DETERMINANTS OF HEALTH SERVICE OUTCOMES IN SUB SAHARAN: USING PANEL DATA

By

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This is to certify that the thesis prepared by SISAY GIRMA entitled “determinants of health outcomes in sub-Saharan: using panel data” submitted as a partial fulfillment for the degree of masters of Science in development economics complies with the regulations of the university and meets the accepted standards with respect to

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DECLARATION

This is to certify that the work included in this Thesis entitled by: "determinants of health service outcomes in sub-Saharan: using panel data" is original research conducted by the researcher and has not been presented for a degree in any other University under supervision of my advisor Dr. MARU SHETE

I, the undersigned, declare that thesis is the result of my own work, investigation and conclusion, and all sources of materials used for the thesis work have been duly acknowledged.

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CERTIFICATION

We certify the study conducted on **"determinants of health service outcomes in sub-Saharan: using panel data"** is worked for the partial fulfillment of the requirements for the degree of Master of Science in development economics (**MSc**) by Sisay girma under my guidance and supervision. Hence, this thesis has been submitted for examination with my approval as a University advisor.

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List of Acronyms

CPI corruption perception index

FGLS feasible generalized lists square

GDP Gross domestic product

GMM Generalized method of moment

OLS Ordinary list square

PCSE panel corrected standard error

SDH Social Determinants of Health

WDI world development indicator

WGI world governance indicator

WHO World health organization

Abstract

Poor health outcomes (low life expectancy and high mortality) in developing countries have always been a concern for both citizens and policy makers. Although many studies have focused on the economic drivers of health outcomes in developing countries, this is not the case for important socioeconomic determinants. Therefore, this study investigated the effects of GDP, general government health expenditure, political stability, and percentage of urban population, unemployment rate, and corruption control on health outcomes in sub-Sahara African (SSA) region. To achieve this, the study explored Fixed and Random Effects as well as dynamic panel model covering 38 countries in the region from 2000 to 2017. The findings reveal that population health outcomes - as measured by infant and maternal mortalities rates are related negatively with GDP, political stability, percentage of urban population, and corruption control, but directly associated with unemployment rate. For life expectancy at birth, increase GDP, political stability, percentage of urban population, and corruption are positively predicted, while related inversely with higher unemployment rate. The findings therefore suggest that for SSA countries to achieve better health outcomes (high longevity and low mortalities) should emphasis on increasing GDP, and investing on political stability and corruption control .Again, greater attention should be on enhancing urbanization and reducing unemployment.

Keywords: Health outcomes, Panel, Data Estimation, sub-Saharan Africa

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Keywords

Maternal mortality rate and its determinants

Infant mortality rate and its determinants

Chapter One

Introduction

1.1 Background of the Study

According to the neoclassical growth model, improvements in human capital, such as education and health, have a long-term beneficial impact on per capita income. according to (Khanam, 2018)There are four mechanisms through which healthier individuals contribute to the economy: the first one is at the workplace, healthier individuals are more productive and thus generally earn a higher income. The second one healthier individual is able to retire later and take fewer sick leaves due to overall good health and so they are able to work longer. The third reason, healthier individuals are more likely to invest in their own education and training which then enhances their productivity. And the last one healthier individual are likely to save and invest more with the expectation of a longer.

Human capital is considered as important factor to achieve the desired economic growth and development in any country. The role of human capital is a backbone of one's country sustainable economic development. Thus, the attention given to higher government expenditure on human capital development is vital because of its impact on individuals' lifetime incomes. Since better health enhances the effective and sustained use of the knowledge and skills that individuals acquire through education, it can reduce the depreciation of education capital, and thus increases the favorable effect of education on growth. (Anyanwu & Erhijakpor, 2009)

The population in Africa suffers poor health as manifested in high mortality rates and low life expectancy. Some researches show that not only good economic growth rate achieve desired improvements in health outcomes rather other environmental and social factors should be considered. According to (Rahman, 2015) In line with this throughout the world income inequality has recently become an issue of serious concern African economy.(WB, 1997) Data shows generally stagnated throughout the 1980s and early 1990s when compared to other developing countries in Asia and Latin America Poverty is a severe problem in Africa as a result of poor economic performance, with 45-50 percent of the Sub-Saharan population living in poverty.

Furthermore, over the last two decades, Africa's population has grown at the fastest rate among developing countries, a trend that continues. One likely result of Africa's high population expansion and poor economic growth has been to diminish governments' and spendeffectivelyonfundamentalsocialservices,suchashealthcare.Another effect coul d have been a worsening of the population's distribution of these services.During the same time period, many African countries experienced civil unrest and political insta bility, which resulted in the deaths of thousands of people. The US President, the Prime Minister of the United Kingdom, the Pope, and leaders of the International Monetary Fund, the United Nations, the World Bank, and the World Economic Forum have all called income one of the most pressing issues of our day, with several emphasizing its social implications. The two most serious issues, according to the 2011 World Economic Forum, are income disparity and corruption. (Anyanwu & Erhijakpor, 2009) Since health is promoted or inhibited by many factors, it is better to consider what foods and exercise alternatives are available and affordable, and what educational, employment, and housing opportunities are attainable. Understanding total healthcare expenditures, comprised of both public and private healthcare expenditures, as share of total gross domestic product (GDP), is also an important issue for effective policy-making. Over the last decade, healthcare expenses have increased in most Sub Saharan African countries.(Bein et al., 2017)

A more unequal society may be predicted to have a higher number of disadvantaged persons at the same economic level. That is, persons with low incomes are more prone to become unwell and, as a result, are less able to work. Because of the fall in individual income, the income distribution will widen if the population's health continues to deteriorate. Today, most of the studies on income inequality and health have used cross-sectional data and have concentrated mainly on developed countries.(Subramanian & Kawachi, 2004)

Because high levels of corruption imply inadequate transparency, paying bribes to obtain contracts, jobs, or services by breaking the law and norms may result in public displeasure or even massive societal damage. Researchers have brought up the Romanian Collective nightclub fire of 2015, which killed 64 people and injured 147 more. This massive disaster sparked a massive anti-corruption movement in Romania, titled "Corruption Kills" (Azfar & Gurgur, 2008).

The level of institutional quality is another crucial determinant of health. The institutional quality affect health through control of corruption, protection of property rights, economic liberalization, political system, and rule of law, political stability and absence of violence and decentralization. Therefore, the relationship between institutional quality and health is often controversial and it is not a priori possible to say without risk of error which are the institutional dimensions that improve health in a particular context (Majeed, 2020).

1.2 Statement of the Problem

Since health is an integral part of sustainable development, and any attempts for its improvement should always be the main development goal of a nation. It is critical for all countries to invest effectively in their health-care systems. At the same time, ill health is considered as a huge financial burden, and it is the major cause of 50% of the growth differential between developed and developing countries(Mafizur, 2015). (Majeed, 2020) Estimate the effectiveness of government health spending on health outcomes in developing economies while controlling for economic development. In comparison to their Asian and Western Hemisphere counterparts, they found that African economies are inefficient in providing health care. If income level has this much of an impact on health, governmental actions to improve income level should be seriously examined, as well as research attention is important. in addition In order to set policy measures it is better to focus on the relevance of economic and social capital as health determinants by analyzing various indicators.

Recent empirical literature has identified important predictors of population health outcomes, however it may be difficult to apply these findings universally in SSA nations because the majority of these studies are based on data from either industrialized or developing economies. (Such studies includes, (Gmel et al., 2016), (Bhattacharjee et al., 2014),(Nuviala et al., 2012) or pooled data from both emerging and developed nations (Kozek-langenecker et al., 2017). Meanwhile, studies on developing countries were very scanty (these few studies includes, (Viner et al., 2017), (Bichaka Fayissaa, 2014) One, the time period covered by this study is not very recent. Two, the study only used life expectancy (as indicator of health outcomes); however, very recent studies emphasized that infant and under-five mortalities could be very close to aggregate indicators of health outcomes (see the studies of

(Liu et al., 2016),(El-kholy et al., 2016) .Very few previous studies have simultaneously analyzed the social and the economic indicators when addressing social determinants of health, Social structures and socioeconomic patterns are the major determinants of population health (Ahnquist et al., 2012).

However, since population health improvement requires action on multiple determinants, (Isham et al., 2013) this study will use factors that consider changes in how they invest in the health of the communities.

In comparison with earlier cross country studies, the main contributions of this study lie in using a panel data structure that allows us to control for country and time unobservable effects. In contrast to the cross-sectional single year datasets which were used in most previous studies this study will use a relatively larger sample size of countries compared to smaller sample sizes of many previous. Most of the previous studies were done in developed country that is why this study focuses sub Saharan Africa countries. The model that is used in the panel data analysis has great effect on the result (Farag et al., 2013).

Thus

by examining data from subSaharanAfrica nations from 2000 to 2017, this study cont ribute additional information in this area.

Paneldata offers certain advantages over crosssectional and timeseries analysis in th at it compensates for omitted variables, considers international differences, and ena bles more accurate inference of model parameters due to more degrees of freedom a nd sample heterogeneity.In addition to that. This study used the two-step system Generalized Method of Moment (GMM) developed by (Areliano & Boverb, 1995). The rationale behind using of this model is due to its benefit in addressing the problem of endogenetiy and collinearty of regressors.

The other most important point that this study want to contribute a is that most studies like, (Chewe & Hangoma, 2020), focused on life expectancy and infant mortality rate as dependent variable and some used cross-sectional data analysis but this study will incorporate the other important dependent variable which is maternal mortality rate and most of all the study use dynamic panel data analysis to cover for omitted variables and consider for heterogeneity of countries.

1.3 Objective of the Study

This section will cover the general and specific objectives.

1.3.1 General Objective

The general objective of this research is to examine the effect of determinants of health service outcomes for Sub Saharan African countries.

1.3.2 Specific Objective

In order to accomplish the research the following specific objectives were done.

- To identify the socioeconomic determinants of health service outcomes in sub Saharan Africa
- To show the trend of health service outcome in sub Saharan Africa for the study periods
- To show the relationship between GDP and health service outcome

1.4 Research Question

This section presents question of the research which were answered at the end of the research.

- What looks the trend of health outcomes in Saharan Africa
- What are the socioeconomic determinants of health outcomes in Saharan Africa

1.5 limitation and Scope of the Study

The study is delimited to its topic determinants of health service outcomes in Sub Saharan Africa. In line with this study is able to determine the socio and economic factors that affect health outcomes. By using three proxies (life expectancy, infant mortality and maternal mortality)to represent health outcomes. Among the limitation the first one is lack of necessary data in developing countries, second lacks of measurement of health outcomes and as the same manner luck of index of health outcomes this forced us to use three models separately and lastly in line with the luck of data reconciliation was challenging.

1.6 Significance of the Study

This study will give an insight for policy makers or any other development officials on

how to handle those social and economic determinat for the betterment of health status. The study also helps any country to better utilize their human capital through addressing the problem related to life expectancy, infant mortality and maternal death rate.

Finally this study can be a bench mark as a literature for those who want to conduct a study on this area.

1.7 Organization of the Thesis

This study has five chapters and the first chapter of this study deals with introductory part, statement of the problem, objective of the study, significance of the study, scope of the study, and organization of the study. The second chapter focuses on literature review of important concepts that are relevant to the study. The literature review part contains theoretical, empirical review and after review it shows the knowledge gap. Chapter three presents the research methodology which is employed to accomplish objectives of the study. Chapter four explains results and data analysis of the study. Finally, chapter five presents conclusion and recommendation of the study.

Chapter Two

Literature Review

2.1 Theoretical literature review

2.1.1 Definition and Concept of Health

Health status isn't a term that's widely used or has quickly gained traction. Most people, especially those who are familiar with health care, would consider it proficient language. The lack of an agreed-upon definition of health is one of the main reasons why this term has evaded basic definition. The World Health Organization (WHO) developed a broad definition of health in 1948, which has been repeated and supported for many years. However, few have sought to operationalize this definition such that it may be used to assess the quality of living among a group of people (Chewe & Hangoma, 2020).

Before an individual's or a population's health level or health status can be assessed, an operational definition of health is required. As the focus of medical and health care has switched from decreasing mortality and increasing longevity to improving health-related quality of life, defining such a term has grown more complex. When it comes to acute conditions that are seriously dangerous, length of life is the ultimate measure of health. However, in chronic conditions where palliative medicines or therapies to prevent further deterioration are involved, the meaningful measure of health status is likely to encompass domains of health other than length of life.(Bergner & Rothman, 1987)

Because health is such a broad term, it resists precise definition. The absence of sickness is the narrow definition of health. The comprehensive definition of health, on the other hand, is based on the achievement of a wide range of personal, physiological, mental, social, and even moral goals, rather than just the absence of sickness. Health is defined by the World Health Organization (WHO) as "a condition of complete physical, mental, and social well-being, not only the absence of sickness or disability" (WHO, 1992) While this definition is a fine and motivating concept, and pursuing it ensures health professionals limitless opportunity to work in the future, as (h.a doll, 1992) it may not be of much practical importance and it also appears to work against its effective functioning(Saracci, 1997). Such a concept is just too broad

and inflexible to be used in any meaningful economic analysis or resource allocation. Health must be defined from a practical standpoint, hence it has been described in terms of life expectancy, infant mortality, and crude death rate, among other things (Barrett et al., 1992) .In fact, it is researched as a function of medical treatment, money, education, age, sex, race, marital status, pollution, and personal behavior such as smoking habits, exercise, and the like. It's also employed as a stand-alone variable to explain labor force participation rates, especially among the elderly. Not only do retired people usually blame their health for their decision to resign, but current employees who report health issues are more likely to leave their jobs in the future. Wages, productivity, educational achievement, fertility, and demand for medical treatment are all frequently used to explain health status. The outcomes are highly dependent on the specific measures used rout

When determining whether a country's health system is operating, the link between resources and outcomes is critical. If a country's health system performs better than another country's for the same amount of resources, or if it produces the same results with fewer resources, it has a better health system(Alber et al., 2007)

2.1.2 Operational Definition of Health

The concept of population health, which is a central concern for all human societies, is relatively new. It can be described in a variety of ways, but in general, it refers to improving public health rather than individual health. From its possible origins in Canada to its current application in the literature, population health has centered on generating positive health outcomes for the population and minimizing health inequities amongst population groups (Alber et al., 2007). Population health has been described by some scholars as the distribution of health outcomes within a group (Kinding, 2007).These groupings can be geographically defined as nations or communities, but they can also be characterized by other factors such as race or ethnicity, socioeconomic status, or gender. This concept suggests a specific unit of population health measurement, where health status indicators are used to assess a population's health in the context of a rich contextual web that includes social and economic factors, physical environments, health systems, and health behaviors (Hooshmand, 2017).

2.1.3 Health and Economics

Economics is concerned with the creation, distribution, and consumption of economic products. Of course, how much should be spent on education, health, books, travel, food, and clothing is a topic for the economist as well as a matter of political, social, or just personal judgment. When people are forced to choose between having more health care and having less leisure or less money to spend on education, they are “economizing”(Andargie, 2008).Economics is the study of how people and society choose to use scarce productive resources that could have other uses to manufacture various commodities and distribute them for consumption, now or in the future, among various individuals and groups in society, with or without the use of money. It examines the costs and advantages of enhancing resource allocation strategies. The term "economics" is not limited to a single type of human activity. Economics applies to all activities in which there is a scarcity of resources and a choice of options (Sculpher, 2021).

This is true in all areas of life, including health. The study of how scarce resources are distributed among alternative uses for the care of sickness and the promotion, maintenance, and improvement of health, including the study of how health care and health-related services, their costs and benefits, and health itself are distributed among individuals and groups in society, is known as health economics. It can be defined as "the application of economic ideas, concepts, and processes to the health sector" in broad terms (Sculpher, 2021). It is thus concerned with issues such as resource allocation between various health-promoting activities, the quantity of resources used in the delivery of health services, the organization and funding of health-care institutions, the efficiency with which resources are allocated and used for health purposes, and the effects of preventive, curative, and rehabilitative health services on indiscriminate use of resources. As a result, health economics has emerged as an unique field of study, stressing in particular the application of economic theory to practical challenges of resource allocation in order to provide effective and efficient health care (Shanmugasundaram et al., 1994). At this level, health economics can be defined as the economic discipline that studies the institutional frameworks for health care (consumption, provision, and finance), as well as the relationships between rules and institutions on the one hand, and the

population's health on the other. There is still a hazy description of the field, and it appears that getting closer in a few words will be difficult. It should be noted that health economists are not always involved in cost-effectiveness or benefit-cost ratio evaluations of health management. However, a health economist's job does not end there. Cost effectiveness, on the other hand, is perhaps the least important aspect of what a health economist can contribute (Kernick, 2003).

The use of limited resources (monetary, human, etc.) to cover all treatments and interventions that improve a society's health is the subject of health economics. For example, a budget limits the amount of money available, while the amount of time available to a nurse is restricted by the number of hours in a day (Mahony & Tolley, 2010).

2.1.4 Health Outcomes

Mortality, morbidity, disease burden statistics, and life expectancy are all markers of health outcomes. The mortality rate is the number of people who die at a given time, in a given population, and from a given cause. There are also several forms of deaths. This includes infants, children under the age of five, and adults. Infant mortality refers to deaths occurring between the ages of zero and 365 days (12 months) in the first year of life. The term "under-five mortality" refers to deaths occurring between the ages of one and five years old, or between the ages of 12 and 59 months. These can be estimated using data from women's birth histories aged 15 to 49(world bank, 2018).

Life Expectancy

Life expectancy at various ages refers to the average number of years that a person who has reached a given age will live if he or she is subjected to current mortality conditions (age-specific probability of dying) for the rest of his or her life. Health expenditures, access to healthcare services, individual education, income distribution, and living style are some of the factors that underlie life expectancy difference (smoking and alcohol consumption) these factors are highly valued in industrialized countries, and their impact on life expectancy is direct(Zakrzewski, 1975).

Mortality rate

The ratio of deaths to individuals in a given population and over a certain period of time: the number of fatalities in a given population over a specific time period

(such as a year), usually expressed in terms of 1000 or 100,000 people. The term "mortality rate" refers to the number of people who die each year. There are many distinct sorts of mortality rates, such as the ones listed below:
Fetal mortality rate: the ratio of fetal deaths to the total number of births in that year (live births + fetal deaths).
The infant mortality rate is calculated by dividing the number of children under the age of one year by the number of live births in that year.

The maternal mortality rate: The number of maternal deaths related to childbearing divided by the number of live births (or by the number of live births + fetal deaths) in that year.

2.1.5 Socio-Economic Determinants of Health Outcomes

Socioeconomic factors have also long been considered as important determinants of health
outcomes, which are now widely known as “social determinants of health” (SDH)(James.W 2009).

Air pollution, socioeconomic disparity, high school graduation rate, public health financing, and health insurance are all factors that have an impact on health outcomes (Ghobad Morad eat al, 2017) .

Well-known determinants of health outcomes include income, medical technology, and education. Recent empirical research have emphasized the importance of information and communication technology (ICT), income inequality, ethnic diversity, and public healthcare expenditure in explaining country health outcomes. Most previous studies (including time-series and panel data estimate) have employed a single variable to evaluate health outcomes, such as life expectancy or mortality rates (infant, maternal, or under-five) . Others have employed outcome variables such disease or infection prevalence or incidence, hospital visits and readmissions, hospital length of stay, work absences due to illness, perceived health status, quality -adjusted life years, and disability-adjusted life years Ghobad M, (2017) .

Gross Domestic Product (GDP)

The Solow model, which explains how saving, investment, and growth respond to population growth and technological change, is the theoretical benchmark for most studies of long-run output growth (typically measured by growth of real gross domestic product (GDP): the value of all goods and services produced in an economy during a year). The model is defined by a production function that explains output levels and includes two input variables: labor and capital (physical and human capital). The amount of accessible capital in the economy, the efficiency with which it is utilized, and the degree to which it is used determine economic growth Fernandez, (2019).

If the new resources are used in the country's production process, population growth and gains in physical capital contribute to growth. Increases in the productivity of human capital and physical capital assets lead to increased efficiency and growth. Growth and investments in human and physical capital boost the capital stock, as long as the investments and growth outnumber depreciation. Education, training, and improved health are all examples of human capital investments. The rate of employment is directly tied to economic growth since the economy's potential resources are not always utilized.

GDP per capita does not entirely account for all of these factors, but it does provide a helpful summary indicator for the economy's overall health that is available globally and consistently for most nations, unlike unemployment and poverty rates, which have widely varying definitions and standards. At the individual level, the link between individual income and health outcomes is widely established. While it is self-evident that poorer countries have poorer health outcomes, the link between changes in GDP and health outcomes is less clear at the national level Fernandez, (2019).

Urbanization

In the twenty-first century, a new reality will influence maternal and neonatal health (MNH). People are flocking to cities, and cities are expanding to accommodate ever-increasing populations. As a result, the environment in which people live, love, work, and reproduce is changing, and MNH must adapt in order to keep up McNab, (2016).

Unemployment

The data on the far-reaching negative impacts of job loss is clear: Losing a job can result in short-term financial losses, permanent lower pay, and decreased mental and physical health, as well as greater mortality rates. Furthermore, losing a parent's employment impedes children's scholastic progress and affects their future incomes. The link between longer periods of unemployment and lower outcomes seems a little shakier. Lower salaries and lifetime incomes are linked to longer periods of unemployment, although the cause for the lower earnings prospects is unclear.

The evidence is shaky at best in domains where we may expect solid evidence, such as mental health outcomes. In the 1930s, most of the discussion focused on the direct physical repercussions of poverty. The following causal relationships were highlighted:

(a) Unemployment resulted in a decrease in household income. (b) As household income fell, so did spending, especially on food, housing, and heating. (c) Lower spending led to an increase in poverty-related disorders like rheumatic heart disease, TB, diphtheria, and maternal and newborn mortality. Jin et al., (1995).

Income Inequality

The hypothesis of economic inequality is more than a statement that poverty is linked to poor health. The argument is that income inequality, in and of itself, has an impact on individual well-being in a society. Inequality in income has been linked to a decline in population health Rowlingson, (2011).

Education

There are three plausible reasons for the relation between health and education in a broad sense. One explanation is that bad health causes a lack of education. Another possibility is that more education leads to better health. Finally, there could be a third factor that boosts both education and health. It's critical for policymakers to know how much each of these hypotheses may account for in terms of the observed association between education and health. Subsidies for education would only be useful in boosting population health if education actually causes health ADavid M. Culter,(2006)

Health may be determined by education. In high-income countries, the general view

appears to be that the effect of education on health is primarily driving the correlation. Cutler and Lleras- Muney, for example, collected a set of quasi-experimental investigations from several nations that supported this viewpoint. Similarly, a recent study by Admas, (2008) indicated that higher educational levels have a favorable effect on self-reported health and reduce the number of chronic illnesses by utilizing data from identical twins to assess the health returns to education.

There are several possible explanations for the relation between education and health. First, persons who see education as a long-term investment are more likely to stay healthy and realize the rewards. In this context, Cutler & Lleras-Muney, (2006)points to differences in preferences and an individual's appraisal of his or her future as key elements explaining health outcomes, both of which may be influenced by educational attainment. Second, as a key “input” in the health production function, education can assist individuals in maintaining or improving their health, primarily through increased knowledge of health issues, access to information, and cognitive skills. Zhunio et al., (2012).

More recent research suggests that more educated children have an impact on their parents' health: Cutler discovered that parents of children with more education were more likely to quit smoking. It's also possible that having a well-educated spouse is beneficial to one's health. Even after controlling for own education, Schillinger, (2006) show that those married to more educated spouses have reduced mortality rates (although this finding is not universal, for example see Suarez and Barrett-Connor 1984). Having a more educated partner is also linked to greater health and less harmful habits like smoking and binge drinking ADavid M. Culter, (2006).

Corruption

Hanf et al., (2011) examine the relationship between corruption and child mortality across a one-year period on a global scale. Their findings suggest that corruption may account for 1.6 percent of global child mortality, although they express concern that the model may understate the effect. According to Kudamatsu, (2012) investigation the link between democracy and child mortality in Sub-Saharan Africa, finding that following democratization, baby mortality decreased. Though empirical results vary, poor health can have serious socioeconomic effects and stifle growth and development (further discussed in previous literature). This effect has been

attributed to health as an important facet of human capital, particularly in underdeveloped nations where human capital is more vital Bloom et al., (2004).

Projects aiming at improving general health may have a reduced impact if corrupt officials steal from the health fund. If bribes are paid in the public health sector, the poorest members of the population may be denied access to cheap health care, which has a negative impact on the country's public health by making the service less effective and Corrupted systems benefit the rich portion of the population while exploiting the poor Factor & Kang, (2015).

Corruption reduces private investment, which has an impact on a country's economic growth. According to previous studies, a 1% rise in the amount of corruption can reduce the economy's growth rate by 0.7 percent .It may also have a negative impact on human capital and exacerbate political instability Azfar & Gurgur, (2008).

In poorer, developing countries, corruption has a greater impact on health outcomes than in richer, developed countries. Good governance practices and a larger urban population have both been demonstrated to improve a country's health outcomes. Transparency is critical in all aspects of health care to reduce corruption and improve health outcomes Factor & Kang, (2015).

Bribery, theft, bureaucratic or political corruption, and misinformation for private gain are the four categories of corruption defined by the World Health Organization (WHO) regional office in Europe. According to Nadpara, (2015) healthcare corruption worsens inequality and disproportionately affects the poorest and most vulnerable people. Furthermore, corruption is more common in low and middle-income countries, further harming the poor. Furthermore, corruption frequently spreads from the public to the commercial sector. Rather than opening their own private clinics, commercial corporations are more likely to exploit public facilities and perpetuate unscrupulous activities. As a result, corruption slows economic growth and diminishes private sector investments, significantly impacting a country's macro economy and, as a result, health outcomes Lichand, (2016).

Institutional Quality

In the case of developing countries, poor quality institutions have hampered the

improvement of health and the delivery of health care services. Despite its importance, the quality of institutions in the health industry is understudied. Lack of functional institutions leads to destabilized health investments and an unclear linkage between health status and health care services. Because of a lack of enforcement and control, metrics such as utilization statistics, hospital infection rates, and operation survival rates are rarely gathered in middle-income and poorer nations Makuta & Hare,(2015).

According to the literature on institutional economics, it is the quality of expenditure or institutions, not the quantity that matters for generating economic growth. Health expenditure in the production function to see the effects of rising health cost. In comparison to other nations with lower institutional quality, our special premise is that when institutions are better, health investment yields more results. Dhrifi , (2018).

Health Expenditure

Economic factors such as production, costs, and insurance are obvious, but many other health issues, even if they appear to be entirely medical, have economic components. This point is shown by a few examples. We also need to look into the financial factors that influence people's health decisions. People take good care of themselves at times and bad care at other times. People's desired health status can be viewed as an important economic decision. Even addiction to a relatively benign substance like caffeine, or a dangerous chemical like methamphetamine, might be better understood when viewed as a potentially logical economic decision.

Numerous health issues have a strong economic component: In terms of health, what role should the government play? What investments in health care should a poor country make? Should cigarette commercials be prohibited? These are not purely economic questions, but they do have an economic component (Arthur & Ã, 2017).

The Japanese government is considering setting a target health expenditure level for each prefecture, concerned about the rapid growth in health spending and regional diversity in health expenditure. While the details of this strategy are still being worked out, authorities are exploring utilizing low-spending prefectures as prospective benchmarks or establishing target health expenditure levels for each prefecture. These policies, which are similar to those proposed in other nations such

as the United States and Europe, are contentious since many of them do not consider quality of care or health outcomes when determining the target health expenditure level. If increased health spending is used in beneficial ways to improve quality and reduce poor outcomes, then policies that focus solely on spending may be harmful to the population's health (Raeesi et al., 2018).

2.2 Empirical Literature Review

The search for major socioeconomic determinants of good health has been a preoccupation of researchers and policymakers for decades. Economic growth has consistently been shown to be a major determinant of health outcomes. However, economic growth alone is not adequate to improve health status to desired levels; for example, it is not adequate to reach the MDG targets.

There is a vast body of empirical research on the relationships between health

systems and socioeconomic determinants and health outcomes. To begin, the relevance of health as human capital in driving economic growth was highlighted in early economics research. Bloom and Canning (2003) and Bloom et al. (2004), among others, have stressed that health is a multifaceted concept. Capital has a favorable impact on the economy as a whole. According to their findings, health capital accumulation accounts for nearly one-fourth of economic growth, and a health condition equivalent to one additional year of life expectancy is linked to faster economic growth of up to 4% each year. Bloom et al, (2004)

Bhargava et al., (2005) discovered the same results. Brock et al., (2015) discovered that fiscal decentralization does not reduce China's high IMR difficulties using the stochastic frontier technique. However, the findings of a more recent study by Mafizur, (2015) in Taiwan showed a positive link between rising health expenditures and lower life expectancy. In general, these research demonstrated the significance of health technology in enhancing one's health.

The reduction in under-five mortality implied by typical income elasticity of under-five mortality is rather low, and even with good economic growth rates there is a modest effect. This was illustrated using a pooled income/U5M elasticity of 0.38 for SSA from a systematic review of 24 studies, and an economic growth rate of 5 %, the average growth rate for Africa for the past decade. A simple projection is that over the 15 years of MDG implementation from 2000 to 2015, the reduction in U5M would be 825 % against the MDG target of 67 %. That is, economic growth alone is not enough to “produce” good health or reach the MDG((((Makuta & Hare, 2015).

(Bakkeli, 2016)studies the effect of income inequality in china using physical functions to measure individual health. The researcher analyzed panel data using county/city-level dummies and year fixed-effects. Unlike the other researchers here (Bakkeli, 2016)found that income inequality does not have a significant impact on individuals' risks of having health problems.

A number of recent studies used individual-level data to examine the relationship between income equality and health status. Gennuso et al., (2016) used data from the Canadian National Population Health Survey to investigate whether metropolitan level income inequality was associated with health status. Their result shows that household income, but not income inequality, appeared to explain some of the differences in health status among Canadians. The researcher used the “Gini

Coefficient" as measure of income inequality.

The fact that reveal whether or not wider income differences play a causal role leading to worse health was conducted by Pickett & Wilkinson, (2015). Their evidence strongly suggests that income inequality affects population health and wellbeing by considering major causal criteria of temporality, biological plausibility, consistency and lack of alternative explanations.

In relation to the positive effects of healthcare expenditure on health outcomes, more empirical evidence has been found worldwide. A study consisting 47 African countries between 1999 and Mafizur, (2015).found that total healthcare expenditure significantly affected health outcomes: for every 1% increase of total health care expenditure per capital, there was a 2.1 and 2.2% decrease in under-five and infant mortality rates, respectively.

(Ouedraogo et al., 2020)investigate the relationship between institutional dimensions and the formation of health capital through corruption, protection of property rights, economic reforms, rule of law, political regime, political stability and absence of violence.

Ahnquist, (2012) analyzed independent associations, and interactions, of lack of economic capital and social capital on various health outcomes. They used the data from the 2009 Swedish National Survey of Public Health, based on a randomly selected representative sample of 23,153 men and 28,261 women aged 16e84 year, with a participation rate of 53.8%. As their result show, from multivariate logistic regression both measures of economic capital and low social capital were significantly associated with poor health status, with only a few exceptions. Their evidence shows that both economic hardships and social capital contribute to a range of different health outcomes.

((((((Fayissaa and Gutema 2014) investigated the socioeconomic and environmental drivers of LE in 33 SSA countries from 1990 to 2000 using one- and two-way panel techniques. They discovered that in SSA countries, an increase in food availability and a decrease in illiteracy increases LE. In addition, health spending was viewed as a major motivator of healthcare provision.

According to Makuta & Hare, (2015) two staged least squares regression technique on panel data from 43 countries in SSA over the period 1996–2011, they estimate the

efficiency of government health expenditure on health outcomes in developing countries, controlling for the impact of the level of economic development. They concluded that African economies are inefficient in providing health services relative to their Asian and Western Hemisphere peers.

(Methipara, 2016) investigates the effect of income inequality on health status using a panel data set for 44 countries covering six time periods specifying the variables: income level, income inequality, and the level of savings and the level of education. Their result shows that income inequality (measured by the Gini coefficient) has a significant effect on health status.
According to ((((Khanam, 2018) the total health expenditure (as a percentage of GDP) and health outcomes in the region of South Asian Association for Regional Cooperation (SAARC) and Association for South East Asian Nations (ASEAN) are lower than that of the OECD region and the world. Using the World Bank data set for 15 countries over a 20-year period (1995–2014), a panel data analysis was conducted where relevant fixed and random effect models were estimated to determine the effects of healthcare expenditure on health outcomes.

Their study investigated the relationship between different types of healthcare expenditures and three main health status outcomes: life expectancy at birth, crude death rate and infant mortality rate in the region. The main variables studied were total health expenditure, public health expenditure, private health expenditure, and GDP per capita, improved sanitation, life expectancy at birth, crude death rate and infant mortality rate. ((((Khanam, 2018).

The other researcher investigate the relationship between corruption and population health using cross-sectional sample covering 185 countries (54 high-income and 131 low-income countries) and the period of the analysis is 2005–2017. This researcher provide clear evidence that the level of corruption significantly affects physical health (expressed as life expectancy and Mortality rate) and mental health (expressed by happiness), under the moderating role of economic development and cultural framework. The result shows a positive correlation between the income level and both physical and mental health.(Achim, Violeta et al., 2019)

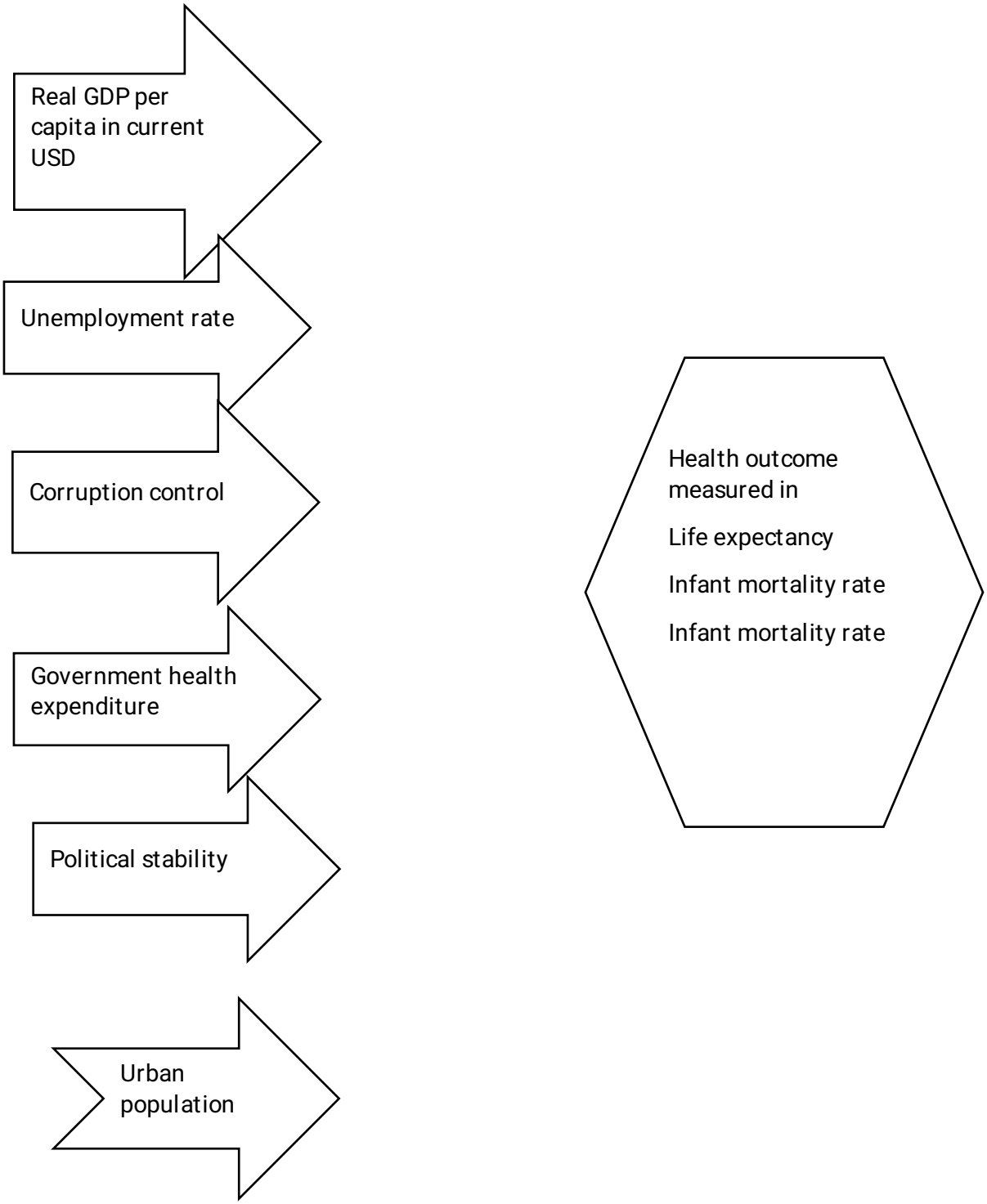
(Maity & Sinha, 2020) were estimated the role of socio-economic status on health

outcomes for United States citizens using micro-level statistics data from 2000 to 2004 and discovered that maternal marital status, education levels, age, income levels, and poverty are driving forces of infant mortality gaps in the United States.

Using general equilibrium spatial structure, (Maity & Sinha, 2020)discovered that socioeconomic variables, cultural, and demographic variables influence health outcomes and behavior in Scotland. In Kenya in the 2000s, a large-scale campaign and distribution of insecticide-treated bed-nets resulted in a considerable reduction in infant mortality (Demombynes & Trommlerová, 2016)

From these studies the determinant of health service outcomes are this study is going to take GDP, Corruption control index, Political stability, unemployment rate, urban population, government health expenditure and health service outcome proxies will be life expectancy infant mortality rate and as an addition from the other studies maternal mortality rate will be added. Generally from the studies conducted before unemployment had a negative effect on the health service outcome.

Conceptual frame work



Source: Adapted and own arrangement

Chapter Three

3. Research Methodology

3.1 Data Sources and Type

A combination of two things must be done in order to construct an accurate and useful model. To begin, the model must incorporate a vast amount of data. Second, the model must include measures that best encompass the equation's variables. There are a variety of health indicators used to reflect health outcomes, ranging from life expectancy to newborn mortality rate. Finally, life expectancy, maternal mortality, and infant mortality are included in the model not because they are the best measurements, but because they are unquestionably the most readily available data measurements. The information were gathered from the World Bank dataset, the World Development Index, the World Health Organization, World governance indicator as well as other relevant national and international institutions. The researcher used secondary data, which is a panel data from 2000 to 2017 for all selected thirty eight sub Saharan African countries, from Angola to Zimbabwe, to conduct the study. Panel estimation is a useful model since it allows for the inclusion of many countries over a long period of time in order to obtain the finest statistical findings.

3.2 Model Specification

According to (Zweifel, 2012) citizens' health outcomes are exposed to various drivers. The study developed three models to identify the determinants of health outcomes by using three health outcome proxies as follows:

$$= \sum \beta X_{it} + \varepsilon_{it}, \text{ where } \varepsilon_{it} = \mu_i + \lambda_t + v_{it} \quad \ldots\ldots(1)$$

Where Y_{it}, and X_{it} represent the dependent variable, and a vector of values of additional explanatory variables(denotes vectors of determinants of health outcomes such as; gross domestic product , government health expenditure, political stability, unemployment ,percentage of urban population, corruption control.) respectively. μ_i indicates individual-specific effect, λ_t indicates time specific effect, and v_{it} represents the disturbance term. i= 1…, N is cross-section and t= 1……, T is time periods.

Functionally,

= (GDP , ghealth , pstablity , uempt , coruption ,

*upop , ,+ εit)(*2) where the subscript i denotes sample nations in SSA region, and t the time periods the study covered (2000-2017).

For the purpose of estimation, this study employed panel estimation techniques. As Baltagi (2008) noted panel technique often provides better understanding in this case. Thus, this study estimated a more restrictive pooled panel that assumes parameter homogeneity, and cross-section independence. However, severe biases can arise if observations are pooled because SSA nations are heterogeneous. Hence , as a standard approach in econometrics literature in estimating panel data model of various effects (fixed and random).

This study expressed equation the above as:

= + 1GDP + ghealth + pstablity + uempt + coruption + upop + + (3)

Where t is vector of population health outcomes. For , the study relies on life expectancy total (LET), infant mortality rate (IMR), and maternal mortality rate (Mmrate). From the model, μ denotes the regional/country specific unobserved effects, while β1… β6 are coefficients of independent variables, and v the disturbance terms. The study also performed robustness checks using the Hausman's test to determine the best efficient estimator between FE and RE.

3.2.1 Model Specification of Dynamic panel model

In addition to fixed and random panel models the study's preceding chapter examined several literatures in order to better understand and gain a detailed understanding of the subject. After that, the researcher devised the two-step GMM models to estimate the research variables. The GMM model that follows develops three models to explain how socioeconomic factors influence health outcomes. To arrive at efficient results, the dynamic link between variables need sufficient information about prior time periods and a stronger ability to deal with variability in adjustment changes. The presence of a lagged dependent variable among the explanatories characterizes the dynamics in a model in econometrics (Pollock, 1992). In this scenario, it is uncommon for the conditional density of outcomes (Yit)

conditional on particular variables (Xit) to be distributed independently and identically across individual I and across time t. It is usual to suppose that, in addition to the effects of observable Xit, there are unobserved individual effects to capture the impact of those omitted elements.

The study developed three models to identify the determinants of health outcomes by using three health outcome proxies as follows:

$$Y_{it} = \alpha Y_{it-1} + \sum \beta X_{it} + \varepsilon_{it}, \text{ where } \varepsilon_{it} = \mu_i + \lambda_t + v_{it} \quad \text{.......(1)}$$

Where Y_{it}, Y_{it-1}, and X_{it} represent the dependent variable, the lagged dependent variable, and a vector of values of additional explanatory variables respectively. μ_i indicates individual-specific effect, λ_t indicates time specific effect, and v_{it} represents the disturbance term. i= 1..., N is cross-section and t= 1, T is time periods.

From equation (1) the study developed the next equation which is specific to research objective

$$Yit = \gamma + \sum_{J=1}^{m} \alpha J Yi, t-j + \sum_{r=0}^{n} \beta r\, Xi, t-r + \mu i + vit \quad \text{.......(2)}$$

Where Y_{it} = Health status, $Y_{i,t-j}$= lagged Health status, $X_{i,t-r}$= vector of socio-economic determinants.

From this equation the study developed the following three econometric models to indicate the determinants of health status as follows:

Model I: Taking life expectancy as proxy for health outcomes

$\ln LE\ it = \beta_1 \ln LE\ it\text{-}1 + \beta_2 \ln GDP\ i;t + \beta_3 \ln ghealth\ it + \beta_4 \ln pstability\ it + \beta_5 \ln coruption\ it + \beta_6 \ln_{puop} it + \beta_7 \ln uemptit + \varepsilon it$..........(3)

Model II: Taking Infant Mortality rate as proxy for health outcomes

$\ln IM\ it = \beta_1 \ln IM\ it\text{-}1 + \beta_2 \ln GDP\ it + \beta_3 \ln ghealth\ it + \beta_4 \ln pstability\ it + \beta_5 \ln coruption\ it + \beta_6 \ln_{puop} it + \beta_7 \ln uemptit + \varepsilon it$..........(4)

Model III: Taking Maternal Death Rate as proxy for health outcomes

$\ln MM\ it = \beta_1 \ln MM\ it\text{-}1 + \beta_2 \ln GDP\ it + \beta_3 \ln ghealth\ it + \beta_4 \ln pstability\ it + \beta_5 \ln coruption$

$it + \beta_6 ln_{puop} it + \beta_7 lnuempt it + \varepsilon it$……..(5)

Where

lnLE, lnIM and lnMM are natural logarithm of life expectancy, natural logarithm of infant mortality and natural logarithm of maternal Mortality rate respectively.

lnGDP =natural logarithm of gross domestic product per capital

lnghealth =natural logarithm of general government health expenditure

lnpstability= natural logarithm of political stability

lncoruption= natural logarithm of corruption control index

lnupop = natural logarithm of percentage of urban population

lnempt =natural logarithm of unemployment rate

3.4 Estimation Method

There are different estimation methods which are often suggested for panel econometric models. Some are criticized for their weak performances while others are considered better depending on the degree of their strengths and the available remedial measures. Using OLS estimator for the estimation of dynamic panel model is both biased and inconsistent. From equations, $Y_{it-1}$and X_{it-1} respectively is correlated with μ_i by construction while taking their lag equations. This in turn indicates that the lagged dependent variable (one of the repressor's) is correlated with the error term, showing the biased and inconsistent result produced when OLS is employed for estimation.

Similarly, the standard within group or least square dummy variable (LSDV) transformation to remove the individual effects produce biased and inconsistent estimates due to the correlation between the transformed lagged dependent variable and the transformed disturbance .(Roodman, 2009) asserts that such a bias will remain a problem especially when the time period considered is small. The within group estimator while employing orthogonal deviation transformation can

only be consistent as N → for fixed T if the data matrix does not contain lagged dependent variable and all the explanatory variables are strictly exogenous (Areliano & Boverb, 1995). According to (H.Baltagi, 2016), the random effects GLS estimator is also biased when applied to a dynamic panel data model.

As a result, the empirical model will be estimated using the system Generalized Method of Moment (GMM) developed by (Blundell & Bond, 1998) The key intuition behind the GMM method is that, the panel structure of the data provides a large number of instrumental variables in the form of lagged endogenous as well as exogenous variables. It is generally known that using many instruments can improve the efficiency of various IV[2] and GMM estimators.

3.3Description of Variables and hypothesis

3.3.1 Dependent variables

The dependent variables are life expectancy (at birth) (Yt1) maternal mortality rate (Yt2) and infant mortality rate (per1000 live births) (Yt3).

life expectancy

We used life expectancy to assess the consequences of a health-care system. Life expectancy at various ages refers to the average number of years that a person who has reached a given age will live if he or she is subjected to current mortality conditions (age-specific probability of dying) for the rest of his or her life (Chiang, 1984). The researcher analyzed life expectancy at birth (years) as the dependent variable.

Maternal mortality rate

The death of a woman during pregnancy, childbirth, or within 42 days following delivery is referred to as maternal mortality. The number of resident maternal deaths in a specified geographic area (state, country, etc.) within 42 days of pregnancy termination due to complications of pregnancy, childbirth, and the puerperium divided by total resident live births for the same geographic area for a specified time period, usually a calendar year, multiplied by 100,000 is the.

Infant mortality rate

Infant mortality happens when a baby dies before reaching his or her first birthday.

The number of newborn deaths per 1,000 live births is known as the infant mortality rate. In addition to providing valuable information regarding maternal and child health, the infant mortality rate is a key indicator of a society's overall health.

All of these dependent variables are perhaps the most accurate indicators of the level of health and well-being in a nation. Thus, the researcher have chosen these three variables to estimate health outcomes in a country.

3.3.2 Independent Variables

The independent variables are

1. Real GDP per capita in current USD

Real GDP per capita is calculated by dividing a country's total economic output by its population and adjusting for inflation. It's used to compare living standards between countries and throughout time.

2. Government health expenditure

We defined government healthcare spending as a government's overall healthcare spending expressed as a proportion of its gross domestic product (GDP). Recurrent and capital spending from government (central and municipal) budgets, external borrowings and grants (including gifts from international agencies and nonprofit organizations), and social (or compulsory) health insurance funds make up government healthcare spending. Health expenses incurred by national, state/regional, and local government bodies (excluding social security schemes) are referred to as general government (excluding social security) expenditures. Non-profit, non-market institutions that are primarily managed and funded by government units are included.

3. Political stability

The likelihood of a government dissolving owing to internal differences or excessive competition among political parties is defined as political instability. A change in government also increases the likelihood of future changes. (-2.5 weak; 2.5 strong) Political Stability Index).

4. Coruption control

The World Bank defines corruption as "a kind of dishonesty or a criminal act

committed by a person or an organization entrusted with a position of authority in order to get illegal benefits or abuse power for personal gain. When persons in positions of power, such as managers or government officials, act dishonestly, this is referred to as corruption. Corruption includes giving or accepting bribes or inappropriate gifts, double-dealing, under-the-table negotiations, election rigging, diverting funds, laundering money, and defrauding investors. Corruption has a negative relationship with Life Expectancy (LE) and Happiness (Happiness), respectively. It is possible to see a link between higher degrees of corruption and lower levels of health proxies, such as mortality rate under 5, life expectancy, and happiness.

5. Urban population

The term "urban population" refers to the people who live in places that have a higher population density than rural areas and are generally more compact. It's the people who live in cities, to put it simply.

In addition to being more densely inhabited than rural areas, urban areas in wealthy countries have a higher percentage of people living in them than on rural land. As a result, the proportion of people living in cities vs the rural population can be a good indicator of a country's overall progress and richness. As the world's population grows, organizations such as the United Nations expect that the percentage of people living in cities will rise.

6. Unemployment rate

The unemployment rate is defined as the percentage of the workforce that is unemployed. It's a lagging indicator, which means it rises or falls in response to changes in the economy rather than forecasting them. The unemployment rate is likely to grow when the economy is in poor shape and jobs are scarce. It is predicted to fall when the economy is growing at a good pace and employment are plentiful.

Expected Sign between Variables

The present study by using the previous studies expects the following relationships between health outcome proxies and selected explanatory variables.

The expected relationship between life expectancy and unemployment is negative while life expectancy will have positive relationship with other explanatory variables.

As well the expected relationship between infant mortality and unemployment rate will be positive and infant and maternal mortality will have negative relationship with other explanatory variables.

3.4 Diagnostic tests

As far as we are going to run Traditional Panel and dynamic panel, then the following diagnostic tests have been tested: Hausman test, Normality test, Multicolineartiy Test, Heteroscedasticity test, Serial correlation, Linearity test.

3.4.1. Testing Pesaran Cross Section Dependence (CD) Test

The first empirical work of the present study is to check the cross-sectional dependence between input variables and health outcomes. The CD test is based on the average of the pair correction coefficients of OLS residuals regressions. (Pesaran, 2004) considered the following model.

$$Y_{it} = \beta_i X_{i,t} + \mu_{i,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$
$$where: \mu_{it} = \alpha_i + \varepsilon_{it}$$

μ_it=intercept of individual crops i at a time t, β_i =slop coefficient of individual crops i

t=1,2,…..30 is the time period, i=1,2,3, $X_{i,t}$ is vector of observing time varying regressorsY_{it} follow iid(0, δ^2_i) for all i and t.

3.4.2 Panel Unit Root Tests

Before the panel data analysis and after confirming cross-sectional dependence, stationarity of the variables has to be test to avoid a spurious regression problem and it is needed to determine the order of integration before using co-integration techniques. For this, Pesaran's Cross-Sectional Augmented Dickey-Fuller (CADF) by (Maddala & Ã, 1999) Levin-Lin-Chu (LLC) test by Levin et al. (2002) and Im-Pesaran-Shin (IPS) test are will utilize for panel unit root test.

After testing for the presence of panel unit root, recently developed dynamic panel data methodology is specified. As known, when all variables are stationary

at level, fixed effects or random effects models are will be estimate. If all variables are stationary in their first differences, then panel fully modified ordinary least squares and panel dynamic ordinary least squares must be employed**(Erdem, et al, 2014)**.

3.4.3. Co-integration analysis

In the conventional time series case, co-integration refers to the idea that for a set of variables that are individually integrated of order one, some linear combination of these variables can be described as stationary. The vector of slope coefficients that renders this combination stationary is referred to as the co-integrating vector. It is well known that this vector is generally not unique, and the question of how many co-integrating relationships exist among a certain set of variables is also an important question in many cases. In this study, we do not address issues of normalization or questions regarding the particular number of co-integrating relationships, but instead focus on reporting critical values for the case where we are interested in the simple null hypothesis of no co=integration (Rivista et al., 2008).

The tests verifying the null hypothesis of no co-integration are based on the principle of deciding whether or not the error process of the regression equation is stationary. These tests can be divided into two groups, the residual-based tests and the likelihood-based tests. But in this test we use only the **Kao Residual** tests, small sample size the former is appropriate.

3.4.3.1. Kao Residual Co-integration Test

According to Kao-Residual co- integration Test (1999), the hypothesis of no co-integration . The starting point of kao- test considers the following model for homogeneous and heterogeneous of cross-sectional parameter across the group.

$$Y_{it} = \alpha_i + \beta X_{it} + e_{it}, i = 1, 2..., N, t = 1, 2...T \leftrightarrow \hat{e}_{it} = Y_{it} - \hat{\alpha}_i - \beta X_{it} \quad \ldots\ldots\ldots\ldots (2)$$

$$Y_{it} = \alpha_i + \beta_i X_{it} + e_{it}, i = 1, 2..., N, t = 1, 2...T \rightarrow \hat{e}_{it} = Y_{it} - \hat{\alpha}_i - \beta_i X_{it} \quad \ldots\ldots (3)$$

Where$\alpha_i$are the fixed effects varying across the cross-section observations, ß is the slope parameter. For equation (2) co-integration vectors are homogeneous between individuals (different intercepts, common slope) and for equation (3) co-integration vectors are heterogeneous between individuals (different intercepts,

different slope). The test statistics for the two cases are different.

For case one: homogeneous between individuals group

$$\Delta y_{it} = \rho y_{it} + \sum_{j=1}^{p} \theta_j \Delta y_{it-j} + v_{itp} \ldots\ldots\ldots fromeq(2)\ldots.5$$

The null hypothesis as Ho :**ρ** =1 against the alternative Ha :**ρ**< 1 .the test statistics is

- Case two:- heterogeneous between individuals

$$\Delta y_{it} = \rho_i y_{it} + \sum_{j=1}^{p} \theta_j \Delta y_{it-j} + v_{itp} \; fromeq(3)\ldots\ldots.6$$

3.5 Post Test Estimation

In most instances one and/or two post estimation procedure(s) is (are) undertaken to evaluate the (Arellano and Bover, 1995) and (Blundell and Bond,1998) model. Two types of diagnostic test are used to determine the validity of our empirical models. These tests include the Hansen-Sargan test of identifying restrictions and autocorrelation test.

It is vital to highlight that in the case of serial correlation, the use of lagged values (and first differences of lags) of the endogenous variable as instruments would be invalid. As a result, we run a serial correlation test to determine the accuracy of our estimates. (Arellano and Bond, 1991) propose two autocorrelation tests, AR (1) and AR (2), which are suitable for linear GMM regression. If the test yields a first order autocorrelation but no second order autocorrelation, the instruments are considered valid. The Hansen-Sargan test of identifying constraints under the null hypothesis of instrument validity (Roodman, 2006) assesses the quality of instruments.

CHAPTER FOUR

4. Data Result Discussion

To accomplish the major and specific objectives outlined in chapter one, we will provide all of the study's statistical and econometric results, together with their interpretations and diagnostic tests.. The section will be divided into two parts. The normality test, correlation matrix, and graphical linkage of the variables in the health outcomes regression model are discussed in the first section. The panel unit root test, the panel co-integration test, and the Dynamic panel regression estimation result of the health outcomes equation will be briefly discussed in the second section, which is dedicated to analyzing the basic econometric results. Finally, in this chapter, we will review the PCSE findings as well as the two-step GMM results of health outcomes regression models.

4.1. Descriptive Analysis

This chapter gives summary and presentation of statistical and results.

Table4.1 Summary Statistics of the Variables Used for health outcomes model

.

Variable	Mean	Std.devation	Min	Max	ob
Life expectancy overall	57.24994	6.540053	40.369	74.51463	N= n= T=
Immrate overall	60.9818	22.76476	12.5	136.9	N= n= T=
Mmrate overall between Within	550.834	313k.43	53	2250	N= n= T=
Gdpoverall between within	2282.906	3181.415	194.8731	20532.95	N= n= T=
Ghealthoverall	1.732173	1.088197	.1585202	5.826442	N= n= T=
pstably overall	-	.6582417	-1.826384	1.303456	N= n= T=
corupt~n overall	-	.6582417	-1.826384	1.303456	N=

					n= T=
upop overall	37.70711	16.4861	8.461	88.976	N= n= T=
uempt overall	8.120217	7.555613	.32	34.35	N= n= T=

This description will focus on the three outcome variables (life expectancy, infant mortality and maternal mortality.) and three countries (Ethiopia, Mauritius and sierra Leone)the main reason why those countries selected for comparison is because of their health outcomes, Mauritius has good health outcome while Seri lone has poor health outcomes in addition the researcher is interested to present the health outcomes of our country Ethiopia by comparing with the higher and lower outcomes with in the selected sub-Saharan countries. As it can be shown in the above table the overall average life expectancy of 38 sub-Saharan African countries is 57.24 years with an overall deviation of 6.54 years. The minimum life expectancy is 40.36(Sierra Leone's) and the maximum is 74.5 (Mauritius's) indicating the huge gap that exists in life expectancy among the countries that are selected for analysis.

The gap can be attributed to different historical and economic regimes the countries have been under for the period between 2000 and 2017 and even before 2000. For instance, Sieraleone was in a civil war in the last decades of the twentieth century and the post-2000 period of reconstruction has been hugely influenced by this national rupture. It is no wonder that its life expectancy is found to be one of least among the countries selected for this analysis. However, Mauritius's higher life expectancy is attributed to its sustained development and richness in resources with small number of population. In terms of GNP, Mauritius has one of the highest GNP

per capita in Africa. Coming to Ethiopia, its life expectancy is 59.99 which is a bit higher that the average Sub-Saharan African countries. Ethiopia's life expectancy has been on the rise since the mid-1990s, for the country has shown positive development in health-related investments and interventions.

Moreover, the overall average infant mortality rate in sub Saharan Africa is 60.9818 with 136.9 maximum (for Sieraleone) and minimum 12.5 (for Mauritius) while Ethiopia's is 58.84 which is a bit below the Sub-Saharan overall average (60.98). Historical developments exposed above and lack of investment and reasonable expenditure on health thereof have inhibited Sieraleone from registering improvement in curbing rising infant mortality rate. Mauritius, on the other hand, has made use of its stability and sustained economic growth to work toward reducing infant mortality rate and that is why the rate is the lowest in Sub-Saharan Africa. Coming to Ethiopia, as recognized by WHO and World Development Indicator, the country's infant mortality rate has shown a marked decline, for instance from 83.6 in 2001 to 39.5 in 2017 (as can be seen from Table 4.1). This marked decline has been attributed to the continuous and focused investment the country has made in the health sector.

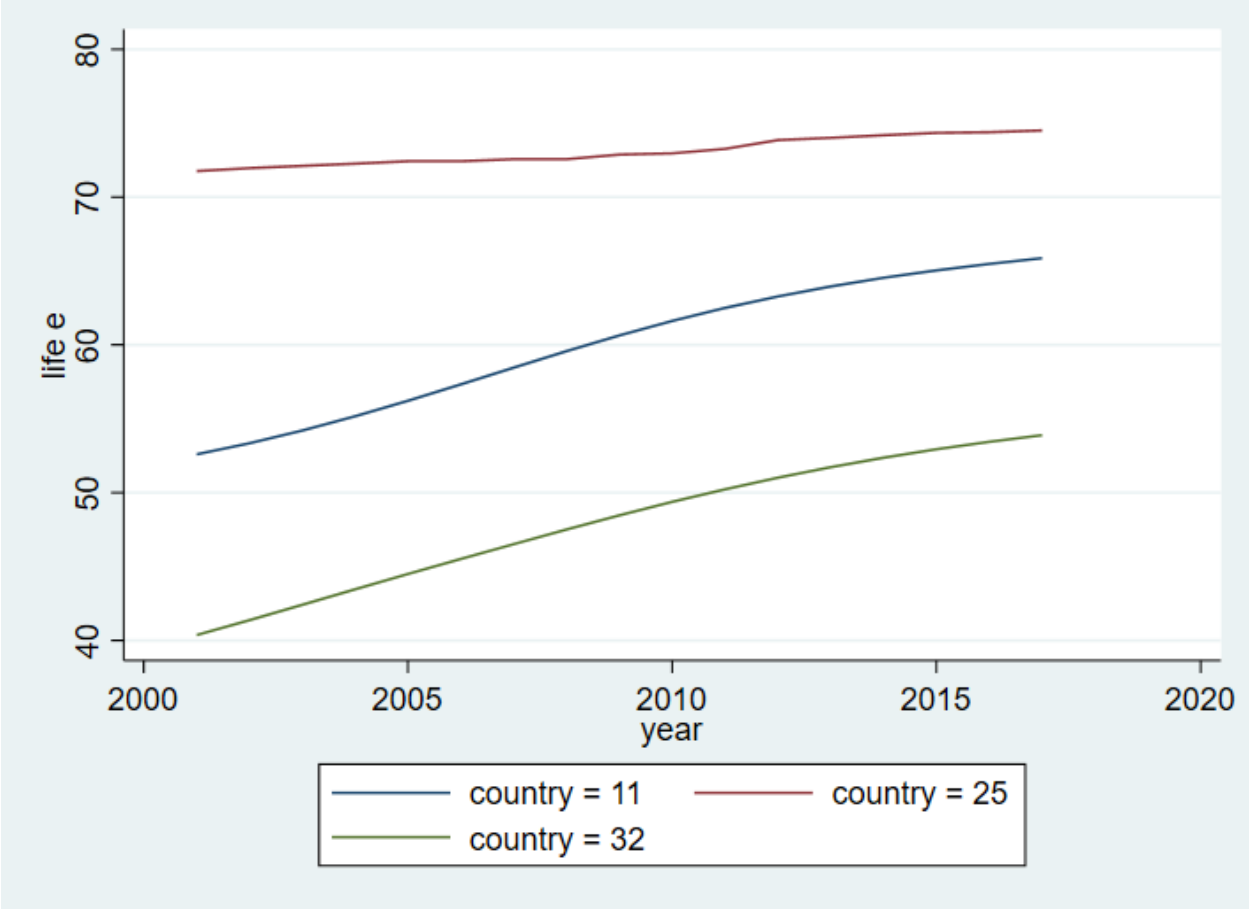


Figure 1 Comparison of Ethiopia life expectancy with Sierra Leone and Mauritius life expectancy

Where 11, 25, 33 represents life expectancy of Ethiopia, Mauritius and sierra Leone respectively.

Source: author's computation

Figure 1 depicts increasing life expectancy of 32: Sierra Leone, 25: Mauritius and 11: Ethiopia. It further confirms that Ethiopia and Sierra Leone's life expectancy is marked by upward trend while Mauritius's is characterized by a seemingly constant but a smooth increasing trend.

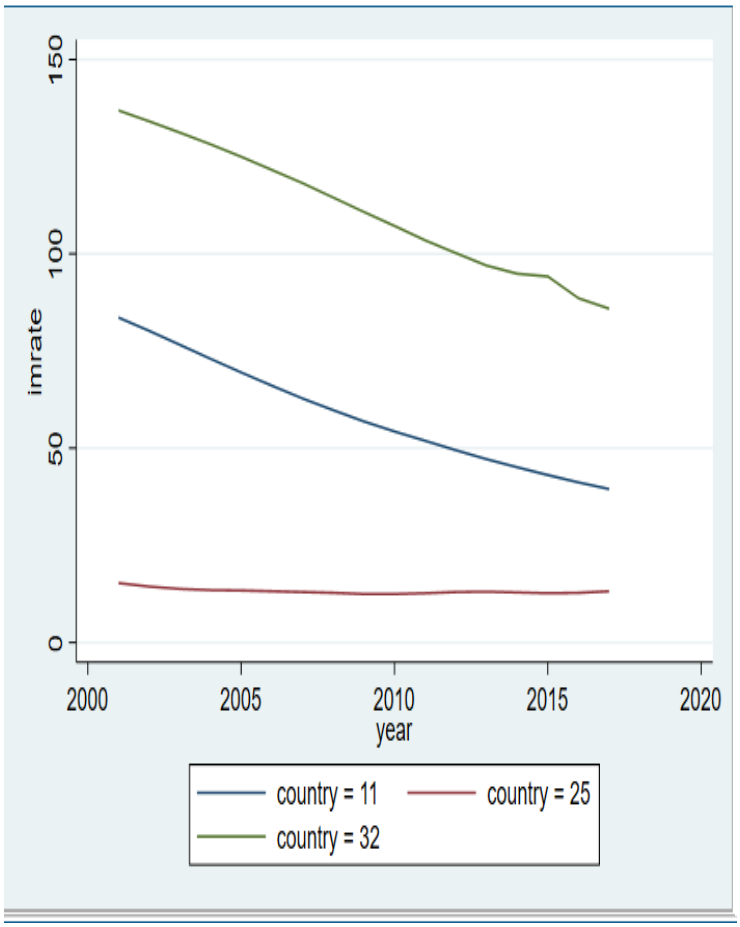


Figure 2 Comparison of Ethiopia infant mortality with sierra Leone and Mauritius infant mortality

Where 11Ethiopia =,25 Mauritius = 33=sierra Leone

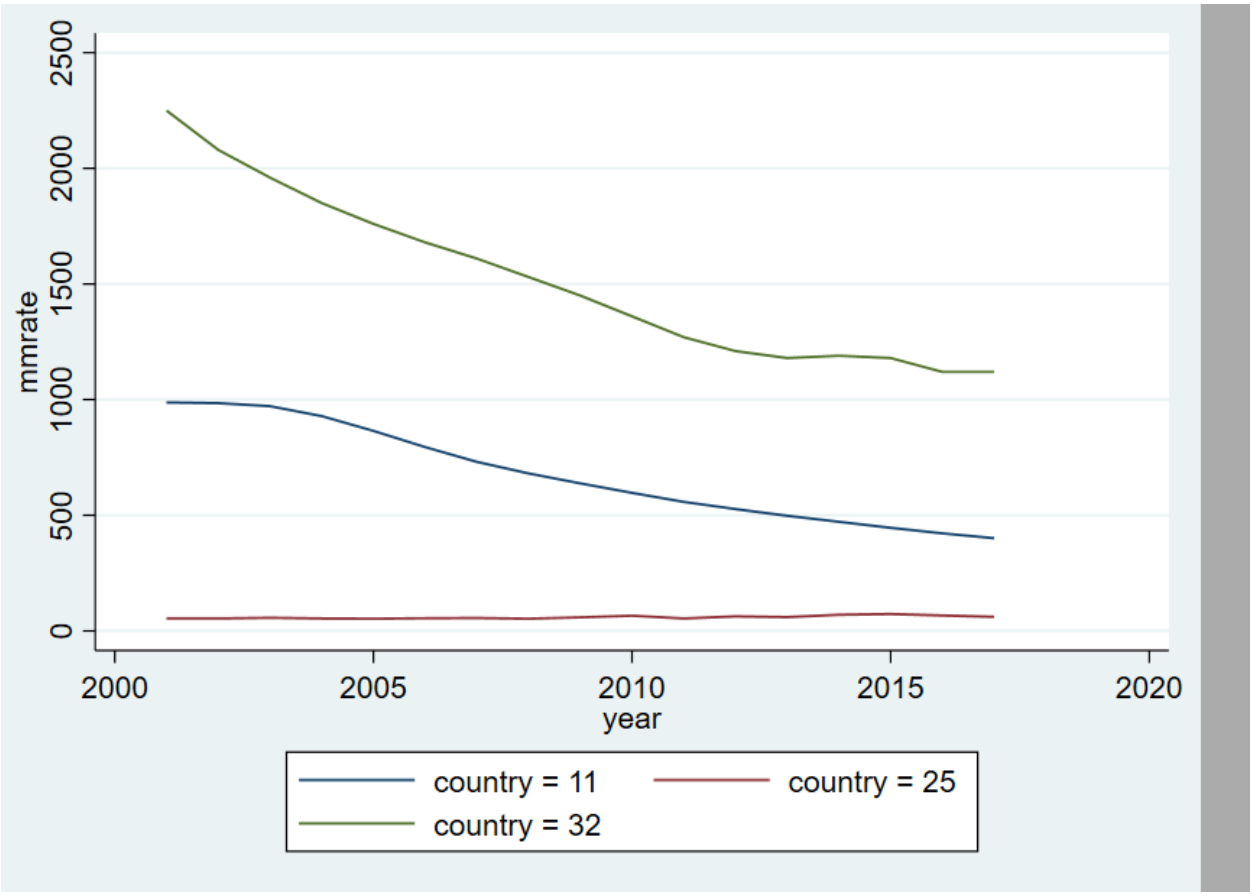


Figure 3 Comparison of Ethiopia maternal mortality with Sierra Leone and Mauritius maternal mortality

4.1.2. Graphical representation of the relationship between life expectancy and its determinants

AppendixA3 shows a graphical link between life expectancy and its determinant variables in order to make our analysis plain and accessible. Except for the unemployment rate, all determinant variables had a positive connection with life expectancy, similar to the correlation matrix results.

4.2. Econometric Analysis of health outcomes model

4.2.1. Normality Test

The normality assumption also plays a crucial role in the validity of inference procedures, specification tests and forecasting. In the panel data literature, Blanchard and M´aty´as (1996) examine the consequences of non-normal error components for the performance of several tests. Montes-Rojas and SosaEscudero (2011) show that non-normalities severely affect the performance of the panel heteroskedasticity tests by Holly and Gardiol (2000). Despite these concerns the Gaussian framework is widely used for specification tests in the one-way error components model; see, for instance, the tests for spatial models in panel data by Baltagi et al(2007).Before we begin regression analysis, it is prudent to ensure that the data is normal. Because normality is a fundamental assumption in econometric models, Table 2 shows the result of the normality test using skewnesses and kurtosis. Before we begin regression analysis, it is prudent to ensure that the data is normal. Because normality is a fundamental assumption in econometric models, Table 2 shows the result of the normality test using skewnesses and kurtosis.

Table4.2 Tests of Normality for Variables in life expectancy model

Skewness/Kurtosis tests for Normality

Skewness / kurtosis tests for Normality

variables	Obs	P(skewenss)	P(kurtosis)	Adjchi2(2)	Pro>chi2
Lifee	646	0.1193	0.9004	2.44	0.2947

gdp	646	0.101	0.701	41.29	0.263
ghealth	646	0.323	0.210	12.14	0.137
pstablity	646	0.732	0.690	25.20	0.154
kcoruption	646	0.825	0.5334	43.64	0.312
uempt	646	0.234	0.613	19.15	0.321
upop	646	0.083	0.3524	29.71	0.134

As it can be showed in the above table except life expectancy, the level of each explanatory variable were not normal but after we transformed it to the logarithmic transformation of all explanatory variables were found normal.

4.2.2. Estimation results for Panel Unit roots and Co-integration

To see if there is a long-term link between the variables, we must first check for the presence of a unit root test. The many forms of unit root tests, such as LLC, IPS, and hadri, can be used to accomplish this. Then, using other co-integration tests such as pedroni, kao, and westerlund, we'll see if there's a log run relationship between our variables.

4.2.3. Panel Unit Root Test variables

Table4.3 Different types of panel unit root tests

	Fisher-type		Levin- Lin Chu (LLC)	
	Statistics	P-Value	Statistics	P-Value
Life	15.3827	0.0000	-40.4146	0.0000

Gdp	D 17.0849	0.0000	-4.0505	0.0000
ghealth	D 40.9499	0.0000	-2.7314	0.0032
pstablity	5.3953	0.0000	-5.5679	0.0000
coruption	4.9710	0.0000	-3.5467	0.0002
uempt	1.8361	0.0332	-3.1635	0.0008
Upop	28.8534	0.0000	-9.9408	0.0000

The table above shows the unit root tests that can able to show us the absence of unit roots. The assumptions for the above LLC and fisher type discussed with their corresponding p-value. The null hypothesis of Fisher-type unit-root test is all panels contain unit roots and the alternative Ha is At least one panel is stationary. Based on this hypothesis, all variables are stationary at level. However, domestic gross product and government health expenditure are stationary at first difference. In the second LLC test, the null hypothesis is Panels contain unit roots and the corresponding alternative hypothesis is Panels are stationary. As a result all p-values are less than 5% this means we can reject the null and accept the alternative which means panels are stationary.

Before we look at the results of economic regression, it's a smart option to see whether there's any correlation between the variables in the equation. Because, in accordance with (Gujarati, 2004). The coefficients cannot be determined with great precision when multicolinearity exists. We may check the normality and graphical association of variables with this.

We can see that the highest level of collinearity between variables is 0.624 when we look at the Correlation matrix among variables in the life expectancy model in Appendix A.2.

Even if this result shows that corruption and government health spending are not highly associated, we can see that the nonexistence of a correlation for the other variables.

Only the unemployment rate is adversely connected to life expectancy in terms of the sign of individual connection. Life expectancy is positively connected to urbanization GDP, political stability, and corruption control. This correlation matrix was used to determine the direction of causality, although it is preferable to utilize the variance inflation factor (vif) because it provides a more realistic multicolinearity feature. As can be seen in Appendix A.2 Vif must be smaller than 5 in order to be considered as free of multicolinearity. The value of vif equals 2.10, indicating that multicolinearity is not a concern.

After verifying for multicolinearity, the next step is to determine whether or not autocorrelation exists in our model. We can reject the null hypothesis H0: no first order autocorrelation since our model exhibits first order autocorrelation when we use the Wooldridge test for autocorrelation in panel data and get a p-value of 0.00. We recognize that the problem of autocorrelation, hetrosedaciticty, and hence we cannot utilize a standard list square in our model. But, because we don't trust this strategy, we merely ignore this model and move on to fixing fixed or random effects with some correction.

4.2.4 Random and Fixed Effect Regression Model Result

By enabling each variable to have its own intercept value, the Fixed Effect Model allows for heterogeneity or individuality between the two variables. Although the intercept may differ among variables, the phrase "fixed effect" refers to the fact that the intercept does not change over time. That is, it is time invariant, whereas the Random Effect Model states that the variables' intercepts share a common mean value. The Hausman Test must then be used to determine which model (fixed effect or random effect) is acceptable.

Table4.4 The impact of socioeconomic factors on life expectancy: Random Effect Regression Model Result

VARIABLES	MODEL 1		MODEL 2		MODEL 3	
	coef.	Std. Err.	coef.	Std. Err.	coef.	Std. Err.
Gdp	-.000174	.0001634	.0010892	.0005461	.0039734	.0060133
Ghealth	.033274	.2263209	.797132	.7584607	21.2499	8.077794
Pstability	.5957806	.3171245	-2.863837	1.056976	-51.87912	11.21075
Corruption	2.753597	.6053137	-8.955522	2.029279	-80.98271	21.95444
Upop	.6677676	.0354724	-1.903386	.1184133	-18.54937	1.333379
Uempt	-.4864081	.0691441	.2344087	.2306493	-.6508315	2.621723
Cons	38.09923	1.641664	120.9302	5.460745	1143.88	66.72619

Lifee	coef.	Std. Err.	Z	P>(z)
Gdp	-.000174	.0001634	-1.07	0.287
Ghealth	.033274	.2263209	0.15	0.883
pstability	.5957806	.3171245	1.88	0.060
coruption	2.753597	.6053137	4.55	0.000

Upop	.6677676	.0354724	18.83	0.000
uempt	-.4864081	.0691441	-7.03	0.000
Cons	38.09923	1.641664	23.21	0.000

Table 4.5 The impact of socioeconomic factors on infant mortality :Random Effect Regression Model Result

Imrate	coef.	Std. Err.	Z	P>(z)
Gdp	.0010892	.0005461	1.99	0.046
Ghealth	.797132	.7584607	1.05	0.293
Pstability	-2.863837	1.056976	-2.71	0.007
Corruption	-8.955522	2.029279	-4.41	0.000
Upop	-1.903386	.1184133	-16.07	0.000
Uempt	.2344087	.2306493	1.02	0.309
Cons	120.9302	5.460745	22.15	0.000

Table4.6 The impact of socioeconomic factors on maternal mortality :Random Effect Regression Model Result

mmrate	coef.	Std. Err.	Z	P>(z)
Gdp	.0039734	.0060133	0.66	0.509
Ghealth	21.2499	8.077794	2.63	0.009
Pstability	-51.87912	11.21075	-4.63	0.000
Coruption	-80.98271	21.95444	-3.69	0.000
Upop	-18.54937	1.333379	-13.91	0.000
Uempt	-.6508315	2.621723	-0.25	0.804
Cons	1143.88	66.72619	17.14	0.000

When we use FE, we anticipate that something about the individual will influence or bias the Predictor or outcome variables, and we must account for this. The assumption of a correlation between the entity's error term and predictor factors is based on this logic. We can analyze the net effect of the predictors on the outcome variable using FE because it removes the effect of those time-invariant traits. Another key premise of the FE model is that those time-invariant features are unique to the individual and should not be associated with other personal attributes.

Table4.7 The impact of socioeconomic factors on life expectancy : fixed Effect Regression Model Result

Lifee	coef.	Std. Err.	T	P>|t|
Gdp	-.0000984	.000162	-0.60	0.287

		9		
ghealth	-.0759617	.2084955	-0.36	0.883
pstability	1.003117	.2881644	3.48	0.060
coruption	2.862498	.5796747	4.94	0.000
Upop	.9288365	.0376264	24.69	0.000
Uempt	-.3079281	.076557	-4.02	0.000
Cons	27.05465	1.550797	17.45	0.000

Table 4.8 The impact of socioeconomic factors on infant mortality :fixed Effect Regression Model Result

Imrate	coef.	Std. Err.	Z	P>(z)
Gdp	.0010307	.0005492	1.88	0.061
Ghealth	1.459824	.7031648	2.08	0.038
pstability	-4.165563	.9659817	-4.31	0.007
coruption	-8.28976	1.957014	-4.24	0.000
Upop	-2.760868	.1268527	-21.76	0.000
Uempt	-.2081993	.2580361	-0.81	0.420
Cons	155.6473	5.23053	29.76	0.000

		7		

Table4.9 The impact of socioeconomic factors on maternal mortality :fixed Effect Regression Model Result

mmrate	coef.	Std. Err.	Z	P > (z)
Gdp	.0063719	.0062324	1.02	0.307
Ghealth	25.13824	7.979672	3.15	0.002
Pstablity	-57.17851	10.96218	-5.22	0.000
Coruption	-75.92332	22.20863	-3.42	0.001
Upop	-22.95517	1.439553	-15.95	0.000
Uempt	-2.153463	2.928252	-0.74	0.462
Cons	1310.472	59.3573	22.08	0.000

The essential point here is determining which model of estimation is acceptable after implementing the proper command and storing it. We will use the hausman test to determine whether fixed or random effect estimation is appropriate. Ho: estimation

of the random effect is appropriate, while Ha: estimation of the fixed effect is appropriate.

Table4.10 Hausman test result of health outcomes model

Model	chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)	Prob>chi2
life expectancy	390.00	0.0000
infant mortality	316.62	0.0000
maternal mortality	60.09	0.0000

Table 4.6 shows that using the result of fixed effect estimation since p-value of chi2 is 0.000 which is less than 5%, we must reject the null hypothesis and accept the alternative hypothesis. This conclusion implies that the fixed effect model an appropriate for analysis purposes.

4.2.5. Diagnostic tests

In this sub section we are going to discuss different tests of fixed effect model and their remedies measure.

Table 4.11 Test of multicolinearity

Variables	Vif	1/vif	
Gdp	2.51	0.389	
Ghealth	2.27	0.440	
Pstablity	2.18	0.458	
Corruption	1.91	0.524	
Upop	1.89	0.528	

Uempt	1.84	0.542	
Mean vif	2.10		

As it can be showed in table above the result of multi-collinearty test is by far less than 10 which makes us confident to say there is no multicolinearity problem.

Table4.12 Test of autocorrelation for outcomes model

Model	F(1, 37)	Prob > F
Life Expectancy	141.186	0.0000
Infant Mortality	219.881	0.0000
Maternal Mortality	198.545	0.0000

As it present in the above table our Wooldridge test for autocorrelation in panel data prove that as we can reject the null hypothesis which is H0: no first order autocorrelation means our model has first order autocorrelation.

Table4.13 Test of cross-sectional dependence for outcomes model

Model	Average absolute value of the off-diagonal elements	Pesaran's test of cross sectional independence = 18.003,
Life Expectancy	0.628	0.0000
Infant Mortality	0.755	0.0000
Maternal Mortality	0.602	0.0000

As our result in table xx implies that our model has cross-sectional dependence,

since probability value less than 5% So we fail to reject the null hypothesis which means there is cross-sectional dependence.

Table4.14 Test of heteroskedasticity for outcomes model

Model	Wald test chi2 (38)	Pesaran's test of cross sectional independence = 18.003,
Life Expectancy	32288.59	0.0000
Infant Mortality	49399.75	0.0000
Maternal Mortality	68739.72	0.0000

In the above table our Modified Wald test for GroupWise heteroskedasticity in fixed effect regression model implies that our model suffers from group wise heteroskedasticity. Because at p-value of 0.000 we can reject the null hypothesis which is H0: Panel Homoscedasticity.

There are three problems in this model first there is first order autocorrelation 2nd there is also group wise heteroskedasticity and we have also informed that the presence of cross-sectional dependence as a result we cannot use this model and rather we required to use Feasible generalized list square(FGLS)/ panel corrected standard error (PCSE) according to xx FGLS is better when the number of time series is greater than the number of cross-section but in our case we have 38 countries and 17 year so we are required to use PCSE. Which used us to consider everything.

Table 4.15 socioeconomic determinants of life expectancy panel corrected standard error (PCSE) Model Result

Lifee	coef.	Std. Err.	Z	P > (z)	(95% conf. Interval)
Gdp	.0003196	.0000333	9.59	0.000	.0002543 .000385

Ghealth	-.1665529	.2183326	-0.76	0.446	-.5944769 .2613711
Pstablity	0.9229681	.2408312	-3.83	0.000	-1.394989 -.4509476
Corruption	5.376967	.3248048	16.55	0.000	4.740361 6.013573
Upop	.1471393	.0133962	10.98	0.000	.1208832 .1733953
Uempt	-.4584589	.0248561	-18.44	0.000	-.507176 -.4097418
Cons	57.49097	.9348982	61.49	0.000	55.65861 59.32334

Table4.16 socioeconomic determinants of infant mortality: panel corrected standard error (PCSE) Model Result

Immrate	coef.	Std. Err.	Z	P>(z)	(95% conf. Interval)
Gdp	-.0006742	.0004592	-1.47	0.142	-.0015742 .0002259
Ghealth	-.5417284	.4320111	-1.25	0.210	-1.388454 .3049978
Pstablity	-1.094878	.3998372	-2.74	0.006	-1.878545 -.3112117
Coruption	-4.135486	1.208785	-3.42	0.001	-6.504661 -1.766311
Upop	-.436666	.131513	-3.32	0.001	-.6944267 -.1789053

Uempt	-.1277164	.1543754	-0.83	0.408	-.4302867 .1748538
Cons	79.68731	8.485296	9.39	0.000	63.05644 96.31818

Table 4.17 socioeconomic determinants of maternal mortality: panel corrected standard error (PCSE) Model Result

Mmrate	coef.	Std. Err.	Z	P>(z)	(95% conf. Interval)
Gdp	-.0183744	.0044218	-4.16	0.000	-.0270409 -.0097079
Ghealth	-3.533575	4.631989	-0.76	0.446	-12.61211 5.544956
Pstablity	-22.28752	6.421547	-3.47	0.001	-34.87352 -9.701519
Corruption	-43.75199	13.02991	-3.36	0.001	-69.29015 -18.21383
Upop	-4.676096	1.133685	-4.12	0.000	-6.898078 -2.454114
Uempt	-2.810701	1.399447	-2.01	0.045	-5.553567 -.0678345
Cons	775.7962	76.02617	10.20	0.000	626.7876 924.8048

4.2.6 Regression Results of Dynamic Panel Model

Among the important features GMM the to eliminate serial correlation and first one is it works hetroskedasity and also used to cover endogenetiy problem.it can be used for time series, panel and cross-section data.it is efficient when we have greater number of cross-section than time series dimension .A reasons why researcher used two step GMM are first it is the augmented two step difference GMM second more robust to one step system GMM and the last it is more efficient and robust to

heteroskedasticity and autocorrelation (roodman,2009)

Table 4.18 socioeconomic determinants of life expectancy: Dynamic panel-data estimation, two-step system GMM Model Result

Lnlifee	coef.	Std. Err.	Z	P>(z)	(95% conf. Interval)
L1	1.091076	.1474386	7.40	0.000	.7923372 1.389815
lngdp	.0326665	.0174967	1.87	0.070	-.0027851 -.0681181
lnghealth	.0048383	.0117126	0.41	0.002	-.0188936 -.0285703
Pstablity	.0043347	.010293	0.42	0.676	-.0165208 .025902
coruption	-.0017097	.0212522	-0.08	0.936	-.0447708 .041315
lnupop	-.1210387	.0652961	-1.85	0.072	-.2533412 .0112639
lnuempt	-.0038529	.0199824	-0.19	0.0048	-.044341 .0366352
Year	-.000291	.0017087	-0.17	0.866	-.0037531 .0031711
_cons|	.4300626	2.903875	0.15	0.883	-5.453746 6.313871

Table4.19 socioeconomic determinants of infant mortality : Dynamic panel-data estimation, two-step system GMM Model Result

Immrate	coef.	Std. Err.	Z	P>(z)	(95% conf. Interval)
Gdp	-.0006742	.0004592	-1.47	0.142	-.0015742 .0002259
Ghealth	-.5417284	.4320111	-1.25	0.210	-1.388454 .3049978
Pstablity	-1.094878	.3998372	-2.74	0.006	-1.878545 -.3112117
coruption	-4.135486	1.208785	-3.42	0.001	-6.504661 -1.766311
Upop	-.436666	.131513	-3.32	0.001	-.6944267 -.1789053
Uempt	-.1277164	.1543754	-0.83	0.408	-.4302867 .1748538
Cons	79.68731	8.485296	9.39	0.000	63.05644 96.31818

Table4.20 socioeconomic determinants of maternal mortality: Dynamic panel-data estimation, two-step system GMM Model Result

lnmmrate	coef.	Std. Err.	Z	P>(z)	(95% conf. Interval)
Lnmmrate L1.	-.0560446	.0062344	-8.99	0.000	-.069261 -.0428283
lngdp	-.3434851	.0080612	-42.61	0.000	-.3605741 -.3263961
lnghealth	-.0817231	.0385392	-2.12	0.050	-.1634225 -.0000237
pstablity	-.1175773	.0116637	-10.08	0.001	-.1423034 -.0928513

coruption	-.3138676	.0399415	-7.86	0.000	-.3985397 -.2291955
lnupop	.0215552	.0178933	1.20	0.246	-.016377 .0594873
lnuempt	.1243133	.0111903	11.11	0.000	.1005909 .1480356
year	.0042034	.0000459	91.57	0.000	.0041061 .0043008

4.2.6 Post estimation Tests Of Two Step System GMM Model

In this section we are going to present the0 necessary tests associated with two step system GMM method. These include autocorrelation and instrument validity tests.

Table 21 Autocorrelation Test for 2 Step SGMM Estimation

Table4.21 Autocorrelation Test for 2 Step SGMM Estimation

Model	Pr >z (AR1)	Pr >z (AR2)
life expectancy (AR1,AR2)	0.992	0.541
infant mortality(AR1,AR2)	0.258	0.168
maternal mortality(AR1,AR2)	0.228	0.467

table 21 implied that our two step system GMM free from first and second order autocorrelation problem Statistically speaking you are correct we cannot reject the null-hypothesis at 5%.

Table4.22 Sargan and Hansen Validity Test For 2 Step SGMM Estimation

Model	sargan test	Hansen test
	Prob > chi2	Prob > chi2
life expectancy (AR1,AR2)	0.987	0.986
infant mortality(AR1,AR2)	0.931	0.876
maternal mortality(AR1,AR2)	0.347	0.792

From table 4.22 above according to sargan and Hansen instrument validity test our instruments are valid. Sargan test has a null hypothesis (H0: over identifying restrictions are valid The null hypothesis of the test implies all instruments are valid p value greater than 5% (0.05) implies, we accept the Ho, that is all instruments are valid .Sargan p-value must not be less < 5%. The higher the p-value of the sargan statistic the better According to Roodman (2006). So, for our case the above results with p-values indicate the group of instruments used in the analysis are valid.

GDP was expected to have an impact on life expected life outcome. and found to be positive impact. From our PCSE model regression result we find , GDP has significant impact on expected life outcome as our result revealed other things remain constant 1 unit increase in real GDP leads to on average of 0.0031year increase in life expectancy under the period taken to account in sub Saharan. This indicates as ones Sub Saharan country (from the study) increases its gross domestic products the life expectation for the citizen will be effected positively. Maternal mortality and infant mortality are negatively related (as our results revealed). Keeping other factors constant, When GDP increase by 1 unit infant mortality decrease by -.0006742 similarly maternal mortality decreases by -0.0183744.which indicates when a country starts to grow economically gdp will lower an infant mortality by 0.0183744 per 1000. Moussa Keita, 2013obtained a similar estimation outcome similarly

(Kavitha.S.V,2017) has found negative relationship between GDP and maternal mortality. by analyzing panel data collected from countries observed every 10 years, from 1960 to 1990. Bloom et al. (2004) find the correlation between health and economic growth to be statistically significant and positive.

The variable government health expenditure impact on the three health outcomes proxies is insignificant (from the result) as it is expected in the hypothesis section. This implies that sub Saharan country spending on the health sector does not affect or the effect can be negligible. it is may be due to For the following reasons, a theoretical link between health systems, which is commonly proxies by government health spending, and health outcomes is complex. First, it might be that sub Saharan countries' government does not perform well in expenditure evaluation with results if there is a functional private health-care market, a rise in government health-care spending may "crowd out" private health-care expenditures, i.e., when the government increases health-care spending, households transfer their resources to other purposes. Second, public resources may be inefficiently utilized. In underdeveloped countries, for example, doctors and nurses frequently fail to show up for work at health institutions, equipment sits idle due to a lack of critical parts, and pharmaceuticals funded by the central government may not be distributed efficiently and accordingly in need of a place (Lewis, 2006). Third, even if government funding is used wisely, supporting services such as water, sanitation, transportation, and communication infrastructure may be absent or inadequate, resulting in little or no improvement to people's health.

by contrasting with our result; Williams, Atun and their friends have shown that an annual 1% reduction in government healthcare spending is associated with statistically and clinically significant increases in maternal mortality in the EU(Maruthappu et al., 2015).

As in hypothesis section stated political stability and citizens of the countries' life expectancy are proportionate. The estimated coefficient for the political stability is found to have a high and statistically significant effect on life expectancy for the sample SS countries under the period take into consideration. When Political stability index increase in 1 unit means when it changed from unstable condition to more stable condition other things remain constant life expectancy increase by 0.922. And

depending on previous studies of the researcher result it was expected infant mortality and maternal mortality were expected to ha have negative relation with political stability. infant mortality decrease by -1.094878 as the same time maternal mortality decrease by -22. stern and his colleagues also found inverse association between political stability and neonatal mortality (r ¼ -0.55).(Stern et al., 2003)

Improvements in life expectancy between 6 and 9 months are associated with agricultural production, political stability, access to clean water and sanitation, good governance, and primary school enrolment.

Corruption control effect as the finding shows affects life expectancy highly which is From our corruption control case we find that on average when corruption control index increase by 1 unit (which in turn lessen corruption) life expectancy will increase by 5.376967year. Corruption in SS countries is a highly concerning issue as it (corruption) happens in most of governmental institution. A one unit Corruption control index increments will cause infant mortality decrease by -4.135486 in the same manner maternal mortality decrease by -43.75199 at 1% statistical significant level. Hanf et al. (2011) examine the relationship between corruption and child mortality across a one-year period on a global scale. Their findings suggest that corruption may account for 1.6 percent of global child mortality, although they express concern that the model may understate the effect.

Witvliet et al. (2013) use survey data to assess the effect of corruption on the general health of adults in 20 African nations, in relation to age, sex, and socioeconomic position, in a paper that is comparable to ours. In all groups, they discovered a link between poor health and corruption.

This may due to Projects aiming at improving general health may have a reduced impact if corrupt officials steal from the health fund. If bribes are paid in the public health sector, the poorest members of the population may be denied access to inexpensive health care, which has a negative impact on the country's public health by making the service less effective (Savedoff & Hussmann, 2006). The wealthy benefit through corrupted systems, while the poor are exploited (You & Khagram, 2004).

Urban in its definition is a city surrounded by dens population and infrastructure

When the percentage of urban population increases by 1 percent unit life expectancy increase by 0.147years while infant and maternal mortality decrease by -0.436666 and -4.676096 respectively. As our results revealed other things remain constant when unemployment increases by 1 percent life expectancy decreases by 0. 458years. Unemployment for a country decreases the benefit that a country should get while unemployment has not significant impact on Infant mortality. According to Fred C.Pampel,Jr the mortality rate is affected more by urbanization, hospital beds, public welfare spending, and ethnic variety. similarly 103 Fred C. Pampel, Jr found a result which implies reduce infant mortality-the former primarily through neonatal mortality .These findings imply that rural areas disadvantage in infant survival when compared to more urbanized areas.

When unemployment increase by 1 percent maternal mortality also increase by 2.810701.our result is supported by Singh & Siahpush, Life expectancy was inversely related to unemployment levels in all time periods similar to us (Singh & Siahpush, 2016) found areas with high unemployment rates had a lower life expectancy . According to Life expectancy varied substantially by time period, sex, and unemployment level, ranging from 69.5 years for men in high unemployment areas in 1990–1992 to 82.7 years for women in low unemployment areas in 2010(Singh & Siahpush, 2016). Two mechanisms were forwarded by Pekka to explain un employment is cause for higher mortality and lower life expectancy excess mortality.
(1) *Causal effects of unemployment*: Becoming jobless and prolonged redundancy have negative
effects on health and increase the risk of premature death. The causal effects of unemployment are
mainly assumed to be mediated through increased psychosocial stress, tobacco and alcohol
consumption, as well as loss of income and material deprivation.

(2) *Selection*: Persons likely to become unemployed, or to have difficulty in re-employment, have
pre-existing ill-health and/or "lifestyle" (e.g. tobacco and alcohol consumption, diet), socioeconomic (e.g. social class, housing tenure) or personal characteristics (e.g. age, sex, physical weakness, psychological characteristics, and early life experiences) that

increase the risk of future ill-health and mortality.

Chapter five

5.1 Conclusion and policy recommendation

This paper scrutinized the impact of socioeconomic factors and health system components
on child health outcomes by applying estimation methods which treat with the endogenous
nature of those variables. The researcher used fixed panel by employing Hausman test, panel corrected standard error test and system GMM to estimate the determinants of health outcomes with a cross-country panel dataset from 38 sub-Saharan countries from 2000 to 2017. The findings imply that enhanced life expectancy in these countries is dependent on GDP, political stability, the percentage of urban population, and corruption control. Furthermore, GDP, political stability, percentage of urban population, and corruption control are all important factors in lowering newborn and maternal death rates in these countries. In this and earlier research, one of the key factors of LE was urbanization. It has long been believed that people living in urban areas have greater access to hospital treatment options and health information. General government health expenditure was expected to have a favorable impact on health status in the current study; however, this was not confirmed, and the data revealed no significant association between general government health expenditure and health outcomes. The results presented in this study indicate a continuous decline in infant and maternal mortality in a majority of countries in sub-Saharan Africa over the past two decades. On the other hand with the selected sub-Saharan countries life expectancy has an increasing trend for the previous 17 years. A large part of this improvement can be explained by coverage of selected maternal, newborn, and child health interventions and other relative improvements in social and economic factors like, annual per capita income, effective governance and urbanization in sub-Saharan Africa.

The study's key finding is that economic stabilization initiatives, such as raising

productivity, economic growth, and lowering unemployment, have a significant impact on the region's health results.

5.2 Policy Recommendations

To improve population health outcomes, the findings call for effective policies to reduce unemployment, increase GDP, promote political stability, and control the occurrence of corruption. As a result, policymakers must implement policies that will help to reduce the country's growing unemployment rate. It implies that lowering the unemployment rate can enhance the health of many people in the country. finally the author want to say state sponsored researches should be investigate in sub Saharan region in order to find different determinants of health outcomes in the region government and nongovernmental organizations and also scholars should give great attention for SSA region.

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Appendix

APPENDEX A1 list of countries

The 38 countries selected are

Angola,

Benin, Botswana,

Burkina Faso, Burundi, Cameroon,

Cape Verde, Central African Equatorial Guinea,

Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau,

Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia,

Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Sierra Leona, Republic,

Chad, Comoros, Congo, D.R. Congo, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

Appendix A.2: Correlation matrix among variables in life expectancy model

	lifee	gdp	ghealth	pstabl~y	corupt~n	upop	uempt
lifee	1.0000						
gdp	0.1856	1.0000					
ghealth	-0.0380	0.1478	1.0000				
pstablity	0.1812	0.3643	0.3292	1.0000			
coruption	0.2245	0.1514	0.6231	0.6107	1.0000		
upop	0.2879	0.6241	-0.0194	0.3291	0.0782	1.0000	
uempt	-0.1059	0.4469	0.6133	0.3815	0.5297	0.3482	1.0000

. vif

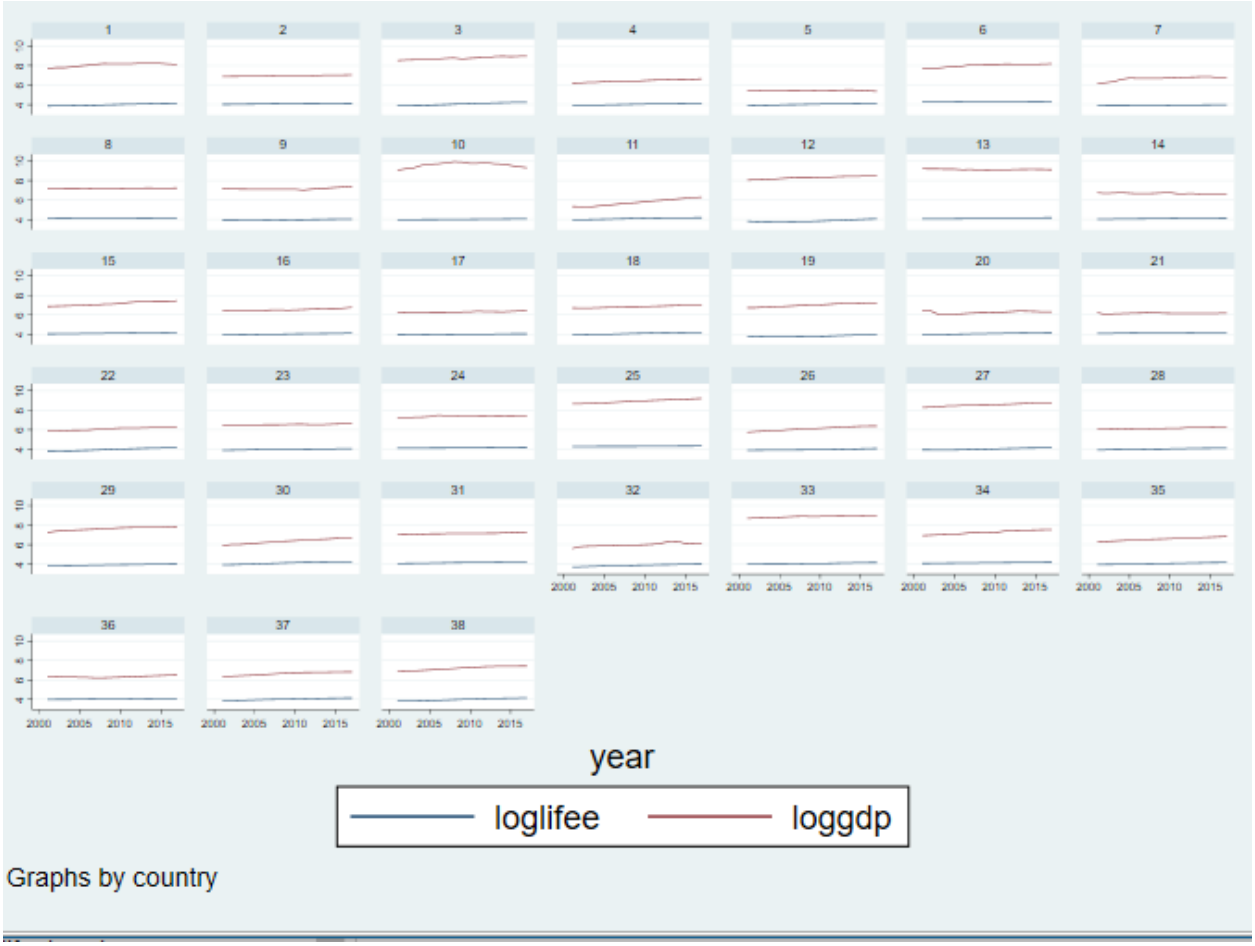
Variable	VIF	1/VIF
coruption	2.51	0.398405
uempt	2.27	0.440968
ghealth	2.18	0.458028
pstablity	1.91	0.524451
gdp	1.89	0.528140
upop	1.84	0.542118
Mean VIF	2.10	

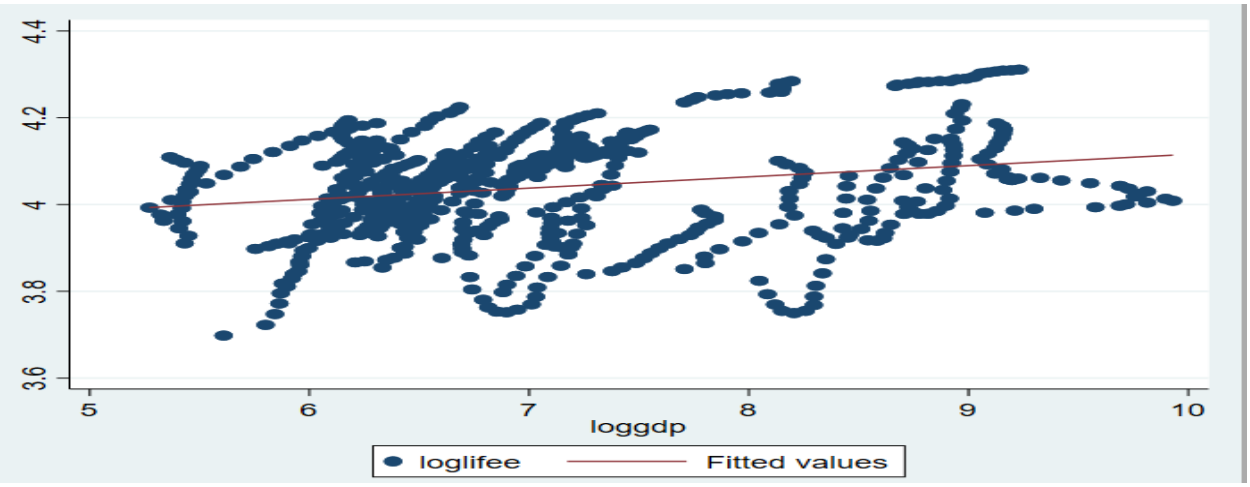
```
. xtserial lifee gdp ghealth pstablity coruption upop uempt

Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,       37) =     141.186
           Prob > F =      0.0000
```

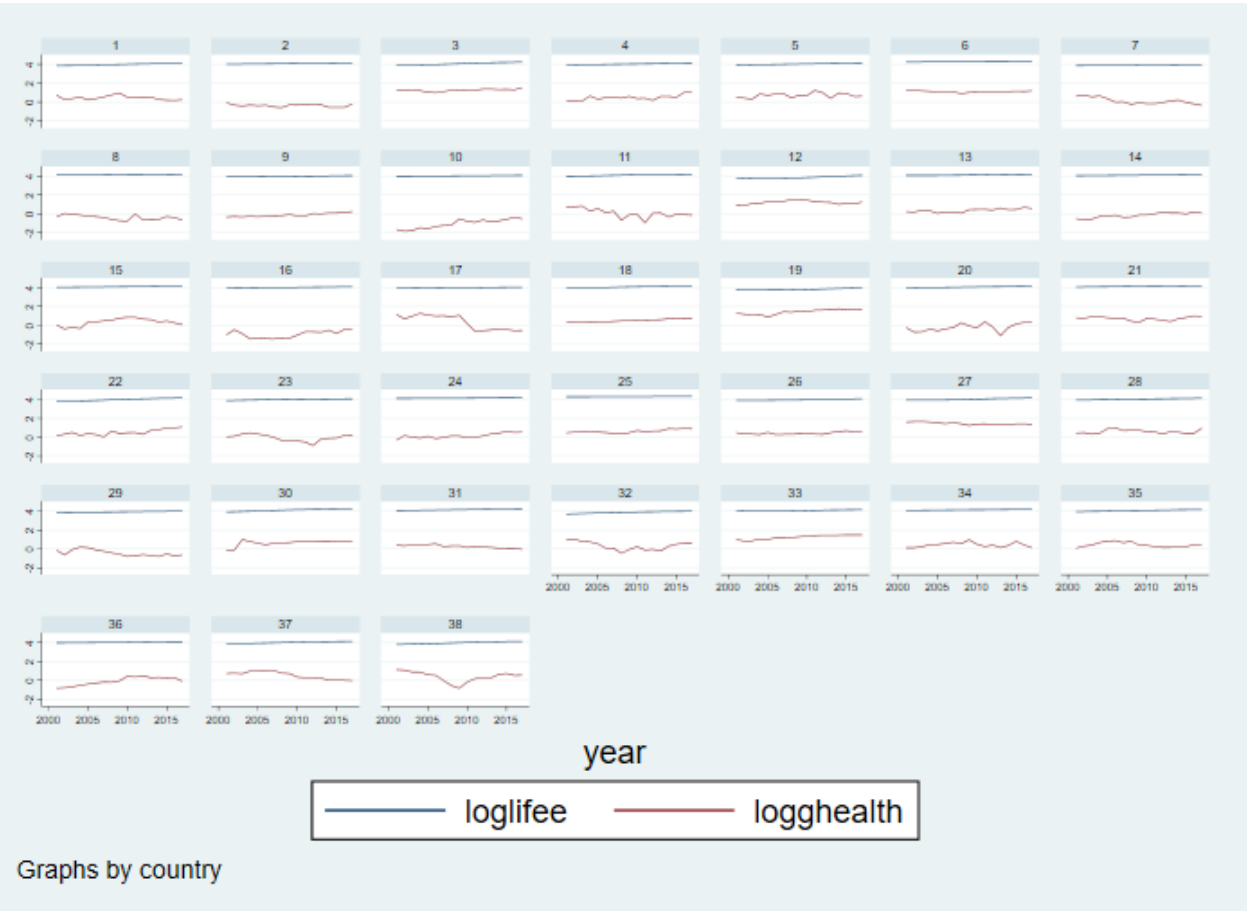
Appendix A.3: Graphical Relationship Between life expectancy and its explanatories

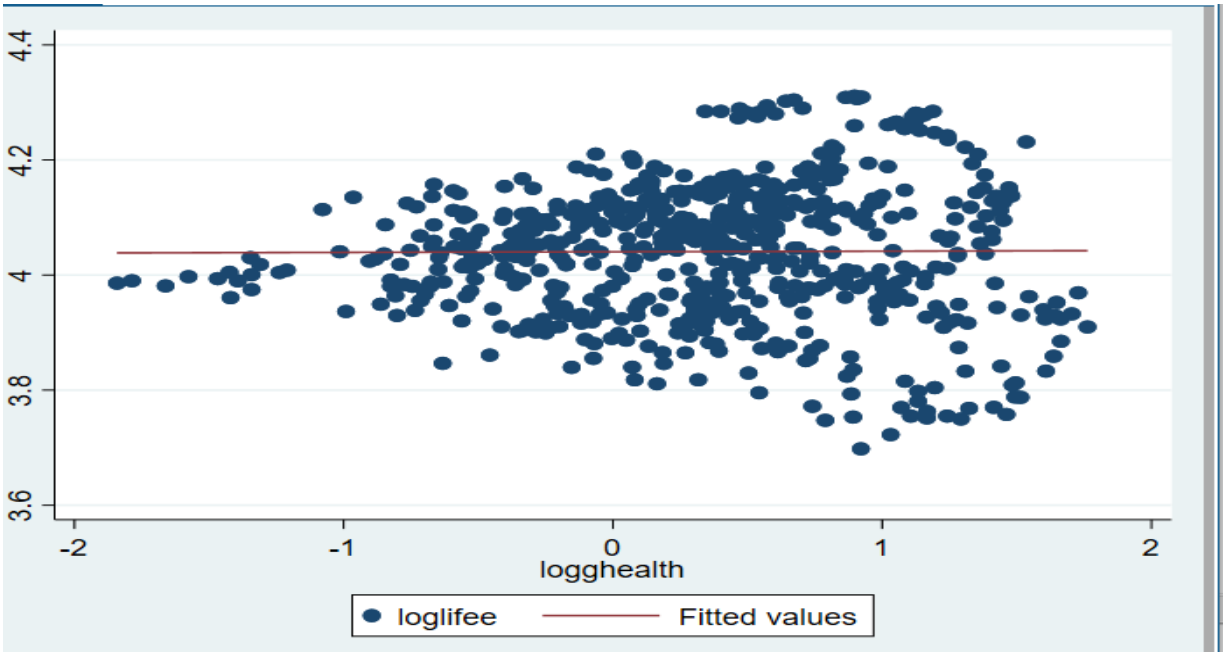
A. Log of life expectancy vs Log gross domestic product



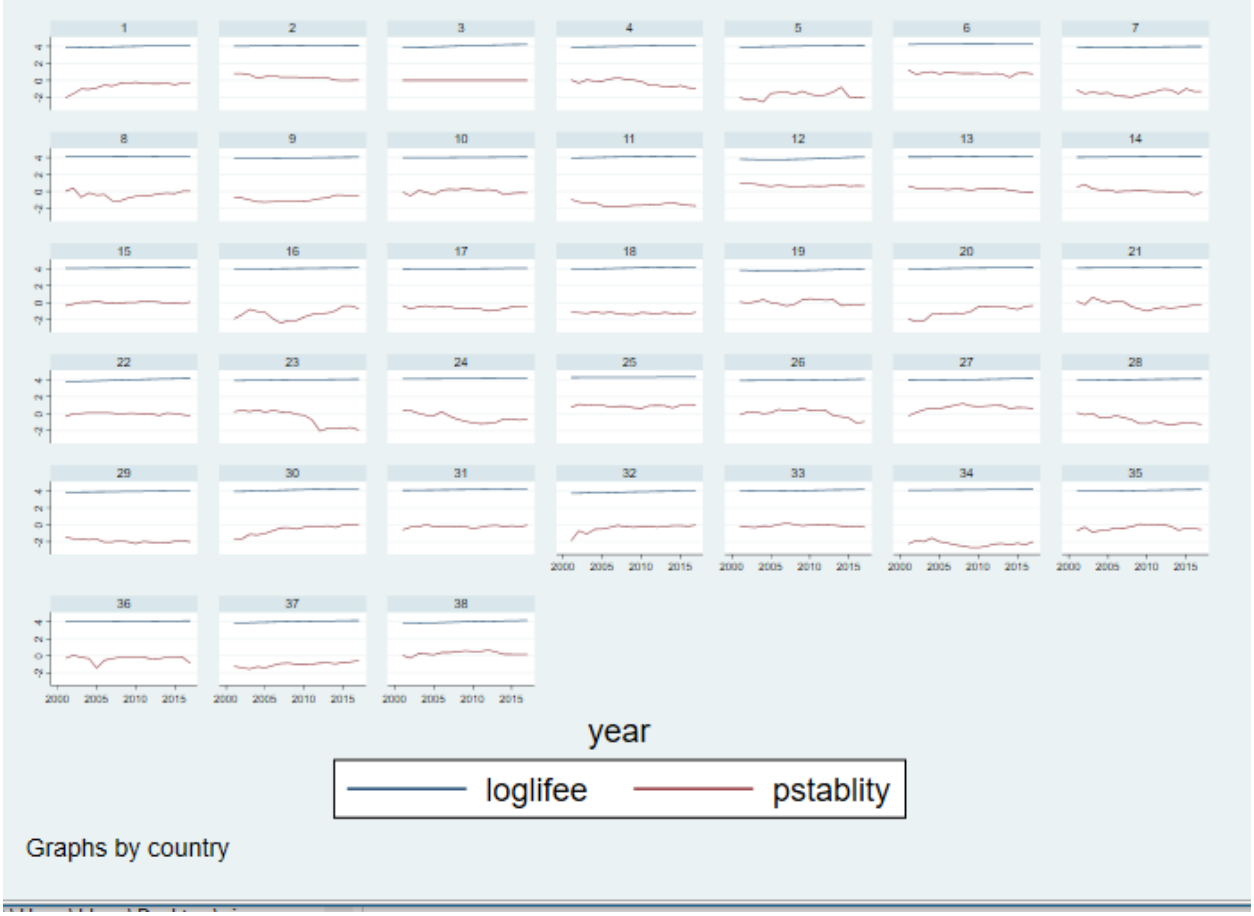


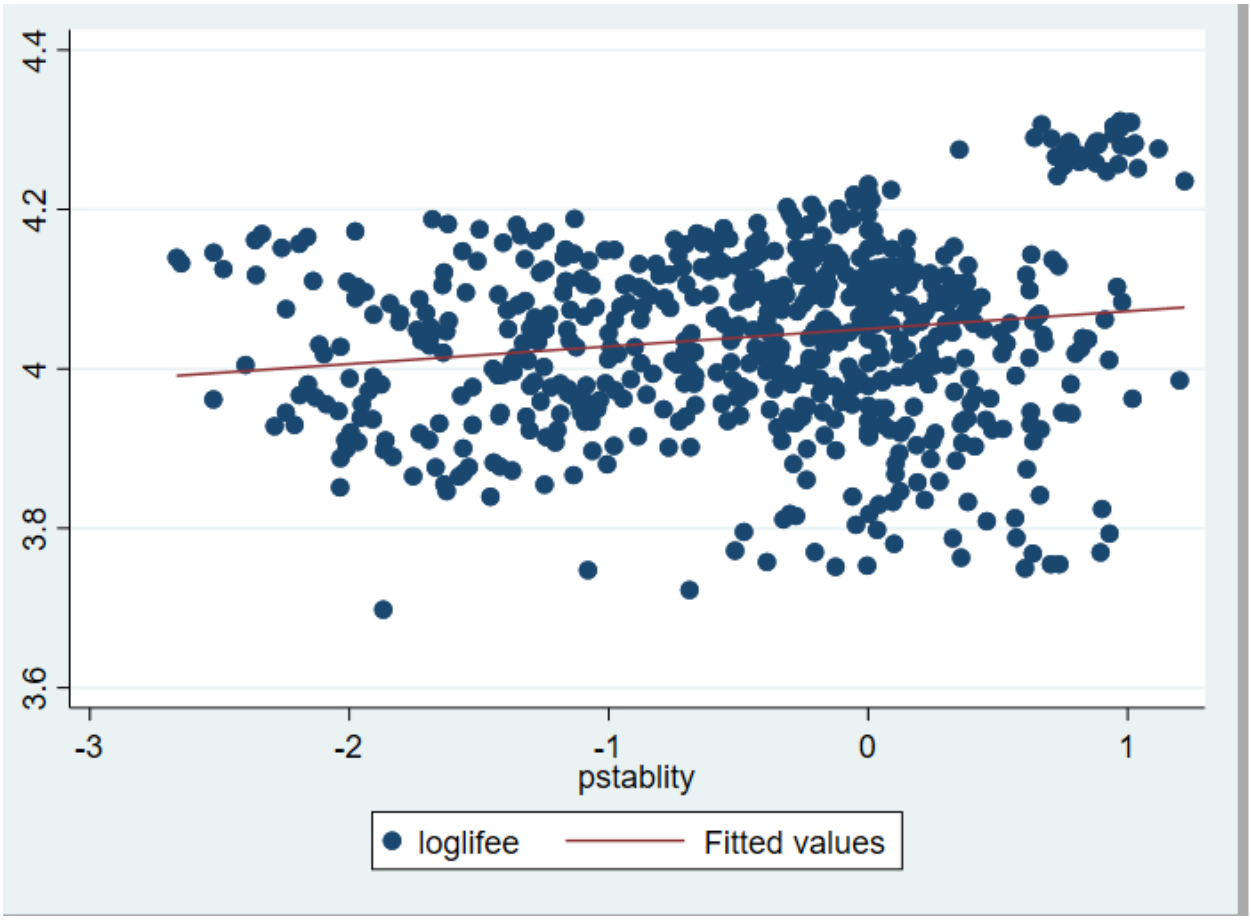
B. Log of life expectancy vs Log of government health expenditure



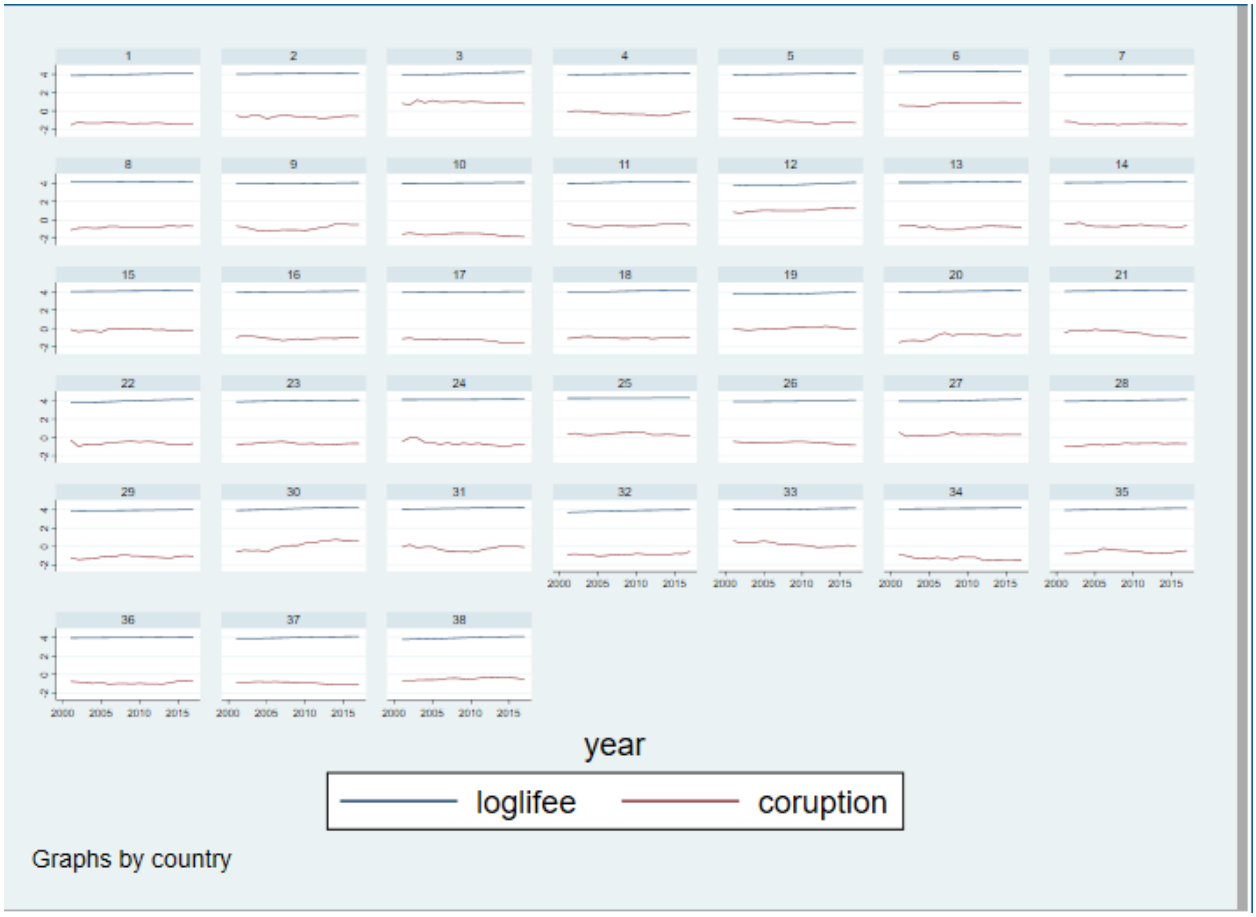


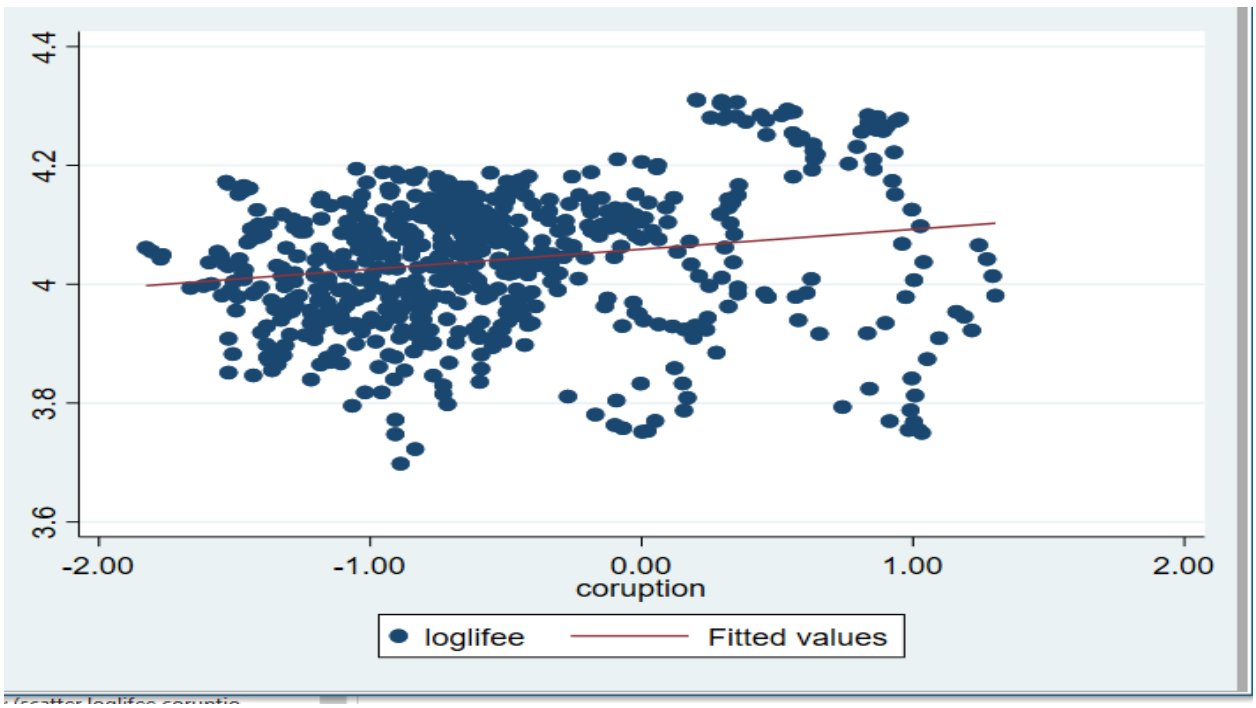
C. Log of life expectancy vs political stability



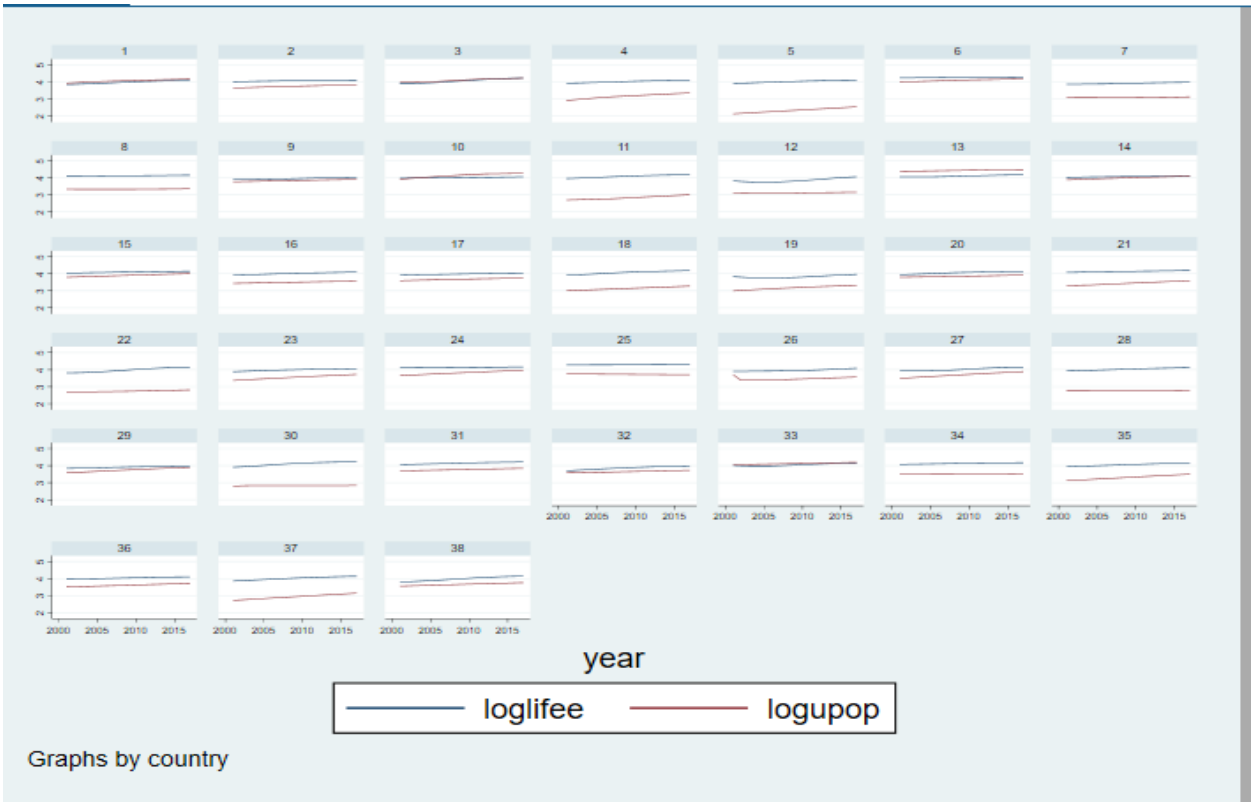


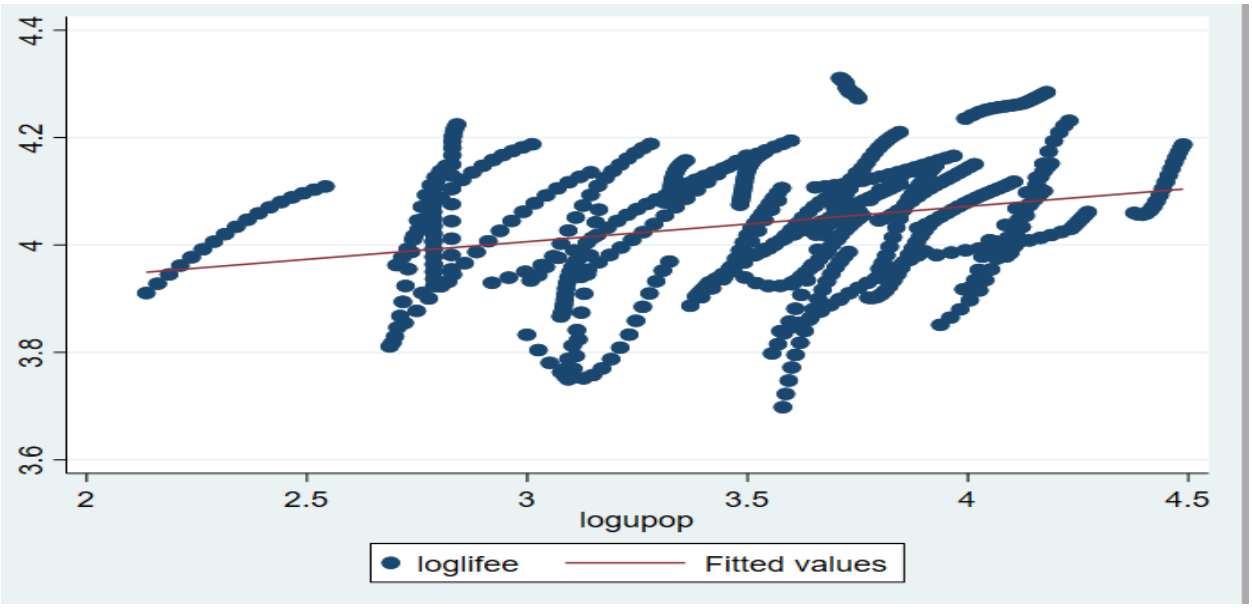
D. Log of life expectancy vs coruption control


year
loglifee
coruption
Graphs by country


4.4
4.2
4
3.8
3.6
-2.00
-1.00
0.00
1.00
2.00
coruption
loglifee
Fitted values

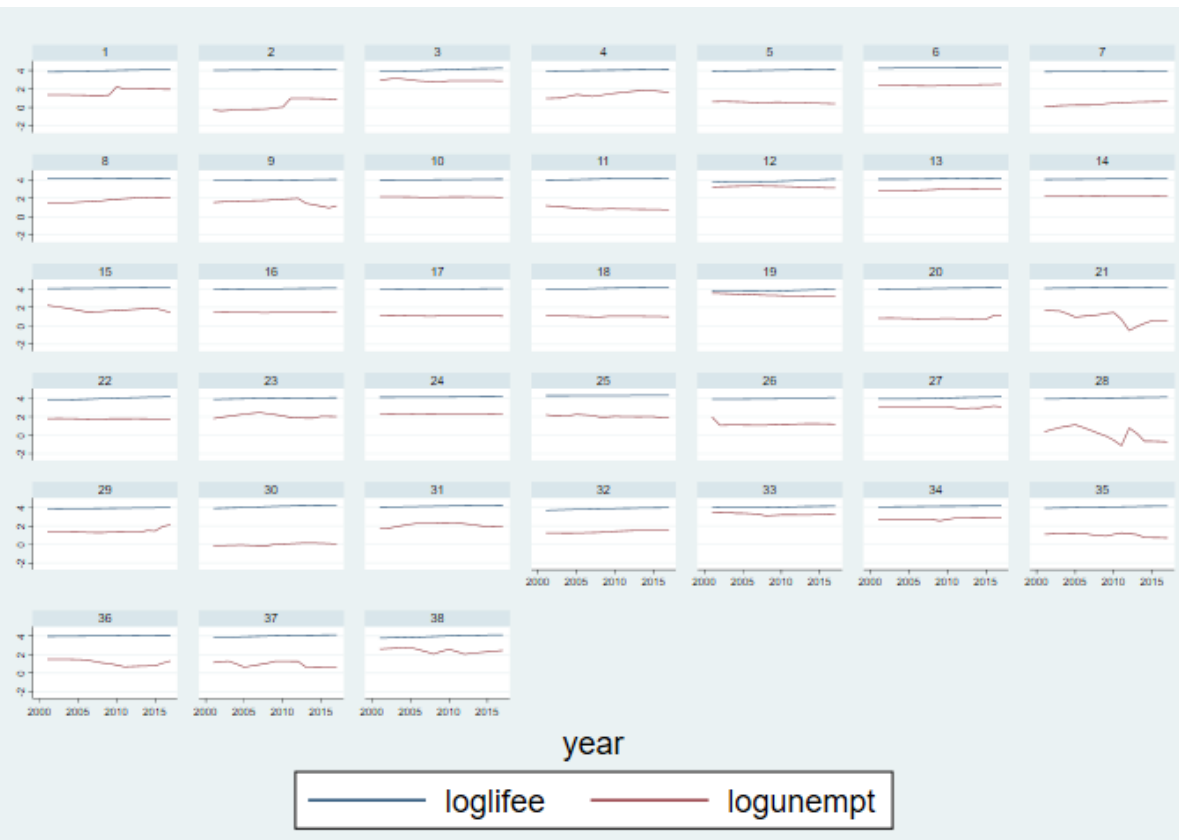
F. Log of life expectancy vs log of urban population



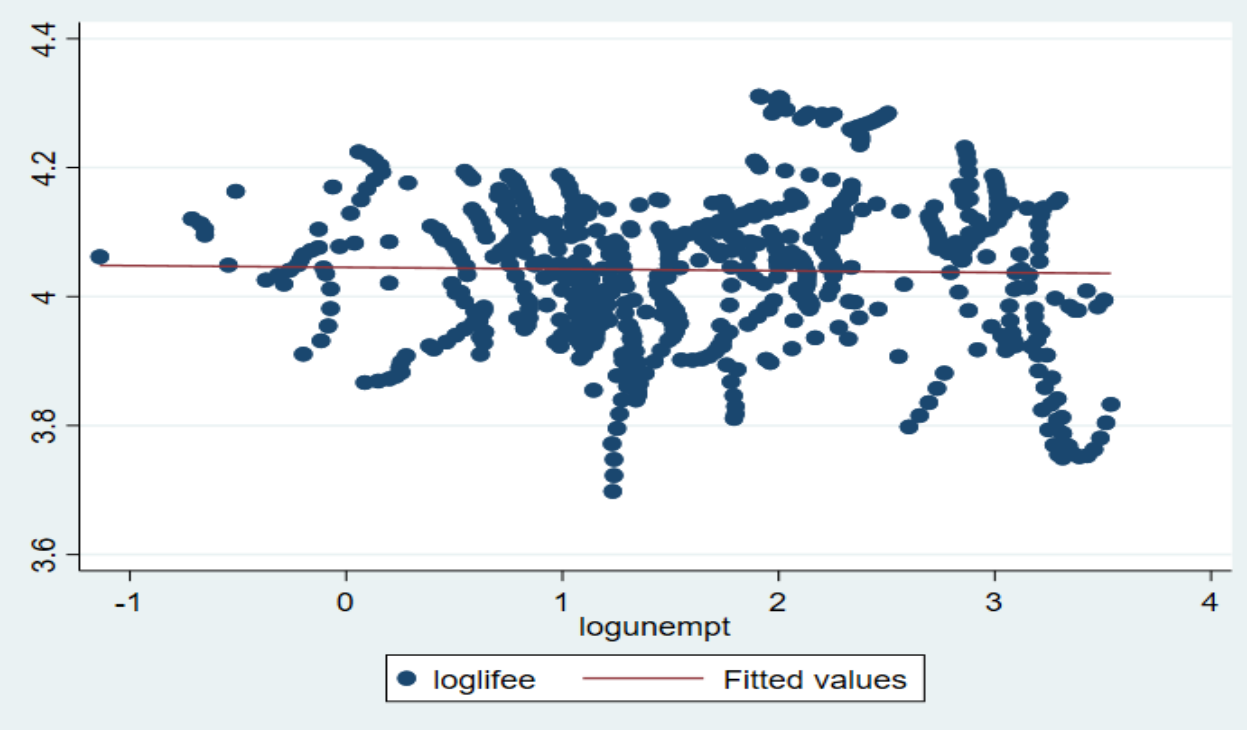


C. Log of life expectancy vs log unemployment

Graphs by country



Graphs by country



APPENDIX B.1 RANDOM EFFECT RESULT

```
. xtreg lifee gdp ghealth pstablity coruption upop uempt,re

Random-effects GLS regression                   Number of obs      =       646
Group variable: country                         Number of groups   =        38

R-sq:                                           Obs per group:
     within  = 0.5385                                         min =        17
     between = 0.1413                                         avg =      17.0
     overall = 0.1511                                         max =        17

                                                Wald chi2(6)       =    472.96
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

lifee	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gdp	-.000174	.0001634	-1.07	0.287	-.0004943	.0001462
ghealth	.033274	.2263209	0.15	0.883	-.4103068	.4768548
pstablity	.5957806	.3171245	1.88	0.060	-.025772	1.217333
coruption	2.753597	.6053137	4.55	0.000	1.567205	3.93999
upop	.6677676	.0354724	18.83	0.000	.598243	.7372922
uempt	-.4864081	.0691441	-7.03	0.000	-.621928	-.3508881
_cons	38.09923	1.641664	23.21	0.000	34.88163	41.31684
sigma_u	4.7831803					
sigma_e	2.5021327					
rho	.78514827	(fraction of variance due to u_i)				

APPENDIX B .2 FIXED EFFECT RESULT

```
. xtreg lifee gdp ghealth pstablity coruption upop uempt,fe

Fixed-effects (within) regression               Number of obs      =       646
Group variable: country                         Number of groups   =        38

R-sq:                                           Obs per group:
     within  = 0.5568                                         min =        17
     between = 0.1103                                         avg =      17.0
     overall = 0.1203                                         max =        17

                                                F(6,602)           =    126.05
corr(u_i, Xb)  = -0.9134                        Prob > F           =    0.0000
```

lifee	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp	-.0000984	.0001629	-0.60	0.546	-.0004184	.0002216
ghealth	-.0759617	.2084955	-0.36	0.716	-.4854286	.3335051
pstablity	1.003117	.2881644	3.48	0.001	.4371876	1.569047
coruption	2.862498	.5796747	4.94	0.000	1.724068	4.000929
upop	.9288365	.0376264	24.69	0.000	.8549416	1.002731
uempt	-.3079281	.076557	-4.02	0.000	-.4582793	-.1575769
_cons	27.05465	1.550797	17.45	0.000	24.00902	30.10028
sigma_u	14.021131					
sigma_e	2.5021327					
rho	.96913689	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(37, 602) = 67.92                     Prob > F = 0.0000
```

APPENDIX B.3. 1REGRESSION RESULT OF PCSE LIFE EXPECTANCY MODEL

```
. xtpcse lifee gdp ghealth pstablity coruption upop uempt

Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable:   country                       Number of obs     =       646
Time variable:    year                          Number of groups  =        38
Panels:           correlated (balanced)         Obs per group:
Autocorrelation:  no autocorrelation                          min =        17
                                                              avg =        17
                                                              max =        17
Estimated covariances      =       741          R-squared         =    0.2933
Estimated autocorrelations =         0          Wald chi2(6)      =    970.71
Estimated coefficients     =         7          Prob > chi2       =    0.0000
```

lifee	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gdp	.0003201	.000033	9.70	0.000	.0002554	.0003848
ghealth	-.1676904	.2177816	-0.77	0.441	-.5945346	.2591537
pstablity	-.9313152	.2588316	-3.60	0.000	-1.438616	-.4240145
coruption	5.385815	.3296327	16.34	0.000	4.739747	6.031883
upop	.1472166	.0134738	10.93	0.000	.1208085	.1736247
uempt	-.4586557	.0248944	-18.42	0.000	-.5074478	-.4098635
_cons	57.4917	.9359306	61.43	0.000	55.65731	59.32609

APPENDIX B.4. 2 REGRESSION RESULT OF PCSE INFANT MORTALITY MODEL

```
. xtpcse imrate gdp ghealth pstablity coruption upop uempt

Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable:   country                     Number of obs     =        646
Time variable:    year                        Number of groups  =         38
Panels:           correlated (balanced)       Obs per group:
Autocorrelation:  no autocorrelation                        min =         17
                                                            avg =         17
                                                            max =         17
Estimated covariances      =       741        R-squared         =     0.3540
Estimated autocorrelations =         0        Wald chi2(6)      =     875.06
Estimated coefficients     =         7        Prob > chi2       =     0.0000

------------------------------------------------------------------------------
             |             Panel-corrected
      imrate |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         gdp |  -.0010912   .0001351    -8.08   0.000    -.0013559   -.0008264
    ghealth |  -2.027385    .626552    -3.24   0.001    -3.255404   -.7993652
   pstablity |   1.791249   .6379418     2.81   0.005     .5409057    3.041592
   coruption |  -19.84665   1.572378   -12.62   0.000    -22.92845   -16.76485
        upop |  -.2305573   .0369796    -6.23   0.000     -.303036   -.1580787
       uempt |   .4769581     .08136     5.86   0.000     .3174955    .6364207
       _cons |   61.86129   2.696302    22.94   0.000     56.57664    67.14594
------------------------------------------------------------------------------
```

APPENDIX C . REGRESSION RESULT OF PCSE MATERNAL MORTALITY MODEL

```
. xtpcse mmrate gdp ghealth pstablity coruption upop uempt

Linear regression, correlated panels corrected standard errors (PCSEs)

Group variable:    country                     Number of obs      =       646
Time variable:     year                        Number of groups   =        38
Panels:            correlated (balanced)       Obs per group:
Autocorrelation:   no autocorrelation                        min =        17
                                                             avg =        17
                                                             max =        17
Estimated covariances      =       741         R-squared          =    0.3775
Estimated autocorrelations =         0         Wald chi2(6)       =    474.61
Estimated coefficients     =         7         Prob > chi2        =    0.0000
```

mmrate	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gdp	-.0315544	.0023884	-13.21	0.000	-.0362355	-.0268732
ghealth	-5.433153	10.02295	-0.54	0.588	-25.07777	14.21147
pstablity	-54.10177	5.887875	-9.19	0.000	-65.6418	-42.56175
coruption	-166.1393	13.83285	-12.01	0.000	-193.2512	-139.0274
upop	-1.202869	.3585979	-3.35	0.001	-1.905708	-.5000301
uempt	2.481263	.8851643	2.80	0.005	.7463729	4.216153
_cons	544.7963	28.6254	19.03	0.000	488.6916	600.9011

a

APPENDENX D Postestimaton Tests of Dynamic Panel Model

A.postestimation test of gmm for life expectancy model

```
Instruments for orthogonal deviations equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/16).L.lifee collapsed
Instruments for levels equation
  Standard
    lngdp lnghealth lnupop lnuempt year
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.lifee collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -0.01  Pr > z =  0.992
Arellano-Bond test for AR(2) in first differences: z =   0.61  Pr > z =  0.541
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(13)   =   4.35  Prob > chi2 =  0.987
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(13)   =   4.40  Prob > chi2 =  0.986
  (Robust, but weakened by many instruments.)
```

B.postestimation test of gmm for maternal mortality model

```
Instruments for orthogonal deviations equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/16).L.lnmmrate collapsed
Instruments for levels equation
  Standard
    lngdp lnghealth lnupop lnuempt year
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L.lnmmrate collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.21  Pr > z =  0.228
Arellano-Bond test for AR(2) in first differences: z =   0.73  Pr > z =  0.467
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(13)   =  14.38  Prob > chi2 =  0.347
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(13)   =   8.75  Prob > chi2 =  0.792
  (Robust, but weakened by many instruments.)
```

C.postestimation test of gmm for infant mortality model

```
Instruments for orthogonal deviations equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/16).L2.imrate collapsed
Instruments for levels equation
  Standard
    lngdp lnghealth lnupop lnuempt year
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.L2.imrate collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.13  Pr > z =  0.258
Arellano-Bond test for AR(2) in first differences: z =  -1.38  Pr > z =  0.168
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(12)   =   5.69  Prob > chi2 =  0.931
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(12)   =   6.72  Prob > chi2 =  0.876
  (Robust, but weakened by many instruments.)
```