HEALTH EXPENDITURE AND HEALTH OUTCOMES IN MALAWI: THE IMPACT OF CORRUPTION

Master of Arts (ECONOMICS) Thesis

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UNIVERSITY OF MALAWI

CHANCELLOR COLLEGE

August 2014

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Submitted to the Department of Economics, Chancellor College, University of Malawi, in partial fulfillment of the requirements for a Master of Arts Degree in Economics

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DECLARATION

I declare that this thesis is my original work and hence any errors made herein are mine alone. The opinion expressed in the study are those of the researcher and do not necessarily represent the views of the supervisor. Where other researchers' work has been used, due acknowledgements have been made accordingly. I further declare that this thesis has never been submitted in any university or any institution of higher learning for similar purposes.

Candidate:_____

COLLINS TAYAN MHANGO

Date: _____

CERTIFICATE OF APPROVAL

I declare that this thesis is the student's own work and effort and where he has used other sources, acknowledgement has been duly made. Hence the thesis is submitted with my approval on behalf of the University of Malawi, Chancellor College, Zomba.

Signature: _____

E.W. Chirwa, Phd (Professor)

Supervisor

Date: _____

DEDICATION

To my mother, Winnie Sella Kanyasho and my late father Smarton Gwalamu Mhango

ACKNOWLEDGEMENT

I am most grateful to God for seeing me through this demanding task. I am also grateful to my supervisor, Prof. E.W. Chirwa for his exceptional expert research assistance, constructive criticisms and dedication in making sure I produce work with substance.

Special thanks should also go to my fellow staff members at Southern African AIDS Trust (SAT Malawi) and all my classmates and relatives for their direct and indirect support and encouragement. Many people contributed to this thesis, and my apologies in advance for names I have failed to mention.

ABSTRACT

This study looks at the links between public spending corruption, and outcomes. Based on the paradigm that most governments try to promote good health in order to attain broad based economic growth, many countries devote huge budgetary allocation to health, but in most developing countries especially, this huge health expenditure fails to translate into better health status. This paper thus investigates how the effectiveness of public health expenditure is affected by corruption in Malawi. Data on public health expenditure and corruption variable captured by the corruption perception index were regressed on infant mortality and under-five/child mortality using both the ordinary least squares and the two-stage least squares in a VECM. The results obtained showed that public health expenditure has negative effect on infant mortality and under-5 mortalities when the corruption indicators are included. It may be worthy while to consider that in Malawi reducing under-5 mortality rate and infant mortality rates may be unattainable if the level of corruption is not reduced considerably.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey Fuller test
AIDS:	Acquired Immunodeficiency Syndrome
ARCH	Auto Regressive Conditional Heteroskedasticity
DF	Duckey Fuller test
DW	Durbin Watson
CMR	Child Mortality Rate
CPI	Corruption Perception Index
GDP	Gross Domestic Product
GDPP	Gross Domestic Product Per capita
GoM:	Government of Malawi
HIV:	Human Immunodeficiency Virus
IID	Independently and Identically Distributed
IMR	Infant Mortality Rate
JB	Jacque Bera
LR:	Log-likelihood Ratio
MGDS:	Malawi Growth Development Strategy

MoF	Ministry of Finance
MoH	Ministry of Health
NSO:	National Statistical Office
OLS	Ordinary Least Squares
PP	Phillips Perron
RESET	Regression Specification Error Test
TI	Transparency International
UN:	United Nations
UNAIDS:	Joint United Nations Programme on HIV/AIDS
UNFPA:	United Nations Population Fund
UNICEF:	United Nations International Children's Emergency Fund
VECM	Vector Error Correction Model
WHO:	World Health Organization

CHAPTER ONE

1.0 Background

In 1948, the United Nations adopted the Universal Declaration of Human Rights (World Bank, 2003). The Declaration embraces human rights concerns, which are presented in 30 articles. The first article lays the universal foundation of human rights with the message that every human being is born free and equal in terms of dignity and rights. The other articles cover issues related to political, economic, social and cultural rights and the 25th article says that "everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including ... medical care and necessary social services" (World bank, 2003). The declaration did not, however, encompass how these rights were to be fulfilled and who was responsible for their fulfillment.

In 1993, during the World Conference on Human Rights, the United Nations adopted the Vienna Declaration and Programme of Action, which identified governments as one of the principal actors in the protection and promotion of human rights, including nations' health and well-being (World Bank, 2003).Amartya Sen, a Nobel Laureate in Economics, claimed that the types of institutions existing in societies and how they function and interact are vital for people's opportunities. He further stated that the provision of sufficient facilities for health care, which he declared are the governments'

responsibilities, are essential to fulfill human rights for well-being and good health (Sen, 1999). Kofi Annan, former Secretary of the United Nations, pushed a very strong agenda to highlight the importance of governance as fundamental for every society and asserted that governance is "perhaps the single most important factor in eradicating poverty and promoting development" (Annan 2007).

Increasing empirical evidence indicates that better governed countries tend to have healthier populations, suggesting diverse and complicated associations between governance and health outcomes (Kaufmann, Kraay & Zoido, 1999; Gupta, Davoodi & Tiongson 2000; Wagstaff, Claeson, 2004; Rajkumar & Swaroop 2008; Reidpath, & Allotey 2006; Mitchell & Bossert, 2010; Lazarova and Mosca, 2008)

The role of good governance, through less corruption levels, has been emphasized in recent years as key to development effectiveness. For example, it has been argued that merely allocating public resources for right goods and services may not lead to desirable outcomes if budget institutions involving planning, management, and execution-are malfunctioning (World Bank, 1998). While this proposition seems pretty straightforward and difficult to disagree with, no serious empirical work has been carried out to support it. In this study, the researcher looks at the impact of public spending on health outcomes at different levels of corruption. The basic idea is to examine the link between specific budget allocations towards health and health outcomes, and see how these relationships are affected with improved corruption status of Malawi.

1.1 Problem Statement

Significant efforts by Government of Malawi (GoM) and developing partners have improved the health status of Malawians in recent decades, particularly Malawian children, but many health challenges remain. With an estimated population of 13.6 million people and an annual growth rate of 3.2 percent, the population of Malawi is projected to more than triple in 30 years (UNAIDS 2013). While contraceptive use is well-established in the culture, total fertility remains high at six children per woman and access to family planning is limited for youth and rural communities. Ninety three percent of women receive at least one antenatal visit although this is usually late in pregnancy (UNAIDS 2013). Nonetheless, women often struggle to access maternity services, inhibited by familial, community, and infrastructure burdens, including the distance to the health facility closest to them. This shows the urgency to prioritise expenditure towards improving health status of Malawians by the GoM.

However, in Malawi, despite the huge government expenditure on health provision, the health status of Malawi is consistently ranked low. Currently Malawi is ranked amongst the 10 poorest countries in the world (NSO, 2012). Malawi has one of the highest maternal mortality ratios in the world at 807/100,000. In addition, infant and under-five morality rates remain high at 72/1,000 and 122/1,000 live births respectively. Neonatal mortality (at 33/1,000 live births) accounts for one-third of infant deaths and one-fifth of deaths among children under-five years of age. Malaria is the leading cause of mortality and morbidity in Malawi with approximately six million episodes of malaria per year. Nutrition remains a serious health and development problem with nearly half of Malawi's children stunted. It is even argued that bad governance, through corruption, is

responsible for most of similar cases in most African countries (World Bank 2008). It therefore becomes imperative to ask if corruption has a significant impact on the effectiveness of health expenditure in Malawi. This research paper thus investigates how the effectiveness of public health expenditure is affected by corruption in Malawi.

1.2 Objectives of the Study

The general objective of this study is to investigate how corruption affects the effectiveness of public health expenditure in Malawi.

Specifically, the research paper will try to achieve the following objectives;

I. To examine the relationship between public health spending and health status.
II. To assess how the relationship between public health spending and health outcomes is affected by corruption in Malawi.

1.3 Hypothesis of the study

The following are the hypothesis to be tested in this study:

I. There is no significant relationship between public health spending and health status.
II. There is no significant effect of corruption on the relationship between public health spending and health outcomes.

1.4 Justification and Significance of the Study

Some researchers have carried out studies on the relationship between public expenditure and development outcomes. For instance, Gupta *et al*. (1999), Kaufmann *et al*. (1999) Kaufman *et al*. (2004), Ricci and Zachariad (2006), McCarthy and Wolf (2001), Chete and Adeoye (2002), Dauda (2004), Glewwe and Kremer (2006), De La Croix and Delavallade (2006) Jayasuriya and Wodon (2007), and more recently, Fay *et al* (2009) and Sparrow *et al*, 2009. Most of these earlier studies did not focus on Malawi.

Most of the studies on Malawi examined the impact of health expenditure or health status on economic growth. For instance Matchaya (2007) in his paper found that income levels of people accessing health services will influence the outcome of the service. Similarly, Chie (2003) found that public health care expenditure in Malawi is positively related to economic growth in the long run but did not find evidence of causality. Most of the other studies on Malawi only concentrated on the effect of public expenditure on health outcome and economic growth, neglecting the role of corruption. However, corruption is believed to have a significant role in determining the relationship of public spending and development outcomes. As such it is imperative to empirically examine the role of corruption in enhancing the relationship between health spending and health outcomes in Malawi.

CHAPTER TWO

OVERVIEW OF HEALTH EXPENDITURE AND CORRUPTION IN MALAWI

2.0 Introduction

This chapter presents an overview of health financing and spending and health outcomes in Malawi. In addition, the chapter also looks at the overview of corruption in Malawi. Outline of the chapter is as follows: Section 2.1 gives an overview of health spending in Malawi and the health outcomes; 2.2 gives an overview of corruption in Malawi; Section 2.3 examines the potential impact of corruption on the health sector in Malawi; and lastly, Section 2.4 summarizes the chapter.

2.1 Overview of health financing and spending in Malawi

Health financing refers to the methods used to mobilize resources that support basic public health programs such as those dealing with infectious diseases and non communicable diseases (NCDs); reproductive health; environmental health, trauma and rehabilitation; nutrition; mental health, social and behavioral research (WHO, 2000). It encompasses resource mobilization, allocation and distribution at all levels (community, district and national), including how providers are paid. Health financing is a key determinant of health system performance in terms of equity, efficiency and quality (WHO, 2000).

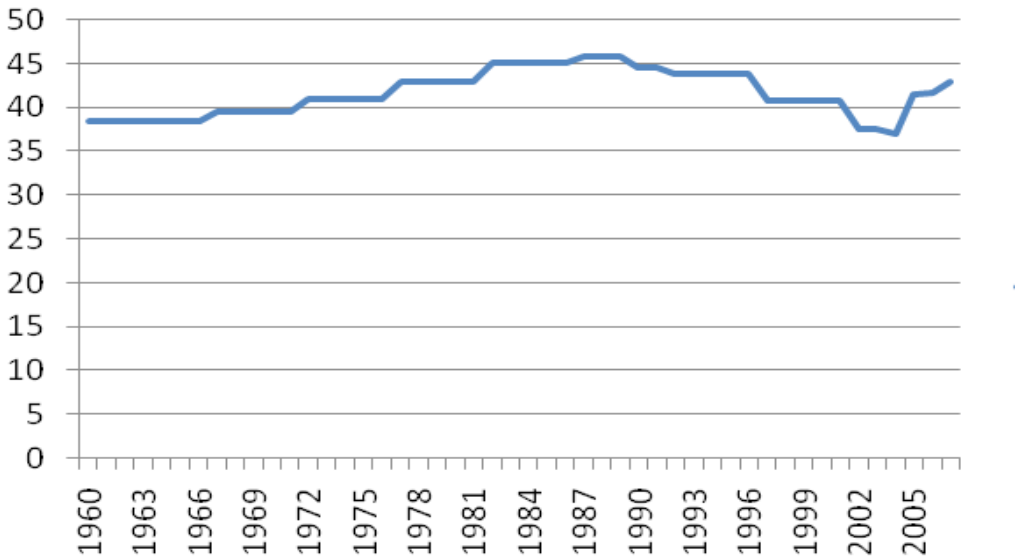
Health financing in Malawi is done though through a mix of *public*, *private* and *donor* sources. *Public sources* are governments' sources that raise funds through taxes, fees, donor grants, and loans. *Private sources* include all sources of financing which do not belong to government sector. This can be private social insurance, private insurance enterprises, private household out-of-pocket expenditure and others (OECD, 2000). In Malawi, private financing sources for health care include Medical Aid Association of Malawi (MASM) or its related arrangements as well as funding from other private-for-profit or private for non-profit organisations. *Donors* finance health systems through grants and in-kind contributions. The mix of sources varies widely among health service providers. The health sector depends on public/government and donor funding as the main financier of its activities (GoM and MoH, 2008; MoHP, 1999). This comes as a result of unreliable sources from other sectors.

The per capita total expenditure on health is one of the lowest in sub-Saharan Africa and is critically short of the US$ 34 recommended by the WHO Commission on Macroeconomics and Health to provide a basic package of services. The total expenditure on health amounts to about 9.8% of the GDP. Government expenditure on health constitutes only 41% of the total health expenditure. Furthermore, expenditure on health constitutes only 9.7% of total government expenditure (WHO, 2007). Despite this being far below the Abuja target (a resolution by the African Heads of State to allocate 15% of the national budget to health), it still shows significant efforts by government to contain health challenges. Despite these efforts, however, infant mortality rates and maternal mortality rates remain high while life expectancy is not desirable. Health indicators for

Malawi are among the worst globally. High illiteracy, poverty, HIV/AIDS and the human resource for health crisis are amongst the factors that aggravate the situation

During the previous decade, infant and under-five mortality rates have declined by an annual average of 5%. This is a significant decline compared to that in many countries in the region and exceeds the average annual reduction rate of about 4.3% required to achieve the targets of the Millennium Development Goal related to reducing child mortality by two-thirds between 1990 and 2015 (MDG 4). The greatest proportion of the disease burden is composed of infectious and parasitic diseases and nutritional disorders. However, like most developing countries undergoing demographic and epidemiological transition, non-communicable diseases are also on the increase – thus posing an additional problem to a health system that is grappling with communicable diseases that sometimes assume epidemic proportions.

Fig. 2.1 Life expectancy summary for Malawi



Source: Author's computation

Besides, there is no clearly discernible trend in government expenditure on health as a proportion of its total expenditure observed from the above figure. Government priorities seem to have been changing from one year to the other as indicated by the share allocated to health. It should, however, be noted that despite a decline in government allocation to health, Malawi still enjoys considerable support from development partners in the sector of health (UNDP, 2004).

2.2 Corruption in Africa and Malawi

Corruption is another manifestation of poor governance in most developing countries. In Africa, corruption is widespread in almost all development sectors, including health, so much that it has been accepted as an 'African problem'(Cockroft, 2012). Corruption in the health sector can mean the difference between life and death, and has been cited as a causal factor for high maternal mortality rates of women during pregnancy in most African countries (Cockroft 2012). This occurs when such women are unable to pay the bribes required by health workers in exchange for services (Cockroft, 2012). Informal payments in the health sector include fees paid by patients towards individuals, mostly for services that are meant to be free. These payments may include, among others, fees for medication, avoiding the queue, or as an insurance to receive better care from health workers in future. These practices can broadly be classified as corrupt and are very much common in Malawi (Matchaya, 2007).

2.3 Overview of the impact of corruption on Malawi

In Malawi corruption has been identified as one of the unresolved problems which have not only remained a long-term major economic and political challenge (Sachs, 2006) but have also hobbled and skewed development critically. Corruption has stunted growth in all sectors of the country (Economic and Financial Crime Commission, 2005).

According to the International Centre for Economic Growth, (1999), corruption ranges from petty corruption to political / bureaucratic corruption or systemic corruption. It is opined that corruption has become so blatant and widespread in Malawi such that it seems to have been legalized. Corruption has not only permeated the government, but the entire nation as well. Corruption and inefficiency are characteristic of service delivery in public places although private companies seem to perform more efficiently and less corruptly than public enterprises (World Bank, 2004). To show the extent of corruption in Malawi, in its Corruption Perceptions Index 2013, Malawi has tumbled from position 88 out of 177 countries last year to position 91 this year. Malawi is on position 91 with the index's score of 37, which is an indication that it is one of the most corrupt countries (Transparency International 2013). Often, Malawi has seen withdrawal of donor aid either from her bilateral donors or multilateral donors due to high levels of corruption. In the public health system, corruption negatively affects the availability of resources, lowers the quality of services offered, denies populations equal access to healthcare, and increases the cost of services provided.

Corruption poses a serious challenge in the development of Malawi. The country suffers from various types of corruption – from high level political corruption to petty bribery that impedes service delivery and patronage and nepotism that exacerbates

inequality and poverty in Malawi society. Corruption is severe in the police, registry and immigration depaartments, customs, and the judiciary. There are also reports of widespread corruption and extortion by public officials in procurement (Matchaya, 2007).

While some of the corruption measurement metrics indicate that Malawi has been making progress on the anti-corruption front in recent years, the country is still marred by high levels of political corruption. Institutions such as the judiciary, the office of the ombudsman and the anti-corruption bureau are seen as being effective in investigating and prosecuting lower level corruption cases. However, experts have raised strong concerns about their treatment of politically significant persons and interests.

The launch of the National Anti-Corruption Strategy in 2008 is thought to have brought many improvements to the anti-corruption framework of the country. Malawi is seen to have strong anti-corruption laws and institutions and initiatives by the private sector complement the governmental efforts (World Bank: 2004). However, experts state that there is still a significant gap between law and practice. For example, civil society and media are two areas where there are adequate laws to protect their independence and freedom, but where the government exerts a strong influence.

2.4 Summary

This chapter has looked at an overview of health spending, health outcomes and corruption in Malawi. In the course of the overview, attempts have been made to link the impact of health spending and health outcomes in Malawi and also the impact of corruption as a governance indicator on Malawi's economy.

CHAPTER THREE

LITERATURE REVIEW

3.0. Introduction

This chapter aims at looking at the literature available on the following issues; i) theoretical literature on the role of health expenditure and health outcomes, ii) factors that have influence on public health expenditures at macro-economic and/or aggregate national level and; iii) empirical literature which focused on the relationship between public health expenditure, health outcomes and governance.

The literature survey is not limited to only developing country studies but it also includes developed countries and countries in transition. Also, the survey includes studies which used data from various countries (cross country studies), panel data studies, studies that used developed and developing country data, studies that applied single country micro level data as well studies that used time series data for one or more than one countries. The main objective of this exercise is to bring in the gaps that exist in the literature. Also, an attempt has been made to answer empirically the questions that arise during literature survey. The literature review is divided into three parts each described separately below.

3.1 Theoretical Literature Review

3.1.1. The Human Capital Theory

The human capital framework is important because the theories of health care demand have evolved from it. One such theory is the human capital theory to demand for health developed by Grossman in 1972 where health capital is regarded as a component of human capital. The identification of health capital as a component of human capital stock meant that people demand good health in order to realize potential gains in productivity. By implication an increase in the stock of health would lead to increase in wage rates as a result of increase in human capital stock. Therefore the decision to invest in health is synonymous with the decision to invest in human capital.

The human capital theory argues that, when there is an increase in an individual's stock of knowledge or human capital, his productivity in the market sector of the economy will increase where he produces money earnings, and in the non-market or household sector where he produces commodities that enter into his utility function (Grossman, 2000). Thus the human capital theory suggests that individuals and society derive economic benefits from investment in people.

Framework on which human capital theory is developed is that costs of investment in schooling and on the job training include direct outlays on market goods as well as the opportunity cost of the time that has to be withdrawn from competing needs. Becker (1967) and Ben-Porath (1967) developed models that determine the optimal quantity of investment in human capital at any age. Assume perfect capital market and T periods, wage as a function of human capital is given by:

$$w_t = r_t^H H_t, \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where H_t, is the stock of human capital which is assumed to be homogeneous and r_t^H is the rate of return to capital. Inter- temporal utility function is given by:

$$\sum_{t=1}^{T} \beta^{t-1} U\left(C_t, \bar{L} - L_t - I_t^z, H_t; t\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

With leisure defined as $F_t = \bar{L} - L_t - I_t^z$ ..... (3)

U denotes utility whereas C_t is consumption, I_t^z is the time attributed to the accumulation of human capital, $\bar{L}$ is total time available and L_t is the available time put into market work. H_t is the stock of human capital for the t-th period and β is the subjective discount rate of the individual. Assume H_t generates direct utility, and it is accumulated by the following process:

$$H_t = (1-\delta)H_{t-1} + \theta\left(I_{t-1}^Z, I_{t-1}^G, H_{t-1;t}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

$$\Delta H_t = \theta\left(I_{t-1}^Z, I_{t-1}^G, H_{t-1;t}\right) - \delta H_{t-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

Where $\theta(.)$ denotes general human capital investment function, ΔH_t is change in stock of human capital from period t-1 to t and δH_{t-1} is human capital that is lost (depreciation) at constant depreciation rate δ I_t^Z is time investment needed for acquiring

human capital and I_t^G is the investment in goods needed for the human capital investment.

Put in words: equation (5) implies that the change in human capital from last period to today be a linear combination of human capital acquired in the previous period (investment) and the stock of human capital once acquired that is lost (depreciation). Inter temporal budget restriction is given by:

$$\sum_{t=1}^{T}(1+r)^{-t+1}w_t L_t + V_0 \geq \sum_{t=1}^{T}(1+r)^{-t+1}\left(P_t C_t + P_t^G I_t^G + P_t^Z I_t^Z\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

The left hand side represents the present value individual's life time wealth. The right hand side represents the present value of lifetime consumption being linear combination of consumption C_t, I_t^Z and I_t^G. V_0 is initial level of knowledge, r is the opportunity cost of capital and P is price. Optimal investment in human capital is calculated by:

Max $\sum_{t=1}^{T}\beta^{t-1}U\left(C_t, \bar{L} - L_t - I_t^z, H_t; t\right)$

Subject to: $\sum_{t=1}^{T}(1+r)^{-t+1}w_t L_t + V_0 - \sum_{t=1}^{T}(1+r)^{-t+1}\left(P_t C_t + P_t^G I_t^G + P_t^Z I_t^Z\right) \geq 0$ (7)

$$\Delta H_t = \theta\left(I_{t-1}^Z, I_{t-1}^G, H_{t-1}; t\right) - \delta H_{t-1}$$

$$w_t = r_t^H H_t,$$

With initial human capital stock H_o and V_0 given, the economic implications of (7) above are explained by two broad scenario namely an increase in $-\left(I_{t-1}^Z, I_{t-1}^G\right)$ and a decrease in $-\left(I_{t-1}^Z, I_{t-1}^G\right)$ conditional upon several factors as explained below. On one

hand, $-\left(I_{t-1}^{Z}, I_{t-1}^{G}\right)$ increases if there is an increase in $\theta(.)$ implying that efficiency of investment is high. Furthermore an increase in T denoting longer time for amortization of human capital investment, an increase in $U(..., H_t, ...)$ implying higher utility of human capital and high returns to human capital $\left(r_t^H\right)$ entail an increase in $-\left(I_{t-1}^{Z}, I_{t-1}^{G}\right)$. On the other hand, $-\left(I_{t-1}^{Z}, I_{t-1}^{G}\right)$ decreases if the depreciation rate of human capital $\delta,$ is high and where the market rate of interest $r,$ is high also meaning that the present is more important than the future.

3.1.2 The Grossman's Demand for Health Model

While the human capital theory emphasizes that an individual's stock of knowledge affects his productivity in the market sector of the economy where he produces money earnings and in the household sector where he produces commodities that enter into his utility function, the model by Grossman (1972) argues that health capital differs from other forms of human capital in the sense that an individual's stock of knowledge affects his non market productivity while his stock of health determines the total amount of time he can spend producing money earnings and commodities.

The Grossman model (1982) emphasizes the role played by health service seekers' choice looking at health and wealth as two interrelated assets the values of which are optimally controlled over time by the individual. In the case of health, the marginal utility of holding a marginal unit of stock has consumption and an investment component, which together must always be equal to its marginal user cost.

Let $U = U(\phi_t, H_t, Z_t), t = 0,1,...,n,$ ..... (8)

Where: U is the utility, H_t is the stock of health at age t or in time period t and ϕ_t is the service flow per unit stock. $h_t = \phi_t H_t$ is the total consumption of health services and Z_t is consumption of another commodity and n is the number of years. Stock of health at any other age is endogenous and death takes place when $H_t \leq H_{\min}$ hence length of life is determined by the quantities of health capital that maximize utility subject to production and resource constraints. As inherited health stock and rates of depreciation are given, the optimal quantity of gross investment determines the optimal quantity of health capital. By definition net investment in the stock of health equals gross investment minus depreciation:

$H_{t-1} - H_t = I_t - \delta_t H_t$ ..... (9)

Where I_t is gross investment and δ_t is the rate of depreciation in the t-th period $(0 \prec \delta \prec 1)$

A set of household production functions are given by:

$I_t = I_t(M_t, TH_t; E)$ ..... (10)

$Z_t = Z_t(X_t, T_t; E)$ ..... (11)

Where M_t, is a vector of inputs purchased in the market that contribute to gross investment in health, X_t is a vector of inputs that contribute to the production of Z_t, TH_t and T_t are time inputs while E is consumer's stock of knowledge exclusive of health and is exogenous.

The inputs budget constraint equates the present value of outlays on inputs to the present value of earnings over life cycle plus initial assets as follows:

$$\sum_{t=0}^{n}\frac{P_tM_t+Q_tX_t}{(1+r)^t}=\sum_{t=0}^{n}\frac{W_tTW_t}{(1+r)^t}+A_0 \quad \ldots\ldots (12)$$

Where P_t and Q_t are prices of M_t and X_t, W_t is the hourly wage rate, TW_t is the total hours of work, A_0 is initial assets and r is the market rate of interest. Time constraint, Ω requires that total time available in any period is exhausted by all possible uses defined as:

$$TW_t+TH_t+T_t+TL_t=\Omega \quad \ldots\ldots (13)$$

A full wealth constraint is given by:

$$\sum_{t=0}^{n}\frac{P_tM_t+Q_tX_t+W_t(TL_t+TH_t+T_t)}{(1+r)^t}=\sum_{t=0}^{n}\frac{W_t\Omega}{(1+r)^t}+A_0 \quad \ldots\ldots (14)$$

Equilibrium quantities of H_t and Z_t are obtained by maximizing utility function in (8) subject to constraints in (9), (10) and (14). Inherited stock of health and depreciation are given hence optimal quantities of gross investment determine optimal quantities of health capital. The first order optimality conditions for gross investment in period t-1 are:

$$\left.\begin{aligned}\frac{\pi_{t-1}}{(1+r)^{t-1}}=\frac{W_tG_t}{(1+r)^t}+\frac{(1-\delta_t)W_{t+1}G_{t+1}}{(1+r)^{t+1}}+\ldots+\frac{(1-\delta_t)\ldots(1-\delta_{n-1})W_nG_n}{(1+r)^n}+\\ \frac{Uh_tG_t}{\lambda}+\ldots(1-\delta_t)\ldots(1-\delta_{n-1})\frac{Uh_nG_n}{\lambda}\end{aligned}\right\} \quad (15)$$

$$\pi_{t-1}=\frac{P_{t-1}}{\delta I_{t-1}/\delta M_{t-1}}=\frac{W_{t-1}}{\delta I_{t-1}/\delta TH_{t-1}} \quad \ldots\ldots (16)$$

$Uh_t=\frac{\partial U}{\partial h_t}$ is the marginal utility of healthy time

λ is the marginal utility of wealth

$G_t : \frac{\partial h_t}{\partial H_t} = -\left(\partial TL_t \big/ \partial H_t \right)$ is the marginal product of the stock of health in production of health time and π_{t-1} is the marginal cost of gross investment in health in period t-1.

Equation (15) states that the present value of Marginal cost of gross investment in health in period t-1 is equal to present value of marginal benefit and it holds for any capital asset not only just for health capital. While equation (15) determines the optimal gross investment in period *t*-1, equation (16) shows the condition for minimizing the cost of producing a given quantity of gross investment. The optimal stock of health in period t is therefore given by:

$$G_t \left[W_t + \left(\frac{Uh_t}{\lambda} \right) (1+r)^t \right] = \pi_{t-1} \left(r - \bar{\pi}_{t-1} + \delta_t \right) \qquad \text{.......................................} (17)$$

Expanding equation (17) we get:

$$\frac{G_t W_t}{\pi_{t-1}} + \frac{G_t U h_t (1+r)^t}{\lambda} \bullet \frac{G_t}{\pi_{t-1}} = r - \overline{\pi_{t-1}} + \delta_t \qquad \text{...................................} (18)$$

Where: $\overline{\pi_{t-1}}$ is percentage rate of change in Marginal cost between period t-1 and period t, $\pi_{t-1} \left(r - \bar{\pi}_{t-1} + \delta_t \right)$ is the user cost of health capital which comprises depreciation, interest rate and capital gains. Grossman assumes that the capital stock of health cannot be traded in a capital market. This implies that gross investment in health capital must be non-negative. However an individual is able to rent the health stock from himself over different time periods, giving rise to a user cost of health capital.

Equation (18) is the essential equation of the Grossman's demand for health model signifying that the marginal utility of holding a marginal unit of health stock has both consumption and investment benefits which together must always be equal to marginal user cost.

Therefore demand for health services is derived demand because the services are meant to maintain or improve upon a certain health status and not consumed for their own sake. Based on equation (18) an individual's demand for health services is given by:

$$M(t) = f[H(t), w(t), P_m(t), age(t), E(t), X(t)] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (19)$$

The demand for health services at time *t*, *M(t),* is endogenously co-determined by the latent variable health status, *H(t),* and is affected by the wage rate *w(t),* a price vector for medical services, $P_m(t)$, individual age, *age(t),* the level of education, *E(t),* and a vector of environmental effects, *X(t).* A higher wage lowers the marginal incentive to hold health as an asset for consumption use, thus depressing the demand for medical care. In contrast it increases the opportunity cost of sick time, hence reinforcing the incentive to hold health as an asset. The impact of prices is negative like that of better education. Education should lower the demand for investment in health because it contributes to lower health stock depreciation. Demand for medical care should increase with ageing, because it is not optimal to let health stock decline in step with depreciation

3.1.3 Demand for health care

McGuire *et al*, (1993) described the analysis of health service delivery 'notorious' because it is lacking a theoretical basis. Grossman (1972) tried to provide a theoretical model for health but due to imperfect health care markets it still needs to be adopted for

better specifications of health care models. Like for example McGuire *et.al*, (1993) explained that without any theoretical basis an additive functional form is estimated by virtually most studies (see for example; Hitiris and Posnett, 1992; Newhouse, 1977 and Wolfe, 1986) while it may be linear or nonlinear. For example, some studies have found that income after a certain level has a declining affect on infant mortality (Rodgers, 1979 and Younger, 2001). Linear models imply that inputs of the models are independent and giving constant marginal products when an additional unit of an input is used. On the other hand log form models show declining marginal products (McGuire *et.al*., 1993).

The law of diminishing returns as applied to population health suggests that with an additional input the marginal increment to health improvements reduces. It is rational because societies take more cost effective decisions keeping other things constant (Bishai, Opuni and Poon, 2007). It also proves that with the increase in income its effect on reducing mortality declines provided the distribution of income is egalitarian. Most of the studies on the determinants of health expenditures used demand function approach to specify the models. Specifically, real health care expenditures (HCE) is hypothesized to be a function of real GDP and a selection of economic and non income variables. It is explained in many empirical studies on health and health care demand that the determination of health expenditures includes political and economic factors while, usually, it is assumed that government is the sole decision maker (Mc Guire *et. al*, 1993). For a consumer, health care expenditures are the product of the quantity consumed and the price paid. But analyzing health spending and its determinants, previous studies lack the demand and price issue and only focus on supply side and on income effects. In

reality, it is market and not the individuals making decisions about the size of expenditures that matter (Mc Guire *et. al*, 1993).

3.1.4 Production function approach

Grossman (1972) stated that the demand for health care is derived; which is produced through a process defined by a production function. His model is widely used in empirical studies of health and health care. Grossman (1972) developed a theoretical model of health care which is commonly applied for analyzing the factors affecting health status and its relationship with economic and non economic factors. The model can be specified as;

$$H = f(A) \qquad (4.1)$$

Where *H* is any measure of health status like Life expectancy and infant mortality and (*A*) is a vector of other economic (income per capita), social (education), environmental (urbanization), demographic (population below or above certain age group) and health service variables (like population to doctor ratio, population to hospital ratio etc) affecting health status. Although, Grossman (1972) presented a model at micro level, number of studies tried to employ his specification at macroeconomic level (see for example Fayissa and Gutema, 2005 and Thorton, 2002).

While to make the analysis more closely to what Grossman specified, it is better to represent the variables in their per capita form. This is done because first it avoids any sort of inequality that can distort the results of the analysis and create biased results. Second, it can be helpful to see the results in a more homogenous way. A country is a big unit of analysis and region may differ widely but per capita estimation can be a possible

source to avoid these regional biases to some extent. We can rewrite equation 4.1 in per capita extended form as follows;

$$h = f(e, d, p, s, n) \qquad (4.2)$$

e is economic factors in per capita terms affecting health status, *h* and *d* are demographic factors, *p* political factors, *s* are social factors and *n are* environmental factors. Classifying inputs and output for the production function is necessary. Feldstein (1967) suggested some output definitions where one of them is improvements in health (i.e., increase in life expectancy or reduce mortality).

3.1.5 Economic growth theory

From a theoretical perspective, economic growth theory increasingly recognizes health as a form of human capital. The theory argues better health increases the productivity of other forms of capital and it contributes to economic growth (Ricci and Zachariad 2006). It postulates that increased expenditure towards health or health services will in turn improve the health status of citizens who in turn will contribute positively to activities that promote economic growth. In addition, a health citizenly has adequate time to spend on productive activities that further promote their well being and that of the whole society. Similarly, production function models of economic growth also identify health as a fundamental component of human capital, work experience and health. They generally argue that good health has a positive, sizable, and statistically significant effect on aggregate output.

3.2 Empirical Review

3.2.1 Public Expenditure and Health Outcome

The literature is replete with works on the relationship between public expenditure and health outcomes. Several endogenous growth models link public spending with the economy's long-term growth. Barro (1990, 1991) Levine and Renelt (1992) among others have examined the relationship between public spending and economic growth. Specifically, some researchers have investigated the link between sectoral public expenditure such as public health care expenditure and health outcomes. Among such studies are Ricci and Zachariad (2006), Sparrow, Pradhan and Kruse (2009). Ricci and Zachariad (2006), used data covering 72 countries from 1961 to 1995, in order to investigate the determinants of public health outcomes in a macroeconomic perspective, taking into cognisance households' choices concerning education, health related expenditure and saving. They found evidence for a dual role of education as a determinant of health outcomes. Sparrow *et al* (2009) on the other hand, using panel data set of 207 Indonesian districts over a 4-year period from 2001 to 2004, concluded that district-level public health spending is largely driven by central government transfers.

Filmer and Pritchett (1999), in their own work found that public spending and health outcome are tenuously related. According to them doubling public spending from 3 to 6 percent of GDP would improve child mortality by 9 to 13 percent. Surveying the literature on the link between public expenditure and outcome Pritchett (1996), notes that all of the negative or ambivalent findings on the effect of public spending on outcomes could potentially be a reflection of differences in the efficacy of spending which could arise due to a variety of reasons including corruption and patronage. Besides, it is also

noted that the link between public spending and outcomes could be broken in the displacement of private sector effort by public spending. This argument is eloquently made in Filmer *et al*. (2000) while commenting on the weak links that several studies have found between public spending on health and health status. Although in most of the studies where public spending is found to have low or negligible impact, it is argued that public provision could lead to a "crowding out" of private sector provision. However, they have failed to question the efficacy of public spending.

In addition to the work on the relationship between public spending and economic growth, many researchers have examined the link between sectoral public spending (mostly in the health and education sectors) and outcomes in those sectors. For example, Harbison and Hanushek (1992) examined 12 studies on developing countries that look at the association between public education spending and educational outcomes. Six of these studies report a statistically significant positive relationship between the two; others found no evidence of any measurable impact of spending on outcomes. Hanushek (1995), Mingat and Tan (1992, 1998), and Wolf (2004) also find that that there is little if any relationship between public education spending and educational outcomes. Using a sample of 70 countries, Gupta *et al*. (2001) note that the relationship between public spending and the health status of the poor is stronger in low-income countries than in higher-income countries. Filmer and Pritchett (1999) provide a good survey of studies linking public spending with health outcomes. In their own work, they find that the two are very tenuously related. According to their results, doubling public spending from three to six percent of GDP would improve child mortality by only nine to 13%.

Factoring in the impact of corruption in the relationship between public health expenditure and health outcomes, Yaqub *et al*, (2008) while investigating how the effectiveness of public health expenditure is affected by governance in Nigeria, found that public health expenditure has negative effect on infant mortality and under-5 mortalities when the governance indicators are included. Similarly, Swaroop and Rajkumar (2007) found that public spending has virtually no impact on health and education outcomes in poorly governed countries.

3.2.2 Governance and Health Outcome

On the issue of the relationship between governance and health outcome, Kaufmann *et al*. (1999; 2004) , show that governance indicators such as voice, accountability, political stability and violence, government effectiveness and corruption among others, have a strong direct negative impact on infant mortality. In the same vein, Gupta *et al*. (1999) find that countries with high corruption have high child and infant mortality rates. De La Croix & Delavallade (2006) find that countries with high corruption invest more in housing and physical capital in comparison with health and education with the associated rent seeking in physical capital which hampers economic growth. Rajkumar & Swaroop (2004), while contributing to the debate, explain that public spending often does not yield the expected improvement in outcomes and that the differences in the efficacy of public spending can be largely explained by the quality of governance.

Overall, the empirical evidence have largely supported a poor link between public health care spending and health outcomes on one hand, as well as poor link between governance and development outcomes on the other especially in developing countries.

CHAPTER FOUR

STUDY METHODOLOGY

4.0 Theoretical Framework

The econometric approach is based on time series data regressions in equations for under-five/child mortality and/or infant mortality rates. The specification is consistent with the literature and allows for the identification of the channels through which government expenditure and other policy interventions affect these health outcomes over time.

Following Rajkumar and Swaroop (2009) who modelled outcome of a public programme, for example public health expenditure as:

$$outcome = GDPP^{\alpha} * \left(\frac{pubexp}{GDP}\right)^{\beta} \quad \text{where } \alpha > 0, \text{ and } \beta \geq 0 \qquad (1)$$

Where

1. *GDPP* is gross domestic product per capita (per capita income)
2. *Pubexp* is public expenditure on health (as a percentage of a country's GDP)
3. *GDP* is gross domestic product

And *outcome* could for example, be an indicator of health status such as life expectancy, infant mortality or under-5 mortality rates. Equation (1) implies that *outcome* (for example infant mortality rate) does the following:

a. improves with an increase in per capita income;

b. improves (or does not worsen) if an increased proportion of the country's resources are spent on health care.

Taking the logs of equation (1), we have the linear form of (1) as equation (2) below.

$$lnOutcome = \propto lnGDPP + \beta ln\left(\frac{pubexp}{GDP}\right) \quad (2)$$

In modelling the relationship between public spending and outcome as specified in equation (2) above, a researcher would usually take the information on spending from public budget documents. But it is known that only a fraction of the expenditure is actually undertaken while the remainder disappears as a result of corruption (in most African countries) (Yacub *et al* 2008). To integrate this line of reasoning, this research assumes that only a fraction γ (.) of public resources is actually spent for productive purposes. Following Pritchett (1996), β, the coefficient of public spending on programme *p* in equation (2) can be written as:

$$\beta = \gamma(.) * \beta_p \quad (3)$$

where β_p represents the productivity of public capital that is created from the spending on programme *p*, assuming $\gamma(.)$ which measures the efficacy of public spending is a function of the state of governance. Therefore,

$$\gamma = \varphi_0 + \varphi_1 G \quad (4)$$

where *G* stands for the level of corruption at each time in a country. Substituting (3) and (4) into (2), we have

$$\ln Outcome = A + \propto lnGDPP + \beta_p (\varphi_0 + \varphi_1 G) ln\left(\frac{pubexp}{GDP}\right) \quad (5)$$

4.1 Model Specification

Building from the preceding background, we estimate the following equation:

$$ln(HS) = \alpha_0 + \alpha_1 ln(GDPP) + \alpha_2 ln\left(\frac{pubexp}{GDP}\right) + \alpha_3 G + \alpha_4 G * ln\left(\frac{pubexp}{GDP}\right) + BX + \in \quad (6)$$

where

1. *HS* is a measure of health status, which in this study is represented by Infant Mortality Rate (IMR) and Child Mortality Rate (CMR). These are widely quoted as best measures of health status of a country as such it is believed that they will work towards the objective of this research.
2. GDPP is Gross Domestic Product per capita for Malawi. This generally shows the level of income per individual in a particular country in a particular year. In this study, it is generally believed that the adoption of this variable will give a general picture in terms of the levels of income of the people of Malawi during the time under the study. It is expected in this study that as GDPP rises, the infant and child mortality rates should drop. This is so since with improved income levels, people can afford better health services.
3. $\left(\frac{pubexp}{GDP}\right)$ is the share of public health spending from GDP in Malawi. Like Filmer and Pritchett (1999), our key spending variable is total public health expenditure, which is available from the World Development Indicators compiled by the World Bank. Unfortunately, data on the composition of spending across different health inputs are not readily available for Malawi. It is generally expected that as public health spending increases, health status must improve.

That is, infant and child mortality rates must go down as there will be increased quality health service delivery.

4. G is a measure of corruption, which in this study is the corruption perception index (cpi). As argued by Filmer and Pritchett (1999) and Kauffman *et al* (1996), as corruption levels go up, health output should go down. That is, infant and child mortality rates must increase as well. This is so since not all funds allocated to the health sector will be used for service delivery as other funds would be siphoned out. This argument generally assumes that the siphoned funds are used for other activities other than those intended for health output improvement.

5. And is € error type. To capture the direct effect of governance on health status, G is included as an independent variable in the equation. G as a measure of corruption may have no direct link to government funds (which explains why it is separately interacted with Government expenditure in equation 6). As a standalone variable, as presented in equation 6, there are two likely sides of the argument. With some probability the corruption index may be associated with people looting government funds and with some probability it may have nothing to do with government funds (and the expected sign of its coefficient is ambiguous)If, for instance, corrupt public health officers that demand payment from people (a form of corruption) end up providing superior services to all that have paid bribes, and people willingly pay these officers, we may see a decline in child mortality. Thus, corruption may be increasing while child mortality is decreasing – and yet this has

nothing to do with government expenditure on health services. On the other hand, the positive relationship between G and child mortality occurs when government expenditure is involved hence G is interacted with government expenditure.

6. X is vector of non-health related factor (which is population in thi) which may affect health outcome and $\in$ is the error term. This study adopts the argument as postulated by Kauffman *et al* (1996). He argues that holding other factors constant, an increase in population should exert pressure on the available health services and hence should result in high infant and child mortality rates.

4.2 Apriori Expectations

In accordance with the literature reviewed earlier, public health expenditure as an indicator of the volume of resources flowing into health is expected to have negative effect on under-five and infant mortality rates. Thus an increase in health expenditure per capita implies a broader access to health care and services which helps to decrease under-five and infant mortality rates. On the other hand, GDP per capita income, a proxy for national poverty or socio-economic status (standard of living), has been shown to be a crucial determinant of human capital outcomes (Baldacci *et al*., 2004; Roberts, 2003). Thus, Gupta *et al*. (1999) had stated that the population's health status improves as per capita incomes (capturing a tapering-off effect of GDP on mortality) rise, suggesting that increasing income would be associated with lower under-five and infant mortality rates.

In addition, higher incomes lead to improved public health infrastructure such as water and sanitation, better nutrition, better housing and the ability to pay for health care

(Pritchett and Summers, 1996; Cutler *et al*., 2006). According to basic economic theory, if everything else is held constant and if health care is a normal good, an increase in per capita income will lead to increases in the demand for health care. Income also increases the capacity of governments and other players to supply more and better health care and to improve access to health care through better infrastructure.

4.3 Sources of data and choice of variables

This study uses data from 1980 to 2012. The data used in the study is sourced from the World Bank Development Indicators, The Ministry of Health of Malawi, the Malawi Anti Corruption Bureau and The Transparency International.

In this study, two indicators have been used as measures of health status because they are the most widely used in the literature (see for example Chie 2003; Kauffman et al 2009; Rajkumar and Swaroop 2007 and Jacqub et al 2009). These measures are the infant mortality rate (IMR), and the under-five/child mortality rate (CMR). These indicators are consistently available for Malawi for the 1980-2012 time period.

This study looks at the impact of public health spending on infant and child (under 5) mortality. However, unlike previous researchers, this study models the interaction between public spending and the governance indicator in assessing this impact. Like Filmer and Pritchett (1999), the key spending variable is total public health expenditure, whose data is readily available for Malawi from the World Development Indicators compiled by the World Bank. However, the researcher in this study realizes that priority should have been given to specific data for programs that try to reduce infant and child

mortality in Malawi. Unfortunately, data on the composition of spending across different health inputs are not readily available for Malawi.

The use of public health expenditure can also be justified in that the nature of health programs requires a comprehensive approach. Expenditure towards maternal health, or safe motherhood, or HIV/AIDS would in the end directly or indirectly contribute towards the reduction of infant and child mortality in Malawi. As such it is generally impossible to isolate specific spending towards infant or child mortality programs from general public health expenditure.

According to Kaufmann *et al*. (1999) and Kaufman *et al*. (2004), indicators such as voice, accountability, political stability and violence, government effectiveness and corruption/graft among others are adequate to indicate level of governance in a country. However, due to issues of data availability as earlier explained, this study chooses to use corruption perception index as an indicator of corruption in Malawi.

This study uses the corruption perception index as a measure of corruption, to interact with the public health expenditure. This choice is made considering availability of statistical data. While appreciating the fact that a special corruption perception index for the health sector in Malawi could have been more suitable in this study, due to time limitations, such an index could not be created in this study as currently there isn't any. This study therefore believes the use of the general corruption perception index (as established by Transparency International) will not significantly compromise the results of the study. There are very few reliable statistics on corruption, hence this study uses the perception of corruption indices published annually by Transparency International as the measure of corruption. This is an average of different surveys of *perceptions* of

corruption in a country in a year. It is ranked from 0 to 10 with 10 being the least corrupt and 0 the most corrupt. The index has been published annually since 1995 when African countries have been widely covered. For years prior to 1995, Malawi did not have annual observations for corruption perception index. Fortunately, Transparency International publishes historical data representing the average index of corruption (as a proxy to the corruption perception index) between 1981 and 1994 (T I 1999). Using this historical data, the researcher in this study proxied the corruption data for Malawi for the years prior to 1995 except for the years 1980, 1982, 1985, 1990, 1993 and 1995 to 2012 of which the proxies as published by the Transparency International were used.

Time series data for the years 1980 to 2012 is used for this study. The selection of this range is as a result of data availability. Most data available for Malawi as used in this study do not provide the statistics for the time period prior to 1980. This, however, implies that a sample size of 33 has been used in the study which is large enough for credible statistical analysis.

4.4 Data Analysis

The methodology used was a quantitative analysis using publicly available data to investigate the association between governance, public health expenditure and health outcomes. In order to measure health outcomes, under-five (child) mortality rate and infant mortality rates have been used. The method used was Ordinary Least Square regression on data using the statistical software STATA Package Version 12.0.

Data on public health expenditure and governance variable captured by the corruption perception index were regressed on infant mortality and under-five mortality, using both the ordinary least squares and the two-stage least squares.

However, since the OLS results are mostly based on the assumption that public health spending is exogenously determined, it may be the case that as previous researchers have noted, the two main variables in this study - public health spending and health status are jointly determined. There also exists the possibility of reverse causation. For example, it may be likely that when faced with poor and/or deteriorating health status of their citizens, GoM would increase spending on health. Rich countries, when providing debt relief to poor countries, often insist that such relief be spent on activities that would improve health and education outcomes. To test the robustness of the results, the study needed to address the endogeneity problem. This was done using instruments for public health spending (as well as for the interaction term) in a two-stage least squares regression. The instruments used are public health spending (expressed as a ratio of GDP); and (own) population.

4.5 Diagnostic Tests

4.5.1 Model Specification Test

It is very important to find out whether the model has correct specification. This means that the model has to be in correct functional form, no omitted variables and that there is no correlation between explanatory variables and the residuals. Ramsey RESET test is used to test for the presence of model mis-specification.

4.5.2 Normality of the Random variable

OLS assumes that the random variable or error term is normally distributed around a zero mean and has a constant variance. Absence of this implies that the OLS estimates are still BLUE but cannot assess their statistical reliability by the classical tests of significance. The Jacque-Bera approach is employed to test the null hypothesis of normality.

4.5.3 Autocorrelation of the Disturbance Term

The classical linear assumption on autocorrelation is that the residuals ϵ_i are mutually independent. OLS estimates, in the presence of autocorrelation are unbiased but not efficient. They do have minimum variance among all linear unbiased estimators. The Breusch-Godfrey serial correlation LM test is used to test for the null hypothesis of no serial correlation of order one.

4.5.4 Heteroscedasticity

Auto-Regressive Conditional Heteroscedasticity (ARCH)

ARCH occurs when the error term variance is auto correlated to the squared error term in the previous period. ARCH in itself does not invalidate standard OLS inference, however, ignoring ARCH effects may result in loss of efficiency. The ARCH LM test is utilized to test for the presence of ARCH effects.

4.6 Unit root analysis (order of integration)

Since the pioneering work of Dickey and Fuller (1981) testing for unit roots has become a norm in time series analysis. Non stationary time series data are generated by a process which does not remain the same over time (Hamilton, 1994). Before proceeding with estimation of time series data, it is necessary to check whether the underlying series is stationary or non stationary as this has important implications for the t-value, Durban Watson (DW) statistics and R^2 measure and use of usual test statistics become invalid (Philips, 1986 and Seddighi, Lawler and Katos, 2000). Therefore, if the stationarity is not achieved the empirical estimation produces spurious regression results (Granger and Newbold, 1974 and Sims, 1980). A series is non stationary (stationary) if its mean and variance are independent of time or in other words remain unchanged (constant) over time and the value of covariance between times period depends only on the lag between time periods. A stationary series has a tendency constantly to return to its mean value and to fluctuate around it in a more or less constant range, while a non-stationary series has a changing mean at different points in time and its variance varies with the sampling size.

4.7 Dickey Fuller and Augumented Dickey - Fuller (ADF) Unit Root Test

There are number of approaches to test the unit root hypothesis but the Dickey-Fuller (DF) test (Dickey and Fuller, 1981) is most commonly used. The DF/ADF-tests are based on the assumption that there is only one unit root in the process (Dickey, et al., 1986).

When utilizing Augmented Dickey-Fuller (ADF) test, we usually meet two problems. The first one is which version of ADF test we should use? Another question is how to decide the optimal lag length of the dependent variable. One solution of the first problem

is to choose the third version of the ADF test which includes a constant and deterministic time trend. The reason is that the first two versions are the special cases of the third one. But if we include some irrelevant variables in the regression equation, the power of the test to reject the null hypothesis of a unit root will be reduced. Verbeek (2004) proposed that the test form can be based on the graphical inspection. If the plot of a series indicates clear upward or downward trend, it is most appropriate to run the test with time trend term. In terms of selecting the optimal lag length of the dependent variable, one approach is based on the lowest value of Information criteria, such as, Akaike Information Criterion (AIC) or the Schwartz Bayesian Criterion (SBIC). However, sometimes, we even face the problem that AIC and SBIC provide us contradictive results. In such situation, SBIC criterion is preferred by the reason that SBIC usually will select the correct model with few lag lengths than that of AIC.

4.8 Testing for Cointegration (long run relationship)

The basic idea of cointegration is to identify the equilibrium or a long-run relationship between two or more variable. If a long-run relationship exists, then divergence from the long-run equilibrium path is bounded, and the variables are said to be cointegrated. In other words, the variables may, in the short run, drift apart from each other but have the tendency to move towards long run equilibrium. In this case, two conditions must be satisfied. First, the series for at least two of the individual variables are integrated of the same order and second, a linear combination of the variables exist which is integrated to an order lower than the individual variables. For example, if the variables become stationary after differencing once, i.e. *I(1)*, then the error term from the

cointegration regression is stationary, i.e. *I(0)* (Hansen and Juselius, 1995), Consider the cointegration regression of the following form:

$$Y_t = \propto + \beta X_t + \mu_t \qquad (4.9)$$

If the series Y_t and X_t are both *I(1)* and the error term μ_t is I(0), then the series are cointegrated of order *I(1,0)*. In (4.9), β measures the equilibrium relationship between the series *Yt* and *Xt*, and μ_t is the deviation from the long-run (mean) equilibrium path.

The economic interpretation for cointegration is that if in the long-run two or more series i.e., Y_t and X_t are linked together to form an equilibrium relationship, then even though Y_t and X_t themselves are trended (i.e. non-stationary), they nevertheless move together closely over time and the difference between them is constant (stationary). Therefore, the concept of cointegration implies the presence of long-run equilibrium to which an economic system moves overtime, and μ_t may thus be interpreted as the disequilibrium error that is the extent to which the relationship deviates from equilibrium (Harris and Sollis, 2003). In other words, from a statistical point of view, a long-term relationship means that the variables move together over time so that short-term disturbances from the long-term trend will be corrected (Manning and Andrianacos, 1993; Hall and Henry, 1989). A lack of cointegration suggests that such variables have no long-run relationship and they can diverge arbitrarily away from each other (Dickey et. al., 1991).

4.9 Error correction specification (short run dynamics)

Once the long run relationship i.e., cointegration is established, then the error correction specification can be used to test the short run dynamic relationship of the

variables. Since, variables can deviate from their mean value or equilibrium path in the short run, therefore, it is interesting to estimate the dynamic behavior of variables using vector error correction model (VECM). This model also includes adjustment coefficient that explains short run deviation from the mean equilibrium path hence the error term is included and the past or lagged value of error term is used to capture the effect of past events on the present values.

If the series cmr (child mortality rates), imr (infant mortality rates) Pubexp (public health expenditure), gdpp (per capita gross domestic product) and some other variables of interests are *I (1)* and are cointegrated, then the Error Correction Model (ECM) is represented by the following equation:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \cdots + \Gamma_{k-1} \Delta Z_{t-k+1} + \aleph Z_{t-k} + \nu_t \qquad (4.12)$$

Where Δ is the difference operator , υ is the white noise error term which is independently and identically distributed (IID) with zero mean and constant variance and Z_t *=[cmr, imr, pubexp, gdpp, cpi, pop)* whereas *i* Γ and Π are ($n \times n$) matrices of the parameters with $\Gamma_i = -(I - A - A \ldots\ldots - A_i)$ where ($i = 1, \ldots, k-1$) , and $\Pi = -(I - A - A \ldots - A_k)$. The estimated values of Γ_i and $\prod^{\Delta}$ gives the short run and long run information of changes in *Zt* .

Error Correction Model (ECM) is formulated in the first difference terms and hence eliminates trends from the variables involved, thus resolve the problem of spurious regressions. As disequilibrium error term is a stationary variable *I (0)* by definition of cointegration hence this has implications that the two variables are cointegrated, implies that there is some adjustment process that prevents the errors in the long run relationship becoming larger. One advantage of using ECM is that it reintroduces, in a statistically

acceptable way, lagged error correction term which captures the long run information which is lost through differencing.

4.10 Granger causality test

Once the cointegration is established between variables the next step is to test for causality. The concept of causality has fascinated philosophers for centuries and it is described as property of reality and not of a model (Hendry, 1995). Therefore, it is not easy to define causality and specifying what makes something a cause (Hendry, 2004). However, Granger (1969) proposed a definition of causal relation of variables using present and past information of the concern variables, it is causality in econometric or empirical sense that is either *t X* causes or does not causes *t Y* . Nevertheless, causality inferences and analysis are helpful policy formulation tools. If two or more variables are in long run relation i.e., cointegrated, then Engle and Granger (1987) error correction specification is one method that can be used to test for Granger causality.

To implement the Granger-causality test, F-statistics are computed under the null hypothesis that in above equations all the coefficients of ε_{1t} *and* ε_{2t} = *0.* Using the following F-test formula can give the F- test values and the test is as follows;

$$F = \frac{(RSS_R - RSS_U)/m}{RSS_U/(n-k)} \qquad (4.13)$$

This follows *F (m, n-k)* degrees of freedom. Where *m* is the number of restrictions, *k* is the number of parameters and *n* is the number of observations.

CHAPTER FIVE

RESULTS AND DISCUSSIONS

5.0 INTRODUCTION

This chapter presents the major findings of the study. It focuses on the link between public health spending and health outcomes in Malawi. In this link, the index of corruption is introduced and emphasis is paid on observations on what happens to the interplay between public health spending and health outcomes. Recall that the primary objective of this study is to investigate how the effectiveness of public health expenditure in Malawi is affected by governance.

5.1 DESCRIPTIVE STATISTICS

In this subsection, descriptive statistics for the data set used in this study has been generated as presented below. In most cases, measures of central location and dispersion are computed using the individual data values. The mean, which is a measure of central location for a data set, is computed as well as the standard deviation, which is a measure of dispersion. In short, the original data set was subjected to descriptive statistics. Below are the results:

TABLE 5.1: Descriptive Statistics

	Infant Mortality Rates (IMR)	Child/Under five Mortality Rates(CMR)	Index of Corruption (CPI)	Public Health Expenditure	GDPP
Mean	114.87	187	3.99	6.28	208.76
Median	132	205	4	5.9	198.11
Maximum	151.5	256	6	8.99	363.64
Minimum	46	71	2.7	4.61	119.96
Std Dev.	31.9547	64.27675	0.9364	1.44	62.659
Obs.	33	33	33	33	33

Source: computed by author

The summary statistics presented in Table 4.1 shows that the average public health spending during the period of analysis is 6.28 per cent of Malawi's GDP while the maximum during that period is 8.99 per cent. The mean per capita income during this period is $208.7691 (in constant US dollar) while the maximum is $363.64. The mean infant mortality rate is 114.87 while that of under-5 mortality rate is 187 (both variables are measured per 1000 live birth). The average corruption index is 3.99 which is rather low. This indicates that the country was regarded as highly corrupt during the period of analysis.

5.2 UNIT ROOT TESTS

The purpose of this subsection is to determine the order of integration using the Augmented Dickey Fuller (ADF) and the Phillips Perron (PP) tests. Summary statistics of the variables used in the analysis showed that infant mortality is downward trended with gradual decline and the GDPP increase is sharp over the period of 1980 to 2012. Infant mortality rates *(imr)* appear to be non stationary both in DF and ADF in its level form where as it is integrated of order zero in difference form with drift, without drift using two lags in DF equation. Therefore, it is I (1) and contains a unit root. Child mortality rates (CMR) also appeared to be I (1) and become stationary after differencing one time in DF and ADF specifications. It is significant at 1% level of significance in both tests.

Public health expenditure is also significant at 1 % level of significance with lags one and two in ADF equations including constant and with constant and trend showing it to be I (1). Gross Domestic Product per capita (GDPP) is non-significant at two lags in ADF equation with constant but when trend is included it becomes significant at 1 % level of significance at one lag. While excluding constant and trend it shows significance at 5 % level of significance at one lag whereas in any equation of DF in level form it is non stationary. Corruption Perception Index (CPI*)* is significant at 5 % level of significance without constant and trend in level form in DF equations while in all other ADF and DF specifications it is non-significant meaning that it contains a unit root (see table 6.3). But in DF equation with constant and with constant and trend, it is significant at 1% level of significance making it an I (1) variable. The null of unit root is also rejected for population *(pop)* in all the DF and ADF models in level form and it becomes stationary after taking first difference.

Table 5.2: DF and ADF unit root results in level and differenced form

	DF			ADF					
	With	With C, T	Without	With C		With C,T		Without C, T	
Var.	C		C, T	1	2	1	2	1	2
lnIMR	-0.02	-1.36	-1.12	-0.24	-0.23	-1.50	-1.41	-1.47	-1.41
InCMR	-1.97	-2.27	4.79	-1.89	-1.92	-2.50	-2.34	-2.50	-2.34
lnPubx	-1.55	-2.13	1.30	-1.72	-1.64	-2.91	-2.54	-2.91	-2.53
lnGdpp	0.74	-2.22	3.49	0.51	0.73	-2.54	-2.22	-2.54	-2.22
lnCpi	0.81	-1.35	-3.50**	0.36	-0.19	-1.48	-1.80	-1.48	-1.80
lnG*Px	-1.02	-1.87	-1.69	0.57	-0.17	-1.09	-1.55	-1.71	-1.27
lnPop	-0.66	-1.16	-6.68**	-0.77	-0.72	-2.10	-2.10	-2.09	-2.10
	ii) DF and ADF unit root results in differenced form								
lnIMR	-4.82**	-5.21**	-4.77**	-3.60*	-2.99*	-4.1**	-3.50*	-3.5**	-2.9**
lnCMR	-5.21**	-5.19**	-3.83**	-4.3**	-3.9**	-4.4**	-4.2*8	-2.9**	-2.45*
lnPubx	-5.02**	-4.96**	-5.01**	-5.4**	-5.3**	-5.2**	-4.9**	-5.3**	-5.0**
lnGdpp	-4.60**	-4.57**	-3.35**	-4.1**	-2.90	-4.1**	-2.88	-2.63*	-1.66
lnCPI	-4.10**	-4.32**	-3.31**	-2.40	-2.40	-2.49	-2.58	-1.91	-1.83
lnG*Px	2.71**	-3.17**	-3.61**	-3.91*	-0.17	-1.39*	-2.75*	-1.71*	-1.27
lnPop	-3.80**	-3.77**	-2.12*	-3.30*	-3.61*	-3.29*	-3.55*	-1.65	-1.56

**and ** show significance at 5 and 1 percent level of significance respectively.1 shows that c is equal to constant and T is time trend. Source: Author's computation*

When constant and trend are excluded from ADF equation this variable becomes non stationary in difference form at lag one and two. Therefore, on balance it can be safely said that all the variables are I (1) in both DF and ADF unit root tests.

5.3 Cointegration results

After empirically estimating possible unit roots in all the variables, that tell us the order of integration, a test for possible long run relationship (Cointegration) is conducted following Johansen (1988). The Johansen cointegration strategy allows estimating the cointegrating vectors between the non-stationary variables of the model, using a maximum likelihood technique which tests the cointegrating rank. The presence of a cointegrating relation among the variables forms the basis for the specification of the vector-error-correction model (VECM). In addition, even with small samples, more efficient cointegration relationships can be determined using the Johansen cointegration strategy (Ghatak and Siddiki, 2001). A Vector Error Correction Model (VECM) is particularly useful in time series analysis since they investigate the short- and long-run properties of the system variables. The variables in their differenced form reflect the short-run dynamics of the model, while the long-run relationship is incorporated in the estimation procedure by including the lagged cointegrating vector.

Johansen cointegration was procedure employed for the presence and number of cointegrating vectors among the variables in the model. The results are presented in Table 4.3 which show that trace statistics strongly reject the null hypothesis that there is no cointegration between variables *(i.e. r = 0)*, but do not reject the hypothesis that there is one cointegrating relationship *(i.e. r = 1)* at 5 % level of significance.

It is therefore concluded that our model has one cointegrating vector (i.e., a unique long-run equilibrium relationship exists). The maximal Eigen value test also rejects the null of no cointegration and hence in line with the results of the trace statistics. The null of no cointegration for the child mortality rate equation is rejected at 1 % level of significance and therefore it is concluded from the trace statistics that a long run relationship exists between child mortality and other economic and non economic macro-level factors (see panel B of table 5.3). The results of Eigen Value statistics confirm the trace test results and point towards the existence of one cointegrating vector. The results for the diagnostic tests are presented in the table as summary measures to see whether there is a problem of any kind in both the models. All the results with their respective values seem non significant meaning that there is no such problem of misspecification, non normality and heteroscedasticity in the estimated models.

Table 5.3: Eigen value and Trace statistics (test for number of cointegrating vectors)

A) Infant mortality rates cointegration results (imr)

Rank	**Eigen value**	**Log Likelihood**	**H_o : rank <=**	**Trace test**	**P-value**
0		264.615	0	74.98*	0.017
1	0.626	280.837	1	42.54	0.144
2	0.622	293.750	2	16.71	0.669
3	0.279	299.152	3	5.91	0.709
4	0.159	302.003	4	0.20	0.651
5	0.0061	302.105			

Test Summary

Vector AR 1-2 Test	F (50, 39) 1.59 (0.068)				
Vector Hetero test	$\chi 2$ (300) 304.22 (0.421)				
Vector normality test	$\chi 2$ (10) 9.69 (0.47)				
B) child mortality rate cointegration results (cmr)					
0		350.1366	0	109.98	0.003**
1	0.75203	373.1453	1	63.961	0.133
2	0.58443	387.6341	2	34.983	0.454
3	0.37225	395.3168	3	19.618	0.460
4	0.29798	401.1545	4	7.9425	0.479
5	0.17516	405.1257	5	1.5879	0.208
Test Summary					
Vector AR 1-2 test	F (72, 22) 1.7998 (0.0614)				
Vector Hetero test	$\chi 2$ (504) 522.74 (0.2729)				
Vector Normality test	$\chi 2$ (12) 12.293 (0.4225)				

** Shows the rejection at 5 % level of critical values. Number of lags included in the analysis 2, Constant is unrestricted. Figures in parenthesis are probability values.*

Source: computed by Author

5.4 Empirical Results

What follows below is a report of the long run cointegration regression and short run dynamics results.

5.4.1 Long Run Regression Results

The table (5.3A) below shows the long run regression results. In line with the objective of the study in which the emphasis is on the impact of governance (measured through corruption perception index) the interaction of public health expenditure and governance in Malawi, the modeling adopts a general to specific approach as used by Kaufmann *et al*. (1999) and Kaufman *et al*. (2004), Ricci and Zachariad (2006) and the results are presented in Table 4.3 below. Equation 1 (Eq1) gives results of a model with all the variables (that is, where CPI is allowed to interact with the public health expenditure variable) while Eq2 presents results where the CPI has no role.

Table 5.3A Long Run Regression Results (Dependent variable: IMR)

Variable	Equation	Coefficient	Std Error	t-statistic	Prob
	Eq1	-2.33	3.224	-1.203	0.204
C	Eq2	1.37	2.577	1.722	0.368
	Eq1	-0.237	1.709	0.74	0.482
LnPubexp	Eq2	-0.114	2.088	1.299	0.522
	Eq1	-3.942	1.922	-2.113**	0.017
LnGDPP	Eq2	-2.99	2.076	-2.107**	0.009
	Eq1	0.323	3.760	0.589	0.007
LnCPI	Eq2				
	Eq1	2.930	2.467	1.846	0.722
LnPOP	Eq2	-1.788	1.988	0.626	0.433
	Eq1	-1.303	0.386	-2.564**	0.024

lnG*Pubxp	Eq2				
		Test	**Summary**		
	Eq1	0.73		Eq1	2.817(0.261)
Adjusted	Eq2	0.68	Autocorrelati	Eq2	2.221(0.215)
R-squared			on B-G		
	Eq1	1.24(0.455)	Stability	Eq1	0.077(0.825)
Normality	Eq2	1.36(0.289)	Ramsey	Eq2	0.032(0.719)
J-B			RESET		
Heterosced	Eq1	0.94(0.226)		Eq1	8.15(0.000)
asticity –	Eq2	0.87(0.382)	F-Statistic	Eq2	7.63(0.034)
ARCH					
				Eq1	1.772
			DW Statistic	Eq2	1.361
				Eq1	2.351
			AIC	Eq2	2.895

*Note: ***, **, * imply significance at 1%, 5% and 10% respectively*

In both scenarios, regression performed well in terms of goodness of fit and overall significance in terms of adjusted R^2 of 73 and 68 percent respectively. This means that 73 percent and 68 percent of the variation in output is explained by the regressors in the two models respectively. The F-statistic was significant at 1% implying that the variables in the model were jointly significant in the long run. Diagnostic tests were conducted and showed that the model was well specified and the errors were normally distributed as indicated by Ramsey RESET test and Jacque-Bera test respectively. B-G test showed no

autocorrelation and White's test highlighted the absence of heteroscedasticity. This in essence implies that the OLS tests are BLUE and so hypothesis testing and forecasting can be done comfortably.

In this study, emphasis is on the coefficients of public health expenditure with and without the interaction of the corruption perception index. This will give a clear picture in terms of the impact of the corruption perception index on the relationship between public health expenditure and health outcomes. With the interaction of the corruption perception index in the equation (equation 1), public health expenditure as a percentage of GDP is negatively related to infant mortality rate though insignificant. Holding all other factors constant, with an increase in public health expenditure as percentage of GDP it implies that the country has more resources available for the health sector and hence this should in essence imply better health service delivery and in the course lower child mortality rates. The insignificant relationship, however, supports the weak link between public health expenditure and infant mortality rates in Malawi. This could be due to the fact that only about 8 percent of the total public health expenditure in Malawi goes towards initiatives that directly contribute towards reduced infant mortality rates in Malawi (UNDP 2012). Another possible explanation to the insignificant relationship between public health expenditure and infant mortality rate could be the fact that Malawi has several donors who directly fund initiatives towards health service delivery (UNDP 2012). Similar results are manifested when the corruption perception index is allowed to interact with the other variables (regressors). As such, it can be concluded that, indeed, there is a negative but insignificant relationship between public health expenditure and infant mortality rate in Malawi.

However, when the corruption perception index interacts directly with the public health expenditure as a percentage of the GDP in a multiplicative form, a different story is observed. In this case, although there is still a negative relationship with infant mortality rate, the coefficient is now significant at 5 percent. This significance, in this case, provides evidence in support of a significant effect of corruption perception index on the relationship between public health expenditure and health outcomes. The negative sign for this variable is expected because corruption in essence diverges funds meant for public health service delivery to other insignificant services or people's pockets and in the course negatively affecting health service outcome; the negative sign entails that as the nation improves on the corruption perception index, there will be a reduction in either infant mortality rates or child mortality rates thereby improving health outcomes. This also supports the argument that bad governance, through corruption, is responsible for most of poor health outcomes in most African countries (World Bank 2008). It is generally considered (especially in developing country) that high corruption rate is to blame for increased mortality (Yamada, 1985). The findings also confirm what proponents of good governance have been arguing: well-functioning public institutions are critical for translating public spending into effective services (Filmer *et al*., 2000).

Again as a regressor, corruption perception inde*x* has a positive but insignificant relationship with infant mortality rate implying that as corruption perception index rises (corruption levels improve) for Malawi, infant mortality rate also rises. However, this relationship is insignificant. This is in contrast to apriori expectation. Perhaps the argument could be as explained by Kaufmann *et al* (2004) in which it is argued that perhaps what is present here is just an index which only shows people's perception of

corruption which in essence does not imply the level or standard of service delivery. To them, what is critical is the interaction of the index and public health expenditure. In some cases, there have been improved health outcomes in periods where corruption perception index for Malawi worsened.

Population is affecting infant mortality rates and child mortality rates positively in Malawi although it is insignificant. This result is in agreement with expectations. As population increases, there is pressure on available resources to provide adequate health services to the increasing population. As such, health service delivery dwindles and hence mortality rates for both children and infants rise. In the second scenario, the population variable seems to show a negative relationship with infant mortality rate although it is also not significant. Similar results are also manifested in the case of child mortality rates.

With per capita GDP, the story is different. The significant negative sign of per capita GDP shows that as the per capita GDPP increases, the infant mortality rate would be declining. Precisely, an increase in per capita GDP by 1 unit would result in a reduction in infant mortality rate by almost 4 per cent. Again, this is in line with theory and expectations. It can be argued that with per capita GDP on the rise, the people are expected to afford and access better and quality health services and as such a reduction in infant mortality rate as households are able to afford essential health services leading to a reduction in mortality rates.

It is also in harmony with Malthusian theory which argues that an increase in per capita income, increases the living standard which augments mortality (Kauffmann *et al* 2004). This finding is consistent with findings of Musgrove (1996), Filmer and Pritchett (1997, 1999), Gupta et al. (2001, 2002), Buor and Bream (2004), Issa and Ouattara

(2005), Imam and Koch (2004) and Alvarez et al. (2009). This result however contradicts the findings of Anyanwu & Erhijakpor (2007), Ricci & Zachariadis (2006), and Acemoglu &Johnson (2006) who reported a weak and insignificant relationship between per capita GDP and mortality rates. However these researchers do not provide a reasonable explanation to the contrasting results.

Similar results also came out when the dependent variable was Child Mortality Rate (see table 4.3B). However, the relationship between public health expenditure and child mortality rate, while maintaining the negative status, is now significant.

5.4.2 Short run dynamics

Based on the cointegration results in table 4.3 above in which it is concluded that both variables of infant mortality rates and child mortality rate are long run phenomenon and thus in short run, it will not be appropriate to measure elasticity to make inferences. As such short run elasticity are not computed.

5.5 Two-Stage-Least-Squares Result

Realising that the OLS results are mostly based on the assumption that public health spending is exogenously determined, it may be the case that as previous researchers have noted, the two main variables in this study - public health spending and health status are jointly determined. There also exists the possibility of reverse causation. For instance, it has been the case that in Malawi when faced with poor and/or deteriorating health status of the citizens, the GoM would increase spending on health. Furthermore, as the UNDP report (2012), notes in cases of drug shortages and deteriorating health needs, several

development partners have been seen to come forward with support towards programs that directly contribute towards reduction of infant mortality rates and child mortality rates. Rich countries, when providing debt relief to poor countries, often insist that such relief be spent on activities that would improve health and education outcomes. With such a background in mind, to test the robustness of the results, the study needed to address the endogeneity problem. This was in a two-stage least squares regression.

Table 5.4 Two Stage Least Squares Regression results

	Infant Mortality Rate		**Child Mortality Rate**	
	Eq. 1	Eq. 2	Eq. 1	Eq. 2
lnGDPP	0.027 (1.96)**	-0.11 (-0.44)	-0.01 (-0.49)	-0.01 (1.22)
lnPubexp	0.09 (2.76)**	-0.10 (-1.78)**	0.05 (2.36)**	-0.06 (-1.68)
lnPOP	-0.48 (-7.74)	0.20 (2.24)	-0.33 (-7.03)	
lnCPI		-0.14 (-1.83)**		-1.19 (5.83)**
InG*CPI		-0.36 (-1.25)		+1.19 (-2.59)
Constant	12.32 (15.9)	0.09(0.5)	10.82 (18.46)	2.11 (2.470)
R^2	0.75	0.57	0.71	0.62

Source: Author's computation

The two-stage least squares regressions results are reported in Table 4.4. In the basic equation without the governance variable, public health expenditure is wrongly signed although it is significant in infant and under-5 mortality equations. When the governance variables are included the public health spending became rightly signed and significant. This is the case with lnGDPP in infant mortality rate. The index of corruption is rightly

signed and significant in all the equations. This is in contrast with initial OLS regression where it was found that CPI was not significant. The interaction term is only correctly signed in the infant mortality equation. In the child mortality equation without the governance variables, public health expenditure is wrongly signed although significant but when the governance variables are included, the variable became rightly signed. These results generally conform with what is obtained under OLS above.

5.6 Granger causality results

Bivariate Granger causality tests are conducted for the variables of policy relevance. The results are presented in table 4.5. Results of Granger causality confer bidirectional causality between infant mortality and corruption perception index. This result is in line with that of Repetto's hypothesis (1978) of bidirectional causality as well as with that of Chowdhary (1988), Narayan (2004), Schultz (1993) and Palloni and Rafalimanana (1999). The results are in contrast with that of Flegg (1982) and Zakir and Wunnava (1999).

The direction of causality also runs from child mortality rates to Public health expenditures but not vice versa. It is also an interesting result because as population grows in age demand for health care also increases (see for example; Barros, 1998 and Murthy and Ukpolo, 1994). Population availability also is causality related with infant mortality and child mortality rates. It is because as population increases there would be pressure on the availability of health services hence the latter becomes limited reducing the quality of health service delivery leading to high mortality rates.

Table 5.5: Granger-causality test

Causality	Lags used	F-statistic	P-value	Result
lnImr ⇨ lnPubexp	3	0.435	0.730	No Causality
lnPubex ⇨ lnImr	3	1.362	0.277	
lnImr ⇨ lnGdpp	3	0.624	0.605	No Causality
lnGdpp ⇨ lnImr	3	1.976	0.143	
lnImr ⇨ lnCpi	3	4.994	0.007	Bidirectional
lnCpi ⇨ lnImr	2	3.067	0.062	Causality
lnImr ⇨ lnPop	3	1.493	0.241	Unidirectional
lnPop ⇨ lnImr	3	6.186	0.003	Causality
lnCmr ⇨ lnPubexp	2	5.341	0.010	Unidirectional
lnPubexp ⇨ lnCmr	3	0.408	0.748	Causality
lnCmr ⇨ lnGdpp	4	2.345	0.086	Unidirectional
lnGdpp ⇨ lnCmr	3	0.717	0.551	Causality
lnCmr ⇨ lnCpi	3	0.564	0.644	No Causality
lnCpi ⇨ lnCmr	3	0.137	0.937	
lnPop ⇨ lnCmr	3	3.472	0.031	Unidirectional
lnCmr ⇨ lnPop	3	2.057	0.131	Causality

⇨ *Shows the direction of causality.* *Source: Author's computation*

5.7 Summary

This section, using mainly cointegration and causality analysis, tries to seek answer to the impact of governance on the relationship between health expenditure and health

outcomes in Malawi. Trace and Eigen value test statistics confirmed the existence of one cointegrating vector at 5 % level of significance for infant mortality rate (IMR) and 1% level of significance for child mortality rates. Granger bivariate causality test is employed to see the direction of causality among the variables. In the long run, evidence supports the presence of a negative but insignificant relationship between public health expenditure and infant mortality rate and child mortality rate in Malawi. However, with the presence of the governance indicator of corruption index, this relationship becomes significant. In addition GDPP is an important factor in determining the health status of infants as well as children. An interesting result is unidirectional causality between child mortality rate and GDP per capita at national level. Public health expenditure appeared to be affecting both the mortality rates and also the child mortality rate. Bidirectional causality between infant mortality and corruption perception index is an interesting result of this study.

CHAPTER SIX

CONCLUSION AND AREAS FOR FURTHER RESEARCH

6.0 Introduction

This chapter focuses on three main areas which are summary, policy implications and recommendations, limitations and further areas for research. The summary focuses on the study outcome in general while policy implications dwell on the importance of the outcome and the measures that the government can put in consideration in relation to governance bearing in mind its impact on public health expenditure and health outcomes in Malawi. Limitations and areas of further research discuss the problems that were encountered in the course of the study and the areas that require further investigation.

6.1 Summary of the study and results

The general objective of this study is to investigate how corruption affects the effectiveness of public health expenditure in Malawi. To achieve this objective, the study has used annual data for the period 1980 to 2012 obtained from various sources. The long run cointegrating equation has been estimated. Diagnostic tests have been undertaken and the OLS method of time series data analysis has been used.

In summary, the study has found that in the long run there is a negative but insignificant relationship between public health expenditure and infant mortality rate and

child mortality rate in Malawi. This is so when the impact of corruption perception index is not factored in. However, with the presence of the indicator of corruption index, this relationship becomes significant implying that public health spending has a stronger negative impact on both child mortality and infant mortality rates in countries that have good governance. As the level of corruption falls, public spending on health becomes more effective in lowering child mortality. In addition, the study reveals a negative and significant relationship between per capita GDP and mortality rates in the long run in Malawi. Perhaps the argument could still be that, in the long run, as people have improved economic resource opportunities, it is expected that they would be able to access better and quality services which would imply better health outcomes. Although, population is affecting infant mortality rates and child mortality rates positively in Malawi, this relationship is insignificant in the long run. Again a similar story happens with the variable of corruption perception index in Malawi.

6.2 Limitations and directions for further research

It should be noted that there are several areas that this study did not look into due to various limitations. The use of a corruption perception index as an indicator of governance is an excellent choice as argued by previous researchers. However, to make the results more plausible, there is need to develop a particular index that rates corruption in the health sector since the index as developed by Transparency international is a general index. Furthermore, data availability issues did not enable the researcher to have complete data set for per capita health expenditure in Malawi for the years under study. What was generally available are the percentage expenditure of GDP towards health.

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APPENDICES

Appendix A: Table 5.3B Long Run Regression Results (Dependent variable: CMR)

Variable	Equation	Coefficient	Std Error	t-statistic	Prob
	Eq1	-0.14	5.387	-1.691	0.334
C	Eq2	2.01	2.116	0.912	0.151
	Eq1	-1.221	0.713	1.772**	0.782
lnPubexp	Eq2	-0.52	2.13	2,771	0.500
	Eq1	-1.57	1.022	-2.799**	0.723
lnGDPP	E2				
	Eq1	1.98	1.209	-2.172	0.085
lnCPI	Eq2				
	Eq1	1.000	3.771	1.200	0.382
lnPOP	Eq2	-0.933	2.892	0.772	0.702
	Eq1	-0.977	1.17	-1.714**	0. 27
lnG*Pubexp	Eq2				
	TEST		SUMMARY		
	Eq1	0.68		Eq1	2.086(0.655)
Adjusted R-squared	Eq2	0.66	Autocorrelation B-G	Eq2	1.721(0.377)
	Eq1	2.059(0.455)	Stability	Eq1	0.077(0.825)
Normality J-B	Eq2	1.363(0.289)	Ramsey RESET	Eq2	0.202(0.733)
Heteroscedasticity	Eq1	0.942(0.226)		Eq1	7.86(0.000)

– ARCH	Eq2	0.802(0.581)	F-Statistic	Eq2	7.93(0.034)
				Eq1	1.330
			DW Statistic	Eq2	1.655
				Eq1	2.001
			AIC	Eq2	2.015

*Note: ***, **, * imply significance at 1%, 5% and 10% respectively*

Source: Author's computation