EFFECT OF MACROECONOMIC VARIABLES ON PUBLIC HEALTH EXPENDITURE IN KENYA

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DECLARATION

Declaration by the Candidate

This thesis is my original work and has never been presented for the award of an academic degree in any university and should not be copied, or reproduced in any format without written authority from the author and/or University of Eldoret.

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Approval by the Supervisors

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I dedicate this thesis to my family for their moral and financial support. This thesis would not have been complete without the greatest academic support from my father Dr. Ibrahim Nyaboga and the constant encouragement from all my good friends.

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ABSTRACT

Health spending is a major concern in low- and middle-income countries because of the less finances allocated in the health sector. One of the main goals of the Kenyan government's "big four" development strategy, which is scheduled for completion by 2022 and was achieved in some few counties in 2023 is universal health care. Health has consistently been prioritized over time and has occupied a central position in political campaign platforms. The government has consistently spent huge amount of money into the health sector. In Kenya, majority of people depend on public insurance and only a very small portion of Kenyans can afford to have access to the private insurance and out of pocket payment, this has led to increased level of poverty and higher dependency ratio. Despite all these efforts, Kenya still has challenges in the allocation of public health expenditure. The purpose of this study was to ascertain how macroeconomic factors affected Kenya's public health spending. This study aimed to establish effects of GDP per capita, corruption, unemployment fiscal deficit and tax revenue on public health expenditure in Kenya. The key theoretical anchors of the study are Public Expenditure theory and Wagner's theory. Explanatory research design was used. Secondary data from the Kenya National Bureau of statistics (KNBS) was used with annual time series data spanning from 1990 to 2023. The data was subjected to stationarity test using Augmented Dickey Fuller (ADF) test, Phillips and Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) for unit root test. The study employed Autoregressive Distributed Lag model (ARDL) to evaluate the relationship among the variables. The long run ARDL analysis revealed that the coefficients of; corruption -2.231 (p-value 0.002<0.05), per capita gross domestic product 0.001(p-value 0.02<0.05), tax revenue 0.075(p-value 0.025<0.05), and unemployment 0.227(p-value 0.03<0.05) significantly affected public health expenditure in Kenya. However, the fiscal deficit was found to be insignificant in the long run 0.008(p-value 0.914>0.05). To ensure prudent public health expenditure in Kenya, the study recommends strengthening anti-corruption laws, maintaining fiscal discipline through effective budgeting, promoting per-capita economic growth by boosting productivity and investments. Optimizing tax revenue through efficient policies and broadening the tax base is vital to fund public services. Addressing unemployment by creating jobs and investing in education is crucial for effective use of the labor force.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

OPERATIONAL DEFINITION OF TERMS

Corruption – It refers to a form of dishonesty or a criminal offense which is undertaken by a person or an organization which is entrusted in a position of authority, in order to acquire illicit benefits or abuse power for one's personal gain.

Fiscal deficit –is the sum of domestic debt and external debt.

GDP per capita – It refers to a measure that calculates the country's economic output that accounts for the number of people in the country or the country's population. The country's GDP is divided by its entire population to get GDP per capita. GDP per capita is calculated by dividing the total gross value added by all resident producers in the economy by the mid-year population.

Unemployment- Refers when people who want to do work and are actively seeking jobs but cannot find employment. People above a certain age who are not paid or self-employed but are still seeking for a job during a reference period are considered unemployed.

Tax revenue –It refers to the income that is collected by governments through taxation. Taxation is the primary source of government revenue. Revenue may be extracted from sources such as individuals, public enterprises, trade, and royalties on natural resources or foreign aid.

LIST OF ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey Fuller
AIC	Aikaike Information Criteria
ARDL	Autoregressive Distributed Lag
CHE	Current Health Expenditure
EACC	Ethics and Anti-Corruption Commission
GDP	Gross Domestic Product
GHED	Global Health Expenditure Database
GOK	Government of Kenya
HQIC	Hannan-Quinn Information Criterion
KHHEUS	Kenya Household Health Expenditure and Utilization Survey
KNBS	Kenya National Bureau of Statistics
KPSS	Kwiatkowski–Phillips–Schmidt–Shin
KES	Kenyan Shillings
LMICs	Low-and Middle-Income Countries
LR	Likelihood Ratio
MOH	Ministry of Health

NACOSTI	National Commission for Science, Technology and Innovation
NHIF	National Health and Insurance Fund
OECD	Organization for Economic Co-operation and Development
OOP	Out Of Pocket
PHE	Public Health Expenditure
PP	Phillips and Perron
SAPs	Structural Adjustment Programmes
SBIC	Schwarz Information Criterion
SDG	Sustainable Development Goals
THE	Total Health Expenditure
UHC	Universal Health Coverage
USD	United States dollar
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter presents the background information to the study, statement of the problem, the objectives, research hypothesis, scope of the study, its significance to the study and the limitations of the study.

1.2 Background Information to the Study

The background information has been classified into; Global perspective of Public Health Expenditure, Africa overview and lastly Public Health Expenditure in Kenya.

1.2.1 Global Public Health Expenditure Overview

According to the World Health Organization (WHO) report, there is still a significant disparity in health spending across the globe, with over 80% of people living in low- and middle-income countries while only making up 20% of global health spending. Low- and middle-income countries (LMICs) have significant obstacles in attaining Universal Health Coverage due to allocation of less health financing. This results in high out-of-pocket health expenditure and poor health services (Behera & Dash, 2019)

According to WHO global expenditure report (2018) on health, the data shows that in low- and middle-income countries, out-of-pocket payments have remained high, accounting for more than 40% of total health spending in 2018. The rapid growth of public health expenditure has become a great concern for both household and governments. Both governments and households are growing more concerned about the rapid increase in health costs.

There are wide differences on the money spent on health across the world on different parts of the country. The amount spent on health care varies greatly depending on macroeconomic determinants. While some nations spend more than 12% of their GDP on health care, others just spend less than 3%.

According to Jakovljevic et al. (2020), global health spending has increased over the last two decades by double in real terms, reaching US$ 8.5 trillion in 2019 and 9.8% of GDP which is up from 8.5% in 2000. The distribution of health spending is still more uneven than that of the global GDP. The United States alone represented over 40% of global health expenditure, with high-income nations making up around 80% of this amount. On average, their per capita spending on health was more than four times higher than the GDP per capita of low-income countries. About half of the spending on health in low- and middle-income countries went toward primary healthcare, accounting for roughly 3% of GDP on average. About one-third of primary healthcare spending came from government sources, and the other half came from external aid. The distribution of health spending by source differed significantly between income groups; in upper-middle-class and high-income countries, government sources financed the majority of health spending, while in low- and lower-middle-income countries, out-of-pocket expenses and external aid combined financed the majority of health spending. Over the past 20 years, the proportion of health spending funded by domestic public sources has increased throughout middle-income and high-income nations, where the percentage of out-of-pocket spending has decreased.

According to Organization (2022), the global health spending in 2020 was US$ 9 trillion, or 10.8% of the GDP, which was not equal in low and middle income nations. Health spending increased in 2020 across all countries, both in terms of a percentage of GDP terms

and per capita terms. The primary cause of the rise in overall health spending between 2019 and 2020 was government spending. All income groups saw a rise in both GDP per capita and government spending on health, with this increase occurring at a faster rate compared to previous years. Also, from 2019 to 2020, health spending as a percentage of total government spending increased in all income groups except in high income countries, where out-of-pocket spending was used to cater for health care expenses.

According to WHO report on Global Expenditure (2020), the health spending during the SDG eras, prior to the COVID-19 pandemic, as well as global health spending in 190 nations between the years 2000 and 2018, the information demonstrates that in low- and lower-middle-income nations, out-of-pocket expenses have remained high, accounting for more than 40% of total amount of the health spending in 2018.

1.2.2 Africa Public Health Expenditure Overview

Africa is investing more in policies and initiatives to enhance health outcomes and hasten the continent's progress toward achieving the Sustainable growth Goals (SDGs) related to health. This is due to governments in the continent are realizing the importance of health to both human and economic growth. At the continental level, initiatives like the 2001 Abuja Declaration have reaffirmed the political determination of national leaders to prioritize health in development. The current economic crisis is placing further pressure on health spending at a time when even the developed nations are finding it more and more difficult to keep up with the rising costs of health care in low-and middle-income countries. In 2010, the average overall health spending in African nations was US$ 135 per capita, a negligible amount compared to the US$ 3150 per capita in an average high-income nation.

Despite the global significance placed on the healthcare agenda, several obstacles have stood in the way of its implementation, particularly in poor countries like Africa. The lack of funding for healthcare is a major source of many of these issues. The majority of developing nations have difficulty creating new sources of income to support their healthcare systems. Due to the increase spending on health sector, financing of health care services has been a concern developing nations, where maintaining good health is seen as a means of reducing poverty (Akosua Akortsu & Aseweh Abor, 2011)

According to the Organization (2016) on health, inadequate money allocation, made worse by budget cuts that haven't spared the health sector, has made meeting the health expenditure targets difficult on several occasions. The ability of nations to produce financial resources for the general population is largely an issue that is not related to the health sector. However, the health ministry must be proactive when it comes to generating general government revenue, as the health sector is typically one of the top two or three industries for public spending. When new or extra mechanisms for public revenue collection have been adopted in many nations, One of the major participants has been the health sector. The countries will need to figure out how to raise the amount of health funds that come from prepaid sources and are then pooled in order to reduce dependency on out-of pocket expenses.

According to World Health Organization (2010), less than 20% of overall health spending in most member States of the African Region comes from outside sources. However, other nations, like Malawi, have unique situations. From 2001 to 2010, foreign assistance regularly made up more than 40% of all health expenditures in Malawi. Between 2005 and 2010, donor financing on health sector became significantly more important in Burundi

and Tanzania. The main obstacle resulting from a lack of funding in the majority of African nations is the inadequacy of the processes and strategies supporting health financing systems. The most regressive method of financing health care is through household out-of-pocket expenses, which account for 40% or even more of total health expenditures in approximately more than 50% of African nations. People who rely only on this payment method run out of the danger of becoming impoverished and face financial obstacles while trying to access health services.

According to Mouteyica and Ngepah (2023), Africa's healthcare systems are underdeveloped and inadequately funded. Despite accounting for 24% of the global's illness burden and 11% of the world's population, the continent only contributed 1% of global health spending. Additionally, the UN Economic Commission for Africa noted that the yearly budget gap for public health on the continent is estimated to be $66 billion. Raising public health money is a concern for many African nations, primarily due to the methods and approaches employed to support the health sectors. For instance, out-of-pocket (OOP) payments account for at least 40% of all health expenditures in the majority of countries. Africa is great concerned about the low level of investment in the health sector. Governments must provide domestic health sectors more funding, even in cases where outside resources are essential. To improve health outcomes and boost government investment on healthcare, African leaders have made pro-health pledges. For example, in 2001, the majority of nations decided to give the health sector at least fifteen percent of their total budget. The groundbreaking document is the Abuja Declaration of 2001, which was later confirmed in the Maputo Declaration of 2003. But in 2010, only a small number of nations including Zambia, Rwanda, and Botswana met the Abuja target. In that same

year, the proportion of government spending on health declined in more than 12 nations, but in other countries the trend remained the same.

1.2.3 Public Health Expenditure in Kenya

Public health expenditure accounts for a significant proportion of health sector resources in Kenya. Kenya's health sector resources are largely devoted to public health spending, which accounted for 46 percent of all health expenditures in a fiscal year where 29 percent is spent by families, 19 percent by donors, and 6 percent by the private sector. The provision of healthcare in Kenya is largely influenced by several factors, including the proximity to the site of service, the availability of necessary medications and other supplies, and the expertise of the medical staff. Counties have focused on addressing these key challenges with most resources going toward creation of infrastructure and the recruitment and retention of competent medical staff (Kimalu et al., 2004)

Kenya features both public healthcare coverage through the National Hospital Insurance Fund (NHIF) and private health insurance schemes. While the private third-party insurance sector is growing, it remains relatively small, mainly catering to urban areas and the formal employment sector. Established in 1968, NHIF's purpose is to offer inpatient care for contributors and their families in registered hospitals. However, NHIF faces challenges such as a weak administrative system, an underperforming investment portfolio, and low claim settlement rates. Notably, the registered health facilities associated with NHIF are infrequently utilized by the economically disadvantaged, who often turn to local clinics and dispensaries. Unfortunately, these local healthcare providers are not registered with NHIF, resulting in the poor not being able to be compensated for their medical expenses despite being fund members. This healthcare financing structure implies that the less

affluent end up indirectly subsidizing the more affluent, given their limited access to reimbursement from the fund. Large sum of funds allocated per person in the NHIF insurance affects the public spending on health due to the out of pocket spending by some individuals not covered by NHIF (Kimalu et al., 2004)

A significant obstacle to attaining universal health care in low- and middle-income counties is health financing. Universal Health Coverage (UHC) is an initiative which promotes access to quality and affordable healthcare service, equitably and to everybody regardless of their financial capabilities. UHC's mission is to guarantee that people may obtain the timely, appropriate, and high-quality healthcare they require without facing any financial risks Murunga et al. (2019). The health sector receives less funding from the government, which results in significant out-of-pocket expenses and, ultimately, poverty. Because it is necessary for economic growth and the reduction of poverty, appropriate health spending is therefore crucial for the well being of health care for all citizens. Therefore, the government's funding of the health sector is a crucial component, which is why it is necessary to increase funding for the health sector. Kenya spends a lot on health care, yet not everyone is insured.

The health sector in Kenya is funded in part by public, private and donor funds. Donor funding reduced from 34.5 to 25.6% between 2009 and 2013, while funding from public sources increased from 28.8 to 33.5%. Over the same period, private health financing increased from 36.7 to 39.8%. This is concerning because out-of-pocket (OOP) expenditures make up a significant proportion of private funding. Specifically, out-of-pocket spending (OOP) accounted for 29% of total health expenditures (THE) in 2013, up from 25% in 2009. Individual health spending has been impacted by a number of health

system reforms that the Kenyan government has adopted over the years. The colonial government's user fees for health services at public facilities were eliminated upon independence in 1963. However, due to the spending constraint, the government introduced user fees in public hospitals and in health centers and dispensaries in 1989. Despite that, user fees were abolished in 1990 for all citizens to get equal opportunities for but they were later reintroduced in 1992 due to financial difficulties. User fees were abolished in the Kenyan government from public health facilities and dispensaries in 2004. The only exception was a one-time registration charge of KES 10 for dispensaries and KES 20 for health centers, which is equivalent to USD 0.1 and USD 0.2, respectively. However, under a cost-sharing arrangement in which hospitals charged fees to patients for healthcare services and got some supply side subsidies from the central government, public hospitals were permitted to keep collecting user fees. Following the election of a new government in 2013, health clinics and dispensaries totally abolished user fees. OOP payments at public hospitals have increased due to the government's uneven health expenditure, even after user fees at healthcare institutions were abolished (Barasa et al., 2017a).

Nyamwange (2012) stated that Kenya is currently facing a critical situation in terms of health finance, which is becoming worse over time. The Ministry of Planning reports that the total expenditure on health, as a percentage of the GDP in Kenya, has dropped significantly from 5.1% in 2002 to approximately 1.5% in 2012. This decrease over the past decade falls well below the recommended 15% GDP to Primary Health Care Expenditure (PHCE) ratio outlined in the 2005 Abuja declaration. Consequently, Kenya's health spending now stands at $36.1 per capita, which is below the World Health Organization's recommended level of $41 per capita.

By 2030, the Sustainable Development Goals (SDG) aim to promote health and well-being for all people, regardless of age, and guarantee free access to healthcare for all people worldwide (Moon et al. (2016). Kenya views health as a fundamental need and the 2010 constitution's bill of rights include it among the rights. As a result both in the near term, as indicated by the national big four agenda, and in the long term as outlined in the national vision 2030 blueprint, improved and reasonably priced public healthcare has been at the top of the nation's development agenda.

According to WHO, access to basic healthcare is considered a human right in virtually to all societies. People must be healthy to contribute and share in social and economic development. Despite the reason for developing countries to improve the healthcare systems, many still allocate a very small amount of government expenditure on public health. Despite the rise in government expenditure on the Ministries of Health (MOH) from Kshs 26 billion in 2007 to Kshs 50.37 billion in 2012, the government of Kenya (Seitio-Kgokgwe et al.) has been affected by these macroeconomic drivers to ensure fair delivery of high quality public health services. This public health expenditure is affected by the macroeconomic drivers highlighted in this study. In most developing and developed countries the government always strives to ensure that the citizens are well catered for in terms of health (Eberl et al., 2011)

The macroeconomic drivers, fiscal deficit, GDP per capita, unemployment, corruption and tax revenue of health spending are essential tools for resource allocation, guiding the creation of health policies, and the accountability and openness of health systems. A major barrier to improving health outcomes in Africa is the macroeconomic factors, which

include GDP per capita, fiscal imbalance, unemployment, corruption, and tax income related to health (Organization, 2013)

1.3 Statement of the Problem

The government has cut back on funding for the health sector, stated by Dr. Amit N. Thakker, the Chairman of the Kenya Healthcare Federation in Kenya. Therefore, this has affected the the public hospitals in ensuring better health for all citizens. Majority of people in Kenya, more than 80% of them rely on this money for their medical requirements, while the 20% of Kenyans can afford to pay their own medical bills. Only a very tiny portion of Kenyans can afford to have access to private insurance.

According to a 2018 World Bank report, 26.1% of Kenya's total health financing came from out-of-pocket expenses in 2017. In contrast to other African nations like the Seychelles, Botswana, and South Africa, where out-of-pocket expenses accounted for 2.3 percent, 5.2 percent, and 6.3 percent of overall healthcare expenditures in 2017, the payments made here are extremely high. The World Bank (2018) claims that this type of spending drives impacted households into poverty by lowering consumption of other goods and services (Nkatha, 2019).

According to World Health Organization (WHO) new report in 2015 on public health spending, low-and middle income countries ((LMICs) spending increase with 6% growth per year. Although more than 80% of people live in low and middle income countries, they see less than 20% of total health spending leading to out of pocket spending and poor health services (Bein, 2020)

Over the years, stagnant growth of public health expenditure is influenced by corruption, fiscal policies, unemployment, GDP per capita and tax revenue which affects the resource mobilization capacity of the economy therefore impedes health sector development (Osoro, 2015). Health care is considered a human right hence one must be healthy to contribute and share in social and economic development. Despite the reason for developing countries to improve the healthcare systems, many still allocate a very small amount of government expenditure on public health. This public health expenditure is affected by the macroeconomic drivers highlighted in this study.

Despite all effort made by the government to reduce public health spending majority of people are still paying too much out of their own pockets and some not covered by the National Hospital and insurance Fund (NHIF) leading out of pocket spending. According to the World Bank (2018), these kind of spending reduce consumption of other goods and services and therefore push the affected households into poverty (Nkatha et al., 2020). This has prompted the researcher to investigate the effect of macroeconomic drivers on public health expenditure in Kenya, to find out how fiscal deficit, unemployment, GDP per capita, corruption and tax revenue have affected public health expenditure.

The Sustainable Development Goal (SDG) 3 aims to ensure healthy lives and promote well-being for all at all ages. While Kenya has made all efforts in improving health outcomes, several challenges remain that hinder the achievement of this goal. Adequate funding for healthcare remains a challenge affecting the delivery of quality services and its availability. Although Kenya has made progress in improving health outcomes and meeting certain SDG 3 targets, the country's health sector continues to face significant challenges. Continued efforts are needed to ensure adequate health financing. This therefore

underscores the need to investigate the effect of macroeconomic drivers of public health expenditure.

1.4 Research Objectives

1.4.1 General Objective

The general objective of this study was to analyze the effect of macroeconomic drivers on public health expenditure in Kenya.

1.4.2 Specific Objectives

The specific objectives of the study were;

i. To evaluate the effect of GDP per capita on public health expenditure in Kenya
ii. To determine the effect of tax revenue on public health expenditure in Kenya
iii. To establish the effect of fiscal deficit on public health expenditure in Kenya
iv. To assess the effect of corruption on public health expenditure in Kenya
v. To determine the effect of unemployment on public health expenditure in Kenya

1.5 Research Hypotheses

The study tested the following null research hypotheses;

H_{O1}: GDP per capita does not significantly affect public health expenditure in Kenya

H_{O2}: Tax revenue has no significant effect on public health expenditure in Kenya

H_{O3}: Fiscal deficit does not significantly affect public health expenditure in Kenya

H_{O4}: Corruption has no significant effect on public health expenditure in Kenya

$H_{O5:}$ Unemployment has no significant effect on public health expenditure in Kenya

1.6 Significance of the Study

This study finding will be of use to policy makers, insurance providers and other stakeholders in the health industry. This will ensure that the stakeholders involved develop a plan and goods that enhance the uptake rise of insurance services and products in Kenya.

Additionally, the research will assist insurance companies in coming up with plans to improve the rate of uptake at which the formal individuals are enrolled. Indeed, the study will be useful to the Kenyan government in formulating policies that support the promotion of the uptake of medical insurance. Additionally, the study will add to the body of knowledge in the subject of health economics and aid in the improvement of previously published works.

1.7 Scope of the Study

The study used annual time series data of the Kenyan economy focusing on the macroeconomic drivers and public health expenditure in Kenya. The data was gauged from 1990 to 2023. The period 1990 to 2023 is because of the time series requirement of large number of data of above 30 years to ensure reliability. Also, in the 1990's the real GDP growth slowed from 4.3 percent in 1990 to almost zero in 1992–1993. The budget deficit of the central government rose from 6.7 percent of GDP in 1989–1990 to 11.4% in 1992–1993 because of the continued deficit of government budgetary and inefficiencies in public health sector. In the year 1992 and 1994, there was a decrease in poverty due to introduction of Structural Adjustment Programmes (SAPs) which facilitated the alleviation of poverty, hence the choice of the period 1992- 2023 (Thomson et al., 2017)

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

The chapter outlines the key concepts of the study, theoretical literature, highlights empirical studies done by different researchers both in Kenya and internationally in relation to fiscal deficit, unemployment, corruption, GDP per capita, tax revenue and public health expenditure. The review aims to gain a thorough comprehension of the existing knowledge, critique these studies and establish a study gap that this research relied on and lastly conceptual framework that show relationship of these macroeconomic drivers.

2.2 Theories Underpinning the Study

The study adapted Public Expenditure Theory, Wagner's, Baumol's, and the Dynamic Theory of Public Expenditure theories for it provides background that supports the variables public health expenditure, tax revenue, GDP per capita, fiscal deficit, unemployment and corruption.

2.2.1 Public Expenditure Theory

Public expenditure is money spent by a nation's government on things like infrastructure, pensions, and other needs and desires that are shared by all citizens. According to Lewis (1952) the allocation of funds between battleships and underdeveloped regions should be such that every last shilling spent on each generates an equal and genuine return. Public spending was limited as laissez-faire ideologies held that money left in private hands could yield better returns. Later, John Maynard Keynes argued the effect of the macroeconomic determinants on public expenditure in the economy which since then government expenditures has shown an increasing trend.

(Brennan (2008)), states that a proper sense of the extent of market failure is relevant rather than its little or no presence in all cases summarized in Buchanan's main points. "There are two messages that emerge from this work: one is that 'correcting' for such market failure is often a complex multidimensional business not captured by 12 direct public provisions at zero price and not necessarily involving expansion of market output."

Still, there are many shortcomings in this articulation of the public expenditure theory of economic policy. First, Graff (as referenced by Brennan, 2008) has made a strong case that the theory's essential premise is contradicted by the predominance of external impacts on consumption. Second, it is typically inappropriate to analyze real-world scenarios using choices between two options. Third, the economist has no special authority to assign social weights to individual welfare in the social welfare function, so this is sufficient justification to rule out strict prescriptions because most policies involve someone losing their welfare. Therefore, a formal basis for interpersonal comparisons is required.

2.2.2 Wagner's Theory

The law states that as income increases public expenditure increases. Subramanian et al. (2002) in the study of Wagner's theory revealed that the macroeconomic drivers played a bigger role in determining health expenditure. The theory argues that favorable macroeconomic determinants increase the capability of countries to purchase and build proper health infrastructure hence reducing public health expenditure. The same study also found a link between increased levels of poverty and bad societal and individual health. Furthermore, there is a linear relationship between health expenditure and macroeconomic determinants because the same variables depend on the countries' economy.

In examining real per capita GDP and health per capita health expenditure, the Granger-causality is bidirectional is dominant. There is a typically a one-way causal relationship between income and health in low and middle income nations, while in high-income nations the opposite is true. As a result, while identifying the factors that influence health care spending, caution must be taken to define the dependent and independent variables (Erdil & Yetkiner, 2009)

2.2.3 Baumol's Theory

In Baumol's study, according to Rathore (2016) on the Baumol effect or cost disease noted that the so-called Baumol effect is the tendency for relative prices of some services to increase on some specific goods and services and it is a reflection of both the leveling of salaries across industries and the lack of a productivity gap in the economy. Because wages in low-productivity industries must keep up with pay in high-productivity sectors, health care prices will rise in comparison to other prices. The proportion of health care spending to GDP would typically rise over time in a price-inelastic demand (Hartwig, 2008)

Pomp and Vujić (2008) in their study on the rising health spending, the Baumol effect and new medical technology pointed out that the increase in health spending as a percentage of GDP in the majority of Organization for Economic Cooperation and Development (OECD) nations possibly because of the so-called Baumol effect, which can occur if labor productivity in the health care sector has stunted growth than in the economy as a whole. The proportion of health spending to GDP will increase over time if the demand for healthcare is also inelastic. The study used a panel data set of OECD nations to determine the Baumol impact on health spending. Although it appears reasonable to predict that the

prices of health care will increase, the Baumol effect may potentially be significant in the growth of health expenditures, but not necessarily in their levels.

2.2.4 Dynamic Theory of Public Expenditure

According to this theory, governments will employ budget deficits and surpluses as a safety net to keep tax rates from fluctuating too much. Governments will therefore run surpluses during times of low government spending demands and deficits during times of high spending needs. The method is predicated on the ideas that governments are inherently generous, that expenditure requirements change over time, and that the deadweight costs of income taxes are a convex function of the tax rate (Battaglini & Coate, 2008).

This theory's underlying economic context is comparable to that discussed in the literature on tax smoothing. The main change is that a legislature, not a kind planner, makes policy decisions. The report highlights the conflict that lawmakers have the ability to use pork-barrel spending to return money to their districts. The idea also affects whether balanced budget needs are desirable. It examines a form of fiscal restriction that mandates the legislature guarantee that tax receipts and public spending be equal every quarter. Assuming the government starts off debt-free, the restraint would limit expenditure to transfers and public goods. Once more, the size of the tax base in relation to the intended growth rate of the economy is the primary factor in determining the health spending of a country.

2.3 Empirical Literature Review

The section reviews the empirical literature related to fiscal deficit, unemployment, GDP per capita, corruption and tax revenue and Public Health Expenditure.

2.3.1 Fiscal Deficit and Public Health Expenditure

Behera and Dash (2019), in their study on the impact of macro fiscal determinants on health financing in Kenya revealed that both per capita economic growth and domestic borrowings have a positive impact on Public Health Expenditure (PHE) in the short term. This study suggests that the favorable influence of government borrowings on PHE indicates that short-term borrowing facilitates financial leverage, enabling an expansion of investment in the health sector. Contrary, other studies have suggested that increased borrowings may lead to a deficit in the current expenditure on public health. According to the health literature on health funding, the unfavorable macro-fiscal policies that have a negatively impacted on the economy's ability to mobilize resources have contributed to PHE's stagnating growth throughout time. This, in turn, has hindered the development of the health sector as a whole. Richer countries' experience suggests that favorable macro-fiscal policies low fiscal deficit and debt level increase the priority of health spending but decrease budgetary allocation during the financial crisis. Conversely, the crisis insurgents had created new fiscal policy solutions, such as mobilizing funds from outside grants and efficiently using the health budget. As a result, the health sector in the former Soviet Union countries did not experience budget cut. Similarly, during the post-global financial crisis era, a number of developing nations experienced increase in fiscal deficits and debt servicing obligations, but social sector spending did not decrease.

Over the years, growth of Public Health Expenditure has been influenced by the unfavorable macro-fiscal policies which have affected negatively the resource mobilization capacity of the economy and thereby it hinders the overall health sector development. Fiscal deficit has affected the Kenyan economy in the amount of health spending such that

there is a difference between total revenue and total expenditure Behera and Dash (2019). While borrowing could seem like a fantastic idea in the short term, it might not be so good for PHE in the long run. This is because paying off interest on debt reduces the amount of money available for ongoing government spending, including healthcare.

The richer countries argues that the lower fiscal deficit and debt level lead to higher prioritization of health expenditure but reduce the budgetary allocation throughout the time of the financial crisis. Prior research has suggested that during the global financial crisis, the United States' public health expenditure (PHE) share of the overall budget was adversely impacted by unfavorable macro fiscal policies. The global financial crisis disproportionately affected the wealthier countries, leading to substantially lower health care budgetary allocations and greater out-of-pocket (OOP) costs due to lower revenue generating in the years after the recession. The results imply that, in the event of an increasing fiscal deficit for a given fiscal year, the health care budget may eventually be allocated less. Therefore, a potential long-term source of income in the health care sector would be certain fiscal policy interventions in the form of alternate revenue creation (Behera & Dash, 2019).

Several developing countries experienced higher fiscal deficit and debt services burden during the post-global financial crisis period but there was no reduction seen in the health sector expenditure. In Kenya, more government spending leads to increase in the price of health expenditures which may result in the increase in price of the health sector making it difficult for citizens to access to the health insurance coverage and National Health Insurance Funds leading to high out of pocket spending (Hartwig, 2008).

2.3.2 GDP per capita and Public Health Expenditure

According to Rono (2013) in the study on the determinants of public care expenditure in Kenya, used descriptive study to analyze secondary data collected from 1983 to 2012 found out that a unit change in GDP causes public health spending to rise by 0.011 units, but a unit change in external financing causes decrease of 0.304 units in public health spending. GDP or income per capita has been proved to be a critical determinant in explaining variations in the amount and rate of growth of overall health care spending among nations. In publications from OECD nations, cross-sectional regressions of overall income elasticity were repeatedly seen to be well above one when comparing GDP per capita to spending per capita, approximately 1.20 to 1.50. While there was some heterogeneity among the countries, aggregate time-series regressions for individual countries typically produced results that were comparable. According to the report, GDP and outside money have a big impact on Kenya's public health spending.

Behera and Dash (2019) concluded that there is a statistically significant positive correlation between GDP per capita and Public Health Expenditure growth. It concludes that there is a 0.020% increase in PHE for every 1% increase in per capita income. This outcome appears to be evident since the government often reduces budget allocation for developmental activities and places more emphasis on fiscal consolidation measures during the post-crisis period due to slower economic growth and reduced revenue collection.

According to (Nyamwange, 2012) on the examination of the connection between GDP and Primary Health Care Expenditure (PHCE) in developing countries accounted for over 92% of changes in PHCE, and GDP per capita economic growth is the best measure of how much a nation can afford to allocate resources to the health sector. An increase in GDP

would result in a percentage increase in PHCE, but the amount of the increase would depend on how elastic the PHCE demand was in that country.

The ideal relationship between health costs and real per capita income would be one of magnitude. GDP per capita, has been found to be a critical determinant in explaining variations in the amount and rate of growth of overall health care spending among nations. Income elasticity was regularly shown to be significantly over one in literature from OECD countries, with cross-section regressions of aggregate health expenditure per capita on GDP per capita showing values between 1.20 and 1.50 (Nyamwange, 2012).

Nyamwange (2012) on the study of economic growth and public health care expenditure did an investigation of the relationship between GDP and Primary Health Care Expenditure (PHCE) in developing countries accounted for over 92% of changes in PHCE, and GDP per capita in growth is the best measure of how much a nation can afford to allocate resources to the health sector. An increase in GDP would result in a percentage increase in PHCE, but the amount of the increase would depend on how elastic the PHCE demand was in that country. The study found that at least 90% of the variations in a nation's spending on health care could be explained by income alone, as indicated by GDP per capita. Furthermore, it was found out that income and health expenditures are positively correlated, indicating that healthcare is a normal good.

Okunade (2005) report that health care income elasticity is greater than unit, further estimate the impact of per capita income on per capita health expenditure using 1984 data from 30 African countries and conclude that income elasticity of health expenditure is very close to unity. Furthermore, Okunade (2005) notes significant differences in the shares of

17 national incomes' per capita GDP and health expenditures between African nations and regions. There are significant discrepancies in health status or outcomes between countries as a result of these disparities as well as systematic variations in demographic and sociopolitical frameworks.

2.3.3 Unemployment and Public Health Expenditure

According to Barasa et al. (2017a) , in the study on the effect of OOP payment on household consumption conducted in 2013 drew data from Kenya Household Health Expenditure and Utilization Survey (KHHEUS). In the study; compared to a household with an employed head, one without an employment had a 75% higher chance of experiencing catastrophic expenses from direct healthcare charges. The study further states that a household with the head of the family who is unemployed is most likely to suffer from catastrophic costs, according to the International Journal for Equity in Health. These results were in line with data on the factors influencing the likelihood of catastrophic medical expenses from various contexts. In Nepal, China, Kenya, and Ghana, for instance, it was discovered that having a household member or head of the family being unemployed increased the likelihood that the home would experience catastrophic health costs.

According to Fronstin (2007), on the study of health insurance coverage stated that employment is important in acquiring a medical insurance policy. A household survey carried out in Kenya revealed a noteworthy trend that majority of the people who are unemployed are living without health insurance. Additionally, the study found that a significant percentage of workers—more precisely, one-third—were involved in retail and wholesale commerce. Among this group, 41 percent lacked health insurance coverage. The overall conclusion drawn from the study of health insurance and unemployment was that a

considerable portion of the unemployed and private business enterprise workers experience limited health insurance coverage, due to their comparatively lower disposable income. Baek and DeVaney (2005) discovered that the employment status of the household head is a decisive factor in determining whether a household has insurance, when the head is formally employed, and the probability of the family having insurance increases.

Unemployment occurs when people are able and willing to work but they do not have a paid job. Unemployment in Kenya affects the health expenditure because the unemployed are unable to access private insurance which covers most of the out of pocket spending. Due to the small size of the formal employment sector, low savings, underdeveloped financial sector, and insufficient institutional environment to support such schemes in such a way that there are very few options available for either public or private insurance (Manda et al., 2020).

Fronstin (2007) states that employment status is important in acquiring a medical insurance policy. According to a household survey conducted in Kenya, a notable pattern emerged among the people who did not access health insurance, with a common characteristic being unemployment. The research also investigated that within the labor force, a substantial portion, specifically one-third, engaged in retail and wholesale commerce. Among this group, 41 percent lacked health insurance coverage. The overall conclusion drawn from the study was that a considerable portion of the unemployed and informal sector workers experience limited health insurance coverage, due to their comparatively lower disposable income. Baek and DeVaney (2005) discovered that the employment status of the household head is a decisive factor in determining whether a household has insurance, when the head is formally employed, the probability of the family having insurance increases.

2.3.4 Corruption and Public Health Expenditure

According to Gupta et al. (2001) there is an estimate that between 10% and 25% of global spending on public health expenditure is lost through corruption. The study further states that although it is recognized that corruption results from government action, corruption can however have a negative impact on the meeting of expectation of social services that are funded by the public, including the health sector. First, in many nations, corruption can increase the cost and decrease the quality of government output and services, such as the delivery and funding of health care and education. Second, investing in human capital may be decreased by corruption. Lastly, corruption can lower government revenue. Corruption hinders the provision of services and quality standards in the private and public sector. In the Kenyan healthcare sector, corruption has frequently been seen throughout the implementation of project, this has led to power abuse, wasteful spending, poor service delivery, and poor-quality standards of medical facilities and equipment.

According to Kagotho et al. (2016) in the study of corruption and public health expenditure found out that Kenya was ranked 139 out of 168 countries in a global corruption perceptions index (CPI), with 43% of respondents perceiving that corruption only exists in the health care sector. The misuse of a public servant's position for personal benefit is known as corruption. Kenyans have a wealth of firsthand knowledge of corruption; of those polled about it, 77% said that someone in their home had bribed the police, 54% public register agencies, and 35% healthcare providers. Corruption, at whatever level, has a negative effect on low-income Kenyans' health spending and can directly result in poor health results.

Corruption is where there is misuse of power for private gain and occurs when public servants with the authority to partake the country's development goals misuse their position and power to benefit themselves and others close to them. Lack of transparency in governance can breed corruption and reduce the quality of health care leading to high health spending. Corruption causes the health system to lose resources and compromises its operational effectiveness by driving up the cost of healthcare, lowering the standard of care given and widening the access gap by penalizing those who are less fortunate financially. Corruption has been a major source of inefficiency in the health sector (Munywoki et al., 2023).

In African nations, political choices about the priority of government activities and interventions determine the level to which the government spends on health care. Countries that have demonstrated a strong political commitment to reforming and intervening in health financing have achieved notable strides in allocating resources for their healthcare systems. But even with these nations' best efforts, Africa still has serious concerns about resource utilization's transparency and efficiency. Furthermore, ineffective accountability systems and poor governance have largely hampered the successful execution of health policies. Examples of these include lack of control of beneficiaries over the use of public funds and governments' ineffective oversight of service providers' corrupt practices (Mouteyica & Ngepah, 2023).

Eboso (2018) found out that corruption affects public expenditure. It was discovered that corruption hinders expenditure on health sector; furthermore, it affects the budgetary allocation such that the health sector is subjected to high bribes. The study also noted that corruption reduces the government expenditure in various departments such as health,

education and military. Of the $7.35 trillion spent on health care globally annually, fraud and corruption cost the globe approximately $455 billion annually. In addition, according to estimates from the Organization for Economic Co-operation and Development, 45% of people worldwide think that the health sector is corrupt or extremely dishonest.

2.3.5 Tax revenue and Public Health Expenditure

According to Kooshkebaghi et al. (2022) in the study conducted in 2020-2021 in Iran revealed that taxes rank the most significant source of revenue that could be exploited in the health sector. The majority of nations rely on tax revenues to fund and grow their health systems. Taxes are recognized as crucial economic instruments for policymakers to enhance public health, but in Iran, they are not particularly very effective and significant hence affecting the health spending. Approximately $10 per capita is added to health spending for every $100 per capita increase in tax revenue annually. Tax money can be utilized to pay for medical expenses or to balance out other sources of revenue for the government.

Kiminyei (2018) examined the nexus between Qatar's taxes and spending using annual data from the year 1980 to 2011. The author came to the conclusion that these variables were cointegrated after the investigation that proved that they were stationary in their first differences. Granger causality analysis was carried out to examine the direction of cause and effect, and the author discovered evidence indicating that taxation led to expenditure. According to the revenue-spend hypothesis, government expenditures are therefore financed by raising revenue first, which is indeed common in many economies. In actuality this viewpoint might not be applied because unforeseen incidents like war, earthquakes, and droughts need to be funded through the government budget.

Behera and Dash (2019) did a study on macro fiscal determinants and health financing using Generalized Method of Moment and concluded there is a statistically positive significant correlation between tax revenue and PHE. According to the study, a 1% increase in tax income results in a 0.057% change in PHE. Additionally, there was a relationship on how direct and indirect taxes affected PHE in LMICs in terms of the manner of tax revenue mobilization. The findings indicate that indirect taxes have a negative impact on PHE and direct taxes have a statistically significant and positive with PHE. Based on the result, a 1% increase in direct tax causes a 0.025% change in PHE, while a 1% increase in indirect tax causes a −0.061% decrease in PHE. The study discovered that one significant source of funding for health in LMICs is tax revenue.

According to Manda et al. (2020) in the study on health expenditure and health outcomes stated that adequate funding for healthcare services is probably going to result in the provision and use of high-quality services, which will then improve population health status indicators. The majority of developing nations depend primarily on government budgets to fund health care services yet they can only be partially funded due to the limited tax bases and ineffective collection capabilities of most governments. Due to competition for funding from other sectors, the health sector is likely to receive less priority even in situations where governments may collect more revenue.

Chipunza and Nhamo (2023) used time series analysis data for the period 1980–2017 to examine the connection between Zimbabwe's fiscal capacity and PHE. The study concluded that both fiscal capacity and GDP had a favorable impact on PHE in Zimbabwe. Since there is a strong correlation between budgetary capacity and PHE, the government of Zimbabwe has made increasing funding for health a top goal when resources are

available. Additionally, a rise in GDP results in an expansion of a nation's tax base because it improves businesses' and peoples' capacity to pay taxes. Tax revenue had witnessed fluctuations between 1980 and 2004, remaining around 15% overall, with 1998 and 2004 being observed in great numbers which was nearly 35%. At the peak of Zimbabwe's financial crisis, tax revenue found to be below 5% of GDP over the years. Similar to tax revenue, PHE was at its lowest that is less than 1% of GDP during the years 2007 and 2008.

In Kenya, like in most developing countries the tax revenue is the major source of funds and is a significant major determinant of overall public expenditure. The amount allocated to health sector by the government is not sufficient to enable it to carry out proper health care services. As for instance over 70% of the Ministry of Health recurrent budget is used to pay for staff salaries and allowances leaving only 30% for supplies and other expenses (Seitio-Kgokgwe et al., 2016)

Ndajiwo (2020) proved that in many African countries, tax revenue has constantly grown to be a significant source of government funding. Between 2008 and 2017, the average tax to GDP ratio increased by 1.5% of GDP on average. Therefore, tax money serves as the government's primary source of funding for healthcare. Nevertheless, still there are many obstacles that face taxation in many African nations, including a weak social contract, losses from inefficient tax incentives, a sizable unreported sector, illicit money flows, and generally low tax compliance. This has positive outcomes for regional public finance, especially with regard to public health spending.

2.4 Knowledge Gap

The government has cut back on funding for the health sector, which has created challenges in the public hospitals. Majority of people in Kenya, more than 80% of them rely on this money for their medical requirements, while the 20% of Kenyans can afford to pay their own medical bills. Only a very tiny portion of Kenyans can afford to have access to private insurance. This has prompted the researcher to investigate the effect of macroeconomic drivers on public health expenditure. Studies exist on the relationship between macroeconomic determinants and public health expenditure (PHE) in developed countries but no evidence exists on this issue in Kenya. The purpose of this study is to fill this knowledge gap.

Knowledge gap table

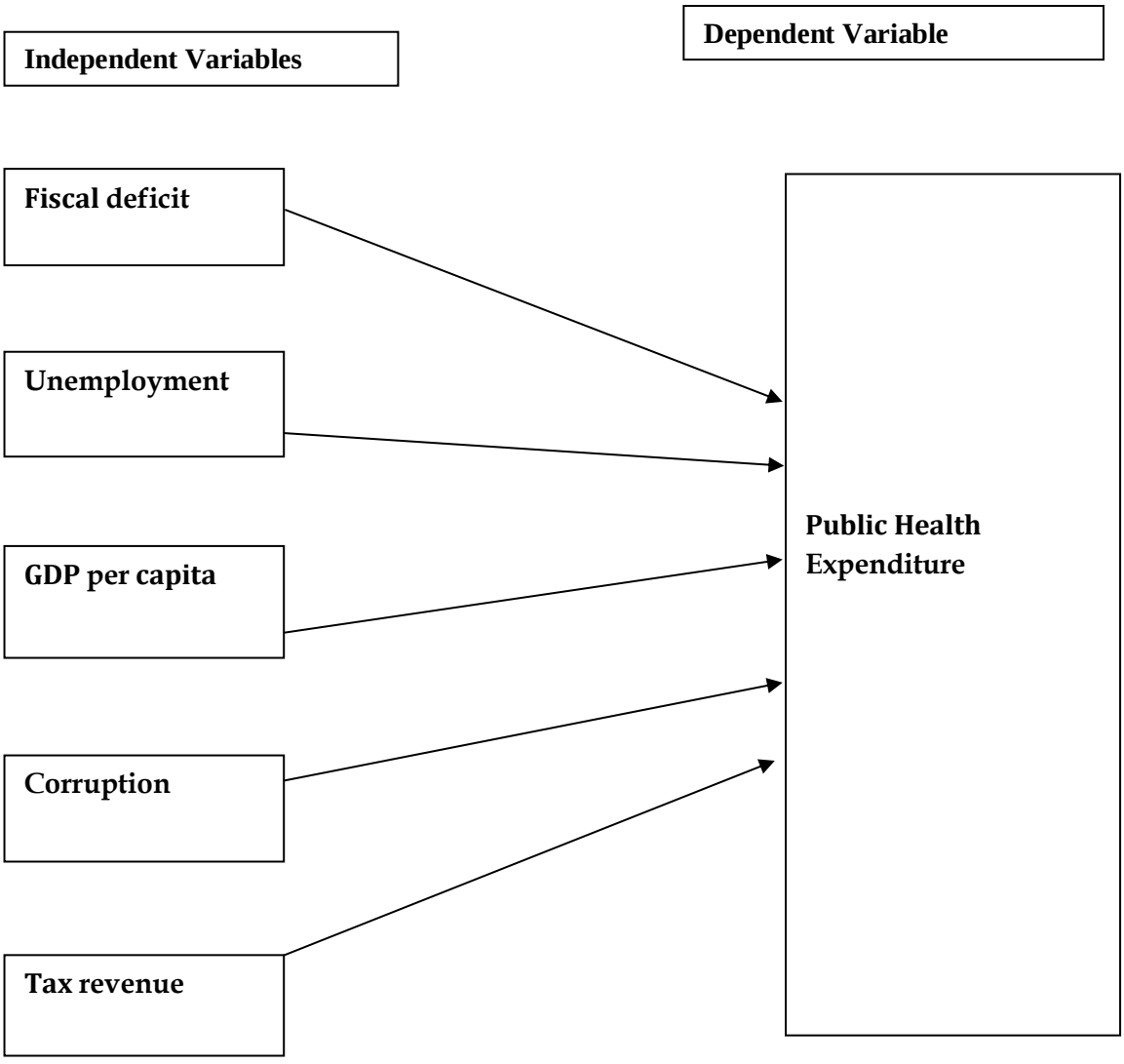
Authors	Topic	Methodology	Findings	Knowledge Gap
Ilori, A. (2015)	Determinants of Public Health Care Expenditure in Nigeria (1981-2014)	The data obtained from this sample were examined using an Error Correction Mechanism Approach	The study's finding shows that there exists a negative but insignificant relationship between gross domestic product per capita and total government health expenditure in Nigeria. The Unemployment rate has positive and significant impact on total government health expenditure. This finding reveals that unemployment lead to increase in provision of public demand of health facilities in Nigeria	The reviewed study was done in Nigeria. However, the current study was done in Kenya in a different period and also employed a different model, that is, Autoregressive Distributed Lag model.

Manda, D. K., Mugo, M. G., & Murunga, J. (2020)	Health Expenditures and Health Outcomes in Kenya.	The ARDL bound test was employed and estimated using error correction model.	The findings suggest that improvements in public health expenditures enhance health outcomes in Kenya. The study findings showed that increasing public health expenditure improves health outcomes in Kenya	This study significantly Improves understanding of the link between public health spending and health outcomes .The current study was done in 2024 and investigated macroeconomic drivers of public health expenditure in Kenya.
Akosua Akortsu, M., & Aseweh Abor, P. (2011)	Financing public healthcare institutions in Ghana.	A structured questionnaire was distributed throughout Ghana institutions.	The findings suggest the main sources of financing the public healthcare institution are government subvention, internally-generated funds and donor-pooled funds	The study was conducted in Ghana on ways of financing public healthcare institutions. The current study focused on the determinants of public health expenditure in Kenya.
Behera, D. K., & Dash, U. (2019).	Impact of macro-fiscal determinants on health financing: empirical evidence from low-and middle-income countries	The study employed the panel System Generalized Method of Moment model.	The elasticity of public health expenditure (PHE) with respect to macro-fiscal factors varies across LMICs. Tax revenue shows a positive and statistically significant relationship with Public Health Expenditure.	The study's focus was among the low-and middle-income countries in the period of 2009-2013. However, the current study was done in a different period which is 1990-2023 and also employed a different model, that is, ARDL model.
Nkatha, L. (2019)	Macroeconomic Determinants Of Health Insurance Demand In Kenya	The study used Auto-regressive Distributed Lag (ARDL) Model for the period spanning from 1980-2018.	The study concluded that income levels positively affect health insurance demand in the long-run but in the short run it has a negative effect. Unemployment has a negative effect on health insurance.	The study was done in the period 1980-2018 and focused on the Macroeconomic Determinants Of Health Insurance Demand In Kenya. The current study was done in the period from 1990-2023 focusing on the macroeconomic drivers of Public Health.

2.5 Conceptual Framework

Mbulwa and Kinyua (2020) defined conceptual framework as "a structure of concepts (variables) that the researcher apply in order to fulfill the defined objectives". The conceptual framework as shown in Figure 2.1 shows the relationship between the independent variables and dependent variable for the macroeconomic drivers of public health expenditure. The dependent variable for the research is public health expenditure while the independent variables include fiscal deficit, unemployment, GDP per capita, corruption and tax revenue.

Figure 2. 1 **Conceptual Framework**



CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter focused on the area of study, the research design of the study, data collection instruments, data sources, theoretical framework, data analysis techniques and finally ethical considerations.

3.2 Study Area

This study determined the effect of macroeconomic drivers on public health expenditure for the period 1990 – 2023. This study was situated in the Republic of Kenya, which spans approximately 582,646 km² and has a population of 49.4 million people (KNBS, 2020). Kenya is bordered to the north by Sudan and Ethiopia, to the east by Somalia, to the west by Uganda, to the south by Tanzania, and to the southeast by the Indian Ocean.

Kenya provides a rich source of economic and health data through various governmental agencies, including the Kenya National Bureau of Statistics (KNBS), which makes it feasible to conduct a comprehensive analysis of macroeconomic variables and public health spending trends. With a large and growing population, Kenya faces unique health challenges, including communicable diseases, maternal and child health issues, and non-communicable diseases. Studying how macroeconomic drivers affect health expenditure in such a context can provide useful lessons for other nations facing similar challenges. Kenya represents a dynamic setting where macroeconomic factors such as GDP per capita, unemployment, tax revenue significantly impact public health expenditure. Kenyan

economy has been undergoing substantial reforms in its health sector, such as the implementation of universal health coverage (UHC) initiatives. These policy shifts make Kenya an ideal case for studying how macroeconomic drivers affect public health funding.

3.3 Research Design

According to Schoonenboom and Johnson (2017) a research design refers to the arrangement of methods established to gather and analyze data in a way that is relevant to the research question. This study used an explanatory design to determine macroeconomic drivers and public health expenditure. Explanatory research design offers a functional explanation as to why a solution includes specific components, based on the requirements stated in the design as it finds the degree and extent of causal relationships between two or more variables (Baskerville & Pries-Heje, 2010).

3.4 Data Types and Source

This study employed secondary time series annual data, from the period 1990 to 2023 on public health expenditure, fiscal deficit, GDP per capita, unemployment, corruption and tax revenue. Data was generated from Kenya National Bureau of Statistics.

3.5 Data Collection Instrument

The study was based on secondary data guided by study variables public health expenditure, fiscal deficit, GDP per capita, unemployment, corruption and tax revenue. The study used content analysis in obtaining data from the sources.

3.6 Theoretical Model

The study adopted the endogenous growth model to investigate the effect of macroeconomic drivers on Public Health Expenditure.

Endogenous growth model takes the form;

$Y = AK^{\alpha}L^{1-\alpha}$ ……*(3.1)*

Where;

Y is the public health expenditure, A is the total factor productivity, K is the capital and L is labor and α is the output elasticity.

The advantage of using an endogenous growth model is that the model is open and flexible Odhiambo et al. (2013). It accommodates any variable that affect public health expenditure. Therefore, the modified model takes the following form as shown in equation 3.2.

$Y = F[FD,\ GDP, UNM, CRT, TR]$ ……*(3.2)*

Where FD- Fiscal Deficit, GDP- GDP Per Capita, UNM- Unemployment, CRT- Corruption, TR- Tax Revenue.

3.7 Model Specification

The study adopted a multivariate model that include macroeconomic drivers affecting public health expenditure such as fiscal deficit, GDP per capita, unemployment, corruption and tax revenue. The relationship among the variables can be written as

PHE = f (***FD***, **GDP, U*NM***, ***CRT***, ***TR***) …… *(3.3)*

Where;

PHE- Public Health Expenditure, **FD**- Fiscal Deficit, **GDP**- GDP Per Capita, **UNM**- Unemployment, **CRT**- Corruption, **TR**- Tax Revenue

PHEt = β0 + β1 $\boldsymbol{\mathcal{FD}}$t +β2 $\boldsymbol{\mathcal{GDP}}$t +β3 $\boldsymbol{\mathcal{UNM}}$t +β4 $\boldsymbol{\mathcal{CRT}}$t + β5 $\boldsymbol{\mathcal{TR}}_t$ + **μ**t ……. *(3.4)*

Where the β's represents the population parameters, **μ** denotes error term, and t is the time trend. The study employed Autoregressive Distributed Lag (ARDL) Model because ARDL model accommodates different orders of co-integration hence it is consistent and efficient. Equation 3.4 will be modeled in ARDL as form as indicated in equation 3.5. If co-integration is present, the ARDL includes the long- and short-term relationships as herby shown;

$\nabla Y_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \sum_{j=0}^{q} \gamma_j \Delta X_{t-j} + \phi Y_{t-1} + \lambda X_{t-1} + \varepsilon_t$ ……*(3.5)*

Where;

∇Y_t= The change in the dependent variable Y at time t.

α = alpha, the constant term (intercept).

β_i =The coefficient of the lagged difference of the dependent variable ΔY_{t-1}.

ΔY_{t-i}= The change in the lagged dependent variable.

p = The maximum lag length of the dependent variable.

Δ = Denotes the first difference, capturing short-run changes.

Φ = the coefficient that represents the speed of adjustment towards the long-run equilibrium. It indicates how quickly the dependent variable returns to its long-run equilibrium after a change.

Y_{t-1}= The lagged level of the dependent variable Y at time $t-1$, representing the long-run relationship for the dependent variable.

λ = The coefficient of the lagged level of the independent variable X_{t-1}

X_{t-1}= The lagged level of the independent variable X at time $t-1$ representing the long-run relationship for the independent variables.

ε_t= The error term at time t capturing the effects of all other variables that are not included in the model.

The first part of the equation represents the short-run dynamics;

$$\nabla Y_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \sum_{j=0}^{q} \gamma_j \Delta X_{t-j} = 0 \quad \textit{(3.6)}$$

While the second part captures the long-run equilibrium relationship;

$$\phi Y_{t-1} + \lambda X_{t-1} = 0 \quad \textit{(3.7)}$$

3.8 Operationalization of Variables

Table 3.1 presents description and measurement of the variables and their relationships with the dependent variable.

Table 3. 1: Description and Measurement of Variables

Abbreviation	Name of the Variable	Description and Measurement	Expected Sign	Source
PHE	Public Health Expenditure	The provision of health services is known as health expenditure, and it encompasses all costs related to nutrition, family planning, and health care. It will be measured by total expenditure on health as a percentage of gross domestic product (GDP)		KNBS
FD	Fiscal Deficit	Fiscal Deficit is the sum of domestic debt and external debt. It is measured as a percentage of the Gross Domestic Product	Negative	KNBS
GDPP	Gross Domestic Product per capita	It is a measure of GDP divided by midyear population of the country. It is measured by taking real GDP divided by population	Positive	KNBS
UNM	Unemployment	Refers when people who want to do work and are actively seeking jobs but cannot find employment measured by the number of unemployed as a percentage of the labor force.	Negative	KNBS
CRT	Corruption	Refers to engaging in dishonesty or committing a crime with the intent of obtaining illegal benefits or abusing the position for their personal gain. It is measured by the Corruption Perceptions Index (CPI)	Negative	KNBS
TR	Tax Revenue	Income that is collected by governments through taxation which is a source of government revenue. It is measured as a percentage of GDP.	Positive	KNBS
μ_t	is the stochastic error term	Factors that affect health expenditure but not captured in the model		

3.9 Data Analysis

Dickey and Fuller (1979) (ADF) test, Phillips and Perron (1988)(PP) test and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) was applied for unit-root test. The Autoregressive Distributed lag (ARDL) bound test was used. The ARDL approach is suitable for it has several merits over conventional cointegration tests such as the two-step residual-based cointegration test proposed by Engel and Granger (1987) and the system-wide cointegration test proposed by Johansen (1988) and Johansen and Juselius (1990). This is because ARDL accommodates variables that are stationary at level and stationary at first order differencing. Jarque-Bera, Skewness and Kurtosis tested for normality of the data and the Eigen value Stability Test to test for stability of the model.

3.10 Unit Root Test

Augmented Dickey-Fuller procedure, Phillips-Perron and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tested the null hypothesis. If the null hypothesis is rejected, this will imply that the series is stationary. If we accept the null hypothesis, we will conclude that the series has a unit root, meaning that it is non-stationary. The random walk model is an example of what is known as a unit root process in the study literature. ADF, PP and KPSS test will be used to test for stationarity (Gujarati, 2009).

3.10.1 Augmented Dickey-Fuller Test

We fit the following augmented Dickey-Fuller regression model to calculate the test statistic.

$$\Delta y = \alpha + \gamma y_{t-1} + \delta t + \sum_{j=1}^{k} \alpha_j \Delta y_{t-j} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.8)$$

Where; α is the constant term, δt is the trend term and k represents the number of lags specified, α_j is the coefficient of the parameter in question and e_t is the white nose error term. A significant assumption of the Dicker Fuller test is that the terms e_t for error are distributed independently and identically. The ADF test improves the DF test by adding the regressand's lagged difference terms to take care of potential serial association in terms of error (Damodar, 2004).

3.10.2 Phillips-Perron Unit Root Test

The test involves fitting the regression model;

$$\Delta Y_t = \varphi Y_{t-1} + \sum_{j=1}^{p-1} \alpha_j^* \Delta Y_{t-j} + \upsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

Phillips and Perron (1988) proposed two alternative statistics, Phillips and Perron’s test statistics can be viewed as Dickey–Fuller statistics that have been made robust to serial correlation by using the Newey and West (1987), heteroskedasticity and autocorrelation-consistent covariance matrix estimator. The greatest advantage of Philips-Perron test is that it is non- parametric, that is it does not require selecting the level of serial correlation as in ADF

3.10.3 Kwiatkowski–Phillips–Schmidt–Shin (KPSS)

Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests are used for testing a null hypothesis that an observable time series is stationary around a deterministic trend against the alternative of a unit root. Kagalwala (2022) stated that the KPSS tests for the null hypothesis that the time series yt is I(0).

Kwiatkowski-Phillips-Schmidt and Shin built on the idea that the time series is stationary around a deterministic trend and is calculated as the sum of a deterministic trend, random walk and stationary random error. It also tests for stationarity of the time series data. The KPSS test is therefore considered as a suitable complement for unit root tests not only due the fact that it directly tests the stationarity, but especially because it can be used for shorter time series (Arltová & Fedorová, 2016)

It is based on the model:

$$Xt = \alpha+\beta t+\eta t \quad \textit{(3.10)}$$

where (Cohen) is a stationary time series. The alternative is the model that includes a random walk:

$$xt = \alpha + \beta t + \sum i \leq t\ ui + \eta t \quad \textit{(3.11)}$$

3.11 Lag Length Selection Criteria

It is necessary to weigh the marginal advantages of adding more lags when deciding how many lags to include in the study. If the order of estimation is too low, the research faces a risk of omitting important information contained in the omitted lag periods and if the value is set too high then many unnecessary coefficients will be evaluated. The analysis will use

the Akaike Information Criterion, Hannan-Quinn information criterion, Sequential modified (LR) Likelihood Ratio test statistic, Final prediction error and Schwarz information criterion. The Schwarz Information Criterion selects the most frugal models with the fewest coefficients whereas AIC selects the most sumptuous models (Luetkepohl, 2009). Basically the decision rule is to pick the model with the least value of the information criteria to ensure that the error term is specified.

3.12 Co-integration Test

A time series variable is said to be integrated of order $d, I(d)$, if stochastic trends or unit roots can be removed by differentiating a series d times and stochastic trend remains after differencing only $d-1$ times(Gujarati, 2009). A variable without a stochastic trend or unit root is said to be integrated of order zero, $I(0)$. A set of variables of same integration order, are said to be co-integrated if a linear combination of the variables $I(0)$ exists, that is, trend stationarity. Two or more econometric variables are said to be co-integrated in econometrics if there is a long-term or equilibrium relationship between them.

Let y_t=$(y_{1t,} \ldots., y_{nt,})$'be an (nx1) be a vector of $I(1)$ time series.$y_t$is cointegrated if there exist (nx1) vector $(\beta_{1,} \ldots., \beta_n)^{\mathrm{I}}$ such that;

$\beta^I Y_t = \beta_{1y1t} + \cdots . + \beta_{nynt} \sim I(0)$ ……..*(3.12)*

The non-stationary time series y_t are cointegrated if there is a linear combination of them that is stationary or$I(0)$. If some elements of β are equal to zero, then only a subset of $y_t$series with non-zero coefficients is cointegrated. The linear combination $\beta^I Y_t$ is referred to as long run equilibrium relationship.

Such that the cointegration relationship may be expresses as;

$\beta^I Y_t = \beta_{1t} - \beta_{2y2t} + \cdots + \beta_{nynt} \sim I(0)$ or

$Y_{1t} = \beta_{2y2t} + \cdots . + \beta_{nynt} + \mu_t$ ……..*(3.13)*

Where $\mu_t \sim I(0)$ this error term

In this study ARDL approach was employed to test for co integration. Two or more economic variables are co-integrated if the residuals from the regression or the variables exhibit stationarity that is if the residuals are of integrated of the order zero$I(0)$. The null hypothesis is that the variables are not cointegrated, that is, the residuals taken from the regression are not $I(0)$ was rejected if the computed τstatistic is lower than the critical τstatistic by taking absolute values (Dube et al., 2018) .

3.13 Autoregressive Distributed Lag (ARDL) Modeling Approach

To investigate the short- and long-run dynamics of macroeconomic drivers and public health expenditure in Kenya, the Autoregressive Distributed lag (ARDL) bound test was applied. The test statistic is based on The Autoregressive Distributed Lag approach (ARDL) Bertsatos et al. (2022). The study will adopt ARDL approach over other conventional methods due to its advantages. It has got an advantage over Johansen and Juselius (1990) test for VECM because the ARDL approach is applicable regardless of whether the underlying endogenous variables are co-integrated. Hence, the ARDL approach does not necessarily depend on pre-testing the order of the stationarity of the variables; it eliminates the uncertainty associated with pre-testing the order of integration. Monte Carlo experiment Breitung (2001) suggests that the ARDL method is suitable in small sample size.

3.14 Model Stability Tests

When estimating a model, it is expected that the model parameters will remain the same for the entire period of study. This is the assumption of constancy or stability of the parameters. Changes in structure could make a model unstable. The study employed the following method;

3.14.1 CUSUM Test

In order to check for the structural stability the CUSUM test by Brown et al. (1975) on stability based on recursive residuals was used. This preference plots the cumulative sum with the 5% significant critical lines. The test observes parameter instability if the cumulative sum moves outside the area between the two critical lines.

3.15 Model Diagnostic Tests

A diagnostic test is crucial in examining a suitable model for establishing the relationship among the independent and dependent variables and how well the model fits. The following diagnostic tests were performed;

3.15.1 Normality Test

(Lomnicki (1961); Thadewald and Büning (2007) suggested a test for non-normality based on the skewness and kurtosis of a distribution.

The null hypothesis of the normality is examined in relation to the alternative hypothesis of non-normal distribution. For a normal distribution, the JB statistic is anticipated to be statistically indifferent from zero. If;

H_0: JB = 0 (normally distributed)

H_1: JB ≠ 0 (not normally distributed)

If the null hypothesis is rejected for any of the variables then would suggest that the variables are not normally distributed; hence a Logarithmic transformation would be necessary.

3.15.2 Portmanteau Test

Portmanteau tests are obtained for checking for autocorrelation of the residuals in a model. This test is the Ljung–Box test, which is a revised version of the Box–Pierce test. It determines whether any of the group of autocorrelations of the residual time series are different from zero. The test is convenient in working with ARIMA like the VECM models (Safi & Al-Reqep, 2014)

3.15.3 Multicollinearity Test

Multicollinearity refers to a condition in which two or more variables in a regression model are dependent upon the other variables in ways that can be linearly predicted from the other with a high degree of accuracy. If the association between two independent variables is equal to 1 or −1, then we have perfect multicollinearity. Usually, the problem of multicollinearity occurs when there is a distinct linear relationship between two or more independent variables. Multicollinearity exists if a single independent variable highly correlates within a set of other independent variables. Variance Inflation Factor was used to measure the amount of multicollinearity in a multiple regression variables (Kim, 2019)

3.15.4 Heteroscedasticity Test

If the variance of the random disturbance is unequal across a range of measured values of elements of the vector, then heteroscedasticity exist. The state of systematic variations in

the residuals' distribution or the model's error term is known as heteroscedasticity. When residual variance is present in a model, it indicates that at least one independent variable affects how the model scatters (Jain & Chetty, 2020)

3.16 Ethical Considerations

The researcher considered the following ethical considerations to be implemented for the research period. The researcher obtained an introductory letter as a requirement of the University of Eldoret and assurance that the thesis was written only for academic purposes. The researcher also acquired a letter of authorization and a work permit from the National Commission for Science, Technology, and Innovation (NACOSTI), to present during data collection. Additionally, the researcher complied with intellectual property standards by accurately acknowledging all information sources. All references are entered into Endnote for accurate citation and in the APA series.

CHAPTER FOUR

RESULTS

4.1 Overview

This section outlines the diagnostic tests conducted, summarizes the descriptive statistics, discusses model selection, presents the outcomes of the vector error correction model, and details the results of hypothesis testing. The study used diverse statistical methods with the assistance of STATA version 14.0, to ascertain the effects of macroeconomic drivers on public health expenditure in Kenya.

4.2 Descriptive Statistics

Here, descriptive statistics are provided in the context of summary statistics, which include measures of dispersion, such as standard deviation, and measures of central tendency, such as mean, minimum, and maximum. To ascertain the general structure and trend of the dataset, descriptive statistics were assessed. The sample data's descriptive statistics, which include the standard deviation, mean, minimum, and maximum, are summarized in Table 4.1.

Table 4. 1 Descriptive statistics

The secondary data collected was characterized using the following descriptive statistics;

Variable	Observations	Mean	Std. dev	Minimum	Maximum
PHE	34	14.05328	15.08679	3.627142	42.73556
GDPACA	34	2874.668	1326.507	1704.031	6323.534
TAXR	34	16.89563	6.017338	13.26486	49.9
FD	34	-.8498235	2.524945	-4.661	3.495
CRPT	34	-1.010077	.1315275	-1.165813	- .7358834
UNMP	34	3.311647	.9807833	2.6	5.69

Whereby;

PHE=Public Health Expenditure, FD=Fiscal Deficit, GDPPACA= Gross Domestic Product Per Capita UNM= Unemployment, CRT=Corruption, TR=Tax Revenue

According to Cohen (2014), the primary descriptive statistics used were measures of central tendency, such as mean and median. The study variables of the maximum and minimum values were also calculated. Descriptive statistics play an important role in time series analysis as they provide a clear presentation of raw data and facilitate easy interpretation of data. Descriptive statistics was calculated with the purpose of obtaining a general knowledge of the sample size and to simplify the large dataset into a manageable and meaningful manner. Public health expenditure over a period of time has a mean of 14.05 percent and a standard deviation of 15.09 percent. Its minimum value is 3.63 percent and the maximum of 42.74 percent. Over the years, the rise in public health expenditure has effect on the economy's ability to mobilize resources, thereby hindering the development of the health sector. The less financial resources allocated towards the health sector would lead to high out of pocket spending and hence poverty.

GDP Per Capita parity had 2874.668 as a mean in current US dollars with a standard deviation of 1326.507 US dollar. Its minimum has been 1704.031 current US dollars and a maximum of 6323.534 US dollars. Tax Revenue (TAXR) being one of the significant sources of funding for health has discovered a standard deviation of 6.02 percent with a minimum of 13.26 percent and a maximum of 49.9 percent. Tax revenue has a mean of 16.90 percent. Unemployment (UNMP) recorded a mean of 3.31 percent, minimum of 2.6 percent and a maximum of 5.69 percent. Fiscal deficit (FD) and corruption (CRPT) have

the mean of negative values such as -.850 percent and -1.01 percent and a minimum of -4.67 percent and -1.17 percent respectively. While borrowing could seem like a brilliant idea in the short term, it might not be so good for Public Health Expenditure in the long run. This is due to the knowledge that paying down debt interest lowers the amount of funds available for the current government spending, such as healthcare as the mean showed a negative (-.850) percent (Behera & Dash, 2019).

4.2.1 Correlation Analysis

The Pearson correlation coefficient (ρ), whose values range from $-1 \leq \rho \leq 1$, was employed in this study. The Pearson correlation coefficient measures the strength of a linear association between two or more variables. A Pearson correlation coefficient finds the line that best fits between the data for two variables. A higher absolute value of ρ indicates a strong relationship, that is, values closer to-1 indicate a strong negative correlation $(-0.75 \leq x - 1)$ while values closer to $+1$ indicate a strong positive association$(+0.75 \leq x + 1)$. There is no linear association between the two variables indicated by a value of 0 (Wong & Hiew, 2005).

Table 4.2 shows the pairwise Pearson's (ρ) correlation coefficients and significance levels for every variable.

Table 4. 2: Correlation Matrix

	PHE	CORPN	FD	GDPPACA	TR	UMN
PHE	1.0000					
CORPN	-0.6934*	1.0000				
FD	0.2943	-0.4289*	1.0000			
GDPPACA	-0.6091*	0.8088*	-0.7061*	1.0000		
TR	0.3602*	-0.3289	0.2704	-0.3586*	1.0000	
UNM	-0.2567	0.7174*	-0.3243	0.7125*	-0.1679	1.0000

From table 4.2, corruption and public health expenditure showed a negative and significant relationship with $\rho = -0.6934$. This explains that increase in corruption rate in Kenya will be unfavorable to the public health expenditure in Kenya. Fiscal Deficit and public health expenditure showed a positive relationship but insignificant while tax revenue and public heath expenditure had a positive and significant relationship. GDP per capita and public health expenditure depicted a negative relationship between them while unemployment and public health expenditure was not significant with a negative relationship at a 5% significance level.

4.2.2 Time Series Plots of Variables at Levels

The initial step in the time series analysis is to create a visual representation of the data. This approach is crucial because describing the data generation process for a system of potentially linked variables requires considering the properties of individual time series. Visual inspection helps in identifying patterns, trends, and potential anomalies that may not be apparent from statistical summaries alone. This step ensures a comprehensive

understanding of each variable's behavior over time, facilitating more accurate modeling and forecasting (McGee & Yaffee, 2019).

The plots in Figure 4.1 show the variables at their levels. Visual inspection demonstrates that Tax Revenue and Unemployment exhibit weak stationarity as they display an almost constant trend at level which could indicate stationarity. Public Health Expenditure and Fiscal Deficit exhibit a downward trend, while Corruption and GDP per capita show an increasing trend. These trends could be affected by seasonal variations and the presence of outliers in the dataset. Analyzing these visual patterns is essential for understanding the underlying data generation processes and essential for selecting the appropriate models for time series analysis.

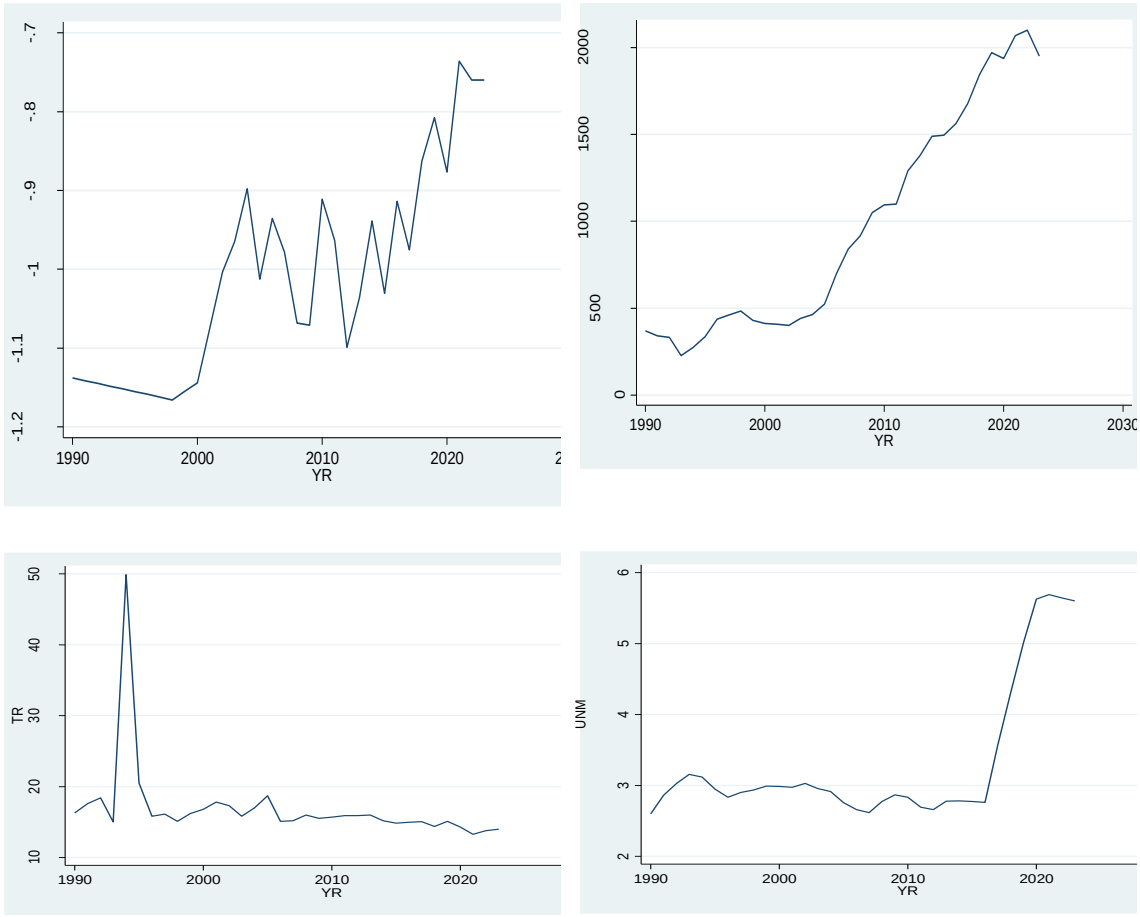
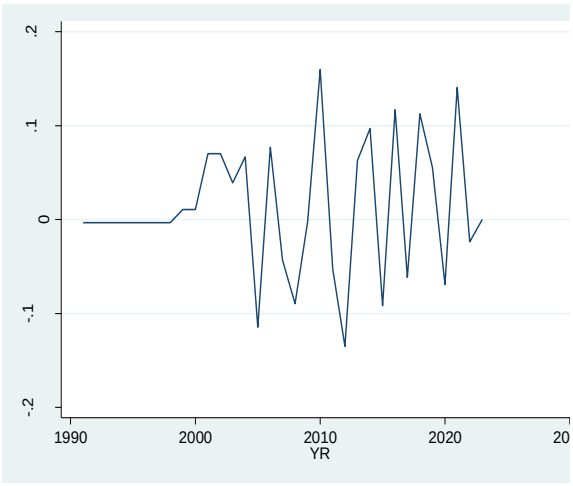


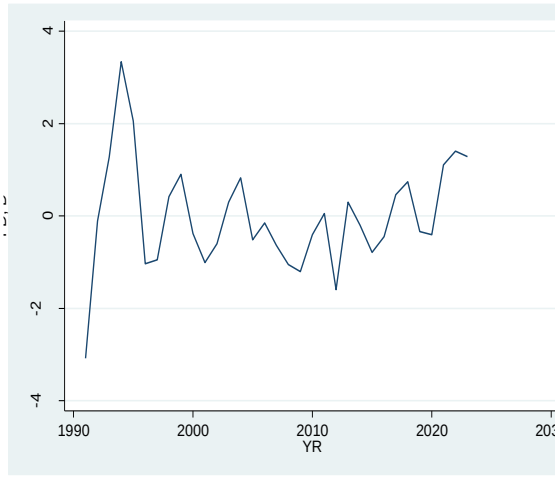
Figure 4. 1: Plots of variables at levels

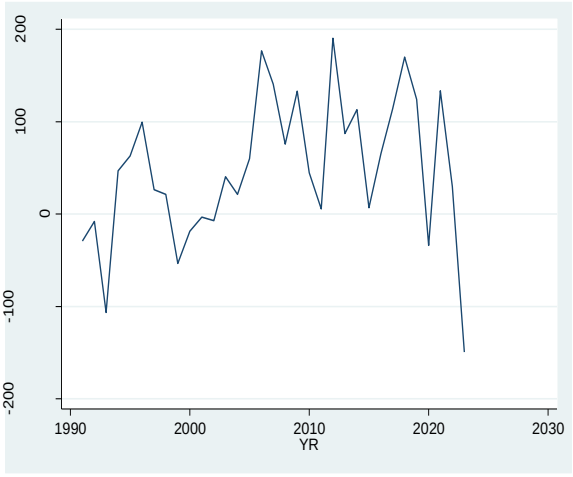
4.2.3 Time Series Plots of Variables at First Difference

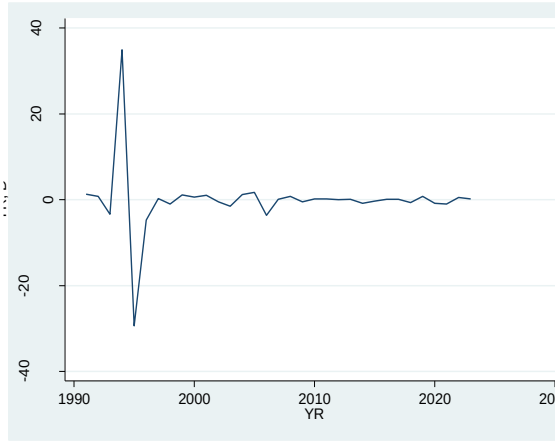
After applying the first differencing of the variables (Public Health Expenditure (PHE), Fiscal Deficit (FD), GDP per capita (GDP), Unemployment (UNM), Corruption (CRT), and Tax Revenue (TR), it was noted that each variable oscillates around a common mean, the sharp shift from the mean and revert back are the structural breaks. This implies that the variables have achieved stationarity which aligns with economic theory. Stationarity in the time series data is crucial as it satisfies the assumption required for many statistical methods and models that are used in econometrics and time series analysis. It indicates that

the properties of the series such as the mean and variance are constant over time making the data suitable for advanced assessment and projection (Bruns & Lütkepohl, 2023).









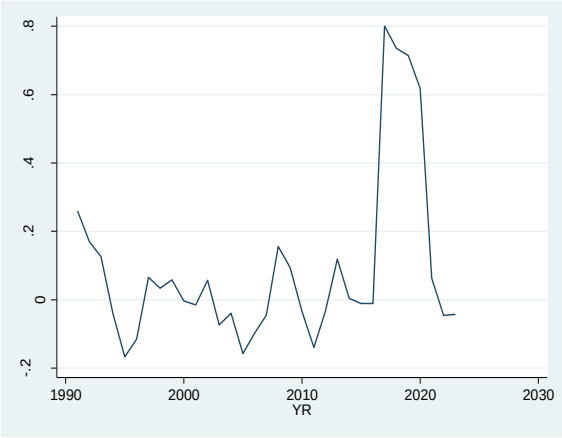


Figure 4. 2: Time Series Plots First Difference

4.3 Unit Root Test without Structural Breaks

Time series data often faces issues related to non-stationarity, where the series lacks a consistent mean and variance over time. Therefore, it is crucial to conduct stationarity tests (Narayan, 2008). Unit root tests were carried out in this study to determine whether unit roots were present conducted on every variable in the multivariate time series, indicating non-stationarity. This study used Augmented Dickey-Fuller (ADF), Philips Perron and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) approaches in unit root diagnosis.

4.3.1 Augmented Dickey-Fuller (ADF) Root Test

Philips - Perron unit root test is regarded as a Dickey and Fuller statistics since it requires calculating t statistics which has been made robust to serial autocorrelation using Newey-West (1987) autocorrelation and heteroscedasticity covariant matrix estimators.

Table 4. 3: Augmented Dickey Fuller Test for Unit Root at Levels and at First Difference

Unit Root Test at Level						
			Critical Values			
Variables	Mackinnon p-values	Test Statistic	1%	5%	10%	*Remark*
PHE	0.3310	-1.893757	-3.646342	-2.954021	-2.615817	*Unit root*
GDPACA	0.9922	0.782055	-3.646342	-2.954021	-2.615817	*Unit root*
TR	0.0927	-2.658485	-3.661661	-2.960411	-2.619160	*Unit root*
UNM	0.5634	-1.413426	-3.653730	-2.957110	-2.617434	*Unit root*
CRPT	0.6752	-1.170493	-3.646342	-2.954021	-2.615817	*Unit root*
FD	0.2380	-2.121405	-3.653730	-2.957110	-2.617434	*Unit root*
Unit Root at First Difference						
PHE	0.0005	-4.816504	-3.653730	-2.957110	-2.617434	*I (1)*
GDPACA	0.0153	-3.479141	-3.653730	-2.957110	-2.617434	*I (1)*
TR	0.0000	-6.372384	-3.661661	-2.960411	-2.619160	*I (1)*
UNM	0.0003	-5.077843	-3.661661	-2.960411	-2.619160	*I (1)*
CRPT	0.0000	-6.035626	-3.661661	-2.960411	-2.619160	*I (1)*
FD	0.0026	-4.181539	-3.653730	-2.957110	-2.617434	*I (1)*

According to the STATA output value in the table 4.3, absolute t statistic value was -1.893757 with the Mackinnon P-value for PHE was 0.3310 greater than 0.005 with at 5% critical value, therefore we fail to reject the null hypothesis of non-stationarity and thus accept the alternative hypothesis of unit root present. GDPACA was noted that its absolute t- value was lower than its critical value at 1% (0.782055<3.646342), 5% (0.782055< 2.954021, and 10% (0.782055< 2.615817) hence GDP Per Capita contains unit root at levels. TR absolute t statistic value is less 1% (2.658485< 3.661661), 5% (2.658485< 2.960411), and at 10% (2.658485> -2.619160) than its critical values at 1%, 5% therefore

Tax Revenue is non-stationary at level. Also, it was observed that the findings from Augmented Dickey- Fuller unit root test that the Mackinnon P-value for UNM, CRPT and FD 0.5634, 0.6752 and 0.2380 respectively were greater than 0.05 at a significance level of 5% thus the null hypothesis was rejected and thus presence of unit root at level.

At the first difference all Mackinnon p-values for the variables in the study were found to be below 0.0500, indicating stationarity: PHE (0.0005 < 0.0500), GDPACA (0.0153 < 0.0500), UNM (0.0003 < 0.0500), TR (0.0000 < 0.0500), CRPT (0.0000 < 0.0500), and FD (0.0026 < 0.0500). As a result, we fail to reject the alternative hypothesis and reject the null hypothesis showing the presence of a unit root, demonstrating that the variables are stationary and integrated of order one I (1).

4.3.2 Philips Perron Test for Unit Root Test

Philips - Perron unit root test is regarded as a Dickey and Fuller statistics since it requires calculating t statistics that has been made robust to serial autocorrelation using Newey-West (1987) autocorrelation and heteroscedasticity covariant matrix estimators.

Table 4. 4: Philips – Perron Test for Unit Root at Levels and at First Difference

Unit Root Test at Level						
			Critical Values			
Variables	Mackinnon p-values	Test Statistic	1%	5%	10%	*Remark*
PHE	0.3310	-1.893757	-3.646342	-2.954021	-2.615817	*Unit root*
GDPACA	0.9867	0.571664	-3.646342	-2.954021	-2.615817	*Unit root*
TR	0.0003	-5.024015	-3.646342	-2.954021	-2.615817	*Stationary*
UNM	0.9668	0.176191	-3.646342	-2.954021	--2.615817	*Unit root*
CRPT	0.8129	-0.775704	-3.646342	-2.954021	--2.615817	*Unit root*
FD	0.5250	-1.492188	-3.646342	-2.954021	--2.615817	*Unit root*
Unit Root at First Difference						
PHE	0.0005	-4.817844	-3.653730	-2.957110	-2.617434	*Stationary*
GDPACA	0.0162	-3.454215	-3.653730	-2.957110	-2.617434	*Stationary*
TR	0.0001	-29.19108	-3.653730	-2.957110	-2.617434	*Stationary*
UNM	0.0002	-5.162510	-3.653730	-2.957110	-2.617434	*Stationary*
CRPT	0.0000	-7.840649	-3.653730	-2.957110	-2.617434	*Stationary*
FD	0.0023	-4.227944	-3.653730	-2.957110	-2.617434	*Stationary*

Public Health Expenditure (PHE) had a Mackinnon p-value of 0.3310 which is greater than 0.05, with an absolute test statistic value of 1.893757. This value is lower than absolute the critical values at the 1% (3.646342), 5% (2.954021), and 10% (2.615817) significance levels. Therefore, the study did not reject the null hypothesis of non-stationarity, indicating the presence of a unit root in PHE.

The Mackinnon p-value for Gross Domestic Product per capita (GDPACA) was 0.9867 exceeding 0.05 with a test statistic value of 0.571664. This result is less than the absolute critical values at the 1% (3.646342), 5% (2.954021), and 10% (2.615817) significance

levels. Therefore the study does not reject the null hypothesis of non- stationarity, showing a unit root in GDP.

For Tax Revenue (TR), the Mackinnon p-value is 0.0003 which is below 0.05 and the absolute test statistic value was 5.024015. This value surpasses the absolute critical values at the 1% (3.646342), 5% (2.954021), and 10% (2.615817) significance levels. Thus, the study rejected the null hypothesis of non-stationarity, indicating that TR is stationary.

Unemployment (UNM) had a Mackinnon p-value of 0.9668, higher than 0.05 with a test statistic value of 0.176191. This finding is lower than the critical values at the 1% (3.646342), 5% (2.954021), and 10% (2.615817) significance levels. As a result, the study failed to reject the null hypothesis of non-stationarity suggesting a unit root in UNM.

Corruption (CRT) showed a Mackinnon p-value of 0.8129, greater than 0.05 with an absolute test statistic value of 0.775704. This value is less than the absolute critical values at the 1% (3.646342), 5% (2.954021), and 10% (2.615817) significance levels. The study therefore failed to reject the null hypothesis of non-stationarity, suggesting unit root being present of in CRT.

The Fiscal Deficit (FD) had a Mackinnon p-value of 0.5250, which is above 0.05 with an absolute test statistic value of 1.492188. This value is below the absolute critical values at the 1% (3.646342), 5% (2.954021), and 10% (2.615817) significance levels. This means that the null hypothesis of non-stationarity was accepted, indicating that the variable contained a unit root.

After taking the first difference, it was clear that the Mackinnon p-values were below 0.05 at 5% level of significance for all variables. This indicates that the sequence becomes stationary after first differencing. The details are as follows;

Public Health Expenditure (PHE) has a Mackinnon p-value of 0.0005 which is less than 0.05 with an absolute test statistic value of 4.817844. This value surpasses the critical thresholds at the 1% (3.653730), 5% (2.957110), and 10% (2.617434) significance levels. Therefore, the study rejected the null hypothesis of non-stationarity signifying that PHE is stationary at the first difference.

In Gross Domestic Product per capita (GDPACA), the Mackinnon p-value is 0.0162 which is also below 0.05 with an absolute test statistic value of 3.454215. This value exceeds the critical values at the 5% (2.957110) and 10% (2.617434) levels but is slightly less than the 1% level (3.653730). Therefore, the study rejected the null hypothesis of non-stationarity showing that GDPACA is stationary at the first difference.

Tax Revenue (TR) has a Mackinnon p-value of 0.0001 significantly lower than 0.05, with an absolute test statistic value of 29.19108. This value is above the critical values at the 1% (3.653730), 5% (2.957110), and 10% (2.617434) significance levels. Thus, this study rejected the null hypothesis of non-stationarity confirming that TR is stationary at the first difference.

The Unemployment (UNM) variable shows a Mackinnon p-value of 0.0002 which is below 0.05, with an absolute test statistic value of 5.162510. This value exceeds the critical values

at the 1% (3.653730), 5% (2.957110), and 10% (2.617434) levels. The study rejected the null hypothesis of non-stationarity and thus UNM was stationary upon the first difference.

For Corruption (CRPT) the Mackinnon p-value is 0.0000 significantly below 0.05 with an absolute test statistic value of 7.840649. The value surpasses the critical values at the 1% (3.653730), 5% (2.957110), and 10% (2.617434) significance levels. The null hypothesis of non-stationarity was therefore rejected this shows that CRPT was stationary at the first difference.

Fiscal Deficit (FD) has a Mackinnon p-value of 0.0023 less than 0.05 with an absolute test statistic value of 4.227944. This value is above the critical values at the 1% (3.653730), 5% (2.957110), and 10% (2.617434) levels. Thus, the study rejected the null hypothesis of non-stationarity and hence FD is stationary at the first difference. The variables were different to become stationary.

4.3.3 Kwiatkowski Phillips Schmidt Shin Test

The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, introduced in 1992, acts as an alternative stationarity test to conventional unit root tests such as the Phillips-Perron and Augmented Dickey-Fuller tests. Unlike these traditional tests, the KPSS test directly examines the stationarity of variables and is particularly useful for shorter time series. The primary goal of the KPSS test is to remove the deterministic trend from the series to achieve stationarity. One key distinction of the KPSS test is its null hypothesis, which assumes stationarity, while the alternative hypothesis suggests the presence of a unit root. The inferences drawn from the KPSS test complement those obtained from the Dickey-Fuller distribution-based tests (Galadima & Aminu, 2020).

The time series is considered non-stationary when the alternative hypothesis is accepted and the null hypothesis is rejected when the LM (Lagrange Multiplier) statistic is greater than the critical value at the alpha levels of 1%, 5%, and 10%. This indicates that the series lacks the level of stationarity that is required for time series analysis, where it has a constant mean and variance over time (Baum, 2018).

The KPSS test findings viewed that Public Health Expenditure (PHE) has a statistic of 0.505873, which is below the 1%, 5%, and 10% critical values (0.739000, 0.463000, and 0.347000, respectively) indicating that PHE is stationary. Gross Domestic Product per capita (GDPACA) has a KPSS statistic of 0.631454, below the 1% critical value but above the 5% critical value and 10% critical value suggesting non-stationarity at the 5% and 10% levels.

Tax Revenue (TR) has a KPSS statistic of 0.456146 which was below all critical values, indicating that TR is stationary. Unemployment (UNM) with a KPSS statistic of 0.412099 is also below all critical values hence stationary. Corruption (CRPT) has a KPSS statistic of 0.670203, above the 5% and 10% critical values but below the 1% critical value, indicating non- stationarity at the 5% and 10% levels. Fiscal Deficit (FD) has a KPSS statistic of 0.427171, below all critical values, indicating it is stationary.

After first differencing, the KPSS test findings indicate that Public Health Expenditure (PHE) had a KPSS statistic of 0.272763 below the critical values at the 1%, 5%, and 10% significance levels (0.739000, 0.463000, and 0.347000, respectively). This indicates that PHE is stationary after first differencing, denoted as I(1). Similarly, Gross Domestic Product per capita (GDPACA) has a KPSS statistic of 0.295457, which is also below the

critical values at the 1%, 5%, and 10% significance levels suggesting that GDPACA is stationary after first differencing, showing that it is integrated of order one, I(1). Tax Revenue (TR) shows a KPSS statistic of 0.299870 which was below all critical values, demonstrating that TR is stationary after first differencing, and hence is I(1). Unemployment (UNM) had a KPSS statistic of 0.260861 which is below the critical values at the 1%, 5%, and 10% significance levels, indicating that UNM is stationary after first differencing, making it I(1).

Corruption (CRPT) had a KPSS statistic of 0.051120 which was well below the critical values at the 1%, 5%, and 10% significance levels (0.739000, 0.463000, and 0.347000, respectively). This suggests that CRPT is stationary after first differencing, indicating it is integrated of order one, I(1). Fiscal Deficit (FD) had a KPSS statistic of 0.130247, that was below the critical values at the 1%, 5%, and 10% significance levels showing that FD is stationary after first differencing, making it I(1).

Table 4. 5: KPSS Test for Unit Root at Levels and at First Difference

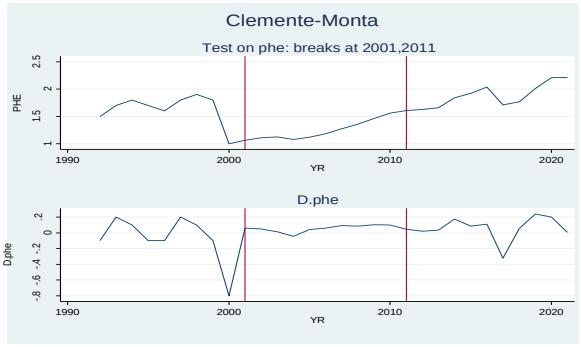
		Critical Values			
Variables	KPSS-LM Statistic	1%	5%	10%	Remark
PHE	0.505873	0.739000	0.463000	0.347000	Stationary
GDPACA	0.631454	0.739000	0.463000	0.347000	Unit root
TR	0.456146	0.739000	0.463000	0.347000	Stationary
UNM	0.412099	0.739000	0.463000	0.347000	Stationary
CRPT	0.670203	0.739000	0.463000	0.347000	Unit root
FD	0.427171	0.739000	0.463000	0.347000	Stationary
	First Difference				
PHE	0.272763	0.739000	0.463000	0.347000	I (1)
GDPACA	0.295457	0.739000	0.463000	0.347000	I (1)
TR	0.299870	0.739000	0.463000	0.347000	I (1)
UNM	0.260861	0.739000	0.463000	0.347000	I (1)
CRPT	0.051120	0.739000	0.463000	0.347000	I (1)
FD	0.130247	0.739000	0.463000	0.347000	I (1)

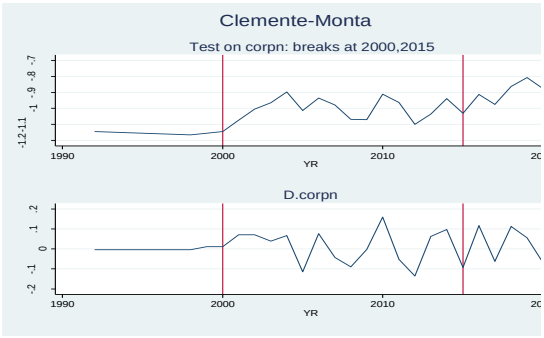
4.4 Unit Root Test with Structural Breaks

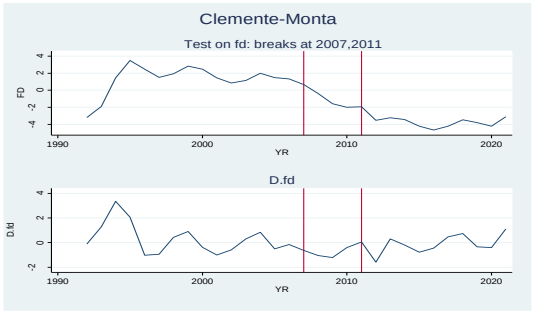
After Augmented Dickey-Fuller and Phillips-Perron tests, The study examined unit roots while accounting for structural breaks. The Phillips-Perron and Dickey-Fuller unit root tests might be affected by bias because they are not taken to consideration for structural changes in time series data. Using alternative methods that consider structural breaks addresses this issue. Consequently, the Clemente-Montañés-Reyes unit root test was employed.

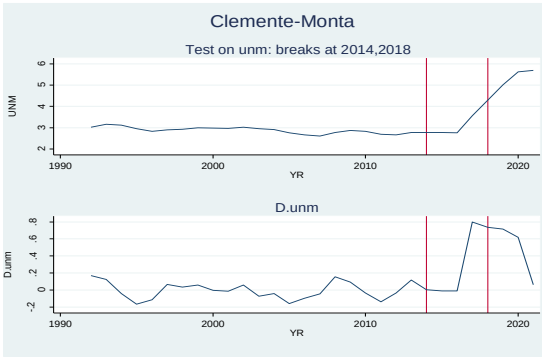
4.4.1 Clemente-Montañés-Reyes Unit Root Test with Two Structural Breaks

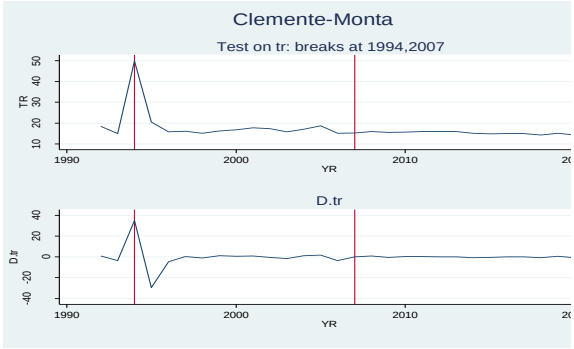
This was done with the use of Clemente-Montañés-Reyes Double Innovative Outlier unit root Test with two structural breaks unit root. The null hypothesis is $(rho - 1)$ is different from zero. An absolute t statistic exceeding critical value is taken as significant and hence the null hypothesis of the structural break accepted alternatively if the p value is less than 0.05 the null hypothesis cannot be rejected (Matundura, 2021).











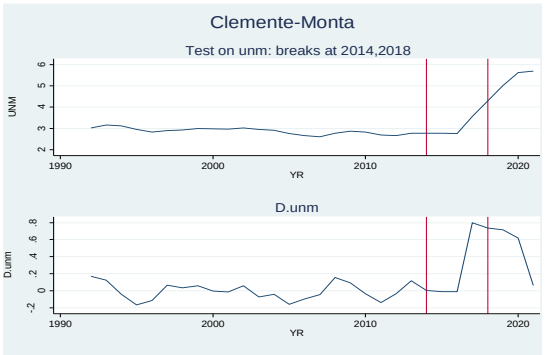


Figure 4. 3: Plots of Clemente-Montañés-Reyes graphs

For public health expenditure (PHE), 2001 showed insignificant structural breaks while there was a structural break 2011 reflecting major policy changes impacting public health funding, such as healthcare reforms and increased government budget allocations to the health sector. These reforms were part of the structural adjustment programs (SAPs) implemented in Kenya, which aimed to improve efficiency and outcomes in public services (Anangwe, 2008).

The significant structural breaks in 2000 and 2015 for corruption signify changes in anti-corruption measures including the introduction of stricter laws and major political events that influenced the level of corruption. The 2000 break aligns with efforts under SAPs to enhance governance and accountability (Willis et al., 2021).

The fiscal deficit had structural breaks in 2007 indicating significant changes in fiscal policy such as shifts in government spending and revenue collection strategies. The 2007 break reflects fiscal adjustments under SAPs, while the insignificant breaks in 2011 aligns with modern reforms to address fiscal imbalances and promote growth (Maupeu, 2021).

The 2008 structural break for gross domestic product per capita (GDPPACA) is attributed with the financial crisis in the global view and post election violence which had profound impacts on GDP. The 2016 break reflects subsequent recovery measures and significant economic policies aimed at stabilizing and boosting the economy (Odhiambo, 2023).

Tax Revenue (TR) had the 1994 break which is due to tax reforms and changes in economic activity. The insignificant break in 2007 indicates that while there were changes in tax

policies, they did not significantly impact the trend of tax revenue. Tax reforms under SAPs aimed to broaden the tax base and improve collection efficiency.

The significant break in 2014 and 2018 reflects major labor market reforms and economic downturns that impacted employment levels. The year 2014 and 2018 were marked by significant transitions in labor markets as countries adapted to new economic realities and implemented reforms to foster recovery and growth.

Table 4. 6 : Results of Clemente-Montañés-Reyes Double Innovative Outlier Test for Unit Root

Variable	Breaks	Coef	T-Statistic	Rho-1	P-Value	Year	Remark
PHE	DU1	-0.29305	-1.464	-0.19402	0.154	2001	No Structural break
	DU2	0.90464	4.519	-1.115	0.000	2011	Structural break
FD	DU1	-2.40378	-2.750	-0.45957	0.010	2007	Structural break
	DU2	-1.86408	-2.042	-4.707	0.051	2011	No Structural break
UNM	DU1	0.48131	3.150	0.13206	0.007	2014	Structural break
	DU2	2.16785	11.388	0.438	0.000	2018	Structural break
GDPACA	DU1	1154.32836	5.903	-0.65054	0.000	2008	Structural break
	DU2	1997.68600	8.319	-1.580	0.000	2016	Structural break
TR	DU1	-6.71292	-2.338	-1.00211	0.026	1994	No Structural break
	DU2	-1.73111	-0.850	-5.601	0.402	2007	No Structural break
CRT	DU1	0.15248	6.518	-1.91511	0.000	2000	Structural break
	DU2	0.16264	6.304	-3.336	0.000	2015	Structural break

4.5 Determination Optimum Lag Length

According to Luetkepohl (2009), assessing the optimal lag length in time series analysis is crucial because it indicates the length of time it takes for changes in one variable to have an impact on another variable. This helps in accurately modeling the dynamic relationships within the data and ensures that the model captures the true temporal dependencies between variables, leading to more reliable forecasts and inferences.

The decision rule is typically to select the model with the least value of the information criteria. This guarantees that the error term is properly defined. The results of the Aikaike Information Criteria (AIC), Hannan-Quinn information criterion (HQIC), Prediction Error (FPE), and Schwarz information criterion (SBIC), lag selection in table 4.7 indicate the use of four lags as the most appropriate lag length to minimize the value of the selection criteria. If the lag duration is too short, the error terms may auto-correlate, resulting in estimators that appear significant but are wasteful. As a result, one would receive incorrect results. Based on the findings in the Table 4.7, the study used four lags in the ensuing analysis (Tiriongo, 2019).

Table 4. 7: Optimum Lag Selection Criteria

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-451.605				1.4e+06	31.2052	31.2948	31.4854
1	-292.879	338.4	36	0.000	210.724	22.3253	22.9528	24.2869
2	-240.498	104.76	36	0.000	96.9158	21.2332	22.3986	24.8763
3	-162.509	155.98	36	0.000	15.9622	18.4339	20.1373	23.7585
4	493.651	1312.3*	36	0.000	3.6e-16*	-22.9101*	-20.6688*	-213.916*

4.6 Bounds Test

The Bound Test is adopted in the context of an ARDL (Autoregressive Distributed Lag) model to ascertain if a long-run equilibrium relationship exists between variables. This test involves comparing the calculated F-statistic with critical values specified by Pesaran et al. (2001). These critical values are grouped into two sets which are the lower bound and the upper bound (Hussein & Hmood, 2024).

According to Reda and Nourhan (2020), the lower bound critical values assume that each of the variables in the model are integrated of order zero, denoted as $I(0)$. This means the variables are stationary at level. Alternatively, all the variables are assumed be integrated of order one, denoted as $I(1)$ in the upper bound critical values. This means the variables become stationary after first differencing.

When performing the Bound Test, if the calculated F-statistic exceeds the upper bound critical value, the null hypothesis of no long-run relationship is rejected. This indicates that there is presence of a long-run equilibrium relationship among the variables. In case the calculated F-statistic is less than the lower bound critical value, the null hypothesis fails to be rejected, suggesting that no long-run relationship exists between the variables.

Should the calculated F-statistic lie between the lower and upper bound critical value, the test is inconclusive. In this case, further investigation is needed to determine if the long-run relationship exists, as the results do not provide a definitive answer.

The first level of the test is calculated under the assumption that all variables in the ARDL model are integrated of order zero $(I(0)$, whereas the second level is calculated under the assumption that the variables are integrated of order one $(I(1)$. The null hypothesis of no cointegration is rejected when the calculated F-statistic surpasses the upper critical bound value. Conversely, the null hypothesis is accepted when the F-statistic is less than the lower bound value. If the F-statistic lies between the lower and upper bound values, the test results are inconclusive. (Belloumi, 2014).

Based on this study's results in Table 4.8, it is evident that a long-run relationship exists between the variables. The calculated F-statistic of 9.179 exceeds the upper bound critical

values at the 10%, 5%, 2.5%, and 1% significance levels, which are 3.35, 3.79, 4.18, and 4.68, respectively, at $I(1)$. Hence, the null hypothesis was rejected of no level relationship.

Table 4. 8: Bounds Test

	Critical Values (0.1-0.01), F-statistic, Case 3			F = 9.179, t = -4.763
	[I_0] [I_1]	[I_0] [I_1]	[I_0] [I_1]	[I_0] [I_1]
	L_1 L_1	L_05 L_05	L_025 L_025	L_01 L_01
k_5	2.26 3.35	2.62 3.79	2.96 4.18	3.41 4.68
	accept if F < critical value for *I (0)* regressors			
	reject if F > critical value for *I (1)* regressors			
	k: # of non-deterministic regressors in long-run relationship			
H_0: no levels relationship				
	Critical Values (0.1-0.01), F-statistic, Case 3			
	[I_0] [I_1]	[I_0] [I_1]	[I_0] [I_1]	[I_0] [I_1]
	L_1 L_1	L_05 L_05	L_025 L_025	L_01 L_01
k_5	-2.57 -3.86	-2.86 -4.19	-3.13 -4.46	-3.43 -4.79
	accept if F < critical value for *I (0)* regressors			
	reject if F > critical value for *I (1)* regressors			

4.7 Post Estimation Diagnostic Checks

Various diagnostic checks were conducted to ensure its reliability of the ARDL model used in the study

4.7.1 Test for Multicollinearity

Multicollinearity arises when independent variables in a regression model are strongly correlated, potentially resulting in unreliable estimates of the regression coefficients. Multicollinearity among the independent variables must be checked in order to ensure the ARDL model's validity. This was done by adopting the Variance Inflation Factor (VIF). A VIF value exceeding 10 usually signals a multicollinearity issue. VIF was computed for each predictor variable, with the results shown in Table 4.9. The average VIF was 7.33, which is below 10, indicating no multicollinearity.

Table 4. 9: Results of Variance Inflation Factor

Variable	VIF	1/VIF
GDPPACA	5.64	0.177345
UNM	4.06	0.246062
FD	1.73	0.576908
TR	1.16	0.865745
CRPT		
Mean VIF	3.15	

The Variance Inflation Factor (VIF) was calculated for each of the predictor variables and the findings are presented in Table 4.9. The mean VIF was 3.15 which is below the threshold of 10. This indicates the absence of multicollinearity among the independent variables.

4.7.2 Breusch–Godfrey LM Test for Serial Autocorrelation

The Breusch–Godfrey LM test was used to determine if there is serial autocorrelation in the residuals of a regression model. When residuals from one period are linked with residuals from another, a phenomenon known as serial autocorrelation occurs. This can lead to inaccurate inferences and ineffective parameter estimates. The null hypothesis of the test states that there is no serial autocorrelation in the residuals, whereas the alternative hypothesis suggests that serial autocorrelation exists.

Table 4.10: Serial Autocorrelation Table Breusch-Godfrey LM test for autocorrelation

Lags	$Chi2$	Df	Prob > Chi2
1	8.378	1	0.7879

Based on the results from the Breusch–Godfrey LM test in table 4.10 for serial autocorrelation, the p-value was found to be 0.7879. As the p-value exceeds 0.05, the study failed to reject the null hypothesis, suggesting that there exists no evidence of serial autocorrelation in the residuals of the ARDL model. This supports the model's validity regarding the independence of residuals.

4.7.3 Whites Test for Heteroscedasticity

Heteroscedasticity occurs when the variance of the residuals is not uniform across different levels of the explanatory variables, which can lead to inefficient estimates and unreliable statistical tests. White's Test was used to detect heteroscedasticity in a regression model. The null hypothesis of the test assumes that the residuals display homoscedasticity, meaning their variance is constant, while the alternative hypothesis suggests the presence of heteroscedasticity, indicating that the variance of the residuals is not constant.

Since this p-value 0.0753 greater than 0.05, the study rejected reject the null hypothesis. This indicates that the errors are homoscedastic.

Table 4. 11: White Test for Heteroscedasticity

White's test for Ho: homoskedasticity
Ha: unrestricted heteroskedasticity
Cameron & Trivedi's decomposition of IM-test
chi2(27) = 34.85
Prob > chi2 = 0.1427
Cameron & Trivedi's decomposition of IM-test

Source	Chi (2)	Df	D
Heteroscedasticity	27	14	0.0753

4.7.4 CUSUM and CUSUMSQ Test for Model Stability

The CUSUMSQ (Cumulative Sum of Squares) test is employed to evaluate the stability of a regression model over time. It helps identify whether the estimated parameters stay consistent or if structural changes occur that influence the model's stability. The null hypothesis of parameter stability will not be rejected if the CUSUMSQ plot remains inside the critical boundaries at the 5% level of significance, indicating that the model parameters

are stable over time. If the CUSUMSQ plot exceeds the critical bounds, it suggests possible instability in the model parameters indicating that the model might require adjustments or a reassessment (Tule, 2020).

It is indicated from the figure 4.4 that the plots of both CUSUM and CUSUMSQ statistics lies within the two straight lines (critical bounds) at 5% significance level and this indicates that the model suffers no structural instability and therefore it was concluded that the coefficients in both of them, the long run and short run remain stable throughout the study period.

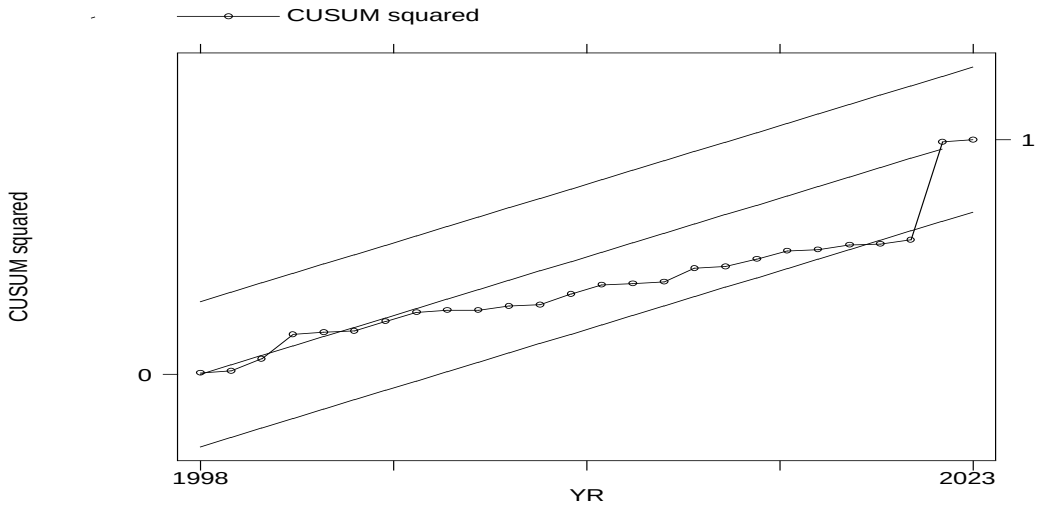


Figure 4. 4: Test for Model Stability

4.8 Autoregressive Distributed Lag Model in the Short Run

An ARDL model is used to estimate the association between a dependent variable and independent variables by taking into consideration both their current and past values. The standard form of a $ARDL(p, q)$ model, where p is the lag order of the dependent variable and q is the lag order of the independent variables can be represented as follows;

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_1 Y_{t-1} + \sum_{j=0}^{q} \gamma_j X_{t-j} + \varepsilon_t$$

Whereby;

Y_t = The dependent variable at time t

α = The constant term (intercept).

p = The maximum lag length of the dependent variable.

β_1 = coefficients of the lagged values of Y_t up to p lags.

Y_{t-1}= The lagged dependent variable.

γ_j. = The coefficients of the independent variable(s) X_t

X_{t-j}. = The independent variable(s) lagged by j periods.

ε_t= The error term at time t capturing the effects of all other factors not included in the model.

In the short run, the ARDL model shows the immediate effects of changes in the independent variables on the dependent variable. These dynamics are expressed through the coefficients of the lagged values of both the independent variables and the dependent variable.

Table 4.12: Results ARDL Model in the Short Run

Sample 1990-2023 Log likelihood = 35.961934			Number of observations = 30 F (9,10) = 37.17 Prob > F= 0.0000 R-squared= 0.9860 Adj R-squared = 0.9595 Root MSE= 0.1264	
PHE	Coef.	Std. err	T	P > | t |
PHE				
L1	.1165285	.1854703	0.63	0.544
CORPN	-1.970741	.6693357	-2.94	0.015
FD				
----	.1256105	.0883063	1.42	0.185
L1	-.2054299	.0883039	-2.33	0.042
L2	.0873201	.0618987	1.41	0.189
GDPPACA				
----	-.001269	.0005666	-2.24	0.049
L1	.0025123	.0006309	3.98	0.003
L2	-.0020028	.0007726	-2.59	0.027
L3	.0018797	.0006879	2.73	0.021
TR				
----	.013532	.0104608	1.29	0.225
L1	.0113298	.0075685	1.50	0.165
L2	.0177778	.0057391	3.10	0.011
L3	.013243	.0055862	2.37	0.039
L4	.0108146	.0054286	1.99	0.074
UNM				
--	-.943672	.3193918	-2.95	0.014
L1	.7128284	.3513893	2.03	0.070
L2	.612786	.3458182	1.77	0.107
L3	-1.307724	.3768357	-3.47	0.006
L4	1.126417	.3012742	3.74	0.004
_Cons	-4.821517	.8957469	-5.38	0.000

Table 4.12 shows the effect of lagged differences of Fiscal Deficit (FD), Per capita Gross Domestic Product (GDP), Unemployment (UNM), Corruption (CRT), and Tax Revenue (TR) on Public Health Expenditure (PHE) short-run coefficients.

The first lag of Public Health Expenditure (PHE L1) does not significantly influence the current PHE, as indicated by the p-value of 0.544 >0.05.

Corruption has a significant negative effect on PHE with a p-value of 0.015 < 0.05.

The current fiscal deficit does not significantly influence PHE as shown by the p-value of 0.185> 0.05. However, the first lag of the fiscal deficit (FD L1) has a significant negative effect on PHE with a p-value of 0.042<0.05.

The current GDP has a significant negative effect on PHE, as indicated by the p-value of 0.049 < 0.05. The first lag of GDP (GDP L1) has a significant positive effect on PHE with a p-value of 0.003< 0.05. The second lag of GDP (GDP L2) has a significant negative effect on PHE with a p-value of 0.027< 0.05. The third lag of GDP (GDP L3) has a significant positive effect on PHE with a p-value of 0.021<0.05.

The current tax revenue does not significantly influence PHE as indicated by the p-value of 0.225 < 0.05. The first lag of tax revenue (TR L1) does not significantly influence PHE with a p-value of 0.165 < 0.05. The second lag of tax revenue (TR L2) has a significant positive effect on PHE, with a p-value of 0.011 < 0.05. The third lag of tax revenue (TR L3) also has a significant positive effect on PHE with a p-value of 0.039 < 0.05. The fourth lag of tax revenue (TR L4) does not significantly influence PHE as indicated by the p-value of 0.074>0.05.

The current unemployment rate has a significant negative effect on PHE with a p-value of 0.014 <.05. The first lag of unemployment (UNM L1) does not significantly influence PHE as shown by the p-value of 0.070>0.05. The second lag of unemployment (UNM L2) also does not significantly influence PHE with a p-value of 0.107> 0.05. The third lag of unemployment (UNM L3) has a significant negative effect on PHE with a p-value of 0.006<0.05. The fourth lag of unemployment (UNM L4) has a significant positive effect on PHE, with a p-value of 0.004, <0.05.

4.9 Long Run Auto Regressive Distributed Lag Model with Error Correction

The ARDL model was employed to ascertain the long-run relationship between the indicators used in the study, aiming to identify the long-term effects of policy changes on public health expenditure in Kenya. The co-integration test results indicated that the variables are co-integrated and integrated of orders $I(0)$ and $I(1)$. This justifies the use of the ARDL bounds test model to determine the factors influencing public health expenditure in Kenya. Table 4.13 presents the results of the ARDL model.

Table 4.13 shows the results of the Auto Regressive Distributed Lag (ARDL) Model with Error Correction Term (ECT) for the sample period from 1990 to 2023. The model aims to determine the long-run relationship between fiscal deficit, gross domestic product, un unemployment, corruption, tax Revenue and their effect on public health expenditure (PHE) in Kenya. Key statistics from the model include a log likelihood of 35.961934, number of observations at 30, an R-squared value of 0.9436, an adjusted R-squared value of 0.8366, and a Root Mean Squared Error (MSE) of 0.1264. These statistics indicate a high explanatory power of the model, with 94.36% of the variation in the dependent variable (public health expenditure) explained by the independent variables. The adjusted R-squared value of 83.66% accounts for the degrees of freedom and provides a more accurate measure of the model's explanatory power.

This negative relationship represents the speed of adjustment to the long-run equilibrium or the rate of return to equilibrium. It suggests that deviations from the long-term equilibrium in public health expenditure are corrected at a rate of 88.35% per period. This means that if public health expenditure deviates from its equilibrium path, the system will adjust rapidly correcting 88.35% of the deviation in the following period to return to the

long-term equilibrium. This adjustment helps maintain budget balance and avoid overspending. The result aligns with findings from studies on public expenditure adjustments, which indicate that systems with such significant correction terms tend to stabilize quickly after experiencing shocks or deviations (Kim & Lim, 2015).

Table 4.13: Auto Regressive Distributed Lag Model with Error Correction Term

Sample 1994 – 2023				Number of observations = 30	
Log likelihood = 35.961934				R-squared= 0.9436	
				Adj R-squared = 0.8366	
				Root MSE= 0.1264	
	D.exp	Coef.	Std. Err	T	P > |t|
ADJ	EXP				
	L1	-.8834715	.1854703	-4.76	0.001
LR	**CORPN**	-2.230679	.5558094	-4.01	0.002
	FD	.00849	.0763173	0.11	0.914
	GDPPACA	.001268	.000458	2.77	0.020
	TR	.0754945	.0286606	2.63	0.025
	UNM	.2270987	.2182744	3.48	0.003
SR					
	GDPPACA				
	D1	-.0023892	.0008904	-2.68	0.023
	LD	.0001231	.000921	0.13	0.896
	L2D	-.0018797	.0006879	-2.73	0.021
	TR				
	D1	-.0531652	.013212	-4.02	0.002
	LD	-.0418354	.0109544	-3.82	0.003
	L2D	-.0240576	.0089636	-2.68	0.023
	L3D	-.0108146	.0054286	-1.99	0.074
	UNM				
	D1	-.0531652	.013212	-4.02	0.002
	LD	-.0418354	.0109544	-3.82	0.003
	L2D	-.0240576	.0089636	-2.68	0.023
	L3D	-.0108146	.0054286	-1.99	0.074
	UNM				
	D1	-1.144307	.270047	-4.24	0.002
	LD	-.4314789	.2580528	-1.67	0.125
	L2D	.1813071	.2716653	0.67	0.520
	L3D	-1.126417	.3012742	-3.74	0.004
	TOT				
	D1	-0.1115034	0.2285363	-0.49	0.632
	LD	-0.3114052	0.1853075	-1.68	0.111
	FIR				
	D1	0.0112124	0.0053738	2.09	0.052
	LD	0.0089802	0.004639	1.94	0.070
	CONS	-4.821517	.895747	-5.38	0.000

Notes: ADJ implies adjusted, LR-long run and SR is the short run

4.10 Summary of the Hypothesis Tested using ARDL Model for the Direct Effect

The Table 4.14 gives a summary of the hypothesis tested using ARDL model with the conclusion thereof.

Table 4.14: Summary of the Hypothesis Tested

Hypothesis	β-Value	P-Value	Decision
HO1: Fiscal Deficit has no significant effect on Public Health Expenditure	0.00849	0.914	Fail to Reject
HO2: Corruption does not significantly affect Public Health Expenditure	-2.230679	0.002	Rejected
HO3: Gross Domestic Product has no significant effect Public Health Expenditure	0.001268	0.02	Rejected
HO4: Tax Revenue does not significantly affect Public Health Expenditure	0.0754945	0.025	Rejected
HO5: Unemployment has no significant effect on Public Health Expenditure	0.2270987	0.003	Rejected

CHAPTER FIVE

DISCUSSIONS

5.1 Overview

This section discusses the findings of this study.

5.2 Descriptive Statistics Test Findings

The finding in Table 4.1 shows the patterns and changes in public health spending, indicating a generally positive trend in Kenya. This implies that GDP per capita, tax revenue, unemployment, fiscal deficit and corruption have increased over time in Kenya. However, there were notable shocks in certain years, such as 1992 and 2007-2010. In 2010, Kenya implemented a new political and economic governance framework with the preface of a new constitution. This included the establishment of a bicameral legislative house and decentralized governance. The shock in 1992 might be linked to increased public expenditure during the transition to multiparty democracy.

5.3 The Effect of GDP per Capita on Public Health Expenditure in Kenya

The findings in table 4.12 shows that GDP per capita has a positive significant effect on public health expenditure on the first lag, second lag shows significant negative effect while the third lag is positively significant. This reflects the economy's varying capacity to fund health initiatives.

In the long-run relationship, GDP per capita (GDPPACA) showed a positive and significant coefficient of 0.001268 (p-value 0.020 < 0.0500) in table 4.13. A unit increase in GDP per capita leads to a 0.001268 unit increase in public health expenditure. This positive relationship implies that higher economic growth enables increased allocation of resources to public health. This shows the ability of a growing economy to support public

services. The findings are in line with studies highlighting the importance of economic growth for public sector spending by (Alqadi & Ismail, 2019).

A study conducted by Younsi et al. (2016) across various low and middle-income countries stands with this view that there is a strong correlation between increase in GDP per capita together with higher public health expenditure. The study suggests implementing policies that foster economic growth to enhance health outcomes. Contrarily, a study by Velenyi (2016) in Latin America found that while economic growth positively affects health spending although the effect is not uniform and depends heavily on government priorities and budgetary constraints. The study concluded that simply raising GDP per capita may not be enough without specific investments in the health sector.

5.4 The Effect of Fiscal Deficit on Public Health Expenditure in Kenya

In the short term, the fiscal deficit has no significant impact on public health spending in table 4.12. This indicates that a previous period's fiscal deficit reduces current public health expenditure possibly due to budget constraints carried over from the past.

In table 4.13, Fiscal deficit (FD) showed a positive coefficient of 0.00849 however, it was not statistically significant (p-value 0.914 > 0.0500) indicating that changes in fiscal deficits do not have a significant impact on public health expenditure in the long run. That lack of significance suggests that fiscal deficits may be offset by other budgetary adjustments leaving public health expenditure unaffected.

5.5 The Effect of Tax Revenue on Public Health Expenditure in Kenya

Tax Revenue does not significantly influence PHE as indicated by the p-value of 0.225 < 0.05 in table 4.12. While immediate tax revenues do not impact health expenditure perhaps

due to delayed budget allocations, previous periods' revenues positively contribute to public health expenditure.

Tax revenue (TR) exhibited a positive and significant coefficient of 0.0754945 (p-value 0.025 < 0.0500), indicating that a unit increase in tax revenue leads to a 0.0754945 unit increase in public health expenditure. This positive relationship demonstrates that higher tax revenues provide the government with more funds to allocate towards public health. Efficient tax collection for enhance public services. These findings align with recent trends on the role of tax revenue in public spending Berembo and Igonikon (2020) who carried out a study on "Tax Revenue and Public Expenditure: Implications for Economic Growth in Nigeria" and recommended enhancing tax collection mechanisms to ensure sufficient funds for public services.

Supporting this view is a study by Ouma (2019) who conducted a study in on “Revenue effects of tax reforms, economic growth and political environment in Kenya.," found that increased tax revenue significantly boosts public health expenditure. The study recommended improvements in tax administration to ensure higher revenue collection and allocation towards essential services like health. Similarly, Muriithi and Moyi (2003) highlighted that efficient tax collection systems correlate with increased public spending on health and education. The study recommends governments to invest in better tax policies and infrastructure.

However, a contrasting study by Njiru (2020) on "The Influence of Devolved Healthcare System on Delivery of Health Services in Meru County, Kenya" suggested that while tax revenue is crucial, its impact on public health expenditure is often mediated by political

and administrative factors. The study recommended that alongside improving tax collection, there should be measures to enhance transparency and accountability in public spending to ensure that increased revenues translate into better health outcomes.

5.6 The Effect of Unemployment on Public Health Expenditure in Kenya

The current unemployment rate has a significantly negative impact on PHE with a p-value of 0.014 <.05 from table 4.12 in the short run. However in the long run, Unemployment (UNM) showed a positive and significant coefficient of 0.2270987 (p-value 0.003 < 0.0500) this shows that when other variables are held constant, a unit increase in unemployment leads to a 0.2270987 unit increase in public health expenditure. This positive correlation indicates that increased number of unemployment rates could lead to greater need for public health services, resulting in a need for increased spending to meet this demand. The findings corroborates with studies that show a link between economic downturns and increased public health expenditure.

In line with this study, Barasa et al. (2017b) in their research on "Assessing the Impoverishing Effects and Factors Associated with the Incidence of Catastrophic Health Care Payments in Kenya," found that households with an unemployed head had 75% more odds of incurring catastrophic expenditure due to direct healthcare costs compared to households with an employed head 1.75%. This study highlights the significant financial strain unemployment places on households, further supporting the link between higher unemployment and increased public health expenditure. The study recommended targeted social protection interventions to mitigate the financial burden on unemployed households.

Further, Qing (2015) in the study "The Effects of Unemployment Rate on Health Status of Chinese People" demonstrated that the unemployment rate was positively associated with mortality. The result also showed that the increased unemployment rate has been harmful to health outcomes of the population; the study highlighted the importance of reducing the unemployment rate to better the public health benefits in developing countries like China.

Another relevant study Ilori (2015) on "Determinants of Public Health Care Expenditure in Nigeria: An Error Correction Mechanism Approach (1981-2014)" examined the effects of various economic factors on public health expenditure in Nigeria. The study discovered that greater unemployment rates usually result in greater public health spending as governments seek to alleviate the negative impacts on public health. The study recommended the implementation of counter-cyclical fiscal policies to stabilize public health spending during economic downturns.

5.7 The Effect of Corruption on Public Health Expenditure in Kenya

Corruption has a negatively significant effect on Public Health Expenditure in the short run. This suggests that higher levels of corruption lead to lower public health expenditure indicating that resources may be diverted away from public health due to corrupt practices.

Corruption (CORPN) exhibited a negative and significant coefficient of -2.230679 (p-value 0.002 < 0.0500) indicating that a unit increase in corruption levels leads to a 2.230679 unit decrease in public health expenditure. This negative relationship can be clarified by the misallocation of resources and inefficiencies caused by corruption which diverts funds away from public health. The results support recent studies showing the detrimental impact of corruption on public spending efficiency (Ernst, 2020). The study carried out by Malyniak et al. (2019) found that higher corruption levels are connected with lower public

spending on health and education corroborating the negative impact of corruption on public health expenditure. However, a contrasting view is presented by Reinikka and Svensson (2006) who argue that increased accountability and transparency mechanisms can mitigate the adverse effects of corruption, suggesting that the relationship between corruption and public spending may not always be straightforward.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Overview

This chapter presents the summary of the findings, conclusions, recommendations, limitations of the study, and suggestions for further research.

6.2 Summary of the Findings

The study examined the effects of, fiscal deficit, gross domestic product per capita, tax revenue, unemployment, and corruption on public health expenditure. Descriptive statistics were computed to check for outliers and describe the general characteristics of the sample. Unit root tests, including Augmented Dickey Fuller (ADF), Philips Perron tests (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) were conducted to check for stationarity. The findings showed that some variables are stationary at level $I(0)$ while others were stationary at first difference$I(1)$. The ARDL model was used to examine the short-run dynamics, and the error correction model was employed to estimate the speed of adjustment to long-run equilibrium. The results examined that discrepancies of the model converge to equilibrium at a rate of 88.3% annually. Diagnostic checks confirmed the robustness of the model, with no issues of serial autocorrelation, heteroscedasticity, or multicollinearity. Key findings were: corruption negatively and significantly impacts public health expenditure in Kenya; fiscal deficit was found to be statistically insignificant; gross domestic product per capita positively and significantly affects public health expenditure in Kenya; tax revenue positively and significantly impacts public health

expenditure in Kenya; and unemployment positively and significantly affects public health expenditure in Kenya.

6.3 Conclusion

The following conclusions were drawn from the study findings; corruption has a negative significant impact on public health expenditure in Kenya, underscoring the need for stringent anti-corruption measures to foster better health spending; the fiscal deficit was discovered to be statistically insignificant hence suggesting that its effect on public health expenditure in Kenya is negligible within the study period; GDP per capita significantly and positively influences public health expenditure in Kenya this highlights the importance of increasing individual income levels to drive better health spending; tax revenue positively affects public health expenditure in Kenya, emphasizing the role of effective tax policies and revenue collection in public health development; and surprisingly, unemployment was revealed to have a positive effect on public health expenditure in Kenya, which may be due to increased labor availability or other contextual factors in Kenya like increased government expenditure on health programmes like linda mama.

6.4 Theoretical Implications of the Study

The study supports existing theories and contributes to the prevailing literature on public expenditure and economic growth. It collaborates with Public Expenditure Theory, Wagner's Theory, and Baumol's Theory providing understanding into how these theories apply to the Kenyan context. Wagner’s Theory states that as income increases, public expenditure increases, which the study supports by showing that GDP per capita affects

positively public health expenditure in Kenya, concluding that higher income levels enable better public health infrastructure and services. Baumol's Theory observes the tendency for relative prices of services like healthcare to be increasing over a certain period of time suggesting that the Baumol effect might contribute to rising health expenditures which if not managed well could negatively impact public health spending in Kenya.

6.5 Policy Implications of the Study

The study's findings indicate that the effect of selected macroeconomic variables on public health expenditure in Kenya were significant and essential for improving the country's public health sector. Policy interventions will be useful in addressing and mitigating the negative effects of these variables in Kenya to achieve sustainable public health expenditure.

Implement Anti-Corruption Strategies. Strengthen anti-corruption laws and enforcement mechanisms to create a more transparent and conducive environment for economic growth. This could involve setting up independent bodies to oversee the allocation and utilization of public funds.

Maintain Fiscal Discipline. Ensure that fiscal policies are aimed at sustainable economic growth without creating excessive deficits. This involves prudent budgeting and expenditure practices to avoid fiscal imbalances which can negatively affect economic growth.

Promote GDP per Capita Growth. Implement policies that enhance productivity, encourage investments, and improve individual income levels. This can be accomplished through skill

development, education and fostering a business-friendly environment that attracts investments.

Optimize Tax Revenue Collection. Develop and implement efficient tax policies to maximize revenue collection. This includes broadening the tax base, improving tax compliance, and reducing tax evasion to ensure sufficient funds for public health expenditure.

Address Unemployment. Create job opportunities and enhance skills development to utilize the available labor force effectively. This can involve investing in education and vocational training, promoting entrepreneurship, and assisting industries with significant job potential.

6.6 Recommendations

Based on the ARDL model regression results, the study recommends the following:

Implement Strong Anti-Corruption Policies. Kenya could enhance transparency and reduce corruption by adopting Rwanda's integrated electronic management system for procurement. This system allows real-time monitoring of expenditures, ensuring more effective use of health sector funds.

Maintain Fiscal Discipline. Adopting Germany's "debt brake" would help Kenya control new debt and maintain sustainable fiscal policies. This would prevent excessive deficits and ensure consistent public health funding.

Encourage Policies that Enhance Productivity, Investments, and Income Levels. Kenya could boost healthcare resources by emulating Singapore's economic diversification strategy which promotes innovation and attracts global investments, driving economic growth and expanding resources.

Ensure Efficient Tax Collection and Management. A digital tax administration system like Estonia's could improve Kenya's tax collection efficiency by reducing administrative costs and enhancing compliance, leading to increased revenue for public health.

Focus on Job Creation and Skills Development. Kenya could improve health expenditure by adopting skills development programs similar to those in Canada. These programs align with labor market needs and boost productivity.

6.7 Limitations of the Study and Recommendations for Further Studies

The study was limited to the period from 1992 to 2023 and focused on major macroeconomic variables in Kenya. Data inconsistency was a concern, but efforts were made to source data from reliable sources such as World bank.

For future research, it is recommended to extend the analysis to other East African countries to provide a regional perspective; consider additional indicators for a more comprehensive understanding of public health spending factors.

REFERENCES

Akosua Akortsu, M., & Aseweh Abor, P. (2011). Financing public healthcare institutions in Ghana. *Journal of health Organization and Management*, *25*(2), 128-141.

Alqadi, M., & Ismail, S. (2019). Government Spending and Economic Growth: Contemporary Literature. *Growth*, *6*, 20-22.

Anangwe, A. (2008). Health sector reforms in Kenya: User fees. *Sama, Martyn/Nguyen, Vinh-Kim (Hg.). Governing health systems in Africa. Council for the Development of Social Science Research in Africa (COSRIA), Dakar: S*, 44-59.

Arltová, M., & Fedorová, D. (2016). Selection of Unit Root Test on the Basis of Length of the Time Series and Value of AR (1) Parameter. *Statistika: Statistics & Economy Journal*, *96*(3).

Baek, E., & DeVaney, S. A. (2005). Human capital, bequest motives, risk, and the purchase of life insurance. *Journal of Personal Finance*, *4*(2), 62-84.

Barasa, E. W., Maina, T., & Ravishankar, N. (2017a). Assessing the impoverishing effects, and factors associated with the incidence of catastrophic health care payments in Kenya. *International journal for equity in health*, *16*(1), 1-14.

Barasa, E. W., Maina, T., & Ravishankar, N. (2017b). Assessing the impoverishing effects, and factors associated with the incidence of catastrophic health care payments in Kenya. *International journal for equity in health*, *16*, 1-14.

Baskerville, R., & Pries-Heje, J. (2010). Explanatory design theory. *Business & Information Systems Engineering*, *2*, 271-282.

Battaglini, M., & Coate, S. (2008). *Fiscal policy over the real business cycle: a positive theory*.

Baum, C. (2018). KPSS: Stata module to compute Kwiatkowski-Phillips-Schmidt-Shin test for stationarity.

Behera, D. K., & Dash, U. (2019). Impact of macro-fiscal determinants on health financing: empirical evidence from low-and middle-income countries. *Global health research and policy*, *4*(1), 1-13.

Bein, M. (2020). The association between medical spending and health status: A study of selected African countries. *Malawi Medical Journal*, *32*(1), 37-44.

Belloumi, M. (2014). The relationship between trade, FDI and economic growth in Tunisia: An application of the autoregressive distributed lag model. *Economic systems*, *38*(2), 269-287.

Berembo, A., & Igonikon, D. (2020). An Empirical Analysis of Government Revenue and Economic Growth in Nigeria: Implications for Leaders. *International Journal of Institutional Leadership, Policy, and Management*, *2*(1), 36-53.

Bertsatos, G., Sakellaris, P., & Tsionas, M. G. (2022). Extensions of the Pesaran, Shin and Smith (2001) bounds testing procedure. *Empirical Economics*, *62*(2), 605-634.

Breitung, J. (2001). *The local power of some unit root tests for panel data*. Emerald Group Publishing Limited.

Brennan, G. (2008). Market Failure: Compared to What? *Éthique et économique= Ethics and economics*, *6*(1).

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological)*, *37*(2), 149-163.

Bruns, M., & Lütkepohl, H. (2023). Have the effects of shocks to oil price expectations changed?: Evidence from heteroskedastic proxy vector autoregressions. *Economics Letters*, *233*, 111416.

Chipunza, T., & Nhamo, S. (2023). Fiscal capacity and public health expenditure in Zimbabwe. *Cogent Economics & Finance*, *11*(1), 2175459.

Cohen, M. X. (2014). *Analyzing neural time series data: theory and practice*. MIT press.

Damodar, N. (2004). *Basic econometrics*. The Mc-Graw Hill.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, *74*(366a), 427-431.

Dube, A. K., Ozkan, B., & Govindasamy, R. (2018). Analyzing the export performance of the horticultural sub-sector in Ethiopia: ARDL bound test cointegration analysis. *Horticulturae*, *4*(4), 34.

Eberl, J. T., Kinney, E. D., & Williams, M. J. (2011). Foundation for a natural right to health care. *Journal of Medicine and Philosophy*, *36*(6), 537-557.

Eboso, J. M. (2018). *Government Expenditure and Public Sector Corruption in Kenya* University of Nairobi].

Elsby, M., Hobijn, B., & Sahin, A. (2008). *Unemployment Dynamics in the OECD*.

Erdil, E., & Yetkiner, I. H. (2009). The Granger-causality between health care expenditure and output: a panel data approach. *Applied economics, 41*(4), 511-518.

Ernst, E. D. (2020). *How corruption affects growth* Ohio Dominican University].

Fronstin, P. (2007). Employment-based health benefits: access and coverage, 1988-2005. *EBRI Issue Brief*(303).

Galadima, M. D., & Aminu, A. W. (2020). Nonlinear unit root and nonlinear causality in natural gas-economic growth nexus: Evidence from Nigeria. *Energy*, *190*, 116415.

Gujarati, D. N. (2009). *Basic econometrics*. Tata McGraw-Hill Education.

Gupta, S., Davoodi, H., & Tiongson, E. (2001). Corruption and the provision of health care and education services. In *The political economy of corruption* (pp. 123-153). Routledge.

Hartwig, J. (2008). What drives health care expenditure?—Baumol's model of 'unbalanced growth'revisited. *Journal of health economics*, *27*(3), 603-623.

Hussein, M. A., & Hmood, M. Y. (2024). Nonstationary Time Series Models Using ARDL and NARDL Estimation. *Journal of Economics and Administrative Sciences*, *30*(141), 439-456.

Ilori, A. (2015). Determinant of public health care expenditure in Nigeria: An error correction mechanism approach (1981-2014). *Journal of Economics and Sustainable Development*, *6*(24), 7-17.

Jain, R., & Chetty, P. (2020). Why is it important to test heteroskedasticity in a dataset?.[online] Project Guru. In.

Jakovljevic, M., Timofeyev, Y., Ranabhat, C. L., Fernandes, P. O., Teixeira, J. P., Rancic, N., & Reshetnikov, V. (2020). Real GDP growth rates and healthcare spending–comparison between the G7 and the EM7 countries. *Globalization and Health*, *16*, 1-13.

Kagalwala, A. (2022). kpsstest: A command that implements the Kwiatkowski, Phillips, Schmidt, and Shin test with sample-specific critical values and reports p-values. *The Stata Journal*, *22*(2), 269-292.

Kagotho, N., Bunger, A., & Wagner, K. (2016). "They make money off of us": a phenomenological analysis of consumer perceptions of corruption in Kenya's HIV response system. *BMC health services research*, *16*, 1-11.

Kim, H. B., & Lim, W. (2015). Long-term care insurance, informal care, and medical expenditures. *Journal of public economics*, *125*, 128-142.

Kim, J. H. (2019). Multicollinearity and misleading statistical results. *Korean journal of anesthesiology*, *72*(6), 558.

Kimalu, P. K., Nafula, N. N., Manda, D. K., Bedi, A., Mwabu, G., & Kimenyi, M. S. (2004). A review of the health sector in Kenya. *Kenya Institute for Public Policy Research and Analysis Working Paper. Nairobi*.

Kiminyei, F. (2018). The nexus between tax revenue and government expenditure in Kenya. *International Journal of Economics & Management Sciences*, *7*(05).

Kooshkebaghi, M., Emamgholipour, S., & Dargahi, H. (2022). Explaining specific taxes management and use in the health sector: a qualitative study. *BMC health services research*, *22*(1), 1220.

Lewis, V. B. (1952). Toward a theory of budgeting. *Public Administration Review*, *12*(1), 42-54.

Lomnicki, Z. A. (1961). Tests for departure from normality in the case of linear stochastic processes. *Metrika*, *4*(1), 37-62.

Luetkepohl, H. (2009). *Econometric analysis with vector autoregressive models*. Wiley Online Library.

Malyniak, B., Martyniuk, O., & Kyrylenko, O. (2019). The impact of corruption on the efficiency of public spending across countries with different levels of democracy. *Financial and credit activity problems of theory and practice*, *1*(28), 290-301.

Manda, D. K., Mugo, M. G., & Murunga, J. (2020). Health expenditures and health outcomes in Kenya.

Matundura, E. (2021). Selected Macroeconomic Determinants of Economic Growth in Kenya: A Co-integration Approach. *The International Journal of Business & Management*, *9*(10).

Maupeu, H. (2021). State, economy and development in kenya. *Kenya in Motion 2000-2020*, 29.

Mbulwa, J., & Kinyua, G. (2020). The Role Of Strategy Formulation On Service Delivery: A Perspective Of Turkana County In Kenya. *International Journal of Innovative Research and Advanced Studies*, *8*(3), 8.

McGee, M., & Yaffee, R. A. (2019). Comparison of Variable Selection Methods for Forecasting from Short Time Series. 2019 IEEE International Conference on Data Science and Advanced Analytics (DSAA),

Moon, J. H., Kim, K. M., Kim, J. H., Moon, J. H., Choi, S. H., Lim, S., . . . Jang, H. C. (2016). Predictive values of the new sarcopenia index by the foundation for the national institutes of health sarcopenia project for mortality among older Korean adults. *PloS one*, *11*(11), e0166344.

Mouteyica, A. E. N., & Ngepah, N. (2023). Health expenditure convergence and the roles of trade and governance in Africa. *Archives of Public Health*, *81*(1), 77.

Munywoki, J., Nyawira, L., Musiega, A., Gathoni, R., Tsofa, B., Hanson, K., . . . Barasa, E. (2023). How does corruption influence health system efficiency? A case study of two counties in Kenya. *medRxiv*, 2023.2006. 2027.23291949.

Muriithi, M. K., & Moyi, E. D. (2003). *Tax reforms and revenue mobilization in Kenya*. AERC.

Murunga, J., Mogeni, G., & Kimolo, D. N. (2019). Public health spending and health outcomes in Kenya. *European Scientific Journal*, *15*(1), 125-138.

Narayan, P. K. (2008). Evidence of panel stationarity from Chinese provincial and regional income. *China Economic Review*, *19*(2), 274-286.

Ndajiwo, M. (2020). The taxation of the digitalised economy: An African study.

Newey, W. K., & West, K. D. (1987). Hypothesis testing with efficient method of moments estimation. *International Economic Review*, 777-787.

Njiru, L. W. (2020). *The Influence of Devolved Healthcare System on Delivery of Health Services in Meru County, Kenya* KeMU].

Nkatha, L. (2019). *Macroeconomic Determinants Of Health Insurance Demand In Kenya* University of Nairobi].

Nkatha, L., Wanjala, K., & Machio, P. (2020). Macroeconomic determinants of health insurance demand in Kenya: An autoregressive distributed lag modelling. *The International Journal of Humanities & Social Studies*, *8*(2), 65-74.

Nyamwange, M. (2012). Economic growth and public healthcare expenditure in Kenya (1982-2012).

ODHIAMBO, D. D. (2023). *Influence of lending interest rates on the relationship between mortgage financing and financial performance of commercial banks in Kenya* Maseno University].

Odhiambo, S. O., Momanyi, G., Othuon, L., & Aila, F. O. (2013). The relationship between fiscal deficits and economic growth in Kenya: An empirical investigation. *Greener Journal of Social Sciences*, *3*(6), 306-323.

Okunade, A. A. (2005). Analysis and implications of the determinants of healthcare expenditure in African countries. *Health Care Management Science*, *8*, 267-276.

Organization, W. H. (2013). State of health financing in the African Region.

Organization, W. H. (2016). *Public financing for health in Africa: from Abuja to the SDGs*.

Organization, W. H. (2022). *Global spending on health: rising to the pandemic's challenges*. World Health Organization.

Osoro, K. (2015). Macro-economic and public health expenditures in Kenya.

Ouma, D. (2019). Revenue effects of tax reforms, economic growth and political environment in Kenya. *African Journal of Economic Review*, *7*(1), 136-153.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335-346.

Pomp, M., & Vujić, S. (2008). *Rising health spending, new medical technology and the Baumol effect*.

Qing, W. (2015). The effects of unemployment rate on health status of Chinese people. *Iranian journal of public health*, *44*(1), 28.

Rathore, A. (2016). Revisiting the Determinant of healthcare expenditure. *International Journal in Management & Social Science*, *4*(2), 582-586.

Reda, A. M., & Nourhan, E. (2020). Using the ARDL bound testing approach to study the inflation rate in Egypt. *Economic consultant*(3 (31)), 24-41.

Reinikka, R., & Svensson, J. (2006). The power of information: evidence from a newspaper campaign to reduce capture of public funds. *World Bank, Washington, DC*, *302*.

Rono, I. J. (2013). *The determinants of public health care expenditure in Kenya* Unversity of Nairobi].

Safi, S. K., & Al-Reqep, A. A. (2014). comparative study of portmanteau tests for the residuals autocorrelation in ARMA models. *Science Journal of Applied Mathematics and Statistics*, *2*(1), 1-13.

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *Kolner Zeitschrift fur Soziologie und Sozialpsychologie*, *69*(Suppl 2), 107.

Seitio-Kgokgwe, O. S., Gauld, R., Hill, P. C., & Barnett, P. (2016). Understanding human resource management practices in Botswana's public health sector. *Journal of health Organization and Management*, *30*(8), 1284-1300.

Subramanian, S. V., Belli, P., & Kawachi, I. (2002). The macroeconomic determinants of health. *Annual review of public health*, *23*(1), 287-302.

Thadewald, T., & Büning, H. (2007). Jarque–Bera test and its competitors for testing normality–a power comparison. *Journal of applied statistics*, *34*(1), 87-105.

Thomson, M., Kentikelenis, A., & Stubbs, T. (2017). Structural adjustment programmes adversely affect vulnerable populations: a systematic-narrative review of their effect on child and maternal health. *Public health reviews*, *38*, 1-18.

Tiriongo, S. (2019). *Credit allocation schemes: Perspectives from credit providers and regulatory regimes in Kenya*.

Toggerson, B., & Philbin, A. (2020). Making (Good) Graphs. *Physics 132 Lab Manual*.

Tule, T. B. (2020). Stability of money demand function in emerging Countries: Static and dynamic panel approaches. *Journal of Economics and International Finance*, *12*(4), 196-222.

Velenyi, E. V. (2016). Health care spending and economic growth. In *World Scientific Handbook of Global Health Economics and Public Policy: Volume 1: The Economics of Health and Health Systems* (pp. 1-154). World Scientific.

Willis, J., Cheeseman, N., & Lynch, G. (2021). The history of elections in Ghana, Kenya and Uganda: what we can learn from these "national exercises". *Journal of African Elections*, *20*(2), 1-25.

Wong, C. C., & Hiew, P. L. (2005). Correlations between factors affecting the diffusion of mobile entertainment in Malaysia. Proceedings of the 7th international conference on Electronic commerce,

Younsi, M., Chakroun, M., & Nafla, A. (2016). Robust analysis of the determinants of healthcare expenditure growth: evidence from panel data for low-, middle-and high-income countries. *The International journal of health planning and management*, *31*(4), 580-601.

APPENDICES

APPENDIX I: AUTHOURIZATION LETTER

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flame of knowledge and innovation

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OFFICE OF THE DEPUTY VICE-CHANCELLOR (ASA)
(Directorate of Board of Postgraduate Studies)

Our Ref: UoE/B/BPGS/NACO/060 **Date:** 6th August, 2024

The Chief Executive Officer
National Commission for Science, Technology & Innovations
(NACOST)
P.O. Box 30623 - 00100
NAIROBI.

Dear Sir/Madam

SUBJECT: REQUEST FOR RESEARCH PERMIT - CYNTHIA KWAMBOKA (REG.NO.SECO/AEC/004/22)

The above subject matter refers.

The above named is a bonafide Masters student in the Department of Applied Economics, School of Business, Economics and Management Sciences. The applicant has completed her coursework and successfully defended her proposal in readiness for commencement of research. Her research is entitled *"Macroeconomic Drivers of Public Health Expenditure* in Kenya."

By this letter, I request you to issue Ms. Kwamboka with a research permit to enable her proceed with her survey for her to write thesis.

Your support will be highly appreciated.

Yours faithfully

DIRECTOR
Board of Postgraduate Studies
University of Eldoret.

PROF. SAMUEL LUTTA
DIRECTOR, BOARD OF POSTGRADUATE STUDIES.

University of Eldoret is ISO 9001:2015 Certified

APPENDIX II: NACOSTI LICENSE

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **117106**

Date of Issue: **12/August/2024**

RESEARCH LICENSE

This is to Certify that Miss.. CYNTHIA KWAMBOKA NYABOGA of University of Eldoret, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Uasin-Gishu on the topic: MACROECONOMIC DRIVERS OF PUBLIC HEALTH EXPENDITURE IN KENYA for the period ending : 12/August/2025.

License No: **NACOSTI/P/24/38800**

117106

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APPENDIX III: SIMILARITY

University of Eldoret

University of Eldoret

Certificate of Plagiarism Check for Synopsis

Author Name	CYNTHIA KWAMBOKA NYABOGA SECO/AEC/ M/004/22
Course of Study	Type here...
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