THE IMPACT OF ENVIRONMENTAL QUALITY ON PUBLIC HEALTH EXPENDITURE IN MALAYSIA

SITI KHALIJAH BINTI ZAKARIYA

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BY

SITI KHALIJAH BINTI ZAKARIYA

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ABSTRACT

Health is one important factor in the development of human capital. Good health will lead to increased levels of productivity. This study was conducted to examine the co-integration between environmental quality and socio economic factor for national health expenditure. This study used secondary data from the World Bank Indicators and the Department of Statistics Malaysia. This analysis employs annual time series data on real per capita Health Expenditure (HE), real per capita Gross Domestic Product (GDP), Carbon Dioxide (CO2), Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2) emission in metric tonnes per capita, Fertility Rate (FR), Mortality Rate (MR) infant per 1,000 live births. The data were obtained from World Bank Development Indicator (WDI) and spanned over the period 1970 – 2013. This data was analyzed using the software E-views and the methodology applied was a co-integration and ARDL approach in order to explore the possibility of estimating both short and long run impacts of environmental quality. The study found that GDP, CO2, MR, FR, NO2 and SO2 could be treated as having relationship which health expenditure in the long run in Malaysia. SO2, fertility and infant mortality rate showed a significant factor in the country's health expenditures affect substantially. The new generation is an important element in ensuring the continuance and sustainability of national development in the future.

ABSTRAK

Kesihatan merupakan salah satu faktor penting dalam pembangunan modal insan negara. Kesihatan yang baik akan mendorong kepada peningkatan kadar produktiviti negara. Kajian ini dijalankan bagi mengenalpasti perkaitan antara kualiti alam sekitar dan faktor socio ekonomi terhadap perbelanjaan kesihatan negara. Kajian ini menggunakan data sekunder daripada World Bank Indikator dan Jabatan Statistik Malaysia bagi tahun 1970-2013. Analisis ini menggunakan data tahunan siri masa per kapita sebenar Perbelanjaan Kesihatan (HE), Keluaran Dalam Negeri Kasar per kapita (KDNK), Karbon Dioksida (CO2), Nitrogen Dioksida (NO2) dan Sulfur Dioksida (SO2) dalam tan metrik per kapita , kadar kesuburan (FR) dan kadar kematian (MR) bayi bagi setiap 1,000 kelahiran hidup. Data ini dianalisis menggunakan perisian E-views dan metodologi yang digunakan adalah model ARDL iaitu untuk melihat kesan kualiti alam sekitar dalam jangka masa pendek dan jangka masa panjang. Kajian mendapati bahawa KDNK, CO2, MR, FR, NO2 dan SO2 mempunyai hubungan dengan perbelanjaan kesihatan dalam jangka panjang di Malaysia. SO2, kesuburan dan kadar kematian bayi menunjukkan faktor penting dalam perbelanjaan kesihatan negara dan memberi kesan yang penting. Generasi akan datang adalah faktor penting dalam memastikan kesinambungan dan kelestarian pembangunan negara dan penting kepada kita untuk memastikan bahawa segala usaha pada hari ini akan memberi kesan yang baik kepada pembangunan modal insan negara.

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CHAPTER ONE

INTRODUCTION

This chapter outlines the introduction of the thesis. In this context, the rationale of the study is presented in the form of problem statement, research hypotheses and research objectives. The importance and scope of the study are also outlined in this chapter. The chapter closes with the research organization.

1.1 Background of the Study

Concern for health has traditionally underlain much of the political priority given to environmental issues across the world. There are many factors out there that influence the health of a population, such as diet, sanitation, socio-economic status, literacy, lifestyle and also environmental. The impact of environmental risk factors on health are extremely varied and complex in both severity and clinical significance. The effects of environmental degradation on human health can range from death caused by cancer due to air pollution to psychological problem resulting from noise. Air pollution from rapid industrialization and the use of energy has been recognized to be a cause of serious health problem.

The increasing deterioration in environmental quality across the world is posing serious challenge to healthy living through the increasing threat of global warming. Increase of global warming and greenhouse gas emissions due to consumption of fossil fuels was affecting the environmental quality. Particulate, sulphur dioxide and carbon dioxide emission from burning of fossil fuels are contributing significantly to pollution

and be a major contributor to global climate change, which has been a topical issue among policy makers and focus of quite a number of researchers across different fields of study.

Pollution will give adverse side effects to the health of the population of young and senior citizens. Emissions of greenhouse gases have the potential of aggravating the problem of climate change which poses serious health challenges in terms of cardiovascular and cerebrovascular disease among the elderly as it is usually associated with excessive temperatures and heat waves that can alter arterial pressure and blood viscosity. Additionally, thermal stress and temperature-related air pollution (thermal inversion), pollen counts, mold growth and pollution precursor (nitrogen oxide-based ground-level ozone) can cause a variety respiratory disease including asthma, bronchitis, pneumonia, cough and cold while increasing temperaturesm humidity and rainfall can effect proliferation, density and maturation of insect vectors such as mosquitoes (which carry malaria) as well as ticks and flies (Pattanayak and Pfaff, 2009).

In Malaysia, the high concentration of human population, traffic and industrial activity intensities the concentrations of the pollutants and hence increase the environmental risk of exposure. Over the past decade epidemiologic studies in europe and worlwide have identified that air pollution causing the increases in mortality and morbidity. World Health Organization (WHO) and European governments have begun to use data from these studies to inform environmental policies. According to the WHO definition of health, all these outcomes are potentially relevant for health impact assessment. Recently, a committee of the American Thoracic Society identified a

broad range of respiratory health effects associated with air pollution that should be considered “adverse” spanning outcomes from death from respiratory diseases to reduced quality of life, and including some irreversible changes in physiologic function. In general, the frequency of occurrence of the health outcomes is inversely related to its severity.

Health is one of the most important factors that determine the quality of human capital, a necessary factor for economic growth. In line with the above, a consensus of opinion have been formed among researchers recognizing health as a public good, the demand and supply of which cannot be left at the mercy of invisible hands or profit maximizing individual as well as on considerations of utility maximizing conduct alone. Hence the need for the government to play a major role in delivering good and qualitative healthcare services that is accessible and affordable for the teeming population. The recognition of the importance of the above led the WHO to propose at the 2010 World Health Assembly, issues that will address financing of health, which will ensure qualitative and affodable healthcare services. The pattern of health financing is therefore closely and indivisibly linked to the quality of health outcomes, capable of achieving the long term goal of enhancing nation’s economic development.

1.2 Environment Policy In Malaysia

Malaysia is historically one of the environmentally rich and abundant in natural resources and high biodiversity countries in the world consists of renewable and non-renewable resources that may include in every sectors of the country including the mineral resources, forestry, fisheries, agriculture, marine, poultry etc. At present, her

traditions and heritage have been facing with numerous environmental problems such as air pollution, water pollution, exploitation of natural resources etc. Although, there are some historic states in Malaysia listed as a United Nations Organization for Education, Science and Culture (UNESCO) Heritage Sites in the country. In order to cope with the environmental problems, the Government of Malaysia has passed some important environmental laws and policies such as the Environment Quality Act 1974 and its Regulations 1989, the Environmental Quality Order 1989, the Protection of Wildlife Act, the National Forestry Act 1984, the Fisheries Act 1985, the National Parks Act 1980, the International Environmental Laws etc.

In Malaysia, the Environmental Quality Act 1974 is considered to be the most comprehensive piece of legislation promulgated to deal with environmental protection and pollution control. The Act also forms the basic instrument for achieving environmental policy objectives. As a developing country that strives for economic growth, Malaysia's rapid development activities especially since the early 1980s have unveiled new dimensions to environmental concerns. National policy on the environment which integrates the three elements of sustainable development: economic, social and cultural development and environmental conservation was formulated and approved in 2002.

The Policy aims at continued economic, social and cultural progress and enhancement of the quality of life of Malaysians through environmentally sound and sustainable development. It is based on eight (8) inter-related and mutually supporting principles set to harmonise economic development goals with environmental imperatives:

I. Stewardship of the Environment

II. Conservation of Nature's Vitality and Diversity

III. Continuous Improvement in the Quality of the Environment

IV. Sustainable Use of Natural Resources

V. Integrated Decision-Making

VI. Role of the Private Sector

VII. Commitment and Accountability

VIII. Active Participation in the International Community

In keeping abreast with the country's rapid economic development and to meet with the nation's aspiration for an improved quality of life, the National policy on the Environment serves as an important guide to all stakeholders to ensure that the environment is clean, safe, healthy and productive.

Badar A. Iqbal (2002) discussed the state of the natural resources in Malaysia titled *'Development Strategy for Malaysian Natural Resources'.* Malaysia with its wealth of natural resources is one of the fastest growing economies in the ASEAN region. The country provides 41 per cent of world supplies of natural rubber, 39 per cent of hardwoods, 37 per cent of palm oil and 32 percent of tin. In 1971, the government developed a New Economic Policy (NEP) which, it was hoped, would bring about a sound and wide base for economic growth.

In Malaysia the Air Pollution Index (API) is used to describe the air quality in Malaysia. The API value is calculated based on average concentrations of air pollutants, namely sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone and fine

dust (PM_{10}). The air pollutant with the highest concentration is the pollutant that will determine the value of the API. Fine dust is typically the dominant pollutant.

This scale below shows the health classifications used by the Malaysian government.

I. 0-50 Good
II. 51-100 Moderate
III. 101-200 Unhealthy
IV. 201-300 Very unhealthy
V. 301 Hazardous

If the API exceeds 500, a state of emergency is declared in the reporting area. Usually, this means that non-essential government services are suspended, and all ports in the affected area are closed. There may also be a prohibition on private sector commercial and industrial activities in the reporting area excluding the food sector.

The Environmental Quality Act of 1974 and other environmental laws are administered by the Division of Environment. Clean-air legislation was adopted in 1978, limiting industrial and automobile emissions. However, air pollution remains as a major problem in Malaysian cities. The National Forestry Act of 1984 was enacted for sustainable forest management, but the act has not been enforced.

Air pollution from industrial and vehicular emissions is a major issue in the urban areas of Malaysia. Malaysia is ranked 42nd in the world in terms of vehicle ownership per capita, with 273 Malaysians having vehicles out of every 1000. Public transportation has been introduced in the form of bus networks and railway systems as mitigation,

but utilization rates are low. Water pollution occurs due to the discharge of untreated sewage; the west coast of the Peninsular Malaysia is the most heavily populated area. 40 percent of the rivers in Malaysia are heavily polluted. The country has 580 cubic km of water, of which 76 per cent is used for farming and 13 per cent is used for industrial activity. Cities in Malaysia produce an average of 1.5 million tons of solid waste per year (WHO, 2014).

Malaysia has enjoyed one of the least polluted urban environments in Asia. However, with the massive industrial development of recent years, and an increase in urbanization and vehicle use, air and water pollution are of growing concern.

1.3 Policy on Healthcare Financing In Malaysia

Recently Malaysia has given fully intention to their healthcare system. There are lot improvements in Malaysia healthcare system which can be seen through the balance of private and public healthcare expenditure. Malaysia healthcare system has transformed into a resilient dual-tiered parallel system. Among the ASEAN countries, Malaysia has improved a lot in their healthcare system (Ramesh and Asher 2000). WHO, 2000 also had mention that most international organisation accounts herald Malaysia having a successful healthcare system. In Malaysia health care system are heavy supported by government (Tan, 2004). The share of health expenditure from the government tends to be higher than private sector for most of the developing country. It is highly subsidized by the government in order to ensure that everyone can access to the system without considered their nationality or income level. There are no such as a waste or too much for the amount spent on health by the nation. This is because

health is considered as a wealth. Government of Malaysia give a full effort and attention to ensure that the public expenditure for health keeps increase from year to year. For example, the Total Health Expenditure (THE) for Malaysia during 1997-2011 rose from RM8, 121 million in 1997 to RM37, 542 million in 2011. The health spending as a share of Gross Domestic Product (GDP) for the same period ranged from 2.88 per cent to 4.26 per cent of GDP. Overall the per capita spending on health ranged from RM630 (USD231) in 1997 to RM1, 292 (USD422) in 2011. The Total General Government Health Expenditure (GGHE) as percentage of General Government Expenditure (GGE) 1997-2011 ranged from five (5) per cent to seven (7) per cent in 2011. The above trends clearly show that health care expenditure in Malaysia has been on the increase over the years. This shows how important the health status of the nation to the economic progress (Malaysia Health Expenditure Report, 2013).

In the past, the country has done well to maintain the health of the nation. However the country faces more challenges as we move towards a developed nation. Malaysia's record of healthcare expenditure is no exception to the rule. Figure 1.1 shows that, at 4.8 per cent of GDP, our spending on healthcare is above our regional peers and public spending is a disproportionate contributor to healthcare costs. The burden on public spending is even more pronounced when compared to countries in the upper-middle to high-income brackets. While numerous efforts are already underway to stem the expenditure trajectory, there is no coordinated effort to grow healthcare revenues. The healthcare NKEA intends to address this asymmetry of focus and identify private sector opportunities to reframe health as an economic commodity as well as a social right.

In 9th Malaysia Plan, one of the objectives is implementation of the health care financing mechanism which will further enhance accessibility and equity through the provision of high quality, efficient, integrated and comprehensive health care coverage for the population. The comprehensive healthcare plans are continuously upgrade in order to give the better health to the people.

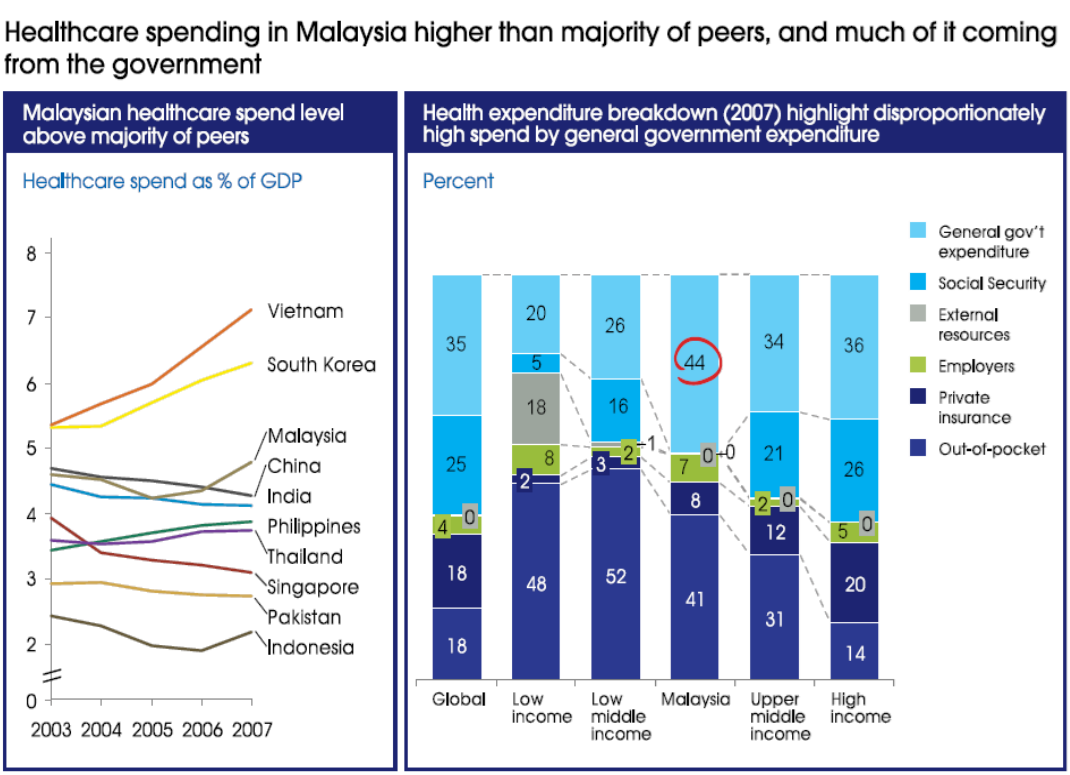

Figure 1.1
Healthcare Spending In Malaysia

In 10th Malaysia Plan transformation of healthcare delivery system call for the restructuring of the national health system, both public and private to enhance coverage for all. A review of financing options that allow management of rising cost, while ensuring that healthcare remains accessible and affordable to the people. This includes the introduction of cost sharing options that allow Malaysians a wider choice in the purchase of health services.

Ensuring the health and well-being of the people is essential for the achievements of visions 2020 in line with the national Missions Thrust in particular Thrust Four which is "To improve the standard and sustainability of quality of life". With the commencement of the 10th Malaysia Plan in 2011, the Government of Malaysia plans to reform the healthcare delivery system with focus on four key areas:

a) transforming delivery of the healthcare system;
b) increasing quality, capacity and coverage of the healthcare infrastructure;
c) shifting towards wellness and disease prevention rather that treatment;
d) increasing the quality of human resources for health

The Malaysian health system that developed since the indipendence from the British in 1957 is heavily influence by the UK health system. The system is centrally administered with the Ministry of Health playing a major role to administer, fund and manage the services at national, state and even district levels. The government of Malaysia has been investing quite well to provide an extensive infrastructure throughout the country. Currently, at the primary health care level, the basic curative and preventive services are provided through 2,856 government health centres and community clinics and more than 6,000 private clinics. The in patient curatives cares is provided by 147 public hospitals which covers 75 per cent of the total beds in country (Malaysia Health Expenditure Report , 2013).

1.4 Statement of the Problem

Poor environmental quality is responsible for many health damages, air, water and soil pollution can increase risks of illness. The share of government spending on health

constantly increasing and it's met by an almost immediate increase in the demand for healthcare. The increasing deterioration in environmental quality across the world is posing serious challenge to healthy living through the increasing threat of global warming. Many studied have examined how some socio-economic and political factors are driving health care expenditure using time series data, cross sectional data and panel data models. They focused on the impact of factors like income, age distribution, globalization, foreign aid, inflation and etc. However, there is a dearth of studies examining the influence of environmental quality on health care expenditure in Malaysia.

There are a number of studies such as Baro (1996), Bloom and Sachs (1998), Baldacci *et al.* (2004), Rahman (2011) Kim and Lane (2013), Boachie *et al.* (2014) and Eneji e*t al.* (2013) are about the macroeconomic determinants of the health expenditure but very few of them have clearly focused on the determinants of health expenditure through the environmental quality.

Besides that there is only a few studies includes the fertility rate and mortality rates as the determinants of health expenditure. Infant mortality rate is the number of infant who die before reaching one year of age, per 1,000 live births in a given year. Infant mortality rate is one of the main health indicator for assessing the health system's performance over the world. Fertility rate is the total (births per woman) in Malaysia was last measured at 2.64 in 2010, according to the World Bank. In the report, it cites that the Minister of Women, Family and Community Development said the nation's total fertility rate (TFR) declined from 3.0 children in 2000 to 2.1 in 2012. The decline in TFR caused the population growth rate to decline.

Population growth is expected to decline further to 1.0 percent for the 2020 to 2030 period. Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates (Malaysia's Statistic Report, 2013).

Nowadays, there is a particular concern that, with an ageing population and therefore the prospect of more elderly people, the pressures for expenditure on health care will escalate. Thus this study will also take account the link between health expenditure and socioeconomics such as mortality rate and fertility rate besides the effects of environmental quality on health expenditure in Malaysia.

1.5 Research Question

Consistent to the discussion so far, there were some the following question. Researches questions have to be answered regarding to the impact of environmental quality to the healthcare spending in Malaysia, follow as:

1. What is the effect of environment quality on health expenditure in Malaysia?
2. What is the effect of socioeconomics factors (fertility and mortality rate) on health expenditure in Malaysia?
3. What is the relationship between environment quality and health status in Malaysia?

1.6 Objective of the Study

1.6.1 General Objective

The general objective of the study is to investigate the impact of environmental quality to the health expenditure in Malaysia.

1.6.2 Specific objective

The specific objectives of the study are express as follow:

a) To examine the cointegration between health expenditure and environmental quality in Malaysia.
b) To examine the long run relationship of environmental quality with respect to health expenditure using Malaysia data.
c) To examine the speeding of adjustment in short run relationship between health expenditure and the environmental quality.

1.7 Significant of Study

It is described that the present study would be significant to academicians and in several ways. By using some indicator as composed to the effects of environmental quality on healthcare spending in Malaysia, that study can identify how the environmental quality will influence the Malaysia budgeting on healthcare. The finding of this study can be used to know the impact of environmental quality to human

health and helping policy makers to set the best strategy to protect the environment and improve the human health quality. Besides that this study will help to examine the significant determinant of health expenditure and the effect of environmental quality to the mortality and fertility rate. This will help the policy maker to plan the best way to improve the human capital quality and estimated the best budgeting for the nation health.

1.8 Scope of the Study

Generally, this study examines the impact of environmental quality and socio economics factors in determining the health expenditure in Malaysia. This analysis employs annual time annual time series data on real per capita Health Expenditure (HE), real per capita GDP, Carbon Dioxide (CO2), Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2) emission in metric tonnes per capita, Fertility Rate (FR), Mortality Rate (MR) infant per 1,000 live births. The data were obtained from World Bank World Development Indicator (WDI) and spanned over the period 1970 – 2013.

1.9 Organization of the Study

The study consists of five chapters; chapter one focuses on the introduction of the study. Chapter two presents the literature review of the study. Chapter three contains the explanation of data and methodology of the study. While chapter four is the analysis of the findings and lastly chapter five concludes the summary of the study and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

This chapter will focus on the theoretical and empirical review on previous study, which provides different framework for analysing the various determinants of health expenditure.

2.1 Theoretical Review

A lot of previous studies are examining the link between health and economic outcomes. Health is one of the criteria for the economic performance both at the level micro and macro levels. It is one of the key elements in our economic growth. Bloom and Canning are well known researcher in this area. According to the Bloom *et. al* (2001), health has positive and statistically significant effect on economic growth. Improvement of one year in a population's life expectancy will contributes to a great increase in output. This is supported by Baldacci *et al.* (2004) which discovered that social expenditure on health have positive significant growth impact to economic growth.

By adopting the neo-classical growth model and used the ordinary least square methods of estimation, Dauda (2004) analysed the impact of healthcare spending on economic growth in Nigeria and found a positive relationship between health care expenditure and economic growth. Besides that Bloom and Sachs (1998) before this also finds that attributes about 35 per cent of the gap to variations in health indicators such as life expectancy which they found to have the highest impact among the health

measures used. Regarding the Bloom and Canning (2000, 2003), one of the factor to determine the investing in education and health is our population quality.

While Brempong and Wilson (2004) found health capital indicators positively influenced aggregate output. Their finding shows that about 22 per cent – 30 per cent of growth rate are attributed to health capital and improvements in health conditions equivalent to more year of life expectancy which associated with higher GDP growth up to four (4) per cent per year. Sapuan and Sanusi (2009) also discovered that investment in health capital have positive relationship with real GDP which life expectancy as proxy of health capital showing a bigger effect to real GDP as one (1) per cent increase in life expectancy will increase 10 per cent of real GDP in Malaysia. Mayer (2003) found that health play significant role in economic growth compared to education. Health increased growth through improvement in education enrolment, productivity level and participation women in economic activities.

This supports by Messer (2002) which view health as a capital. Better health will increase productivity, fewer sick days and higher wages. Health status determines job productivity, the capacity to learn at school and the ability to grow intellectually, physically and emotionally. Elimination of diseases and improvement of individual health will enhance income earning capacity (WHO 2004). While Filmer and Pritchett (1999) found that doubling public spending from 3 to 6 percent of GDP would improve child mortality by only nine (9) to 13 per cent.

According to Bloom and Canning (2000,2003) healthy population will give impact to economy in four ways which are through increasing productivity level, spend more

times at work, invest more in education and increase the investment due to high expectation of a longer life. Aquayo-Rico and Iris (2005) studied the impact of health on economic growth use OLS during period 1970-80 and 1980-90 for 13 European countries, one (1) African countries, 16 American countries and 11 Asians countries found that health capital has a significant effect on economic growth.

Gupta and Mitra (2003) examines that per capita public health expenditure positively influence health status and also found that poverty decline with better health and that growth and health have a positive two way relationship. Aurangzeb (2001) investigates the relationship between health expenditures and economic growth for Pakistan during the period 1973-2003, finds that there are a significant and positive relationship between GDP and health expenditure in both short and long run. Gallup, Sachs and Mellinger (1998) also supported the positive relationship between health and economic growth. Using life expectancy at birth as their basic measured of overall health of the population, they found a strong relationship between initial levels of health and economic growth. They conclude that improved health is associated with faster economic growth.

Nurudeen and Usman (2010) suggest that we should increase the expenditure in the development of the health sector because its enhance productivity and economic growth. Philips (2005), affirm that over the past 50 years, life expectancy has improved and infant mortality declined continuously in all parts of the world except Sub – Saharan African in the 1990s. Good health can reinforce economic growth by enabling people to be more productive especially in countries that have little corruption; poor health can constrain economic growth because it reduces the quality and quantity of

labour. Riman *et al.* (2010) mentioned that level of government expenditure on health can give improvement to the nation health status and therefore determines the ultimate level of human capital development which eventually leads to better, skilful, efficient and productive economy.

Eneji *et al*. (2013) finds the strong relationship between health status and productivity besides other factors such as technology, capital, infrastructure and education. Healthier people can work more and are physically and cognitively stronger. Become more productive and indirectly can earn more income with higher life expectancy rate.

Some studies relates better health status with increasing income by its effect on productivity and better functioning and reduced disease burden (see for example; Hanmer *et al.*, 2003 and Ramirez *et al.*, 2000). Nevertheless, public health expenditures are determined not only by income but also by host of other social, economic, demographic, environmental, cultural and political factors. Better health can be regarded as a major determinant of welfare level and therefore, affects poverty directly. The strong association between health and economic indicators suggests that health is also a determinant of economic welfare of the nations. In recent years impact of human capital formation (especially health status) is realized to be an important predictor of economic growth not only in individual countries but across countries and over time (Alderman et al., 2003; Bhargava, 2001; Webber, 2002 and Zon and Muysken, 2003). Therefore, health and its likely impact on individual's wellbeing and on economic development received immense importance at various levels (Frank and Mustard, 1994). Although, health is associated with development but what is not yet confirmed is the path of causation as empirical evidence argues both ways (see for

example; Ramirez, Ranis and Stewart, 1997 and Gallup, Sachs and Mellinger, 1998). It is doubtless to say human welfare and wellbeing is an end in itself, while understanding in a refined way, this complex relation between health and economic growth as an important policy issue for priority settings. Evidence from post-World War-II literature suggested an unprecedented increase in life expectancy and reduction in infant and child mortality. Although, the distribution is skewed across region and within

While this process of decline in mortality and increasing life expectancy had different path to reach at some better level in today's world. It took two to three centuries in Europe to reduce its infant and child mortality and increase life expectancy while in South-East Asia it took only few decades which is described by a study of Asian Development Bank (ADB, 1997) as "demographic gift". This demographic change has contributed 0.5 to 1.3 per cent in annual growth since mid-1960 to early 1990 or 15 to 40 per cent of the region's overall economic improvement. The effect of health and demographic variables are also analysed for Africa, by Bloom and Sachs (1998) and concluded that half of the difference between growth of Africa and rest of the world can be explained by demographic factors and health improvements over the same period. Reduced mortality by 2 per 1000 live births accounts for one (1) per cent increase in growth rate in subsequent quarter century in 25 African countries. Because of the fact that mortality have direct bearing on fertility which directly affects growth process, as fertility reduces by two (2) child growth increases by one (1) per cent. Cyclical nature of health development relationship makes it important to take care of both sides (Hamoudi and Sachs, 1999).

2.2 Empirical Review

Hansen and Selte (2000), examined the relationship between air pollution and human health effects. Their main focus was on investigating the impact of deteriorating health due to air pollution, which leads to more sick leaves, on labour productivity. They used data from Oslo and employed a logit model. They found that an increase in small particulate matter increases number of sick leaves, which negatively impacts trade and industry in Oslo.

Boachie *et al.* (2014) in a study on determinant of public health spending in Ghana revealed that CO2 emissions (used as proxy for pollution) impact positively but insignificantly on health care spending, implying that air pollution tends to increase public spending. They however contended that the non-significance of this variable could be due to the fact that there is low level of industrialization in Ghana. Kiymaz *et al.* (2006), also found that environmental factors like pollution have been found to have positive impact on public health spending in certain provinces in China in a study that involved the use of panel unit root and cointegration analysis.

Jerret *et al.* (2003), investigated the relationship between environmental quality (proxies by total pollution emissions and government expenditures devoted towards defending environmental quality) and health care expenditures. They used cross-sectional data from 49 countries of Ontario, Canada. They found that countries with higher pollution have higher per capita health expenditures and countries that spend more on defending environmental quality have lower expenditures on health care.

Narayan and Narayan (2008), examined the role of environmental quality in determining per capita health expenditures used a panel cointegration approach in order to explore the possibility of estimating both short and long run impacts of environmental quality. The empirical analysis is based on eight OECD countries, namely Austria, Denmark, Iceland, Ireland, Norway, Spain, Switzerland and the UK for the period 1980-1999. They found that per capita health expenditure, per capita income, carbon monoxide emissions are cointegrated.

Wang *et al.* (2007) study apply the method of Granger causality which is more accurate than classical correlation analysis method to determine whether the main air pollutants: Nitrogen oxides (NOx), Sulphur Dioxide (SO2), Carbon Monoxide (CO), Total Suspended Particulates (TSP), particulate matter smaller than 10 microns (PM10) and the mortality respiratory diseases of the residents in Beijing have causal relationship. After ensuring NOx, SO2 and CO as the responsible substances, used the time series method to construct the autoregressive integrated moving average model (ARIMA) of the pollutants, so that we could predict the amounts of the pollutants from 2005 to 2008. Then used the predicted value of pollutants as the input of the neural networks model and obtain the output as the change of the death rate of respiratory disease from 2005 to 2008. In the end, reducing the amount of the pollutants by 10 per cent and inputting the data in the neural network model, we make the prediction to evaluate the level of the pollutants and concluded that NOx is the most important pollutant to control.

Adusanya *et al.* (2014), adopts the ARDL Bounds testing approach to investigate the effects of environmental quality (proxy by CO2 emissions) on healthcare spending in

the long and short run periods, revealed that CO2 emission in metric tonnes per capita have positive impact on health spending in Nigeria, implying that as the environment quality deteriorates, health spending increases.

Yazdi *et al.* (2014), used cointegration and ARDL approached in order to explore the possibility of estimating both short and long run impacts of environmental quality in Iran for period of 1967 to 2010. They find that health expenditure, income, sulphur oxide emission and carbon monoxide emissions are cointegrated. Short and long run elasticity reveal that income, sulphur oxide emission and carbon monoxide emissions exert a statistically significant positive effect on health expenditures.

Furthermore, during the past fifteen years, with the emergence of environmental concerns, many studies examine the association between income inequality and natural environment quality. A large body of research has reported strong associations between income inequality and environmental degradation explain how income inequality may improve environmental quality. Through a panel of 42 countries in the period 1975-1992, Ravallion *et al.* (2000) first estimate CO2 emissions as a cubic function of average per capita income and of population and time trend. They estimate their equation with fixed effect model and simple pooled model using ordinary least squares. They conclude that higher inequality within countries reduces carbon emissions. However, the impact of income distribution on the environment decreases at higher average incomes.

CHAPTER THREE

METHODOLOGY AND DATA

This section provides discussion on the sample of data and methodology used in the present in order to examine the relationship between environmental quality and socio economic factors with health expenditure in Malaysia.

3.1 Samples and Data Description

This chapter study on specific model that is used to analyse the impact of environmental quality and income in determining the Health expenditure. This analysis employs annual time series data on real per capita Health Expenditure (HE), real per capita GDP, Carbon Dioxide (CO2), Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2) emission in metric tonnes per capita, Fertility Rate (FR), Mortality Rate (MR), infant per 1,000 live births. The data were obtained from World Bank World Development Indicator (WDI) and spanned over the period 1970 – 2013.

3.2 Sources of Data

The data were obtained from World Bank World Development Indicator (WDI) and spanned over the period 1970 – 2013.

3.3 The Specification Model

This study is to see the correlation between environments quality and the health expenditure spending in Malaysia. This study is to find out the magnitude of the impact of non-income determinants of health expenditure in Malaysia using ARDL approach to VECM test generalized by Pesaran & Pesaran (1997), Pesaran & Smith (1998), Pesran & Shin (1999) and Pesaran *et al*. (2001). This approach can be used when the series have the constant degree which is the same and I(d) same either. However, this method required the degree I(I) in the dependant variable like the past study by Caranagh, Elliot and Stock (1995).

In addition, if the study has a small sample, the Eigle-Granger (1987), Johansen (1988) and Juselius (1990) are not reliable. Kremers *et al.* (1992) provide an empirical evidence that with the small samples, is no cointegration can be established among the variables if they integrated order (I).

ARDL model is preferable to the other cointegration methods. One reason is that the model does not involves the pre-testing variables, which means the test on existence of relationship between variables in level can be applicable irrespective of whether the underlying regressor are purely I(0), purely I(I) or fractionally cointegrated (Pesaran & Pesaran, 1997).

The model used in the study emanated from the works of Murthy and Okunade (2009) and Narayan & Narayan (2008). This approach can be used when the data series have the constant degree which is different I(0) is different. However this approach requires

degree I(I) for dependant variable the frame model AD-AS will be used to explain the implication of environmental quality. We assume that the final health expenditure is the function against the other variables, so the specific model will shows the relationship between the dependant and independent variables.

$$HE = \beta 0 + \beta 1 GDP + \beta 2\ CO2 + \beta 3\ SO2 + \beta 4\ NO2 + \beta 5\ MR + \beta 6\ FR + \varepsilon t \qquad (3.1)$$

HE = Health Expenditure per capita,

GDP = real per capita,

CO2 = Carbon Dioxide emission in metric tonnes per capita

NO2 = Nitrogen Dioxide emission in metric tonnes per capita

SO2 = Sulphur Dioxide emission in metric tonnes per capita,

FR = Fertility Rate

MR = Mortality Rate infant per 1,000 live births.

Relationship between health expenditure and economics and social factors has taken various forms. This bivariate formation has been expanded by several recent studies Karatzas (2000) to include additional socio economics factors as determinants of health expenditure. Thus they model the relationship within a multivariate framework.

All variables are converted in natural logarithms form to allow us to interpret them as elasticities. The equation 3.2 can be written as follows:

$$\ln He_t = \beta 0 + \beta 1 \ln GDP_t + \beta 2\ \ln CO2_t + \beta 3\ \ln SO2_t + \beta 4\ \ln NO2_t + \beta 5\ \ln MR_t + \beta 6\ \ln FR_t + \varepsilon t \qquad (3.2)$$

All the variables are transformed to natural logarithms for the purpose of the analysis.

3.4 Estimation Procedure

The objective of this section is to explain the relevant econometrics procedure in testing this time series data. The most appropriate estimation procedure will be discussed under various conditions so as to allow us to achieve the specific objective.

3.4.1 Test of the Stationarity

In the literature there are several test of stationary. Granger (1974) argues that we cannot do any regression, unless all variables are stationary. It will be nonsense regression when we run the regression by non-stationary variables. According to Granger, $R^2 > d$ (Durbin-Watson) is a good rule of thumb to suspect that the estimated regression is nonsense. It may be added that the R^2 at t-statistic from such a spurious regression are meaningless.

Implementation of the unit root test in the ARDL procedure necessary to ensure none of variables are I(2) or beyond. So this test can be describe as follows:

i) estimate the following regression:

$$Y_t = A1 + A2_t + A3Y_{t-1} + U_t \qquad (3.3)$$

where represent the first difference operator, where t is the trend variable,

taking values of 1,2 and so on and where Y_{t-1} is the one period lagged value of the variable Y.

ii) The null hypothesis is that A3 the coefficient of Y_{t-1} is zero, which is another way of saying that the underlying time series is non stationary. This is called the unit hypothesis.

iii) To test that A3 the estimated valued of A3 is zero, ordinarily we would use the now familiar t test. Unfortunately we cannot do that because the t-test is strictly speaking, valid only if the underlying time series is stationary. However we can use an alternative test called the τ (tau) test whose critical values were tabulated by its creators on the basis of monte carlo simulations. In the literature the tau test is known as the Dickey Fuller (DF) test in honour of discovers. If in an application the computed τ (tau) value Dickey Fuller tau values we reject the unit root hypothesis: that is, we conclude that the said times series is stationary. On the other hand, if the computed tau values is smaller (in absolute value) than the critical tau values, we do not reject the unit root hypothesis.

3.4.2 Cointegration Version Model

The analysis of the empirical study to find out the long run relationship and the dynamic interaction across the variables, the approach applied by Pesaran *et al.* (2001) is the procedure of co-integration boundary test ARDL. Currently, panel data method has been widely used. This is because of the small sample of study, panel data analysis

could lead to the enhancement of the estimation by using supplementary information obtained from cross sectional dimension. Other panel data methods such as the ECM model, also makes supplementary information available by allowing the estimation and by through the speed of adjustment coefficient that provides information concerning the duration of the effects.

The advantages procedure of co-integration boundary test ARDL is to lose the needs in categorizing the variables into I(I) or I(0). There are three reasons why this model used. Firstly, the procedure of the boundary test is easy and different from other various variants co integration techniques where the co integration estimated using KDT when the level of lat for model determined. Secondly, pre-test of unit root for the variables needed in the procedure of boundary test. The test implementation can be done whether the regression in the model is I(I) , I(0), or there is co integration. Thirdly, although the size of the sample data is small or limited, the test relative is more effective. But of the series is I(2) the procedure of the boundary test cannot be done.

The application of the procedure of the boundary test is through the form of the long run. Equation (1) is the model of general vector auto regression (VAR) for the p & Z as in the study of Pesaran *et al.* (2001)

$$\mathrm{Z} = c0 + \beta + \sum_{1=i}^{p} \varphi \mathrm{z} \qquad (3.4)$$

C0 = vector (k+1) for intercept (drift)

β = vector (k+1) trend coefficient

Pesaran *et al.* (2001) derive the vector error correction model (VECM) based on the equation 3.3:

$$\Delta z = Cc + \beta t + \Pi z_{t-1} \Sigma\Gamma i z_{t-1} + \varepsilon t, \quad t= 1,2,4,.....T \tag{3.5}$$

(k+1)x(k+1) is the matrix for $\Pi = Ik +1 + \Sigma\psi i$ and $\Gamma = \Sigma\psi j$, i = 1,2,....,p-1 that contains the long run coefficient and the coefficient of VECM. Zt referred to the vector variables refers to yt and xt respectively. yt referred to the dependant variable 1(1), namely health expenditure and xt referred to the GDP, CO2, NO2, SO2, FR and MR is the matrix vector of the power of regression I(1) and I(0) which have been identified same in various variation and the free distribution (I,I,d) zero mean error vector ei= (e1t + e2t), and the process of homokedastic. With the assumption that the relationship in the long run exist within variables, the position of VECM (3,4,2) will be:

$$\ln y_t = c_0 = \beta_t \ln T + \Sigma^{p-i}_{i=1} \lambda \ln y_{t-i} + \Sigma\beta i P j_{t-i} + \Sigma\alpha \ln WO_{t-i} + \Sigma\alpha \ln Lm_{t-i} + \delta i y_{t-i} + \delta P_{jt} + \delta 3 WO_{t-i} + \delta 3 \ln LM_{t-i} + \varepsilon_t \tag{3.6}$$

Where d1 is the coefficient in the long run, CO is the intercept ant et is stochastic.

3.4.3 Procedure of Boundary Test

In the ARDL approach, we should estimate the equation five by using common KDT to test whether there is the long run relationship among the variables using F test for the significance with the variables coefficient in lat, namely Ho: d1=d2=d3=d4=0

versus Ha: $1 \neq \delta 2 \neq \delta 3 \neq \delta 4 \neq 0$. Two values of critical boundary provided for cointegration when the explanatory variables I(d) (when 0=d=1) low value assuming that variable I(0) while high value referred to the variable I(I). If F statistic value is out of the boundary data area, the null hypothesis can be rejected. Instead of that, if statistic test is in the area of the boundary, alternative hypothesis can be rejected and if the value of statistic is on boundary, the decision is unknown. When cointegration is determined, the position of the long run ARDL model (P1,q1,q2,q3) for y_t can be estimated as:

$$\ln y_t = c_0 = \beta_t \ln T + \Sigma^{p-i}_{i=1} \lambda \ln y_{t-i} + \Sigma \beta i P j_{t-i} + \Sigma \alpha \ln WO_{t-i} + \Sigma \alpha \ln Lm_{t-i} + \delta i y_{t-i} + \delta P_{jt} + \delta 3 WO_{t-i} + \delta 3 \ln LM_{t-i} + \varepsilon_t \quad (3.7)$$

Equation 3.7 need to choose the level of the lat ARDL model (P1,q1,q2,q3) for 4 variables. The next step is to obtain the dynamic parameter in the short run by estimating error correction model which match to the long run estimator. Model specification is as below:

$$\ln y_t = \mu + y_t T + \Sigma \phi \Delta \ln y_t + \Sigma \phi \Delta P_{t-i} + \Sigma \eta \Delta \ln LM_{t-i} + \delta y_{t-i} + \delta P_{jt} + \Delta \delta \Delta WO_{t-i} + \delta 3 \ln \Delta LM_{t-i} + VECM + \varepsilon_t \quad (3.8)$$

ϕ,f, y and η is the dynamic coefficient in the short run for the model to converger to the equilibrium and v is market volatile.

3.5 Conclusion

This chapter laid out the details pertaining to the research approach. Basically, the study deployed methods of quantitative approach in data collection. Techniques for analysis of data and other measures were clearly outlined. In the next chapter, analysis of data and research findings are discussed.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter discusses the major findings for all various regression models used in the study. Possible explanations for the findings are discussed in each section, along with their implications. This chapter concludes discussion of the relationship of the findings to the theoretical model proposed in Chapter Three.

4.1 Regression Analysis

Unit root test is significant in examining the stationary of a time series because the non-stationary regressor rejects many empirical results. The existence of stochastic trend is determined by the unit root test time series data. In this study, the unit root tested using the ADF (1979) and PP (1988). This ARDL model requires degree of I(I) for dependant variable alone.

Table 4.1 present the result of the ADF and Phillips Perron Test, the order of integration is tested at one (1) per cent, five (5) per cent and 10 per cent significance level and the critical values obtained from Mackinnon (1991) Tables. The results are robust regardless of the lag length. These tests are done for both trend and without trend. From Table 4.1 we found that we reject the null hypothesis of non-stationary which indicates that most of the variables are stationary at the first differences at five (5) per cent level of significance except for FR stationary in level and MR stationary at second difference. It is clear from the empirical results in Table 4.1, under these circumstances and especially when we faced mix results, applying the ARDL bounds

approach is the efficient way of determining the long run relationships among the variables under investigation. The using ARDL is it does not need the data series test on the variables.

Table 4.1

Results of Unit Root Test

	ADF		PP	
	t_μ	t_τ	τ_μ	τ_τ
A: Level				
HE	1.9313(0)	-0.0950(0)	1.7296(1)	-0.2313(1)
GDP	-1.8555(0)	-1.3675(0)	-1.7971(1)	-1.4450(2)
CO2	-1.0978(0)	-1.6048(0)	1.0978(0)	-1.5818(2)
FR	-3.9343**	-9.2082**	-1.4630(5)	-4.7203**
MR	-2.1061(1)	0.8510(3)	-2.6187(1)	0.1423(0)
NO2	-1.5174(0)	-3.0900(0)	-1.2077(14)	-2.8275(6)
SO2	-0.4478(1)	-0.7825(1)	-0.4229(1)	-0.8360(0)
B: First Differences				
dHE	-4.8144**	-5.3500**	-4.8433**	-5.2570**
dGDP	-5.4667**	-5.8022**	-5.4122**	-5.8082**
dCO2	-7.6862**	-7.7019**	-7.6423**	-7.6608**
dFR				
dMR	-1.9736(0)	-3.8539**	-1.9736(0)	-2.7627(2)
dNO2	-6.3488**	-6..2752**	-10.5360**	-11.3450**
dSO2	-2.9321***	-3.0882(1)	-6.2770**	-6.5824**
C: Second Differences				
dMR,2	-3.2930**		-3.2930**	-3.1984***
dSO2,2		-5.3084**		

Table 4.2

Autoregressive Distributed Lag Estimates; Dependent variable is Health Expenditure (HE)

Regressor	Coefficient	t-statistic
dHE(-1)	0.21838	0.62543[0.547]
dHE(-2)	-1.0778	-3.5811[.006]
dGDP	-1.5171	-2.6680[.026]
dGDP (-1)	4.5192	4.1213[.003]
dGDP (-2)	3.0241	4.0458[.003]
dGDP (-3)	1.3466	2.5361[.032]
dMR	-4.4867	-.75932[.467]
dMR(-1)	23.2088	1.5893[.146]
dMR(-2)	39.5010	3.9424[.003]
dFR	-11.0761	-1.8703[.094]
DFR(-1)	8.1007	.81343[.437]
DFR(-2)	7.8217	1.3236[.218]
DCO2	.70536	3.8696[.004]
DCO2(-1)	-1.6210	-3.6380[.005]
DCO2(-2)	-.41655	-1.7974[.106]
DSO2	1.4685	3.7019[.005]
DSO2(-1)	-3.0594	-6.3465[.000]
DSO2(-2)	-2.5998	-7.0222[.000]
DSO2(-3)	-1.4334	-3.0202[.014]
DNO2	-.80734	-2.2711[.049]
DNO2(-1)	-3.4148	-1.5286[.161]
DNO2(-2)	-2.1099	-1.0593[.317]
DNO2(-3)	-2.7508	-1.7650[.111]
C	190.5516	4.0313[.003]
HE(-1)	-1.3149	-2.7482[.023]
GDP(-1)	-8.3113	-4.4716[.002]
MR(-1)	-6.7849	-3.9114[.004]
FR(-1)	-2.5030	-3.9466[.003]
CO2(-1)	3.8107	4.6951[.001]
SO2(-1)	3.7892	7.9936[.000]
NO2(-1)	.53356	.21860[.832]
R-Squared	.98759	
	Diagnostic Tests	
A:Serial Correlation	3.4128[.102]*	
B:Functional Form	1.7777[.219]*	
C:Normality	7.6710[.022]	
D:Heteroscedasticity	1.5603[.219]*	

The results in Table 4.2 show that there are significant effects of the lags of some of the macroeconomics variables on Health expenditure. There are significant effect of the first, second and third lag of the GDP, second lag of MR, first lag of CO2, first, second and third lag SO2 and second lag of Health Expenditure.

The ARDL model was estimated form of recursive search of the optimal numbers of lags through the Schwarz Bayesian Criterion (SBC) and from the diagnostic statistic. Given the few observations available for estimation, we set the max lag order of the various variables in the model equal to unity.

Table 4.2 presents the ARDL estimates. In fact, this is the first stage of an ARDL modelling for univariate co-integration test. The result of the few diagnostic tests include that there is no error of Autocorrelation and conditional Heterocedasticity and that the errors are normally distributed. This evidence indicates that the relationship between variables is verified.

This implying that the current GDP, CO2 and SO2 would still affect the Health Expenditure for the coming year and the current of MR would affect the Health Expenditure for the next two years and the current of Health Expenditure would also still have significance on the Health Expenditure in the next year.

The next step is to investigate whether the Malaysia Health Expenditure, GDP. NO2 emissions, FR, MR, CO2 and SO2 emissions share a common long run relationship. To achieve this, as explained earlier we test the presence of the long run relationship.

The co-integration test in bound's framework involves the comparisons of the F-statistic against the critical values, which are generated for specific sample size (Narayan, 2005).

Table 4.3

Cointegration Result of Bounds Test For Malaysia In Health Expenditure (HE)

	Wald Statistic	
Computed F-value:	6.8063***	
	Critical value	
	Lower bounds	Upper bounds
10% significance	2.618	3.532
5% significance	3.164	4.194
1% significance	4.428	5.816

Note: The bounds critical values were obtained from Narayan *et al.* (2000); Critical values for the bounds test: Case II: restricted intercept and no trend (k = 6); *, ** and *** denote significant at 1%, 5% and 10% significance levels

From the table 4.3, using the asymptotic critical value computes by Pesaran *et al.* (2001), we find that there is a long run relationship between the variables when health expenditure is a dependant variable because its F-Statistic, which turn out to be 6.8063 is higher than the upper bound critical value of 4.428 at one (1) per cent level of significance.

Going by this result, the null hypothesis of no co-integration is not accepted. Regardless of whether the variables are I(I) or I(0) or a mix of both. The test also indicates the presence of the valid long run relationships between the independents variable and the dependant variable at the calculated F-statistics of 6.8063 which

exceed the upper critical value. Thus, GDP, CO2, MR, FR, NO2 and SO2 could be treated as having relationship which health expenditure in the long run in Malaysia.

In the first step of analysis of ARDL, the existence of the long run coefficient is estimated and the results are reported in Table 4.2. As discussed earlier, one of the important issues in applying the ARDL is the choice of the order of the distributed lag function. In order to select the best performing ARDL model, the significant of the result ARDL-VECM parameters, the Schwarz Bayesian Criterion (SBC) is preferred to other models specification criteria because it tends to define more parsimonious specifications. The small data sample in the current studies underlies this preference (Pesaran and Smith, 1998). The SBC lag specifications for this model are shown as ARDL 2322233 respectively.

Table 4.4

Estimated long-run coefficient using the ARDL approach of log health expenditure (HE)

Variable	Coefficient	t-statistic	p-value
Constant	102.4816	1.9144	[0.088]
dGDP	3.9652	1.8135	[0.103]
dMR	31.3133	2.3849	[0.041]
dFR	2.6064	2.0593	[0.070]
dCO2	-0.716408	-1.3688	[0.204]
dSO2	-3.0248	-4.8017	[0.001]
dNO2	-4.8849	-1.6288	[0.138]

The long run and short run elasticity's for impact of GDP, NO2, CO2, SO2, MR and FR on health expenditure are generated using ARDL Estimators. The long runs estimated are described in Table 4.4. All estimated coefficient can be interpreted as Long run elasticity's, given that variables are expressed in natural logarithms.

Beginning with the long run results, our main finding can be summarized as follow. First, we noticed that 3 variables which are MR, FR and SO2 statistically significant determinant of Health Expenditure but SO2 variable appears with a negative sign. Another 3 variable which are GDP, CO2 and NO2 are insignificant determinant of health expenditure.

The coefficient for GDP is positive, elastic but statistically insignificant. It shows that one (1) per cent increase in the GDP results into 4% increase in Health Expenditure. Besides that, CO2 and NO2 also have insignificant effect on Health Expenditure in Malaysia. The coefficient for both variables is inelastic. The estimated coefficient implies that for every 1% rise in CO2 there will be 0.72 per cent decrease in Health Expenditure in Malaysia and 1% rise in NO2 will be 4.9 per cent decrease in Health Expenditure.

The coefficient of MR is positive, elastic and statistically significant at the five (5) per cent level. Increase one (1) per cent in MR will increase 31 per cent of Malaysia Health Expenditure. The coefficient of FR also positive, elastic and statistically significant at five (5) per cent significance level. Increase one (1) per cent in FR will increase 2.6 per cent of Malaysia Health Expenditure. Furthermore, the coefficient of SO2 is negative, inelastic and statistically significant at one (1) per cent significance level.

This implies that increase one (1) per cent in SO2 emissions will decrease three (3) per cent of Health Expenditure.

The error correction term indicates the speed of the adjustment which restores equilibrium in the dynamic model. The ECM coefficient show how quickly variables return to equilibrium and it should have statistically significant coefficient at five (5) per cent level of significance with a negative sign (Pahlavani *et.al.* 2005). Bannerjee *et. al*. (1998) hold that a highly sign ECM is a further proof of the existence of a stable long run relationship. Therefore, having determined the long run coefficient for each selected ARDL model, we derive the estimators for the ECM. The results are presented in Table 4.5.

The one lag error correction terms (ECM) are found to have the expected negative sign and highly statistically significant. This confirm that the existence of co-integrated relationship among the variables in the model. The coefficient of ECM(-1) are equal to -1.86 which implies that convergence to equilibrium is relatively high and deviations from the long run Health Expenditure are corrected by 1.86 per cent over the following year. This means that the adjustment takes place relatively. This confirms the existence of the long run relationship among the variables with their various significant lags.

As shown in the table 4.5, the variables have a contrast impact on HE in short run compare the impact in the long run. CO2, SO2 and NO2 which either exhibited a negative influence on per capita HE in the long run exert a positive effect in the short

run. On the other hand, GDP, MR and FR like in the long run period are expected to influence Health Expenditure are negatively in the short run period.

Table 4.5

Error Correction Representation for the Selected ARDL Model

Regressor	Coefficient	t-statistic
dHE1	1.0778	3.5811[0.003]
dGDP	-1.5171	-2.6680[0.018]
dGDP1	-4.3707	-3.5531[0.003]
dGDP2	-1.3466	-2.5361[0.023]
dMR	-4.4867	-0.7593[0.459]
dMR1	-39.5010	-3.9424[0.001]
dFR	-11.0761	-1.8703[0.081]
DFR1	-7.8217	-1.3236[0.205]
DCO2	0.7053	3.8696[0.002]
DCO21	0.4165	1.7974[0.092]
DSO2	1.4685	3.7019[0.002]
DSO21	4.0332	5.0524[0.000]
DSO22	1.4334	3.0202[0.009]
DNO2	-0.8073	-2.2711[0.038]
DNO21	4.8607	1.3748[0.189]
C	190.5516	4.0313[0.001]
dHE(-1)	-1.3149	-2.7482[0.015]
dGDP(-1)	-8.3113	-4.4716[0.000]
dMR(-1)	-6.7849	-3.9114[0.001]
dFR(-1)	-2.5030	-3.9466[0.001]
dCO2(-1)	3.8107	4.6951[0.000]
dSO2(-1)	3.7892	7.9936[0.000]
dNO2(-1)	0.5335	0.2186[0.830]
Ecm(-1)	-1.8594	-3.1185[0.007]

Estimations shows that the coefficient most of the regressor have the hypothesized sign and are statistically significant at five (5) percent level. We conclude that Table 4.5 contains the final estimators results of the ECM based on ARDL approach. These results give us some intuitions on the order of magnitude of the impact environmental quality on health expenditure in Malaysia.

4.2 Conclusion

From the ARDL bound test, results shows that there is a long run relationship between the variables when health expenditure is a dependant variable. The test also indicates the presence of the valid long run relationships between the independents variable and the dependant variable. Beginning with the long run results, our main finding can be summarized as follow. First, we noticed that 3 variables which are MR, FR and SO2 statistically significant determinant of health expenditure but SO2 variable appears with a negative sign. Another 3 variable which are GDP, CO2 and NO2 are insignificant determinant of health expenditure.

CHAPTER FIVE

CONCLUSIONS AND POLICY IMPLICATIONS

This chapter summarizes and concludes policy implications of the findings (as discussed in Chapter Four), detailed limitations of the study, and suggestions for further research.

5.1 Conclusions and Discussions

This study is to find out the magnitude of the income elasticity and the impact of non-income determinants of health expenditure in Malaysia using ARDL approach to VECM test generalized by Pesaran & Pesaran (1997), Pesaran & Smith (1998), Pesran & Shin (1999) and Pesaran *et al.* (2001).

This analysis employs annual time annual time series data on real per capita Health Expenditure (HE), real per capita GDP, Carbon Dioxide (CO2), Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2) emission in metric tonnes per capita, Fertility Rate (FR), Mortality Rate (MR), infant per 1,000 live births. The data were obtained from World Bank World Development Indicator (WDI) and spanned over the period 1970 – 2013.

We found that there is a long run relationship between the variables when health expenditure is a dependant variable. The test also indicates the presence of the valid long run relationships between the independents variable and the dependant variable. Thus, GDP, CO2, MR, FR, NO2 and SO2 could be treated as having relationship

which health expenditure in the long run in Malaysia. This confirm that the existence of co-integrated relationship among the variables in the model. The findings from Odusanya *et al.* (2014) support our result which also indicate the strong relationship between the independent and dependent variables.

From the result in chapter four, we also found that MR, FR and SO2 statistically significant determinant of health expenditure but SO2 variable appears with a negative sign. Another 3 variable which are GDP, CO2 and NO2 are insignificant determinant of health expenditure. There are a positive relationship between the GDP, MR and FR with health expenditure. This is contrast with the finding by the Kim and Lane (2013) and Odusunya *et al.* (2014). While the result shows the negative relationship between the CO2, SO2 and NO2 with the HE. Findings by the Odusunya *et al.* (2014) shows the contrast results which state that CO2 have a positive relationship with the health expenditure.

The one lag error correction terms (ECM) are found to have the expected negative sign and highly statistically significant. This confirm that the existence of co-integrated relationship among the variables in the model. So this indicates that the variables have a contrast impact on HE in short run compare the impact in the long run. CO2, SO2 and NO2 which either exhibited a negative influence on per capita HE in the long run exert a positive effect in the short run. On the other hand, GDP, MR and FR like in the long run period are expected to influence health expenditure are negatively in the short run period. The results in the ECM is support by findings of Odusunya *et al.* (2014).

5.2 Policy Implications

The results obtain in this study have very useful implications for policy formulating regarding public health expenditure in Malaysia. This study shows that MR, FR and SO2 statistically significant determinant of Health Expenditure. This suggesting that policies that have the potential to spur growth in the number of births per 1000 people would cause substantial investment in the health services. Given the rapid growth of population in Malaysia, it is imperative for government to increase its spending on health sector in order to have efficient health system. It can be conclude that, socio economic factors play an important role in determining health expenditure in Malaysia.

Malaysia as a developing country must invest more resources in health. The use healthcare during pregnancy and childbirth and healthcare for infants is very critical to national productivity, and must be stepped up through increased health expenditure. The major policy recommendation that emerges from the study is the need for Malaysian policy makers to pay more attention to the health sector and increased it yearly budgetary by considered the socio economic factors. Besides that, take into account the importance of health quality to the nations, government also should look deeply to the private health system in order to make sure that the fees is not burden to the people. This is also can encourage the increasing of fertility rate.

Once the country experience an economic growth, there is also increase in oil, crude oil, gasoline, kerosene, diesel and fuel consumption, so that the effects on a medium term will be greater than on a shorter term of health expenditure. Our remarks implicitly refers to the facts that unsustainable economic growth will increase

environmental degradation, this increasing the risk population decay induced by pollution and mortality. If there is increase of health cost due to finding allotted for healthcare offered to those affected by environmental deterioration, then there are fewer funds available to improve the quality of environment and if this process continues, it is likely to lead to greater pressures exerted on government budget. Pollution damages the environment, it implies that health management policy should include considerations for the use of biofuels in all countries.

5.3 Suggestion for Further Studies

Human capital is very important in developing countries, especially in ASEAN countries. We can extend our study in order to enhance understanding the others important determinants of health expenditure. The effect health status is very important to our nation productivity. Injection more budgeting to health expenditure to enhance the health status, could turn results in more productivity. Environmental quality is one of the factor that influence our health status. Green budgeting would be one of the interesting study that will light up some future determinants for health expenditure in Malaysia.

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