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The Determinants of Healthcare Expenditure in Ghana

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Abstract
The study is motivated by the conviction that previous studies on the determinants of per capita healthcare expenditure are mostly based on international comparisons. This paper examines the demand-side macroeconomic determinants of publicly financed healthcare expenditure in Ghana. Employing annual time series data on Ghana from 1970-2006 and an error correction model that captures both short-run and long-run relationships; the analysis clearly captures the demand-size factors that motivates decision to allocate financial resources to the health sector. The main finding highlights the dominants of per capita income (Per capita GDP) and other macroeconomic factors such as health status of the population and age structure of the population in influencing the decision to invest in healthcare. This therefore suggests that in order to meet the minimum expenditure requirement for achieving the health related MDGs, per capita income in Ghana ought to be increased considerably. Specifically, the coefficient of per capita GDP is found to be far below unity in the long run and above unity in the short run. One of the major implications of this result is that, healthcare in Ghana is a necessity in the long run and a luxury in the short run. This could be an indication that healthcare delivery is one of the most important issues to Ghana's policymakers.
Keywords: Determinants, Healthcare expenditure, Income elasticity, co integration, error correction

1. Introduction

Health related issues predominantly feature in three out of the eight Millennium Development Goals. The goals include; reduction in child malnutrition and mortality, improving maternal health and combating HIV/AIDS, malaria and other diseases. The World Health Organization (WHO) has indicated that the millennium development goals (MDGs) on health cannot be achieved without fully functioning and equitable health systems in various countries. Achieving the health related MDGs in Africa will therefore require both mobilization of additional financial resources and better spending of scarce resources in the health sector. Although more money is needed to achieve this, resources could be wasted without achieving the desired health targets. An efficient healthcare system is therefore crucial in breaking the vicious cycle of poverty and poor health. Moreover, it is critical in meeting the Millennium Development Goal (MDG) of "marked improvements in the health of the poor by the year 2015."

There are acute shortages of both human and financial resources in the health sector all over the African continent. Without adequate financing of the health sector, many countries in the region will not realize these goals given that the health systems are chronically under-funded, and health budgets remain far below what is seen as the minimum spending required to achieve the health related Millennium Development Goals (MDGs). Identifying appropriate policies on how to finance and provide healthcare in Africa is a serious constraint on most governments. Healthcare financing policies are also essential for all countries as they determine who will have access to basic healthcare services, the quantity and quality of services to be offered and the mode of payments for healthcare services. A well functioning healthcare system is needed to provide the basic package of health services that is affordable, sustainable and is based on the ability of households to pay regardless of their need or risk.

Currently, the African continent is not on track in achieving the health related Millennium Development Goals since healthcare spending in the region is far below the minimum levels needed to achieve the health goals (World Bank 2006). In trying to predict how much per capita government healthcare expenditure could increase in the future and what policy can do about it in order to meet the minimum healthcare expenditure needed to achieve the health goals, more and better targeted spending as well as improved management of scarce resources will be instrumental in addressing the problem(s). Although much is known about healthcare financing challenges in other regions the world over, robust analysis of the key issues and policy options remains scanty. In light of this, the need to examine the main determinants of per capita government healthcare expenditure in Ghana is predominant.

Africa has severe budget constraints and the worst health outcomes the world over. Strategies that will have significant impact in terms of securing more fiscally sustainable source of financing, managing the financial vulnerability and ensuring greater benefits should be underpinned by robust analysis of the determinants of per capita government healthcare expenditure. The main problem with studies in this direction has to do with unavailability of health data, the econometric and statistical method to adopt and the type of data to use. Lessons

from countries that have implemented reform to tackle the acute problem of financing healthcare such as Ghana, Uganda and Zambia highlight the facts that reform are inherently political, and may not be sustained without a strong political will and legal framework (Bossert, 2000). Other problems associated with such reforms concern the resource intensiveness of sustaining and maintaining a reform process, the necessary improvements in managerial systems, institutional and capacity, the need for good data as a basis for justification for a reform process and structuring the reform within each country's financing capacity.

Numerous studies have explored various aspects of this pervasive area varying conclusions about the magnitude of the income elasticity of healthcare expenditure. The diversity of methodological perspectives – panel analysis, Generalised Methods of Moments (GMM), cointergration and error correction of the studies attests to modeling intriguing and complex nature. In recent times, the growth and pattern of healthcare expenditure and its share of Gross Domestic Product (GDP) have become a phenomenon which is constantly the subject of discussion in many countries. This can be explained by the fact that all countries put similar interest in cost effectiveness and cost containment of healthcare interventions, yet economists have to date failed to reach consensus on what determine the healthcare expenditure growth of nations. Many of these studies emphasize the important role of GDP and other factors such as the price of medical care, urbanization rate, proportion of population above 65years of age, share of publicly funded proportion of health expenditure and life expectancy at birth in explaining healthcare expenditure growth(see Abel Smith 1963, Newhouse 1972, 1977, Gerdtham 1992). Parkins et al, (1987) also found GDP to account for most of the variation in aggregate health expenditure and suggested that the influence of non-income factors were dependent upon the structure of the population and the health sector in particular.

Newhouse (1977) in his seminal paper examined the determinants of healthcare expenditure by regressing healthcare expenditure on Gross Domestic Product and other factors. The study concluded that non-income factors such as price paid by the patient and the method of physician payment have only marginal significance on healthcare expenditure. The study focused mainly on the demand side determinants of per capita government healthcare expenditure in Ghana. This study will however ignore the production, cost efficiency and equity in healthcare spending and considers only variables such as per capita GDP, life expectancy at birth, proportion of population ages 65years and above, proportion of population below ages 15 years and urbanization rate using time series analyses. The dependent variable is the per capita publicly financed healthcare expenditure in Ghana. Unavailability of healthcare data explains why this study will not consider the per capita healthcare expenditure in total and disaggregating it into the public-private per capita healthcare expenditure mix. This was expected to help us measure the different responsiveness of the varying determinants of healthcare expenditure on the disaggregated total, public and private healthcare expenditure in Ghana. The first part is an introductory one, the rest of the study is organized as follows; relevant literature review, methodology, data sources, choice of variables and the model specification, estimation of the model and interpretation of results ends with the summary, conclusion, recommendations and policy implications, area for future research and the limitations.

1.1 Major Research Questions

The study seeks to answer the following specific research questions;

- Is healthcare a luxury or a necessity?
- What demand factors explain the growth of per capita publicly financed healthcare expenditure in Ghana?
- How do these factors influence healthcare spending in Ghana?

1.2 Study Objectives

Generally, the objective of the study is to find out the set of demand driven factors that determine how much government spends on healthcare in Ghana. Specifically, the study seeks to achieve the following objectives;

- To develop a model of both income and non-income determinants of per capita government healthcare expenditure in Ghana.
- To measure both short run and long run linkage between per capita government healthcare expenditure and its determinants.
- To identify and predict the long-term growth of per capita government healthcare expenditures in Ghana.
- To estimate the income elasticity of per capita government healthcare expenditure and to determine whether healthcare is a luxury or a necessity.

2. OVERVIEW OF THE HEALTH SECTOR

Ghana is a tropical country on the west coast of Africa. It is bordered to the south by the Gulf of Guinea, La Côte d'Ivoire to the west, Burkina Faso to the north and Togo to the east. Administratively, the republic of Ghana is divided into ten administrative regions and 170 decentralized districts. The data compiled from the 2010 Census questionnaires yielded a population of 24,658,823. The figure represents an increase of 30.4 percent over the

2000 census population of 18,912,079. The data further indicate that the most populous region is Ashanti, with a population of
4,780,280, representing 19.4 percent of the country's total population followed by Greater Accra, with a population of 4,010,054 (16.3%). The least populous regions are Upper West with 702,110 persons constituting 2.8 percent of the total population and Upper East with 1,046,545 persons or 4.2 percent of Ghana's population (GSS 2010). The government is one of a presidential democracy with an elected parliament and independent judiciary. The principal religions are Christianity, Islam and African traditional religion. Ghana's economy is predominantly agrarian (small scale peasant farming) absorbing about 60% of the adult labour force, a small capital intensive mining sector and a large and growing informal sector. Each of the 138 districts is further sub-zoned into sub-districts, with each district having at least one health management team (DHMT), (World Bank Statistics 2007).
The goal of the health sector will be achieved through pursuing five inter-related and mutually reinforcing objectives. These are:

- Improving health outcomes
- Ensuring equity in access to and payment for healthcare services
- Ensuring efficiency in healthcare delivery
- Overall control of expenditure (reduce escalating cost of healthcare)
- Ensuring quality (patients and provider satisfaction)

The structure of the Ghana healthcare system can be classified into three distinctive categories based on the level of technological sophistication and complexity of healthcare services namely; Primary, secondary and tertiary services. The structure looks hierarchical and/or pyramidal.
At the top of the pyramid are the few tertiary level healthcare facilities which are mainly concentrated in the two major cities in Ghana: Accra and Kumasi. These include the specialized as well as the teaching hospitals. The regional distributions of these facilities are skewed towards the urban areas of Ghana. There are 16 specialized hospitals out of which 8 are located in the capital town, Accra, 5 in Kumasi, the Ashanti regional capital, 2 in the Northern region and 1 in the Central region. Currently, there are 5 teaching hospitals in Ghana, specifically, 2 in Accra, 2 in Kumasi and 1 in Tamale, the Northern regional capital. These are established purposely for the training of healthcare personnel, to undertake health related research and handling highly complicated and high cost treatment of complex diseases and referral cases from the secondary level (Ghana Health Services, facts sheets 2006).
The secondary healthcare services are normally the first referral hospitals or centres from the primary level which are mostly situated in the district and regional capitals. These facilities are more advanced than the primary ones. They consist of district hospitals and polyclinics. Here, both in-patient as well as out-patient services are delivered. There are about 136 district hospitals, 10 polyclinics and 14 regional hospitals. There are also about 60 for-profit hospitals and religious based hospitals currently in Ghana (Ghana Health Services, facts sheet 2006). However, at the broad base of the pyramid is the primary healthcare unit that includes the health posts, healthcare centers and clinics. Currently there are about 245 community health posts, 734 health centres, 671 clinics and 217 maternity homes in Ghana (Ghana Health Services, facts sheet 2006). These facilities serve as "gate keepers" where they undertake both preventive and curative care for some basic diseases like "common" headache, malaria, and stomach upsets. The facilities are mainly located in the small towns and selected villages.

3. LITERATURE REVIEW

Lack of theoretical guidance has been the center of debate for both econometric and statistical studies on healthcare expenditure determinants. To date, there have not yet been consensus in the literature on the particular econometrics and statistical method(s) to use and the type of health data to use for analyses (see Firat Bilgel 2003). While the debate is still ongoing, there is no conclusion concerning the magnitude of the income elasticity of healthcare expenditure. However, it is known that, in the presence of national health insurance, the individual income elasticity of healthcare expenditure is closer to zero but this income elasticity is likely to be greater than unity at the national level.

3.1 Demand Function for Healthcare

Among theories and empirical studies on the demand function for healthcare highlights the relationship between health, healthcare and economic growth. The Demand for healthcare services is described within an orthodox static utility-maximizing framework originally pioneered by Grossman (1972). In this framework, individuals are assumed to consume healthcare not because they value healthcare per se, but because it improves their stock of health, which is used as a productive resource. Cropper (1977) extended Grossman's model to account for the disutility that illness may impose on individuals, and examine differences in the demand for preventive and curative care, and the dynamics of demand for healthcare over the life cycle.

Healthcare is fundamentally a production process and shares many of its economic concepts with production generally. Several studies offer insights into the contribution of healthcare to health. On one hand, evidence suggests that lifestyle and environment expenditure could provide more marginal benefits per dollar cost of health than healthcare. On the other hand, healthcare is seen as a major contributor to health. Economists and policymakers are so much concern about the price and income elasticities of the demand for healthcare. This is because; they determine the effects of various pricing and distributional policies on healthcare demand. If there is no responsiveness of demand to price, then prices play little role in determining the allocation of healthcare resources among individuals. In the absence of financing constraints, free provision of healthcare might be warranted. But, if healthcare is responsive to price, some user fees should probably be charged to discourage overuse. These charges should however, not be so high as to force individuals into imprudent decisions about whether to seek medical attention. Similarly, if income has a large, with direct effect on demand or on the price responsiveness of demand, some form of targeting of subsidized healthcare services may be desirable.

3.2 Empirical Literature on the determinants of healthcare expenditure

Previous studies on the subject emphasize the importance of national income (GDP) in explaining the growth of total (mixed of public and private) healthcare expenditure. These studies however considered a number of non-income factors. Some variables identified in the literature are; the relative price of health care (proxied by the ratio of medical CPI to GDP price index), the proportion of the population over the age of 65, urbanization rate and the publicly funded proportion of healthcare expenditure. While GDP accounts for most of the variation in total health care expenditure (see Parkin et al. (1987)), the significance of non-income variables were indentified to depend on the structure of the population in general and the health sector in particular. Pioneering empirical work on the subject, Newhouse (1977) used a sample of 13 United Nation countries to explain the determinants of healthcare demand by regressing per capita total healthcare expenditure on per capita income. He estimated an income elasticity greater than one, which suggests that healthcare is a luxury good. Newhouse further suggested that the estimated income elasticities decrease as the income level rises.

A number of interesting empirical studies also employed time-series data in analyzing the determinants of healthcare expenditure. Most of such studies were conducted using data from the OECD countries. In his study, Roberts (1999) employed techniques to analyze the properties of non-stationary variables over the period 1960-1993. The study adopted the Auto regression Distributed lag (ARDL) model to capture the heterogeneity across the OECD countries. Roberts regressed per capita total healthcare on per capita income, proportion of the population over the age of 65, relative price of health care, the proportion of publicly funded health spending and a time trend which captures technological change. The study found income, the proportion of publicly funded health spending and the relative price of health care to have long run significant effects of total healthcare spending. The study estimated the long-run income elasticity to be above unity.

Getzen (2000) argued that healthcare is an individual necessity and a national luxury in the sense that the magnitude of income elasticity depends on the level of analysis. Getzen identified that, at the individual level, budget constraints do not provide sufficient information about how much to spent on healthcare as long as there is a system of pooling resources which removes those individual constraints. However, at the national level analysis, budget constraints still limits the amount of funds a country can devote to healthcare. Getzen therefore concluded that the analysis of the determinants of healthcare expenditure should be based on the units of observation at which decisions are being made. In another interesting study, Okunade and Karakus (2001) employed ADF test for Unit Roots, Engle-Granger and Johansen cointegration analysis for real per capita health expenditure. They examined the determinants of total healthcare expenditure using data on real per capita GDP and relative price of healthcare in 19 OECD countries between 1960-1997. They estimated the income elasticity of healthcare expenditure to be above one. They concluded that their findings were consistent with the previous estimates. Clemente et al. (2002) examined the stability of HE models in the OECD countries by adopting a cointegration approach. They criticized the stability assumption in the healthcare expenditure- income relationship and argued that there exist structural breaks which may bias the long-run relationship. They further conducted their analysis by disaggregating total expenditure as public and private health expenditure. The results suggested that the inclusion of structural breaks does not change the income elasticity of healthcare expenditure from being greater than one. Estimating a demand function by using panel data for 18 OECD countries, Bac and

Le Pen (2002) also adopted a cointegration approach using a model where per capita total health expenditure depends on per capita GDP and the relative price of health care. They have found strong evidence on the cointegration of these variables. They used various models including OLS, fully modified OLS (FMOLS) and dynamic OLS (DOLS) to enable them account for variations in results due to methodological differences. The latter two techniques accounted for endogeneity and serial correlation. Interestingly, the results confirmed that the income elasticity of health care spending exceeds unity.

There exist other empirical studies specially based on the OECD countries examining the cointegrating relationships and unit root problem. The first of such studies was evidence in the work by McCoskey and Selden (1998). Using a sample 20 OECD countries, they employed country-by-country ADF tests on a model where per capita total healthcare expenditure depended. They found that the variable contain no unit roots hence they rejected the null hypothesis of unit root. This led to the obvious conclusion by McCoskey and Selden (1998) that one need not be concerned about the existence of unit root in the OECD data. In a contradictory study by Gerdtham and Löthgren (2002), they employed panel data for 25 OECD countries for the period 1960-1997. They examined the relationship between per capita total healthcare expenditure and income. They found that the unit roots tests indicated that both per capita healthcare expenditure and GDP are difference stationary series. They also found that in 12 countries out of 25 countries in the sample, per capita total healthcare expenditure and GDP were cointegrated. Presenting evidence on the stationarity and the presence of structural breaks in per capita healthcare expenditure and GDP covering 38 annual observations for 20 OECD countries, Jewell et al. (2003) suggested on the contrary that both per capita total healthcare expenditure and GDP are stationary if they allow for structural break(s).

Others studies also presented interesting and supporting findings. Di Matteo and Di Matteo (1998,) focused on the determinants of Canadian provincial government health expenditures within time-series framework for the period 1965-1991. The determinants of provincial government health expenditures were examined to be the real per capita provincial income, the share of senior population in total population and real provincial per capita federal transfers. The limitation of such is studies is that, the issue of stationarity (Unit roots) was not fully addressed, yet, they found that the income elasticity of government health care spending is 0.77. In a related study, Di Matteo (2000) decomposed total healthcare expenditure into the public-private mix. This allowed the examination of the public and private Canadian healthcare expenditures over the period 1975-1996. The studies also examined the major determinants of public-private mix as per capita income, the share of individual income (at the individual level analysis) and federal health transfers. Health expenditures are examined at another level as aggregates and categorized into sub-expenditures such as hospital, physician and drug spending. The empirical evidence suggested that increases in per capita income are associated with more private healthcare spending relative to public spending. In other words, increases in per capita national income leads to more of private spending than public healthcare expenditure.

In a modified study, Di Matteo (2003) employed data for the U.S states, the Canadian provinces and the OECD countries. He argued that an estimate of the income elasticity of health expenditure and its magnitude is highly dependent on the level of analysis. Estimating data at the international level lead to the conclusion that the income elasticity of healthcare expenditure in total is greater than one. Di Matteo also provided evidence that the income elasticity of healthcare expenditure is higher at low-income levels and lower at high-income levels. Ariste and Carr (2001), also used provincial data on real per capita income, the proportion of the population over the age of 65 and the ratio of the deficit/surplus to GDP to explain the real per capita government health expenditures. They examined the non-stationarity of the variables, the cointegrating relationships and found that variables, both individually and collectively, are non-stationary and possibly non-cointegrated. They identified income, the ratio of the deficit/surplus to GDP, the share of senior population and a time trend capturing technological progress as the main the determinants of government health expenditures. They found an insignificant coefficient for the share of senior population. They also concluded that all the variables are non-stationary and non-cointegrated. They also estimated that the income elasticity of government health spending is 0.88.

Some of the studies in the early 1990s considered cross-section analysis. Gbesemete and Gerdtham (1992) applied cross-sectional data for 30 African countries to measure the effects of socioeconomic and demographic variables on per capita total healthcare expenditure. The regress per capita total healthcare expenditure on per capita GDP, percentage of the population under 15 years of age, crude birth rates and per capita foreign aid percentage of births attended by health staff, urbanization rate. They found that only per capita GDP, percentage of births and per capita foreign aid were positive and statistically significant. The income elasticity of healthcare expenditure was estimated to be below unity. Gerdtham et al. (1992) also investigated a similar relationship for 19 OECD countries using cross-section data. They estimated a model of per capita healthcare determinants to depend on income, the relative price of health care, age structure and urbanization. The results estimated the income elasticity to be greater than one. In a closely related study, Gerdtham et al. (1994) incorporated other

socioeconomic and demographic factors such as alcohol and tobacco consumption, income, age structure of the population, and female labor force participation ratio as well as various institutional factors in 22 OECD countries. They found that income elasticity is significantly below unity.

There are also a number of interesting empirical analyses based on panel data methodologies. Popular among them is the work presented by Hitiris and Posnett (1992). Using 560 panel observations for 20 OECD countries, they analyzed the determinants of per capita total healthcare expenditure. With an estimated income elasticity of less than unity, the results support that GDP is the most important determinant of per capita total healthcare expenditure. They however found that the effects of non-income variables are important but very small. Kanavos and Mossialos (1996) emphasized that the inclusion of national income does not reflect the society's ability to pay and argued that GDP may not be effective at all in explaining the growth of healthcare expenditure among countries such as Germany, Greece and the Netherlands.

Moore et al. (1992) specified a model of per capita healthcare expenditure to depend on per capita income, per capita number of physicians, nurses and beds, and the ratio of public expenditures to total health care expenditures. The results indicated that the number of per capita beds has a negative effect on health care spending. They also found that health is a necessity in the short-run while a luxury in the long-run. Hansen and King (1996) while concerned about the nature of the model specification postulated that the per capita healthcare expenditure-income relationship is spurious if the variables are not stationary. Blomqvist and Carter (1997) used panel data for 18 OECD countries for the period 1960-1991 to check the common finding that health is a luxury good. They found out that both real per capita total health expenditure and income are non-stationary and cointegrated for most of the countries. The study found the income elasticity to be close to unity.

Casasnovas and Saez (1998) examined the determinants of per capita total healthcare expenditure using data for eight OECD countries in 1997. They found very significant country-specific effects. They analyzed a model where log of per capita health expenditure depends on log of per capita income, share of public health spending and the share of population over the age of 65. The results confirmed that the income elasticity is far less than one. They also found that increases in the share of population over the age of 65 are associated with increases in healthcare expenditure. The analysis of healthcare expenditure determinants has been based on a standard demand theory linking healthacare expenditure and GDP. Most of the studies that focused on the econometric models of healthcare expenditure determinants agree upon the view that the income elasticity of healthcare expenditure varies with the unit of observation and statistical method used in the analyses (Hitiris and Posnett 1992, Gerdtham et al 1992). Empirical studies on healthcare expenditure determinants can however be grouped into three generational studies based on the econometric models and type of data used (Atella and Marini 2002). The first generation studies are based on international comparison of healthcare expenditure linking healthcare expenditure and GDP (Newhouse 1977, Parkins 1987, Gerdtham et al 1992,). The second generational studies are based on panel data analyses of healthcare expenditure determinants. Panel data analyses enable us to test for the country-specific and time-specific effects (Gerdtham 1992, Hitiris and Posnett 1992). Advancement in econometric and statistical methods led to extension in the empirical literature on healthcare expenditure determinants. Most of the third generation studies were based on the OECD countries using cointegration and unit roots (Hansen and King 1996, Mckoskey and Selden 1998, Jewell et al 2003).

4. METHODOLOGY

Previous studies on the determinants of healthcare expenditure are characterized by lack of dynamics in the specification. The failure to include certain key variables as determinants to capture both the income and price effects of healthcare spending will lead to specification errors and incorrect estimates. It is often asserted that the structure of a country's health spending adjustment process is not well known. In most cases, income have both permanent and transitory component and incomes earned in a particular year may not be fully spent in the same period but rather spent over time. To avoid misleading and biased conclusions thereafter, one should therefore expect lags of some variables in the specification (Getzen 2000).

The model specification in this study will be based on times series and the nature of the data will determined the specific model to adopt. Proxies are used for certain variables in the study due to unavailability of health data. In order to quantitatively examine the determinants of per capita government healthcare expenditure in Ghana, a time series modeling technique is employed using data for Ghana over the period 1970 to 2006.The exact functional specification of the model is therefore dependent on the nature of the data. A test for unit roots (stationarity) and therefore, a test for cointegration of the variables will justify the validity or otherwise of the use of an Error Correction Model (ECM).

4.1 Methodological Issues

On the economic frontier of healthcare expenditure determinants, there has not yet been a formal theory that predicts the per capita healthcare expenditure growth of nations. Following from Parkins, McGuire and Yule (1987), formidable problems exist when researchers attempt to specify a formal model of health expenditure

determinants through the spending behaviour of the economy. The main methodological issue here is the absence of a formal theory. Most studies on this subject are based on pre-existing modeling. The literature mainly consists of international panel studies based on cross-country comparison allowing for greater sample size. However, working with times series data will bring a lot restriction with regards to the sample size and the accuracy of the asymptotic test. The model should therefore be treated with the greatest caution.

4.1.1 Model Specification

Following empirical studies on the determinants of healthcare expenditure, several factors have been identified. The study is basically designed to use time series approach in modeling the determinants of healthcare expenditure in Ghana. The dependent variable is per capita publicly financed expenditure on healthcare. Most of these studies argued that income (GDP) is the main determinant of healthcare expenditure (see Newhouse 1987, Gerdtham et al 1992, Hitiris and Posnett 1992). This assertion is based on the underlying economic principle that the ability to spend depends to a large extend on income level. It is expected that as GDP increases, healthcare expenditure will continually increase over time at the national level.

In the context of traditional macroeconomics, a country's ability to spend depends mainly on its income level, however, in the area of healthcare industry, healthcare expenditure cannot be said to be solely dependent on a country's ability to pay (income) but also depend on several other variables such as; the proportion of publicly funded healthcare expenditure (as a percentage of GDP), the relative price of healthcare/medical care (price effect since individuals spend in response to the system of healthcare payment), proportion of population ages 65 years and above, life expectancy at birth (measure of population health status), urbanization rate, educational levels and technological progress. The study employs the dynamic model based on Firat Bilgel (2003) formulation in analyzing the demand approach to healthcare expenditure determinants in Turkey for the period (1927 - 1996). This is considered in the following model with some modifications based on the availability of health data.

$$HCE = f\left(GDP, POP65, POP15, LEB, URB, ATH\right) \quad \textbf{(1)}$$

Where, HCE is per capita publicly financed healthcare expenditure**,** GDP is per capita GDP (in national currency units at current market prices), POP65 is the proportion of population ages 65years and above, POP15 is the proportion of the population below the ages 15years, LEB is life expectancy at birth (measure of population health status), URB is urbanization rate (proportion of population living in towns with more than 5,000 inhabitants), ATH is the proportion of population (as percentage of total population) with access to basic health facilities

The motivation for this study is to model the determinants of healthcare expenditure in Ghana. To achieve this objective, we can express a standard empirical model for per capita publicly financed healthcare expenditure determinants in a linear specification as below;

$$HCE_i = \beta_0 + \beta_1 GDP_i + \beta_2 POP65_i + \beta_3 POP15 + \beta_4 LEB_i + \beta_5 URB_i + \beta_6 ATH + \varepsilon_i \quad \textbf{(2)}$$

Where; ε is an identical and independently distributed error term (white noise?), β_0 is the constant, β_i is vector of parameters (estimated coefficients) and i is time (1, 2, 3, . ..T)

Following the specification from Bewley (1979) formulation, we can transform any linear specification to a natural log-linear form. This transformation can be written in such form that the estimated parameters are direct long-run elasticities or effects. The specification can thus be expressed as follows;

$$\ln(HCE_i) = \alpha_0 + \beta_1 \ln(GDP_i) + \beta_2 \ln(POP65_i) + \beta_3 \ln(POP15_i) + \beta_4 \ln(LEB_i) + \beta_5 \ln(URB_i) + \beta_6 \ln(ATH_i) + \varepsilon_i \quad \textbf{(3)}$$

We can modify this model by replacing the initial equation above by a first-order autoregressive, AR(1) model in which per capita government healthcare expenditure depends on a one period lagged value of HCE. The inclusion of this lagged value of the dependent variable is highly intuitive from the fact that, budget for the current year is prepared in the previous year, as such government will usually consider this lagged relation when deciding on how much to spend on healthcare in the current year. Finally, the following modified model is considered;

$$LHCE_i = \beta_0 + \beta_1 LHCE_{i-1} + \beta_2 LGDP_i + \beta_3 LLEB_i + \beta_4 LPOP15_i + \beta_5 LPOP65_i + \beta_6 LURB + \beta_7 LATH_i + \varepsilon_i \quad \textbf{(4)}$$

5.DEFINITION OF THE VARIABLES

5.1 Per capita publicly financed healthcare expenditure

A common measure of healthcare expenditure is the amount of expenditure devoted by the Government of Ghana solely to the health sector with the main objective of improving health. This consists of the sum of all expenditure made by central government for hospitals, clinics and public health affairs and services; for medical, dental and paramedical practitioners; for medications, prosthesis, medical equipment and appliances; for applied research and experimental development and for health affairs. This includes both recurrent and capital (development) expenditure allocation by the central government to the health sector in Ghana. This figures are expressed them in per capita terms.

5.2 Per capita Gross Domestic Product (GDP)

This measures the income level of a country. A country's ability to spend on healthcare depends to an extent on its income level measured in terms of GDP per capita. Economic theory posits per capita GDP to be positively correlated with per capita healthcare expenditure with inconclusive results on the magnitude of the coefficient. Empirical studies also suggest income as the major determinant of healthcare expenditure. Economic theory also argues that other things being equal; the amount of government will spent on healthcare should depend on its income level. Therefore as the income level of a country increases, its share of healthcare allocation increases as well, holding all other factors constant.

5.3 Proportion (in percentage) of total population aged 65years and above, (POP65)

This measures the proportion of the population age 65 and above (as percentage of total population). It measures a population human capital. According to Grossman (1972, 1999), the population health stock depreciates over time. The elderly population tends to have higher rates of depreciation in their health stock; that is to say, depreciation in the population health stock is an increasing function of age). Government must continually invest on the health of the aged (persons aged 65years and above) by providing them with more healthcare than persons below that age group. Treatment of the aged also involves prolonged, hardly curable, higher cost, complex illness requiring technical knowledge and equipment that increases the cost of healthcare. One will therefore expect a positive relationship between the proportion of population aged 65years and above and healthcare expenditure.

5.4 Proportion of Population below 15 years (POP15)

This measured the proportion of the total population below the ages 15 years expressed as a percentage. Statistical data on Ghana indicates that the proportion of population that is below the age of 15 years recorded an average of 45.3% of the total population in 2005 and an average of 39.20% of the total population in the 1970's. Since the population structure of Ghana is significantly composed of the minor population, the inclusion of the variable is necessary in order to capture the influence of the young/minor on the long term cost of healthcare. Theoretically, younger population also tends to consume more healthcare than the adult and active population of between ages 15 and 64 years. We will therefore expect a positive association between the proportion (in percentage) of the population below 15 years and healthcare expenditure.

5.5 Life expectancy at birth (LEB)

Currently, the widely recognized measure of aggregate population health status is the Quality Adjusted Life Years (QALYs) and the Disability Adjusted Life Years (DALYs). Due to data unavailability, this study will use the life expectancy at birth as a proxy for the population health status. The shortcoming of using life expectancy at birth is that, it measures quantity of life rather than quality of life years. The relationship between healthcare expenditure and health status is very controversial. Theoretically, increasing life expectancy is associated with long-term cost of healthcare and the sign of this effect is ambiguous. We will expect a positive effect if marginal increases in health status leads to an increase in healthcare expenditure. This implies that the cost of maintaining higher health status increases. Hence, we will need to spend more on healthcare in order to make people live longer. Otherwise, we expect the effect to be negative if marginal increases in health status decrease health expenditure implying that cost of maintaining previous levels of health decreases as the health condition improves. This situation leads to less need for healthcare and thus less expenditure on healthcare..

5.6 Urbanization rate (URB)

This variable is used to capture the fraction of the population living in towns with more than 5,000 inhabitants (Ghana Statistical Service: 1980, 2000 Population and Housing Census, Special Report on Urban Localities, 2002). The inclusion of this variable in the model is to enable us measure the degree to which per capita healthcare expenditure could increase with changes in the proportion of population living in urban areas. The main justification for the inclusion of these variables in the study is that, most urban areas are associated with higher risks of contagious diseases, they can also easily access healthcare facilities, they have lower travel time and cost to healthcare facilities. This suggests that more people will tend to use healthcare facilities in the urban areas than rural dwellers that may not even have access to a proper healthcare facility. We will expect a positive correlation between urbanization rate and per capita government healthcare expenditure**.**

5.7 Proportion of the population with access to basic healthcare facilities (ATH)

This measures the proportion of the population (as percentage) of total population with access to basic healthcare facilities such healthcare centres, clinics and hospitals. It is often maintained however that, the availability of healthcare facilities does not necessarily guarantee accessibility to healthcare. Economic theory does not help us with expectations to the sign of this effect. Several economic and epidemiological factors have been identified as possible determinants of per capita government healthcare expenditure. Nonetheless, there is no evidence in the literature on the relative importance of such factors. The inclusion of this variable implies that, those who have easy access to healthcare facilities are more likely to use healthcare than their counter parts that do not have access to such facilities, all other things being equal. We may thus expect the positive correlation between the variable and healthcare expenditure.

6. DATA SOURCES

All data used for this study are annual secondary data covering the period 1970 -2006. The sources of data were extracted from various issues. Data on the dependent variable; per capita publicly financed healthcare expenditure data are extracted from the Ghana Statistical Service, Quarterly Digest of Statistics and international financial statistics year book. Other variables that are of interest to the study are per capita GDP, proportion of population ages 65 years and above, proportion of population below 15 years, Urbanization rate, and the proportion of population with access to basic healthcare facilities. All these data were drawn from various issues of World development indicators (WDI-2007), African Development Indicators (ADI 2007), Global Development Indicators(GDI 2007), Ministry of Finance and Economic Planing (MoFEP), Ministry of Health (MoH), Ghana Health Services (GHS), International Financial Statistics (IFS 2005, 2007), United Nations Development Programme (U.N.D.P) and the World Health Organization (WHO). Inconsistency in data is the main limitation of this study since the data were extracted from different sources.

7. PROCEDURE OF ESTIMATION

Most researchers using time series data have limited knowledge about the economic process which generates the observed data. Models involving such data are transformed by economic and statistical theory and tested using econometric techniques. Therefore, it is necessary to consider also the process that generates the time series variables. In econometric modeling, we assume that the data are stationary at their levels but it has been shown that models containing non-stationary variables will often result in the common problem of spurious regression. In this case, the results will show statistically significant relationship between the variables in the model when infact they are obtained from contemporaneous correlations rather than meaningful economic relations.

7.1 Test for Unit roots

If appropriate tests are not employed in econometric modeling, the presence of unit roots may result in a common trending between the variables rather than meaningful economic relationship (see Engle and Granger, 1974). A model should be treated over stationary forms of the variables. A common problem in time series is the existence of unit root. Regression on non-stationary variables results in spurious correlation, commonly called "seemingly good" regression. Therefore the study used the Augmented Dickey-Fuller (ADF) unit root test proposed by Dickey and Fuller (1979) under the null hypothesis of unit root.The first problem that appears in unit root testing is whether to include a time trend. On one hand, Hansen and King (1998) claimed that Augmented Dickey- Fuller (ADF) regression should include a linear trend. On the other hand, McKoskey and Selden (1998) argued that it should not include a time trend. It has however been observed that most macroeconomic variables have the tendency to increase over time; therefore it is appropriate to include a deterministic component into unit root testing. However, some variables may not evolve around a trend component at all, yet may appear stationary. Economic theory does not help as to whether to include a linear trend or not, but for the purpose of this study, we will include a time trend since we can observe some trends either downwards or upwards in the variables above.

7.2 Test for Cointegration

Most time series variables are classified as being integrated of order d, denoted as I (d), that is, if the series must be differenced d times in order to become stationary then it contains d unit root. The economic interpretation of cointegration is that, two or more series are linked to form a long run equilibrium even though they may be non-stationary (they may contain stochastic trends). If the variables are non-stationary then they will never move closer to each other over time and the difference between them will be stationary (stable). Cointegration in econometric modeling is used to mimic the existence of this long run equilibrium to which this economic variables converge over time. When two or more series have unit root (non-stationary), they may also be cointegrated. In the presence of unit roots, we test for cointegration of these variables to capture the long run equilibrium relationship between the variables. Otherwise, no equilibrium exits. If the series are cointegrated, then we have information about their long run behaviour of the variables and the coefficients are interpreted as the long run multipliers. We can then estimate the short run parameters by an Error Correction model. Otherwise, we estimate an Autoregressive Distributed Lag (ARDL) model when the series have unit roots and are not cointegrated.

7.3 Error Correction Model (ECM)

The use of an error correction model in this study will be necessary if the variables have unit root and are cointegrated. The preliminary test for the existence of cointegration is done through inspection of the order of integration of the variables. If the variables are integrated of the same order, then the test for cointegration and the use of an Error Correction Model becomes appropriate and the number of cointegrating vectors will be determined. An Error Correction Model represents the disequilibrium relationship between the short run and long run parameters. The absence of an error correction model in this case will lead to loss of the short run parameters in the model. After testing for the presence of unit roots in the variables, if the variables contain unit roots and are not cointegrated, then we cannot apply an Error Correction Model. In this case, it becomes necessary to employ the popular econometric model using the Autoregressive Distributed Lag (ARDL) modeling to capture both the short run and long run influence of these variables. The regressors may include lagged values of the dependent variable and current and lagged values of one or more explanatory variables. This model allows us to determine what the effects are of a change in a policy variable. The choice of an Error Correction Model (ECM) or an Autoregressive Distributed Lag Model (ARDL) will depend on the nature of the available health data.

8. RESULTS

The study considered the Augmented Dickey-Fuller test and the Philip Perron test for unit roots. Under both tests statistics, a variable is stationary (contains no unit roots) if the ADF test statistic or the Philip Perron tests statistic is less than the conventional 5% critical value. Otherwise, we compared the t-probability with the significance level of 5%. This preceded the final estimation of the true long run and short run static models of the determinants of healthcare expenditure. The study then estimated the final logarithmic model in order to interprete the results based on economic theory and statistical significance of the explanatory variables. Table A1 in the appendix shows the summary descriptive statistics of the variables used for the study. The study employed 37 times series observation on available health data in Ghana from 1970 to 2006. The Jarque-Bera statistics for normality shows that the logs of all the variables are not randomly distributed. In other words, the variables are normally distributed at 5% level of significance. The results of the unit roots test based on both the Augmented Dickey-Fuller and Philip Perron test statistics with the inclusion of only a constant and with a constant and linear trend are displayed in the table 5.1 below. The result shows that all the variables contain unit roots (non-stationarity) at their level at both 1% and 5% significance level. The results however confirm that all the variables are stationary at their first difference. In other words, all the variables are integrated of the same order I (1). The graph showing the stationarity of the variables are to be found in figures A1 and A2 in the appendix. The results are shown in appendix;

The study applied the Johansen (1991) test procedure to capture the long run relationship between healthcare expenditure and its determinants. This procedure is the maximum likelihood for vector error correction and is easily calculated using eviews. The choice of this method is not just because it is a VAR. The model is simple in modelling time series variables. The procedure also performs better than the single equation and/or multivariate regression methods. We applied an error correction model to capture both the short and long run relationship. The intuition behind error correction model is that, we need to recover information lost from differencing the variables to get stationarity. This problem is rectified by introducing an error correction term. The error correction term is derived in this model from the long run equation based on the basic economic theory to measure the speed of adjustment of healthcare expenditure to its long run equilibrium value after a disequilibrium.. The results of the cointegration test are reported in the appendix

The result from the Max-Eigenvalue test shows that there are three (3) cointegrating equations in the analysis.

The result of the normalized unrestricted cointegrating coefficients (PT-matrix) of the betas from the Johansen cointegration test and preferred cointegrating relationship are displayed in table A2a and A2b of the appendix. Using the statistical significance and signs of the coefficient based on the underlying economic theory, the first cointegration relation is chosen. The normalized cointegration equation is shown below;

$$ECM = LHCE + 0.21LGDP + 3.66LATH + 1.88LLEB + 9.26LPOP15 + 12.11LPOP65 + 11.872153LURB \quad (5)$$

The above results showed that, the coefficients are statistically significant and provide meaningful explanation for changes in per capita healthcare expenditure. As shown in table A2b in the appendix, from the normalized cointegrating coefficients, all the coefficients are shown to be significant and positive in explaining changes in per capita government healthcare expenditure in Ghana. Having ascertained that all the variables are non-stationary at their levels but stationary after differencing them once and that they cointegrated, the phase is thus set to formulate an error correction model. This intuition behind such a model is to recover the long run information lost during differencing 1the variables. The error correction model rectifies this problem by introducing an error correction term.

8.1 Preliminary Results

The study proceeds after the test for unit roots and the number of cointegrating equations to estimate both the over-parameterized and parsimonious error correction models. We estimated a vector error correction model. This is necessary in order to capture the long run relationship between the variables. This is done simply by introducing the error correction factors to reconcile both the short run and long run relationship. The error correction term measures the speed to which healthcare expenditure adjusts to its long run equilibrium after disequilibrium. This also provides us with information about the proportion of disequilibrium errors accumulated in the previous periods that are corrected in the current period. The error correction results are shown in the appendix.

8.2 Results from the Error Correction Model

Having estimated the general or over-parameterized Error Correction Model as shown table A3 of the appendix, the results from the unrestricted coefficients also help us to include a lag length of two based on the Akaike information Criterion (AIC) and the Schwarz information Criterion (SIC) as shown in appendix A4. A maximum lag length of two is therefore used in both the cointegration test and in estimating the over-parameterized model. The study further estimated a parsimonious error correction model by eliminating the entire group of insignificant variable in the over- parameterized model. This is to enable the estimate the final Error Correction Model over only significant regressors. The result of the parsimonious model is showed in table 5.3 below while the result of the over-parameterized model is presented in table A3 of the appendix.

8.3 Results of Diagnostic test

It is extremely important to critically examine the properties of the regression model. Here we conduct a statistical test for normality (Jarque-Bera statistic), Breusch-Godgrey test for serial correlation, ARCH test for Autoregressive conditional heteroscedasticity, the white heteroscedasticity test, Chow breakpoint and Chow forecast for stability, and the Ramsey Reset test for specification errors. The diagnostic test result displayed on the table 5.4 below shows that the regression residuals are normally distributed with no serial correlation. The parameters are stable and the model is correctly specified.

8.4 Discussion of Results

Table 5.3 above presents the results of the parsimonious error correction model. This is extracted from the general or over-parameterized error correction model shown in table A3 of the appendix of the study. The model included only the significant variables and some lagged values from the over-parameterized model with a maximum lag length of two. The result shows the R^2 in the regression which measures the goodness of fit or the explanatory power of the regression. The adjusted R^2 of 0.6467 shows that about 64.67% of variations in healthcare expenditure is explained by the independent variables in the regression with the F-statistic which also measures the overall significance of the regression shown to be statistically significant at 1% level indicating that the overall result is good. The other tests results like the Durbin-Watson statistic of 1.866 an indication of the presence of no autocorrelation in the regression.

The coefficients from the final regression have implication for the growth of healthcare expenditure. This result confirms the general assertion that healthcare expenditure depends on its one period lagged values since the budget for the current year depends on the budget for the previous years and government usually considers this lagged relationship in their spending behaviour. The coefficient of one period lagged per capita government healthcare expenditure is negative and significant at 1% level indicating that a one percent increase in healthcare expenditure in the previous year will decrease healthcare expenditure in the current year by ten percent. The t-statistic of the constant of the regression suggests that it is insignificant at 5% and positive. This confirms the macroeconomic principles that people/nations will spend even at a zero income level either through borrowing or

through other means. Both economic theory and practice has it that a government ability to spend depends greatly on the income level.

The coefficient of GDP and its lagged values are 1.7091 and 1.2490 respectively. Both coefficients are statistically significant at 1% in the short run. Interestingly, the results from the long run relationship found the income elasticity of per capita public healthcare expenditure to be less than unity (0.21). This led to the obvious conclusion that healthcare is a necessity in the long run. However, the coefficient of per capita GDP and its lagged values in the short run relationship are above unity (1.7 and 1.25). The result therefore found a contradiction between both short and long run income coefficients. Although not very different, a similar finding by Moore et al. (1992) found healthcare to be a necessity in the short-run while a luxury in the long-run. The variation in the income estimates between both the short run and long run relationship may be due to fact that there are time lags for changes in income transcend into the budgetary allocation. The results therefore found that per capita healthcare expenditure depend on two period lagged values of GDP per capita.

The health status of the population measured quantitatively in terms of life expectancy at birth also influence the growth of per capita healthcare expenditure of nations. Since more expenditure may be needed to maintain previously high health status, the coefficient of life expectancy at birth as a measure the effects of the population health status is significant at 1% and shows that an increase in life expectancy at birth (number of years a new-born baby is expected to live) by a percentage will increase healthcare expenditure by about 4.2%. Other result from the coefficients of the age structure of the population brings to mind certain attributes in the demand for healthcare and thus per capita government healthcare expenditure. The coefficients of the proportion of population below 15 years and proportion of population age 65years and above are also significantly different from zero at 1% level of significant. The study found that both variables are negatively related to per capita government healthcare expenditure. Economic theory of healthcare demand suggests that the vulnerable population (persons aged below 15years and persons above 65years) tend to demand more healthcare than the youthful and active population since the depreciation rate in the aged is higher than the rest in the age structure (see Grossman 1977, 1992). The negativity of these coefficients are however not a theoretical contradiction. Economic theory on healthcare also suggests that the people make choice over the consumption of healthcare and all other goods (exercise, leisure, market goods and life style choice) in the production of good health. The results indicates that children and the aged in the population structure rather consume more of other health productive inputs like exercise, good diets, healthy lifestyle choice than the active population.

The results also indicates that a percentage increase in the proportion of the population below 15years and the proportion ages 65 years and above will decrease healthcare expenditure by as much as 10% and 9 % respectively. Urbanization rate and its lagged values exert a very significant and positive influence on the growth of healthcare expenditure. The statistically significant coefficient of urbanization rate is about 4.33 and 3.96 respectively. This indicates that a one percent increase in urbanization rate will increase per capita healthcare expenditure by about 4%. The proportion of the population with access to basic healthcare facilities together its two period lagged values also exert a positive and significant impact on per capita healthcare expenditure at 1% significance level. This supports the theory that the more people access to healthcare facilities, the more they will demand healthcare and its consequences on healthcare expenditure. The result further shows that the speed of adjustment of healthcare expenditure to the long run equilibrium path is very relatively low. About 38% specifically of the disequilibrium errors that occurs in the previous year are corrected in the current year.

The overall result suggests that GDP, proportion of the population with access to basic healthcare, life expectancy at birth, urbanization rate exerts significantly positive impact on healthcare expenditure. However, the one period lagged healthcare expenditure, the proportion of the population below 15 years and the proportion ages 65 years and above significantly exert negative impact on healthcare expenditure while GDP and its two lagged values, Urbanization rate and life expectancy at birth exerts significantly positive impact on healthcare expenditure.

9. SUMMARY AND RECOMMENDATION

The main purpose of this study is to empirically model the determinants of healthcare expenditure in Ghana. This is necessitated by the fact that, the World Health Organization has a minimum healthcare spending requirement that is expected to meet the health related Millennium Development Goals. Specifically, Using an error correction model, the results from the study show that the lagged HCE, GDP, proportion of the population aged 65 years and above, proportion of population below 15 years, urbanization rate and the proportion of the population with access to basic healthcare facilities significantly influence the growth of per capita healthcare expenditure in Ghana. The study also measures the extent, determinants and income elasticity of healthcare expenditure in Ghana. The results from the parsimonious error correction model showed the income elasticity of healthcare expenditure to exceed unity. Thus, public healthcare in Ghana is a luxury good. This could be an indication that the health sector in Ghana has a priority among the goals of social and economic development.

This finding is consistent with previous studies on the subject that, the income elasticity of healthcare expenditure depends largely on the unit of observation, the econometric method used and type of data analyzed (see Newhouse 1977, Gerdtham et al 1992). It is vital to mention that this paper is the first of its kind in Ghana and that there are a number of salient issues not discussed here due to either unavailability of health data or the model does not emphasize some aspects of the determinants of healthcare expenditure; the production of health, efficiency, equity in the provision of health services. Subsequent research on the subject needs to include variables such as per capita number of physicians, beds, an index of efficiency of medical practitioners. It can be distinguished that the econometric modeling of the determinants of healthcare expenditure used in this paper is based only on the demand side principles of healthcare and can therefore be strongly criticized on it statistical plausibility. It should also be maintained that, the amount individuals allocate to healthcare (out- of-pocket payments) should be considered when deciding on how much government should spend on healthcare.

Another issue that needs mentioning has to do with the power of unit roots test, cointegration and the various tests for auto-correlation, heteroscedascitity and misspecification. Time series modeling of the determinants of healthcare expenditure is however superior to both cross sectional and panel analyses. Time-series analysis eliminate problems regarding the validity of homogeneity of healthcare demand functions, convertibility in unit of measurement and data comparability, as well as consistent data collection.

The main findings of this study can be summarized as follows;

- Per capita healthcare expenditure is integrated of order one, I(1) and cointegrated with all the other explanatory variables
- The income elasticity of healthcare expenditure is found to be above unity. Thus, healthcare in Ghana is a luxury good. This could imply that public health in Ghana has a high priority among the goals of social and economic development
- From the preferred or parsimonious error correction model, the main determinants of healthcare expenditure are per capita GDP, lagged dependent variable, one and two period lagged GDP, two period lagged values of life expectancy at birth, one period lagged values of both proportion of population (as percentage of total population) under 15 years and proportion of population ages 65years and above and urbanization rate and its one period lagged.
- The speed of adjustment of healthcare expenditure to the long run equilibrium path is relatively low. The result shows specifically that about 38% of the disequilibrium errors that occurred in the previous period are corrected in the current year.
- Finally, the result shows that GDP, life expectancy at birth, urbanization rate, proportion of population below ages 15 years and proportion ages 65 years and above and proportion of the population with access to basic healthcare facilities are the long run determinants of healthcare expenditure in Ghana.

9.1 Recomendations and policy implications

A number of key issues need to consider when modeling the determinants of government healthcare expenditures in Ghana. These will provide to basis for recommendations and policy implications. It is intuitive that, per capita GDP may have both permanent and transitory components, thus, changes on income may not be fully spent in the same period but rather its spending may be allocated through time. Further, current period per capita government healthcare expenditure may also depend on its past values. As confirmed by Roberts (1999), the structure of the adjustment process of per capita government healthcare expenditure is not well known. Getzen (2000) also argues that one should expect lags on the dependent variables such as per capita GDP as the budget is usually prepared at least a year in advance. These shortcomings indicate that the early estimates of the determinants of per capita government healthcare expenditures may have been biased and conclusions drawn could have been misleading. It is argued that the dynamics of per capita government healthcare expenditures should not be neglected for the purposes of modeling and policy implications.

One may observe from country-specific experience that the mode of healthcare financing might be politically driven. This is because, in situations where the structure of the healthcare system is moved along the lines of a National Health Insurance System or agenda; public health insurance is the mainstream funder and offers healthcare coverage irrespective of government income. In such a case, per capita income may not be the only determinant of per capita government healthcare expenditure. However, the positive and significant coefficient for GDP might be capturing some evidence of the Wagner law, according to which public expenditure expands with economic development. This can be explained by the fact that the public financing system may not take into accounts an adjustment process for needs/ risks.

Another recommendation that can be from the results is that, the amount spent on healthcare by the government may solely be determined per capita income rather than other factors such as; life expectancy rate, the age structure of the population, urbanization rate and the proportion of the population with access to healthcare are also considered. This observation is very obvious and not particularly new to researchers but has not always been consistently incorporated in the discussions of health policy and programmes.

Interestingly in Ghana since 2005, almost all districts in Ghana have been empowered with healthcare responsibilities through the District-Wide Mutual Health Insurance Scheme (DWHIS). One can infer from the Ghanaian experience that, unless coordination mechanisms is instituted to play a more active role, the development of the National Health Insurance Scheme (NHIS) is unlikely to be fostered. Potentially, one way to promote the expansion of healthcare coverage has to do with the transfer of financial responsibilities to districts and communities so that the mechanisms of competition between schemes take into account potential differences in the delivery of healthcare. In this case, members of each Scheme are able to compare current levels of healthcare coverage they receive with the levels of premium paid.

A potential limitation of our study lies in the fact that no evidence of private health expenditure data is available in Ghana. Some studies indicate that private health insurance (PHI) play only a little role in supplementing public healthcare coverage in several countries. Finally, the growth of per capita government healthcare expenditure in the long run implies that African governments and people view public health expenditure as important in the promotion of welfare and living standards.

9.2 Areas For Future Research

The main recommendation for studies on the determinants of healthcare expenditure is that, we still need more macroeconomic theories on healthcare and healthcare expenditure. Therefore, we recommend that future studies should concentrate on analyzing healthcare expenditure on the macroeconomics framework of expenditures. It will further be interesting to analyze the determinants of healthcare expenditure at the micro level (individual level analysis) taking into accounts the effects of institutional factors on the quantity and price of healthcare.

For future research on the subject, it is recommended that considerable attempts should be made to disaggregate the total healthcare expenditure into the public-private mix. This is expected to help measure the different responsiveness of the explanatory variables on the disaggregated public and private healthcare expenditure. This will help examine the impact of both micro and macro factors on the public-private healthcare expenditure in Ghana.

What is also not known is the exact effect of measures of the indicators of the quality of life (QALYs and DALYs) rather than quantity of life (life expectancy at birth) on health and healthcare. Future research should incorporate Quality Adjusted Life Years (QALYs) and Disability Adjusted Life Years (DALYs). Proxy measures for the effectiveness of the healthcare system, the quality of health services and health status can serve such purposes. The proxies for quality of life can include, waiting time for an operation, length of stay in hospital, number of post-operation complications. This will allow us to examine the effects of an increase in the quality of health on healthcare expenditure. Therefore, future studies should be based on qualitative measure of health rather than quantitative measure.

9.3 Limitations

The main limitation of this study has to do with unavailability of health data on both public and private healthcare expenditure at the national level. Another limitation to this study is that, the study only concentrated on the demand side determinants of healthcare ignoring the effects of the production, supply, efficiency and equity in healthcare on healthcare expenditure. The study also fails to examine the different effect on the regressors on the disaggregated total, public and private healthcare expenditure. It is recommended that future research on the subject should incorporate these limitations when analyzing the determinants of healthcare expenditure.

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NOTES:

Table 1: The major compositions of finance to the Ghana health sector;

Sources Finance	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Government health Budget	51%	61%	62%	59%	59%	48%
Health Fund	13%	18%	15%	21%	-	13%
Earmarked fund from development partners	22%	8%	10%	6%	-	13%
Others(fees, Insurance)	14%	14%	14%	13%	14%	26%
Per capita expenditure on Health (US Dollars)	6.3	8.1	10.5	13.5	23.9	25.2

(Source: National health accounts estimates), Note: - indicates data not available for those years.

Table 2: Results of Unit Roots test

Variable	**ADF**		**Philip Perron**		**Order of integration**
	Constant	**Contant and Trend**	**Constant**	**Constant and Trend**	
LHCE	-0.3078	-2.6053	-0.1773	-2.2314	I(1)
DLHCE	-6.3192***	-6.2423***	-6.4549***	-6.3826***	
LGDP	-1.0195	-0.4356	-0.8775	-0.9938	I(1)
DLGDP	-4.5470***	-4.7282***	-4.5919***	-4.7021***	
LLEB	-1.9029	-2.1044	-1.9207	-2.1044	I(1)
DLLEB	-6.8535***	-6.8961***	-6.8535***	-6.8680***	
LPOP15	-1.2125	-1.6645	2.1482	-0.4828	I(1)
DLPOP15	-3.9712***	-3.9986***	-3.3900**	-3.5055***	
LPOP65	2.4364	2.5838	2.6039	1.7989	I(1)
DLPOP65	3.6356***	-3.7882***	-3.1673**	-4.7472***	
LURB	0.5653	-2.5851	2.6109	-2.3384	I(1)
DLURB	3.6802***	-4.0096***	-3.8059***	-3.8349***	
LATH	-2.2021	-1.0894	-2.2959	-0.1721	I(1)
DLATH	-4.8485***	-3.5293**	-5.1204***	-8.6901***	

Source: Computed; Note: D represents the difference operator of the variables and L represents the logarithm of the variables. The ADF and PP Critical Values are provided below, **ADF test : -3.6268, -2.9458 and -2.6115** for 1%, 5% and 10% respectively. **The Philip Perron (PP) test; -3.6268, -2.9458 and -2.6115** for 1%, 5% and 10% respectively. ***, ** (*) means significance at 1%, 5% and 10% respectively. We start with a maximum lag length of 2 and pare it down as per the Akaike Information Criterion.

Table 3: Johansen Hypothesised cointegration relations

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.871941	71.93421	45.28	51.57
At most 1 **	0.750349	48.56916	39.37	45.10
At most 2 **	0.723738	45.02414	33.46	38.77
At most 3	0.489746	23.54966	27.07	32.24
At most 4	0.431395	19.75991	20.97	25.52
At most 5 *	0.334966	14.27709	14.07	18.63
At most 6	0.042718	1.527994	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Table 4 CE=cointegrating equation(s)

Table 4: Normalized cointegrationg coefficients

Normalized cointegrating coefficients(standard error in parentheses)

LHCE	LATH	LGDP	LLEB	LPOP15	LPOP65	LURB
1.000000	-3.662429	-0.210964	-1.877214	-9.258544	-12.10928	-11.87153
	(1.35020)	(0.11173)	(1.41808)	(10.7569)	(9.98941)	(1.72141)

Table 5:Result of Final Error Correction Model

Dependent Variable: DLHCE
Method: Least Squares
Sample: 1970 2006
Included observations: 37

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.323472	0.276012	1.171952	0.2557
DLHCE(-1)	-1.063985	0.255434	**-4.165401**	0.0005
DLATH	5.543882	2.402814	**2.307245**	0.0325
DLATH(-1)	18.95348	3.123694	**6.067649**	0.0000
DLATH(-2)	8.993819	3.206372	**2.804983**	0.0113
DLGDP	1.709174	0.387701	**4.408482**	0.0003
DLGDP(-1)	1.249044	0.366027	**3.412434**	0.0029
DLGDP(-2)	0.603896	0.275446	**2.192427**	0.0410
DLLEB(-2)	4.209559	3.264876	1.289347	0.2128
DLPOP15(-1)	-10.59022	2.595969	**-4.079479**	0.0006
DLPOP65(-1)	-9.047834	3.432526	**-2.635905**	0.0163
DLURB	4.339251	1.649881	**2.630037**	0.0165
DLURB(-1)	3.968602	1.374207	**2.887920**	0.0094
ECM(-1)	-0.375986	0.066072	**-5.369055**	0.0000

R-squared	0.790238	Mean dependent var	0.285928
Adjusted R-squared	0.646716	S.D. dependent var	0.269497
S.E. of regression	0.160183	Akaike info criterion	-0.528586
Sum squared resid	0.487512	Schwarz criterion	0.106296
Log likelihood	22.72166	F-statistic	5.506055
Durbin-Watson stat	1.866380	Prob(F-statistic)	0.000457

Note: D represents first difference operator of the variables and L represents the logarithm. **Bold** t-Statistics indicates significance at 5% and 1% level of significance. All variables are as previously defined.

Table 6:Results of diagnostic test

Diagnostic tests	F-Statistic	Probability
1)Normaility test: (Jarque-Bera Statistic)	0.2448	0.8849
2)Serial correlation: (Breusch-Godfrey serial Correlation LM test)	0.0342	0.9665
3)ARCH test: (Autoregressive conditional Heteroscedasticity)	0.2415	0.6266
4) Heteroscedasticity: (White Heteroscedasticity test : no cross)	0.7511	0.6910
5) Heteroscedasticity: (White Heteroscedasticity test : with cross)	0.5658	0.8784
6) Stability Test: Chow breakpoint (1984)	0.1801	0.2105
:Chow forecast test (1984 to 2006)	0.1423	0.1520
7) Specification test: (Ramsey Reset Test)	0.4264	0.3031

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I): Johansen cointegration analysis

LAHCE	LATH	LGDP	LLEB	LPOP15	LPOP65	LURB
5.325100	-19.50280	1.123404	-9.996351	-49.30267	-64.48311	-63.21711
-1.653926	-0.226888	1.510212	-74.84686	266.6437	197.8035	-30.42838
0.604528	-67.27432	5.870295	5.847136	129.5622	72.98383	-38.98272
0.173035	-3.288983	-2.816819	-6.098528	214.8799	146.3049	18.48262
-0.276192	-13.62987	-0.295235	61.64643	116.0692	171.7553	-49.75919
0.729262	63.16736	2.383979	-17.18722	-616.1319	-627.0912	34.97473
0.424110	17.21607	3.745807	-16.35021	-309.7911	-230.3463	-85.13198

Table 7: Normalized cointegration coefficients results of the first cointegration equation

Cointegrating Equation(s):						
Normalized cointegrating coefficients (standard error in parentheses)						
LHCE	LATH	LGDP	LLEB	LPOP15	LPOP65	LURB
1.000000	-3.662429	-0.210964	-1.877214	-9.258544	-12.10928	-11.87153
	(1.35020)	(0.11173)	(1.41808)	(10.7569)	(9.98941)	(1.72141)

Table 8: Determination Of Lag Length

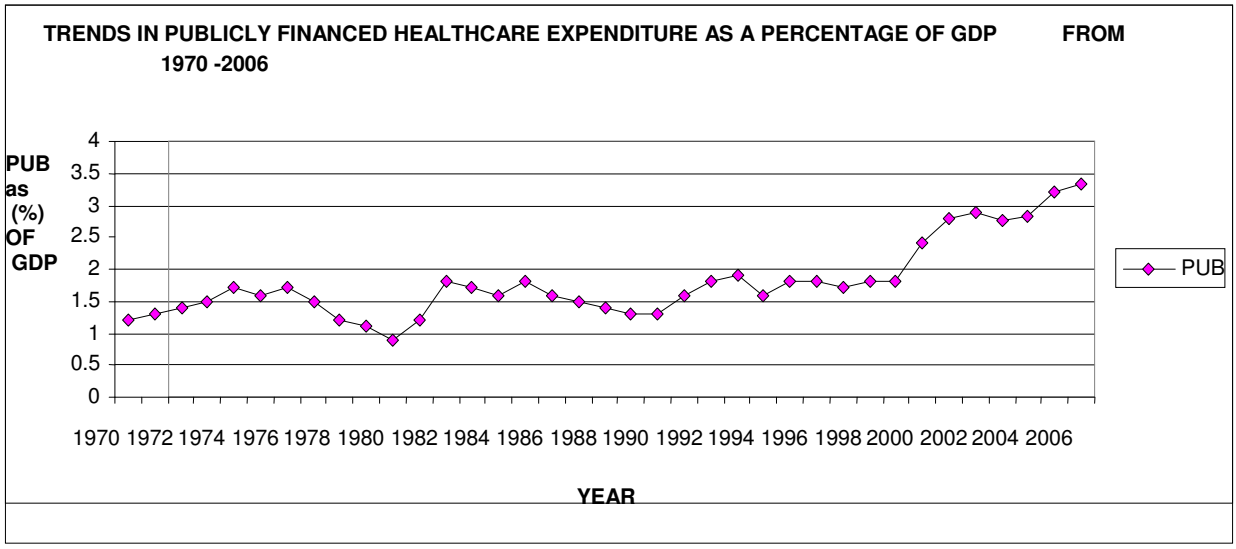
Lag length	LR	AIC	SIC
1	770.54	-40.08	-37.93
2	831.42	-41.91	-37.55
3	924.52	-45.32	- 38.41
4	Values not reported		

Note: LR=log likelihood ratio, AIC=Akaike information Criterion and SIC= Schwarz information Criterion

Table 9: Summary Statistics of Variables

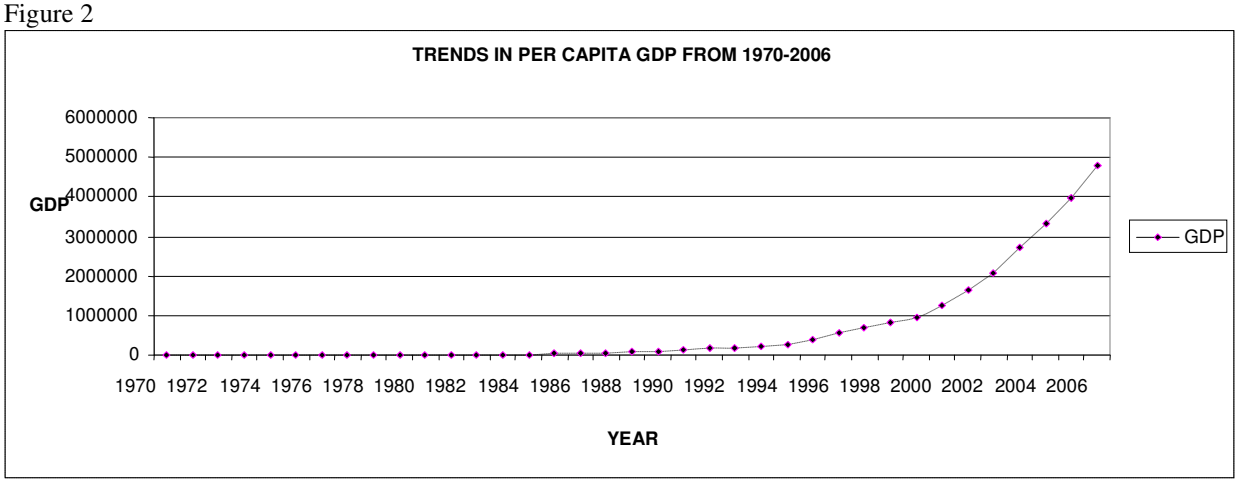
	LHCE	LATH	LGDP	LLEB	LPOP15	LPOP65	LURB
Mean	6.361092	3.943344	10.78073	4.011967	3.771847	1.126096	3.585568
Median	6.779524	4.007333	11.31384	4.025352	3.795939	1.098612	3.557061
Maximum	11.35842	4.229749	15.51026	4.094511	3.809326	1.319086	3.882388
Minimum	1.223775	3.449988	5.569489	3.896503	3.664074	1.018847	3.367296
Std. Dev.	3.246239	0.248286	3.266177	0.053684	0.045354	0.086729	0.167102
Skewness	-0.062816	-0.595680	-0.225144	-0.576359	-1.263849	0.747044	0.325969
Kurtosis	1.669398	2.133900	1.718867	2.383460	3.124674	2.366646	1.691926
Jarque-Bera	2.753855	3.344600	2.842928	2.634527	9.874072	4.059882	3.293123
Probability	0.252353	0.187815	0.241360	0.267867	0.070176	0.131343	0.192711
Sum	235.3604	145.9037	398.8871	148.4428	139.5584	41.66555	132.6660
Sum Sq. Dev.	379.3704	2.219258	384.0448	0.103750	0.074051	0.270786	1.005230

Figure 1



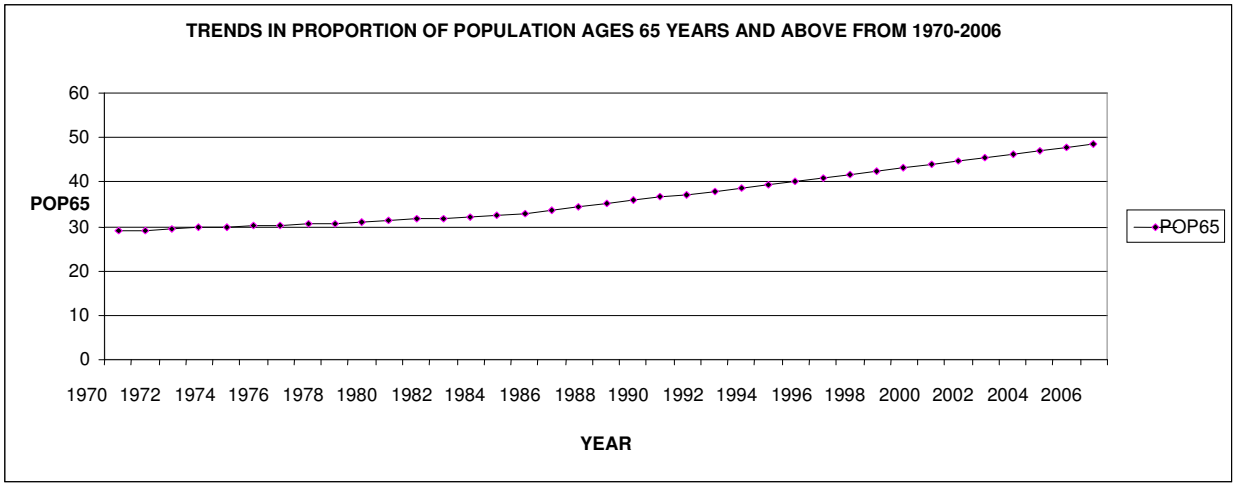
(Source: National health accounts, World Health Organization 2005, IFS 2007 and other issues)

Figure 2



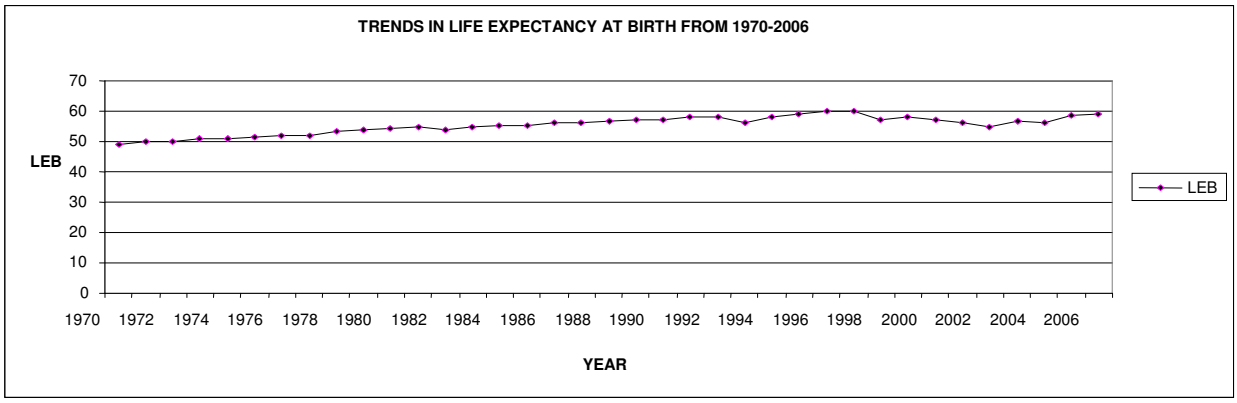
Source: African Development Indicators and World Development indicators 2007 with modification by author

Figure 3



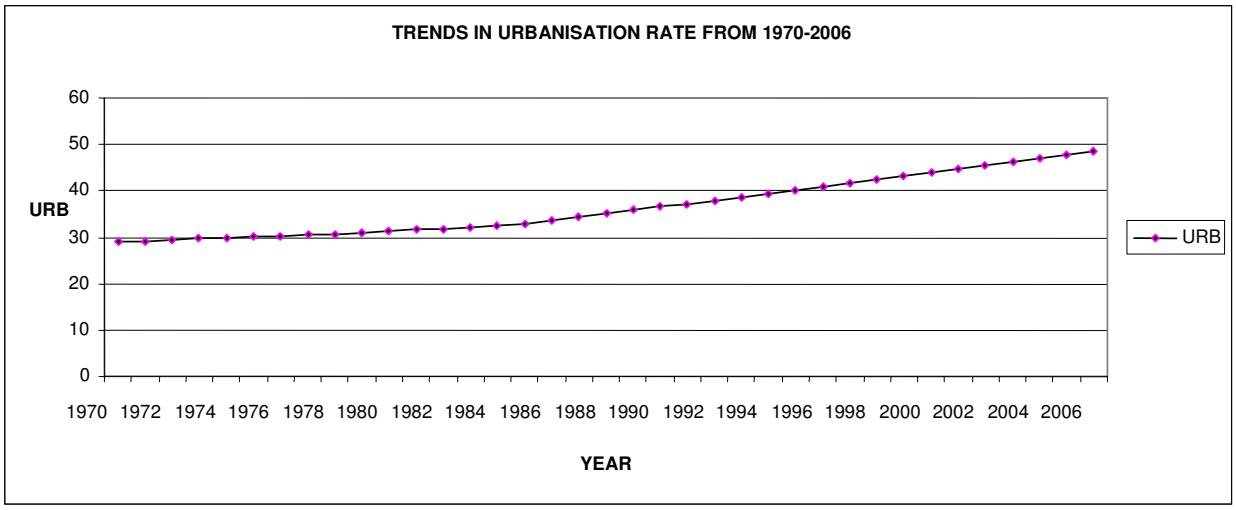
Source: African Development Indicators, World Development Indicators 2007 with modification by author

Figure 4



Source: African Development Indicators, World Development Indicators 2007 with modification by author

Figure 5



Source: African Development Indicators, World Development Indicators 2007 with modification by the author