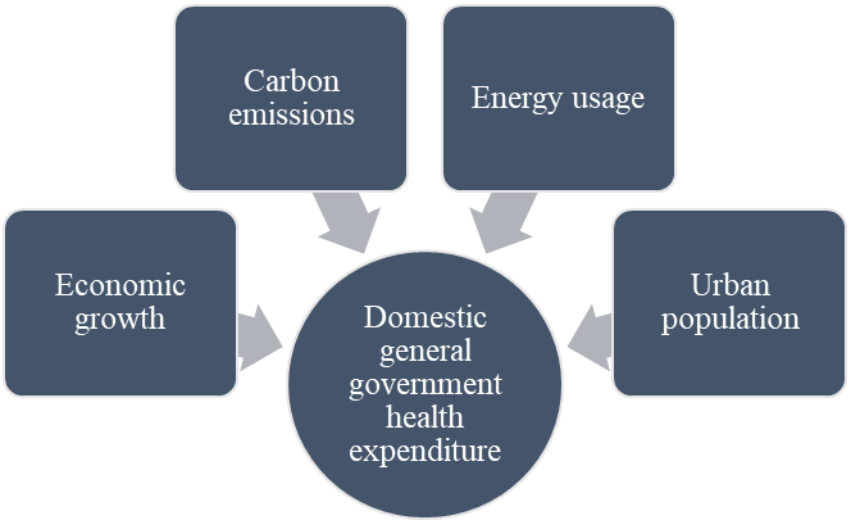

Figure 6. Proposed Framework

2. Methods

This research intends to review the relationship between healthcare expenditure (HE) and its explanatory variables. The basic model is adapted from Govdeli (2019), which includes only two variables. The extension model includes dependent variable, which is HE and four independent variables, namely economic growth, carbon emission, urban population, and energy usage. The functional model and econometric model are designated as follows:

$$HE_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 CO_{2_{it}} + \beta_3 UB_{it} + \beta_4 EU_{it} + \mu_{it} \quad (1)$$

Where,

HE_{it} = Domestic general government health expenditure (% of GDP)

GDP_{it}= GDP per capita (current US$)

$CO_{2_{it}}$ = CO_2 emissions (kt)

UB_{it} = Urban population growth (annual %)

EU_{it} = Energy use (kg of oil equivalent per capita)

μ_{it} = Error term

This study uses the panel data analysis to analyze two-dimensional panel data (multiple years and countries). The data collected are secondary data, with 15 years ranging from 2000-2014, for 6 ASEAN countries: Indonesia, Philippines, Thailand, Malaysia, Singapore and Brunei Darussalam. All data are collected from the World Bank database as it has the most accurate and complete data. After compiling all relevant data, the data analysis will be conducted using E-views software and results will be explained accordingly. Details of each

variable are stated below. This study involves n units of observations (6 ASEAN countries) within T time periods (15 years from 2000 to 2014), with a total of 90 observations and thus considered as a significant number of observations. This method was chosen due to many advantages including its ability to capture the dynamic of adjustment in the model, individual unobserved heterogeneity, obtain unbiased results, provide huge number of observations, and high degrees of freedom (Alemu, 2012).

Panel Unit Root Test is necessary to analyze the stationarity in the time series data of all variables before conducting panel co-integration test (Karlsson & Lothgren, 2000). Besides, panel unit root tests are more systematic and powerful if being employed to study complex issues of dynamic properties and behaviors as compared to unit root tests which are used in individual time series (Baltagi, 2005). Besides, Barbieri (2006) mentioned 2 types of panel unit root tests that had been categorized. The first type [Im, Pesaran and Shin test (2003), Levin, Lin and Chu test (2002), and Fisher-ADF tests, and Breitung test] are mainly used for the estimation regression with lagged differences terms while the second type [Levin, Lin and Chu test (LLC), Fisher-PP test, and Hadri test] are mainly used for the estimation regression with kernel weighting. In this study, both the ADF test and PP test will be performed. Since the Augmented Dickey-Fuller Test (ADF) test is able to handle relatively complex models, it is more powerful to check whether or not there is a problem in the statistical inference in the form of a time series (Greene, 1997). Using this approach, H_0 will be rejected, signifying that the series contains unit root if the test statistics is lower than the critical value or the p-value is smaller than the level of significance. Another test similar to the previous test is the Phillips-Perron (PP) test because both tests usually provide the same results. Gujarati and Dawn (2009) concluded that the PP test is better in comparison to the ADF test due to the advantages that users are not required to set out a lag length to test the regression.

Pooled Ordinary Least Square (OLS) is said to be the simplest form of the linear regression model which is employed to estimate the unknown parameters in a linear regression model with an assumption of the intercepts and all slopes are constant across all observations. If there is a violation of the assumptions of this model, then Fixed Effect Model and Random Effect Model are considered as alternative models (Gujarati & Dawn, 2009). According to Gujarati (2004), this model is known as a statistical model, where all variables are considered as a non-random value to the factoring process. Williams (2015) mentioned that the biggest advantage of using Fixed Effects Model (FEM) would be eradicating huge source of bias as it has the capability to control immeasurable stability characteristics that

change over time. However, the cons of FEM would be ignoring the between-person variation. This is because the between-person variation can destroy immeasurable characteristics, resulting in high standard error, hence the outcome of FEM will be affected (Allison, 2005). The important underlying assumption under REM is that the individual error component does not have any correlation with any explanatory variables and the model is favored in estimating the coefficient fixed effect problem. Furthermore, Williams (2015) stated that Random Effects Model (REM) is probably considered as the best model among others as it shows a small standard error and unbiased estimate of coefficient. According to Gujarati (2004), if the random effects assumptions hold, REM is better than the FEM. But if the model fails to hold the assumptions, then REM is considered as not consistent.

Approaches for the selection of the best model include the use of Poolability F-Test, Hausman Test and Breusch-Pagan Lagrange Multiplier Test. In an unrestricted model, it stipulates that the slope and intercept coefficients differ across the panel data either cross sectional or time-based (Gujarati, 2004). When the p-value is larger than the level of significance, POLS model is preferable. If the p-value is less than the significance level, no common intercept is found between the observations, meaning that FEM is preferable. Hausman Test is known as the standard technique applied in the empirical analysis on the panel data. The main function of this test is to pick whether a random-effect model or fixed-effect model is preferable in this study. The null hypothesis is REM, which is also known as the appropriate model while FEM will be the alternative hypothesis (Gujarati, 2004). The BP-LM test is one of the common tests employed in order to examine heteroskedasticity. It is conducted to see whether the Pooled OLS or REM is more suitable to be used to estimate the regression model (Gujarati, 2004).

3. Results and Discussions

Based on ADF, the conclusion is to reject H_0 as the p-value of domestic HE, GDP per capita, CO_2 emissions, urban population, and energy usage in second differencing with the trend and without trend are lower than 5% significance level. Therefore, sufficient evidence is obtained to deduce that domestic HE, GDP per capita, CO_2 emissions, urban population, and energy usage do not contain unit root and they are stationary. As for the PP Test, the conclusion is to reject H_0 because the p-values of domestic HE, GDP per capita, CO_2 emissions, urban population, and energy usage in second differencing with trend and without trend are lower than 5% significance level. Therefore, sufficient evidence is obtained to deduce that domestic

HE, GDP per capita, CO_2 emissions, urban population, and energy usage are stationary and do not have a unit root. In order to estimate the panel regression model in this study, three tests have been employed to select the best model out of three.

See Table 2, This test was conducted to choose either Pooled OLS or FEM to be the estimation model. Poolability F-Test recommends that POLS was a more appropriate model to be used to estimate the regression compared to FEM. This test was adopted to investigate whether REM and FEM was a better model for model estimation. Hausman test suggests that REM is more relevant to be employed as the estimation model instead of FEM.

The result has been obtained after conducting the Poolability F-Test, BP-LM Test and Hausman Test. After analysing both fixed and random effects using Hausman's Test, the next step is to choose which model is better. The difference between these FEM and REM is tested by the Chi-square test and if p-value is less than 0.10, the random-effect model should be used instead of the fixed-effect model. Table 2 returns the p-value of 0.0929 and it is lower than 0.10, so that the random-effect model will be better than the fixed-effect model. The conclusion turns out that REM is the most relevant one to be chosen as the estimation model of this study among the three models.

Table 2. Test Results for Selection of Best Model

	Pooled OLS	FEM	REM
Poolability F-Test	0.4098		
	(0.9951)		
Hausman Test			0.3534
			(0.9861)
BP-LM Test			2.8231
			(0.0929) *

Note: ***, **, * indicates significance level of 1%, 5% and 10% respectively.

Furthermore, as shown in Table 3, a significant relationship was found between LGDP2 and HE2 at significance level of 1% since p-value (0.000) < 0.001. The negative coefficient of -0.7912 suggests that as GDP per capita increases, the domestic general government health expenditure tends to decrease. As this is a linear-log model, the coefficient has estimated of LGDP2 means that on average, when GDP per capita increases by 1%, the domestic general

government health expenditure will decrease by 0.007912 (% of GDP), ceteris paribus. Furthermore, the result implies that URB2 has a negative significant relationship with HE2 at 1% level of significance since p-value (0.000) < 0.001. By holding other variables constant, when the urban population growth rises by 1% annually, on average, domestic general government health expenditure will fall by 0.0989 (% of GDP). This indicates that the higher the urban population growth, the lower the domestic general government health expenditure will be. Meanwhile, the p-values of LCO22 and LEU2 of 0.6319 and 0.8872 respectively signify an insignificant relationship between each variable with HE2.

Table 3. Regression Results for REM Estimation after 2nd Differentiation

Dependent variable: HE2		
Independent variables	Coefficient	Probability (P-value)
LGDP2	-0.7912	0.0000***
LCO22	0.0505	0.6319
URB2	-0.0989	0.0001***
LEU2	-0.0229	0.8872
R-squared: 0.4024		
Adjusted R-squared: 0.3697		
F-statistic: 12.2890 (0.0000) ***		

Note: ***, **, * indicates significance level of 1%, 5% and 10% respectively.

The F-statistic value of 12.2890 comes with a p-value of 0.0000. By conducting F-test using the significance level of 1%, the p-value is less than 0.01. Hence, H_0 will be rejected which leads us to the conclusion where the overall model is significant. The adjusted R-squared value of 0.3697 indicates that 36.97% of the variation in HE in the 6 selected ASEAN countries is explained by the variation of all explanatory variables, after taking into account the degrees of freedom. With the coefficient of determination, the R-squared value of 0.4024 indicates that 40.24% of the variation in the domestic general government health expenditure (HE) in the 6 selected ASEAN countries is explained by the variation in all the explanatory variables. It has been justified that an R-squared value above 0.35 is meaningful in social sciences that include economics (Jost, 2021). According to Campbell (2006), as cited in Shantikumar (2016), the R-squared value from this study is considered as moderate. For instance, a study conducted by Bonnel (2000) showed similar results where the R-squared values for both models were 0.40 and 0.38 respectively.

Healthcare is not luxury goods, and therefore, governments should provide more support to the public health care system due to the income inelasticity of healthcare. There is individual's income inelasticity of health care expenditures that individuals being covered by public health will reduce the out-of-pocket healthcare expenditures. According to Rahman et al. (2018), the effect of private health expenditure is larger than that of public health expenditure. However, the income-vulnerable individuals unable to assess public health will be impacted as the private healthcare spending is not affordable for them. In crisis events such as the outbreak of Corona Virus Disease 2019 (COVID-19) pandemic, the poor will face financial difficulties to seek timely treatment from private hospitals in case of the congestion at the public health system.

This study's outcome indicates that economic growth has a negative significant relationship with healthcare expenditure, indicating that a drop in economic growth will bring about an increase in HE. This is in line with the findings of Wang (2011) that economic growth will reduce health care expenditure growth. However, the negative significant result can be explained by the study of Raghupathi and Raghupathi (2020). Raghupathi and Raghupahi (2020) explained that as the country has a lower GDP, their cities might be lacking the infrastructure planning or not being developed well, so the city's environment begins to become dirty and chaotic. As people live in unhygienic environment for a long time, their physical resistance will drop and they will become prone to diseases. This will cause existing medical institutions and facilities to be overloaded as the demand of healthcare services will exceed the supply of healthcare services, therefore HE will need to increase to maintain public health status.

Bloom et al. (2018) also mentioned that although economic growth declines, the government will continue to provide more expenditure as it is their duty to provide health services. A similar statement has been made by Xu et al. (2011). As for lower income countries, more than 20% of the HE was sponsored by other high-income countries through special funding as sectorial and program supports. Thus, when government receives funds, they will reduce the country's budget on HE, so that they can allocate the money to other sectors. Saida and Kais (2018) also mentioned that the GDP per capita has a negative significant relationship with HE in the long term

The findings concluded that there was a negative significant relationship between urban population and HE and it means a lower urban population growth will generate higher HE. The result is in line with the study of Pan and Liu (2012) and Sagarik (2014) with a result of

negative significant relationship between the variables. This statement is supported by Abbas and Hiemenz (2011) who had conducted their study showing a negative relationship between both variables. Besides, Guida and Carpentieri (2021) had highlighted the Lombardy region's statistics, the Health Protection Agency of Milan (ATS – Agenzia di Tutela della Salute) of the Metropolitan City of Milan, Italy recorded 54.5% of access to private healthcare services in 2017. Consequently, residents in urban areas have better access to quality food with high nutrients, have more chance to receive medical knowledge in building a healthier body. They tend to have better immunization and less demand on healthcare. Thus, the government might need to spend less on HE in urban areas. By contrast, the government continues to provide more public healthcare services in rural areas as fewer private hospitals are based in these areas.

Based on the findings, a significant negative relationship is found between economic growth and healthcare expenditure (HE). Hence, it is expected that an enhancement in the health status of people can reduce country's HE and lead to a boost in economic growth. According to the findings in this study, HE is significantly and negatively influenced by urban population. Hence, several policies could be proposed to encourage HE in ASEAN, at the same time build a higher productivity and healthier country that helps to improve the country's economic growth and development. According to the underlying theory of Wagner's Law, a positive significant relationship was discovered between economic growth and public expenditure. That said, based on the findings, it denotes a negative and significant relationship between economic growth and HE. For justification, as the country development and economic level are different, Europe's overall economic level is relatively higher than ASEAN countries.

Useful policy implications can be revealed from the results of this study. Universal health coverage (UHC) is an important mechanism to reduce obstacles to healthcare service access. Many countries have concentrated on improving people's health standards, giving an easy access to healthcare services. An important policy implication emerges that in order to promote improved health outcomes, policymakers need to pay attention not only to the level of spending, but also to the state of the health outcomes. In particular, it is important for the impacts in the high health outcomes, and effectiveness administration of health expenditure. ASEAN Governments should continue to provide key social services, including health. Improving real growth in health expenditure is vital to realize improved health outcomes.

Health expenditure can be effective as a factor that improves the health standard which is coordinated with the economic growth process.

4. Conclusion

Public policies to encourage health expenditure are required to establish a healthier and productive society to support economic growth and development. Health expenditure is vital for a society with high capacity with healthy mentality. Nevertheless, there is still a shortfall in the public expenditure on the aspect of healthcare in the developing countries compared with other developed countries. Furthermore, tertiary healthcare providers especially in the urban centres with the mass of population should also be improved to serve the urban poor. It is also critical for policy makers to implement health policies targeted at public health expenditure. The main policy recommendations resulting from this study are:

a. Governments need to ensure that government intervention in health is of a sufficient proportion of GDP. The public investment should be more focused on healthcare infrastructure as well as skill development of healthcare professionals.
b. In medium term, policy makers should try to reduce the dependency on the subsidised fossil fuel energy consumption. This will save crucial financial resources which can then be allocated towards improving the public health infrastructure.
c. In the long term, Governments should consider embarking on health insurance programmes for public finance sustainability.
d. In order to maintain health outcomes of the urban population in ASEAN countries, governments should give tax and other incentives to stimulate the private hospital development to facilitate urbanisation livability while the health outcomes are maintained.
e. In order to raise healthier outcomes among the aging group, a balanced health spending on disease prevention and treatment should be the governments' goal to increase life expectancy for a healthier population.

The first limitation that was encountered in this research is the data collection problem. The data selection for this study has only covered the period from year 2000 to 2014. This is because most data are acquired from World Development Indicators (WDI), and there are incomplete and missing data. The second limitation would be the small sample size. The study only comprises the selected data from 6 ASEAN countries. In short, one of the

recommendations to future researchers is to extend their research on the HE by comprising other HE indicators in order to obtain excellent research outcomes.

Author Contribution

Conceptualization, Qi Hui Ng; Methodology, Yi Ling Chong; Software, Yi Ling Chong; Validation, Yi Ling Chong; Formal Analysis, Yuan Yuan Tay; Investigation, Yuan Yuan Tay; Resources, Yuan Yuan Tay; Data Curation, Yuan Yuan Tay; Writing – Original Draft Preparation, Yi Ling Chong, Qi Hui Ng, Jen Hee Tan, and Yuan Yuan Tay; Writing – Review & Editing, Visualization, Yuan Yuan Tay; Supervision, Hui Nee Au Yong; and Project Administration, Qi Hui Ng; and Funding Acquisition, Hui Nee Au Yong.

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