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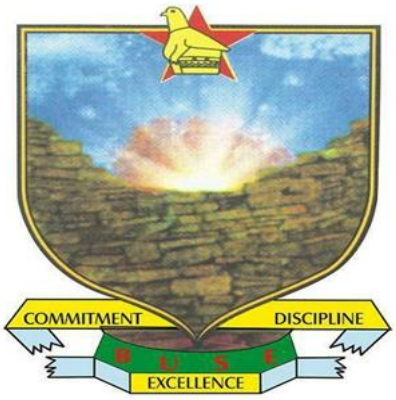

THE IMPACT OF PUBLIC HEALTH EXPENDITURE ON ECONOMIC GROWTH IN ZIMBABWE.

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APPROVAL FORM

The undersigned certify that they have read and recommended to the Bindura University of Science Education for acceptance, a project entitled, **the impact of public health expenditure on economic growth in Zimbabwe,** submitted by **Ruth Rutendo Chisangowerota** in partial fulfilment of the requirements of the **Bachelor of Science (Honours) Degree in Economics.**

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CHAIRPERSON DATE

DECLARATION

I dedicate this work to the Lord Almighty who gave me spiritual guidance, strength and power of mind, to my dearly loved parents who provided their moral, emotional and financial support.

ABSTRACT

The researcher sought to investigate the impact of public health expenditure on economic growth in Zimbabwe, with an understanding that public health expenditure is an important aspect of successful health systems. Good health plays a substantial role in economic growth. It enhances high worker's effectiveness and productivity through reduced sick days at work, high cognitive sense hence increased physical and mental capabilities which then lead to increased production as a result improved economic growth. The researcher investigated the impact of the public health expenditure on economic growth in Zimbabwe using yearly time series data for the period 1990-2020.

The study was explained by the Vector Error Correlation Model (VECM) using time series data to show the impact of public health expenditure, inflation, foreign health aid and public education expenditure as they affect economic growth in Zimbabwe. A country's financial commitment to health investment and expenditure has a corresponding effect on its economic growth and development therefore, the study recommends that government should put more effort in increasing its yearly budgetary allocations to the health sector in order to have a strong improvement on health outcomes in Zimbabwe.

The government should try to meet the WHO recommendations of increasing the allocation to 15% and ensure policies that will have good cooperate governance to the health sector ensuring that funds are correctly spent. In Zimbabwe the average budgetary allocation to the health sector is 2.4% which is far less than the WHO recommendations. Increasing the budgetary allocation in Zimbabwe will make government health expenditure to have a hearty effect to the economy. As the economy becomes wealthier through increased national income, government expenditure on health should increase proportionally.

There is a need to recommend a model which enhances public health expenditure (PHE) in Zimbabwe. It is recommended that the government should consider health as a back bone of the

economy. There is great need for the government to increase its budget allocations towards public health care expenditure.

Investment in health has both backward and forward spillover effect to the economy. A healthier nation means a healthier economy since there will be an increase in life expectancy, a healthier population, healthy educated children, more hours at work hence more production leading to increased output which at the end is increased growth. Babatude (2012) postulates that better health facilitates a sound ability for workers and enterprises which as a result improve the tax base of an economy thus a better fiscal base hence better economic performance leading to poverty reduction. More investment in health and nutrition should be done in Zimbabwe. Adequate investment in the sector will improve educational outcome as well as economic growth.

Policies that support provision of facilities should be promoted in the country. The study also showed a positive relationship between public health expenditure and economic growth. Hence in Zimbabwe it implies that per capita GDP growth could be achieved in Zimbabwe by increasing savings so as to raise adequate capital. In Zimbabwe there is low capital formation which results in shortage of capital due to the fact that there are low savings done. Thus, increasing savings could make adequate capital available to investors.

Increasing savings could be done by increasing institute deposit insurance to safeguard depositors. This will act as an incentive for depositors to save in banks hence adequate capital can be raised which can be channeled to investors to increase their production as a result increased economic growth. Investment in agriculture and industry could be growth enhancing. When this is done it would complement with domestic investment hence accelerate economic growth. The government should increase remuneration of nurses so that they provide health care to the public. In addition, the government should subsidies for research and development in Zimbabwe.

ACKNOLEDGEMENTS

First and foremost, I would like to thank the Lord Almighty for the power of mind and guidance. I owe a deep sense of gratitude to my supervisor Dr S Mukoka for his patience, tolerance and active guidance throughout the completion of this dissertation. I am extremely grateful to my beloved parents for their love, prayers, financial support and the sacrifices they made throughout this dissertation and my best friend Audrey Kutsanzira for her support. May God bless you.

ABREVIATIONS

ADF	Augmented Dickey Fuller
BLUE	Best Linear Unbiased Estimator
E	Public education expenditure
FHAID	Foreign health aid
GDP	Gross Domestic Product
IMF	International Monetary Fund
INF	Inflation
OLS	Ordinary Least Squares
PHE	Public Health Expenditure
VIF	Variance Inflation Factor
WHO	World Health Organization
ZIMSTAT	Zimbabwe National Statistics Agent

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CHAPTER ONE

THE PROBLEM AND ITS SETTING

1.0 Introduction

This chapter highlights the structure of the project on the impact of public health expenditure on economic growth in Zimbabwe. It focuses on the introduction to the study, background of the study, objectives of the study, statement of hypothesis, assumptions of the study, scope of the study, delimitation of the study, limitation of the study, definition of terms and the chapter summary. This chapter reveals the outlook of the project and gives a brief picture on what the research project covers.

1 .1 Background of the study

Health is an asset individuals possess, which has an essential value. Being healthy, meaning a complete state of physical, mental and social well-being including the absence of illness, is one of the goals most valued by human beings. Thus, the most common analysis related to health is an understanding of factors that determine good health for its intrinsic value. It is unquestionable that avoiding or alleviating illness, and developing or maintaining our physical and mental abilities are something that an individual and social level are considered an essential part of human welfare. Yet several decades ago, and especially quite recently the contribution of health to the generation economic growth has been emphasized.

Decisions regarding the allocation of public funds in the health sector and health related areas must consider their intrinsic and instrumental value of health. In order to explain the relationship between public health and economic growth, it is necessary to understand the concept of health in a broad sense. Health is not only the absence illness, it is also the ability of people to develop to their potential during their entire lives. Health impacts economic growth in a number of ways. For example, it reduces production losses due worker's illness.

In Zimbabwe the proportion of public health expenditure has been far much below the WHO bench mark for the world developing countries. The economic trend for Zimbabwe for the past decades has been taking nose dive trend evidenced by increasing unemployment rate, falling industrial capacity utilization and persistent BOP deficit and high external debts among others. Despite all the empirical and theoretical literature to learn from it is noted that Zimbabwe apportion insignificant funds towards public health care expenditure. This had enticed the research to open an inquiry on the relationship between public health care expenditure and economic growth in Zimbabwe for the period ranging from 1990 to 2020.

Public health expenditure in the first few years of independence were significant, and proved what a positive energy and dedication could achieve. This was as a result of increased budget allocations to the health sector and the education sector, which was in line with the Growth and Equity Policy Statement (1981) that supported the provision of social services to the majority. The health status of Zimbabwe's population mirrored a glaringly unequal socio-economic structure, characterized by appropriately racial inequalities and significant inequalities between urban and rural populations.

Therefore, health expenditure in Zimbabwe started declining around 1990 after independence. In the 1990s, Zimbabwe embarked on a World Bank-inspired Economic Structural Adjustment Programme (ESAP) that was meant to usher in a new era of modernized, competitive and export led industrialization. There were massive cuts on social expenditures such as education and health.

All these reforms were standard ingredients of liberalization and put special emphasis on reducing the government deficit, civil service reform and shedding of public enterprises.

Government allocation to the health sector under ESAP fell from 2.6% of GDP in 1980 to about 2.2% by 1997. Since 1990, there has been a steady decline in real per capita spending on health. Its health expenditure as a percentage of total government expenditure was 5.3% in 1988, and by 1990 it was around 6.2%. The economy grew sharply; real GDP growth averaged about 4% per year as compared to a 2% GDP growth rate for its neighboring countries like Zambia, during the 1980s. Health services was extremely expanded because of large government spending on social services during the early and mid-part of the decade.

While Zimbabwe's health system used to be relatively sound in 1980s, however since 1990s most of the country's health delivery institutions have been scaling down their operations, with some facilities closing down. Due to a fall in health financing in developing economies, World Bank recommended that 15% of the government budget should be allocated to the health sector yet in Zimbabwe it has not been achieved from the period under assessment. Budgetary allocation to health was high in 1990 which was 6.2% which is far less than the WHO recommendation. It is noted that it follows a decreasing trend up to 4.2% in 1996.

1.2.1 Trends in the Zimbabwe health expenditure

The general trend in developing countries have been to increase governments' responsibility in health care, but in Zimbabwe the economic crisis prompted the opposite despite the first decade of independence. In the first decade of independence there was a higher expenditure in the health sector, the proportion of GDP rose from 2.0% in 1980/81 financial year to 2.6% by 1988/89. The government channeled large sums of money to public health care thus increased public health care expenditure percentage of total government expenditure up to year 1990.

From the period 1991 to 1996 it was seen that there was a decrease in the proportion of public health care expenditure as a percent of GDP. This was noticed when there was the introduction of ESAP (Economic Structural Adjustment Policy). From this period economic growth trend started declining and was consistently negative from the period 2000 to 2008 with annual average rates negative 6.44%. ESAP was meant to usher the new phase of modernized competitive and export led industrialization hence there were huge cuts on social expenditures such as health and education.

Health expenditure as a percentage of government expenditure fell from 6.2% in 1990 to 4.2% in 1996 which is a drop equivalent to 32.2%. Government allocation to health sector fell from 3.0% of GDP in 1990 to 2.0% in 1996. Since 1990, there had been steady decline in per capita spending on health which was seen to have declined from US$22 in 1990 to US$11 in 1996 (Auditor General's Report 1996). The HIV /AIDS pandemic also worsened the crisis creating problems for hospitals in coping with the demand for services.

An estimation of over 3000 victims died every week. This led to the lowering of worker productivity, increasing the proportion of the dependency ratios in rural areas as well as increase in the cost of health services (World Bank, 1996). The last decade from 2000 to 2010, the economic environment was worsened. It was characterized by social, economic and political melt down which included decline in value of local currency, liquidity crisis, and shortage of fuel, drugs and electricity and balance of payment problems (World Bank, 2011).

As of 2000 per capita health was US$8.55 compared to US$22 in 1990 which was recommended by the Commission of Review into Health Sector in 1997. It further decreased to US $0.19 in 2008 leading to the collapse of the health sector. Education sector also suffered fiscal austerity. Thus, expenditure on education declined by above 30% during ESAP, the budget allocation to education expressed as a percentage of total recurrent expenditure fell from 39% in 4 1999 to 2.1% in the 2000 budget. The per capita allocation to education fell in real terms from Z$37.83 in 1990 to Z$30.44 in 2000 causing a fall in real wages.

Total expenditure on health fell from a peak in 1998 to just 7% of GDP in 2005, with falling public expenditure on health and increasing private expenditure on health. Of this the largest increase was in household out-of-pocket expenditure to 53% (in 2003) of private expenditure on health, placing significant burdens on individuals. As government spending fell, the relative contribution of donor funding grew from a low of 2.1% (2000) to a high of 21.4% (2005) of total expenditure on health.

It has been noted that there was a gradual decrease in the proportion of health expenditure allocated to the health sector from the period of 1990 when ESAP was introduced. Decrease in GDP which is a proxy for economic growth is also seen from the period where there was decrease in the public health care expenditure which enhances economic growth through labor productivity. The public health expenditure budget is not enough compared to the demand of the majority. The per capita budget has fallen since 1991 to a level where it does not manage to pay for prevention, clinic and districts hospital cost per capita (WHO, 2010) Since late 2018, the real health budget was being severely eroded by the combined effect of exchange rate depreciation and increasing inflation.

Zimbabwe's per capita spending in health care is below the WHO recommended threshold of US$86. Overall, the percentage of children that received vaccinations increased from 69.2% in 2014 to 76% in 2019. Maternal mortality rates have dropped significantly from 614 deaths per 100,000 live births in 2014 to 462 in 2019. All Early Childhood mortality rate improved over the same period, except for neonatal, which increased from 29 deaths per 1,000 live births to 32 in 2019. The number of births attended by a skilled professional also increased from 78% in 2014 to 86% in 2019.

Although there were positive gains in 2019, the sector faced significant challenges in 2020 which were negatively impacting the achievements of the targets in the National Health Strategy. These challenges which range from inadequate funding, shortage of foreign currency to import essential drugs and equipment, power outages and intermittent fuel supply, which has significantly impacted

on the operations of health care centers, depreciating local currency and increasing inflation, which has eroded the health budget, among others.

The Covid-19 pandemic also worsened the crisis creating problems for hospitals in copying with the demand for services in 2020. Many people died in 2020 and this pandemic led to the lowering of worker productivity as working hours were reduced, schools also closed. The latest economic analysis for the country says the Covid-19 pandemic and its impacts disrupted livelihoods, expanding the number of extremely poor citizens by 1.3 million, and increasing extreme poverty to 49% in 2020. The pandemic further disrupted provision of basic public services in health, education, and social protection, which were constrained prior to the pandemic.

In 2020, the supply-side challenges facing the health system following a prolonged period of doctor strikes, reduced working hours for nurses, and limited and slow access to personal protective equipment initially contributed to a decline in the coverage and quality of essential health services. The number of institutional maternal deaths increased by 29% in 2020 compared to 2018, while deliveries at home increased by 30%.

The 2020 health budget still falls short of the 15% Abuja Declaration Target. Though there was a slight improvement from 7% in 2019 to 10% in 2020, more needs to be done. Per capita spending in health care is below the WHO recommended threshold of US$86. However, Zimbabwe's per capita allocation, which had improved to US$57 in 2017, is estimated to have sharply declined to US$21 in 2020 which puts at risk gains made over the years.

The public health expenditure budget is not enough compared to the demand of the majority. The per capita budget has fallen since 1991 to a level where it does not manage to pay for prevention, clinic and districts hospital cost per capita (WHO, 2010) It has been noted that there was a gradual decrease in the proportion of health expenditure allocated to the health sector from the period of

1990 when ESAP was introduced. The National Health Strategy (NHS) (2016-2020) gives strategic direction for the provision of healthcare services in Zimbabwe.

The strategy is aligned to the Sustainable Development Goals (SDGs), particularly Goal 3 which aims at providing equitable quality health care services to all Zimbabweans, with a focus on promoting primary health care but there is more work need to be done. As Zimbabwe is currently facing tight public finances and limited resources to external financing, it will need to rely heavily on reallocating domestic resources to optimal public uses, mobilize humanitarian support to prevent increasing fragility and leverage private financing where possible to stimulate growth.

1.3 Statement of the problem

Zimbabwe is facing poor economic growth which is associated with problems of low capacity utilization, low industrial output, low productivity, high poverty incidents, and increased external debts. It has been stated in theory and proven in a number of studies that increase in public health expenditure contributes to the expansion of an economic set up both in the short run and the long run. The health expenditure budget in Zimbabwe is not enough to meet health needs as the public health care financing is decreasing. Zimbabwe's capita budget started decreasing since 1991.

The decrease in public health spending has resulted in delayed upgrades of deteriorating health facilities, shortages of essential drugs and prolonged periods of doctor strikes. This shortage will increase child mortality rate, morbidity rate, crude death, maternal mortality rate, reduces human capital and reduces life expectancy at birth. However, there are debates among policy makers over public health expenditure's contribution to economic growth through consumption and investment effect as proposed by theory. Therefore, this study gives an opportunity to analyze if public health expenditure has a short run or long run impact on economic growth in Zimbabwe so as to inform the policy makers on the correct position.

1.4 Purpose of the study and Objectives

This research sought to assess effects of public health expenditure on economic growth from 1990 to 2020.

Objectives will be as follows:

(i) To determine the nature of the relationship between Public Health Expenditure (PHE) and economic growth in Zimbabwe.

(ii) To find the magnitude of the relationship between Public Health Expenditure (PHE) and economic growth in Zimbabwe.

(iii) To determine the implications of the relationship between Public Health Expenditure (PHE) and economic growth in Zimbabwe.

(iv) To recommend a model which enhances Public Health Expenditure (PHE) in Zimbabwe.

1.5 Statement of the Hypothesis

H_0: There is no relationship between public health expenditure and economic growth in Zimbabwe.

H_1: There is a relationship between public health expenditure and economic growth in Zimbabwe.

1.6 Significance of the study

The current research study is highly significant in that public health expenditure is an important aspect of successful health systems. Good health plays a substantial role in economic growth. The current research study will help readers in identifying and understanding the impact of PHE on economic growth. The importance of this study is summarized under the following headings:

1.6.1 To the Public health institutions

The study will help different institutions with an insight on the public health expenditure to demand in order to meet specific health expenditures. It helps public health institutions to know when and how to recruit and retain more health care professionals in the public system when the government is increasing public health expenditure. Also, the Ministry of health and childhood development will be able to know the amount money which they can allocate to the budget.

1.6.2 To Bindura University of Science Education

The study will help the institution to pay much attention and to acknowledge the feasibility of the study. Successful completion of this study should give Zimbabwean higher learning institutions, particularly BUSE, a platform for further research on the impact of public health expenditure on economic growth in Zimbabwe given the sector is critical for poverty alleviation and is of interest to both students and policy makers. The study will serve as a stepping stone for other students either for reference sake or to pursue further study into the subject matter.

1.6.2 To the researcher

The most prominent reason to engage in research is to enhance your knowledge. The successful completion of this study is fulfilling part of the requirements for Bachelor of Science Honours Degree in Economics. Also academic phase helps you prepare for any research tasks you will have to accomplish in the future. The findings of this research will also provide literature, understanding the importance of public health expenditure and helps students with further and future researches.

1.6.3 To the Zimbabwean economy

This study will help the economy by raising awareness to policy makers on the impact of public health expenditure on economic growth. This research will help Zimbabwe when structuring the yearly budgets on how much is needed towards the health sector after recognizing how much government expenditure contributes on economic growth and also knowing how best to allocate limited resources. Therefore, investing carefully in various public health aspects would boost income, GDP, and alleviate.

1.7 Assumptions of the Study

- Information used is not biased
- All other factors that affect GDP are held constant.
- literature review gives a detailed insight into the study
- This research assumes that the data collected provides all the necessary information required in carrying out the research.

1.8 Scope of the study

- The study focuses on the impact of public health expenditure on economic growth over the period 1990 to 2020.
- The study utilizes time series data obtained from the World Bank, ZIMSTATS and IMF.

1.9 Delimitation of the study

The study will be carried out on the case of Zimbabwe taking reference from 1990 to 2020 using time series data.

1.10 Limitation of the study

Data accuracy will be distorted; they will be need for natural logarithms.

Data availability; there will be no data for some variables on ZIMSTATS.

1.11 Definition of terms

Gross domestic product (GDP) = is the monetary value of all the finished goods and services produced within a country's borders in a specific time period, usually calculated on an annual basis (Lipsey,1995).

Public health = refers to all organized measures to prevent disease, promote health, and prolong life among the population as a whole. Its activities aim to provide conditions in which people can be healthy and focus on entire populations, not on individual patients or diseases (WHO, 2014).

Expenditure = is a transaction made through the payment done via cash basis or cash-equivalent for goods or services, or a charge against available funds in settlement of an 8 obligation as evidenced by an invoice, receipt, voucher, or other such document (Lipsey, 1995).

1.12 Chapter Summary

This chapter, being an introduction to the study gave an overview of the whole study. It involved the background of the study which provides the context of study, statement of the problem which

shows the problem to be solved by the study. It also includes the purpose of the study, research questions and the statement of hypothesis which is the probable answer of the study. Chapter 2 will consist of theoretical and empirical literature to this study.

CHAPTER TWO

LITERETURE REVIEW

2.0 Introduction

This chapter examines the literature relevant to the study. It follows the conceptual framework, which has the mandate to clearly outline the variables under review within this study, that is the independent and dependent variables; theoretical framework, which is guided by the research objectives mentioned earlier, it outlines the relationship that exist between the two variables under study and the implications of the relationship that exist; theory underpinning the study which is an overview of the relevant theories that the study will take into consideration; empirical framework, this is mainly empirical works (past studies) carried out by other researchers relevant/related to the current study and lastly research gap analysis which outlines the gap that the study seeks to fill in to the existing body of knowledge on the subject matter.

2.1 Theoretical literature review

2.1.1 Grossman Model (1999)

Grossman (1999) theory put more emphasizes on the demand for health as the human capital model in much of the literature on health economics because it draws heavily on 'human capital theory'. Grossman (1999) argues that health capital differs from other forms of human capital (Becker ,1967). The model views health as durable capital stock that result in a healthy life time. He claimed that a person's stock of knowledge affects his market and non-market productivity, while his stock of health determines the total amount of time he can spend producing money earnings and commodities. These commodities are Bentham's (1931) three pleasures that exhaust the basic arguments in the utility function.

Consumers produce commodities with inputs of market goods and services and their own time. Since goods and services are inputs into the production of commodities, the demand for these goods and services is a derived demand for a factor of production. In other words, the demand for medical care and other health inputs is derived from the basic demand for health. There exists a vital link between the household production theory of consumer behavior and the theory of investment in human capital. Consumers as investors in their human capital, produce these investments with inputs of their own time, books, teachers' services, and computers. Thus some of the outputs of household production directly enter the utility function, while other outputs determine earnings or wealth in a life cycle context.

Health, on the other hand does both. In Grossman's model, health defined broadly to include longevity and illness free days in a given year is both demanded and produced by consumers. Increase in the illness free days' increase productivity in the form of labor hours offered by an individual in production hence increase in economic growth. Health is a choice variable because it is a source of utility (satisfaction) and because it determines income or wealth levels. In other words, consumers for two reasons demand health; as a consumption commodity, it directly enters their preference functions, or put differently, sick days are a source of disutility. As an investment commodity, it determines the total amount of time available for market and activities. Since health capital is one component of human capital, a person inherits an initial stock of health that depreciates with age at an increasing by investment.

Death occurs when the stock falls below a certain level, and one of the innovative features of the model is that individuals "choose" their length of life. Gross investments are produced by household production functions that relate an output health to such choice variables or health inputs as medical care utilization, diet, exercise, cigarette smoking and alcohol consumption. In addition, the production function is affected by the efficiency or productivity of a given consumers as reflected by his or her personal characteristic. Efficiency is defined as the amount of heath obtained from a given amount of health inputs. For example, years of formal schooling completed plays an important role in this context.

The most fundamental law in economics is the law of the downward sloping demand function, the quantity of health demanded should be negatively correlated with its "shadow price". The shadow price of health rises with age if the rate of depreciation on the stock of health rises over the lifecycle and falls with education (years of formal schooling completed), if more educated people are more efficient producers of health, under certain conditions, an increase in the shadow price may simultaneously reduce the quantity of health demanded and increase the quantities of health inputs demanded. It must be noted that when health stock has been increased there will be increase in life time lived which brings an incentive to save for retirement as well as increase in productivity due more hours worked hence improve economic growth.

2.1.2 Public expenditure growth

Public expenditure is spending made by the government of a country on collective needs and wants such as pension, provision and infrastructure. Until the 19th century, public expenditure was limited as laissez faire philosophies believed that money left in private hands could bring better returns. In the 20th century, John Maynard Keynes argued the role of public expenditure in determining levels of income and distribution in the economy. Since then government expenditures have shown an increasing trend. There are two messages that emerge from this work: one is that a proper sense of the extent of market failure, rather than its mere presence, is relevant in all cases; the other is that 'correcting' for such market failure is often a complex multidimensional business not captured by direct public provision at zero price and not necessarily involving expansion of market output.

As a public expenditure theory of economic policy, this formulation leaves much to be desired, however, the prevalence of external effects in consumption contradicts a necessary assumption of the theory. Second, analysis of real-world situations is usually ill-suited to be couched in terms of choices among two alternatives. Third, since most policies involve a loss of welfare to someone, a formal basis for interpersonal comparisons is needed, and since the economist has no particular

right to attach social weights to individual welfare in the social welfare function, this is sufficient ground to rule out rigid prescriptions (Font and Novel, 2004).

2.1.3 Human capital theory

The theory was advocated by Gary S Becker. The theory put more emphases on the cost, skills and returns that are expected from attaining education which (Schultz 1999) viewed as investment in skills and competencies. It assumes that an educated population is a more productive one, it increases economic outputs. Human capital theory emphasizes that education raises productivity and efficiency of workers through the increase in the cognitive stock of those economically productive people employed hence raise future incomes and retirement savings. Human capital development in education and training has been empirically evidenced by the East Asia Tigers (Hong Kong, Korea, Singapore and Taiwan) to have a positive relationship with economic growth. However, it is evidenced that the more the provision of education and training in the country, the more the increase in the economic growth.

2.1.4 Wagner's Law of Public Spending

Wagner (1983) advocated a positive correlation between degree of economic activity and the scope of government. This implies that government expenditure for the provision of social good and redistribution will increase if per capita income increases. The idea was coined into the law of increasing expansion of the public and state activities. As interpreted by Musgrave, Wagner's law refers to the growth of the relative size of the public sector not the absolute size. The law states that as per capita income in an economy grows, the relative size of the public sector also grows, Brown and Jackson (1990).

The argument is that, as an economic system becomes industrialized, the government's role to correct market failures and to provide goods and services is called upon. According to Wagner the

main component of growth is foreseen in education and health services and in regular areas of legal administration and protection. Wagner's statements were empirical. Wagner had discovered the growth of the public sectors of a number of European countries and the United States and Japan during the 19th century.

2.2 Empirical literature

Wang (2011) studied the relationship between total healthcare expenditure and economic growth using the Granger causality test for several countries and concluded that there exists a positive relationship between the two. Simon Oke (2012) in his study of human capital investment and economic growth in Nigeria using secondary data spanned through 1978 to 2008. He concluded that government expenditure on education maintained a positive long run relationship with the index of national productivity while government expenditure on health and gross capital formation exhibited long run negative relationship with the economic growth. He recommended that more stock of physical capitals needed to be acquired to facilitate more investment in human capital and thereby enhance economic growth

Amiri and Ventelou examined the relationship between health expenditure and economic growth using improved version of Granger causality using the Organization for Economic Co-operation and Development (OEDC) countries thus concluded that a bidirectional Granger causality was leading.Rahman and Yunnah also did the same study in Bangladesh using vector autoregressive (VAR) model with Granger causality and concluded that there was unidirectional causality.

Blejer and Khan (1994) although in different countries. They concluded that those social expenditures (health and education), when competed with the private sector cause reduction in economic growth. It has been noted that the relationship between public expenditure and private investment expenditure is that they compete with or complement the private sector. However, it

has been evidently seen that public expenditures that complement private investment promote economic growth.

Hansen and King (1996) analyzed the determinants of health care expenditure for 20 OCED countries for the period 1960-1987. They employed a country by country analysing using OLS and an error correction model to estimate the determinants of health care expenditures in these countries. Their study concluded that real GDP per capita is the most vital determinant of health care expenditures, they also observed that non income variables like literacy rate, population are additionally significant, although its impact was small.

Nurudeen and Usman, (2010) carried out their study on the relationship between health status and economic growth using autoregressive distributed lag (ARDL) approach, they claim that increase in government expenditure on health results in an increase in economic growth since it enhances productivity. Berger and Messer (2002) sight health as a form of capital, such that health care is both a consumption good that yields direct satisfaction and an investment good that yields indirect utility through increased productivity, fewer sick days and higher wages.

Aranda (2010) noted that the major reason for health expenditure is the hope of improved health status, and that health status is governed by health investment. The demand for health care is derived from the demand for health itself. Both health care expenditure and improved health status are means to an end; the end is increased productivity and economic growth.

Grossman (1991) analyses linear relationship between growth in government spending and total economic growth. The conclusion of this study was that there is a strong and significant positive relationship between government expenditure size and economic growth. Using a production function approach, Ram (1986), came out with the empirical evidence that government expenditure propels or reduces economic growth. He concluded that big governments, measured

by their share in consumption expenditure to Gross National Product (GNP), reduced economic growth.

Baldacci et al (2004) analysed the role played by health expenditures to economic growth using panel data set for one hundred and twenty developing countries form the period 1975-2000. He concluded that expenditure on health within a period of time contributes to growth within that same period while lagged health expenditures seem to have no effect on growth. He concluded from his result that direct effect of health expenditure on growth is a flow and not a stock effect.

Mankiw (1992) find out that the growth of population is positively related to economic growth. He concluded that the growing population increases output by increasing the number of working population. However, the growth of population can only bring about economic growth if the supplies of capital and other resources are increasing adequately along with the growth of labour.

The paper reviews the national policies emphasizing health services as well as the trend in access to and public sector spending on health care facilities in Pakistan. The study explores the inequalities in resource distribution and service provision against the government health expenditure. The rural areas of Pakistan are the more disadvantaged in the provision of health care facilities. The expenditures in health sectors are overall regressive in rural Pakistan as well as at provincial and regional levels. Public health expenditures are pro-rich in Pakistan.

Maitra and Mukhopadhyay (2012) examined the role of public spending on the education and health sectors is examined with regard to promoting the gross domestic product (GDP) of 12 countries in asia and the Pacific over the last three decades. In six of those countries, namely Bangladesh, Kiribati, Malaysia, Maldives, the Philippines, and the Republic of Korea, Johansen co-integration tests confirmed the existence of co-integrating relations. In the remaining countries namely Fiji, Nepal, Singapore, Sri lanka, Tonga, Vanuata, co-integrating relations were absent.

The casual impact of education and health care spending on GDP was further examined in the study.

Chete and Adeoye (2002) empirically examine mechanics through which human capital influences economic growth in Nigeria. They used the vector Auto regression analysis and ordinary least square in their research. Hence concluded that there was a positive impact of human capital on economic growth which the various Nigerian governments since the post-independence have appreciated by remarkable expansion of educational infrastructure across the country.

Another study of human capital and economic growth was conducted by Lawanson (2009). They gave special attention to the key note of education and health. The study found out that there exists a positive relationship between government on education and economic growth. However, the study suggests that there is a negative relationship between government expenditure on health. The study concluded that the contribution of human capital development to economic growth is less significant.

2.3 Gap analysis

There is a great need for this study to be done in Zimbabwe because the researcher acknowledges that there is very little comprehensive research focusing specifically on the effects of public health expenditure on economic growth. It should be noted that most of the above studies were not done in Zimbabwe, so the researcher decided to fill in the gap. The major contributing factor of this research is to analyze if public health care expenditure has a short run or long run impact on economic growth in Zimbabwe so as to inform the policy makers on the correct position. Therefore, thus study will add to the existing literature and board of knowledge.

2.4 Chapter Summary

This chapter focused on the literature behind the study of public health expenditure on economic growth, focusing mainly on the theoretical and empirical literature. Several studies that have been carried out in other countries have been outlined. This will enable the researcher to come up with the necessary information that will enable him to construct a model for public health care expenditure in Zimbabwe. The next chapter will look at the methodology that will be used in constructing the effects of public health expenditure on economic growth in Zimbabwe.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The purpose of this chapter is to present the description of the research method to be used and statistical procedure utilized in analysing data. The main objective of this chapter is producing a well detailed account of the research methodology that is being used. The key elements to be covered in this section is research design, research approach and research strategy that was adopted. Also, on the data analysis section, stability tests that ensures the reliability and validity of results are being used, these includes normality test, autocorrelation and heteroscedasticity test. The model specification is also an important aspect of this chapter.

3.1 Model specification

3.1.1 Theoretical framework

The theoretical framework of the model is the endogenous growth model between real GDP per capita as a dependent variable and independent variables, which include; public health expenditure, inflation, foreign health aid and public education expenditure. The hypothesized structural relationship for real GDP per capita in Zimbabwe can be specified as follows:

Economic growth = f (PHE, INF,FHAID, E) ..... (1)

Where: GDP = Per capita GDP; PHE = Public health expenditure; INF= Inflation; FHAID= Foreign health aid and E= Public education expenditure.

3.1.1.2 Empirical model

As postulated by Lucas, (1988) in establishing the relationship between public health care expenditure and economic growth the equation can be explained in the form of changes in the variables and can be expressed in its liner form (log log form).

Equation 1 is a linear equation used to measure the change in GDP by finding its derivative with respect to PHE. This means that, a percentage change in PHE will change GDP per capita by β1. Given that the study involves PHE, the study shall employ Inflation (INF), Foreign health aid (FHAID) and Public education expenditure (E), as other control variables that affect GPD per capita.

$$\ln GDP = \beta 0 + \beta 1 \ln PHE + \beta 2 \ln INF + \beta 3 \ln FHAID + \beta 4 \ln E + \varepsilon t \quad (1)$$

Where:

βi = elasticity measure of changes of exogenous variables to GDP per capita

ln PERCAPGDP = natural log of GDP per Capita

ln PHE = natural log of Public health expenditure

In INF = natural log of Inflation

In FHAID= natural log of Foreign health aid

In E = natural log of Public education expenditure

ε = Error term

β0 , β1, β2 , β3 = estimation parameters

The decision to use the log log model is important because it reduces the scale of the variables from a tenford to twoford, thus minimizing the occurrence of heteroscedasticity in the model (Gujarati ,2004). Also the need to investigate the percentage change in GDP growth to changes in public health expenditure, inflation, foreign health aid and public education expenditure, has also contributed the reason for using the log log model.

3.2 Description and justification of variables

3.2.1 Economic growth (INPERCAPGDP)

Economic growth is an increase in the production of economic goods and services, compared from one period of time to another. It is measured by GDP (Gross Domestic Product) in this model and it is the dependent variable. Economic growth is calculated as a percentage change in Gross Domestic Product, it is included in the model due to the fact that it reflects domestic productive capacity. It is used to gauge the health of an economy. When output increases demand for goods produced also increases making additional investment more profitable. Sound investors respond by increasing investment hence change in GDP is a good proxy for economic growth. According to this study increase in public health care expenditure results in the increase in economic growth hence there is a positive relationship between economic growth and public health care expenditure (WHO, 2014).

3.2.2 Public health expenditure (INPHE)

Public health expenditure refers to expenditure on health care incurred by public funds which includes government budgetary on allocation. Public funds are also state, regional and local government bodies and social security. Public expenditure includes measures such as medical facilities, family planning activities and nutrition regulation which contributed to the decline in child mortality, increase in life expectancy, improving the complete mental, physical and social well-being of the community WHO (2010).

It is vital in capturing how much funds are allocated to health by the government and how sound is the investment in health. Therefore, public health expenditure is a good measure for the level of investment in health of the economy, which then determines the level of economic growth. There is a positive relationship between public health and economic growth. So its coefficient should be positive.

3.2.3 Inflation (ININF)

Inflation refers to a general progressive increase in prices of goods and services in an economy. When the general price level rises, each unit of currency buys fewer goods and services, consequently, inflation corresponds to a reduction in the purchasing power of money. Inflation in this research is peroxide by the consumer price index, which is a measure of the overall cost of the goods and services bought by a typical consumer. The previous studies indicate that there exists a statistically significant negative relationship between inflation and economic growth. Conversely, observations of high inflation tend to be associated with low or negative growth in GDP per capita. Spending decisions on health are not solely affected by the income level alone but also by the size of the recipients (WHO, 2014).

3.2.4 Foreign health aid (INFHAID)

Foreign health aid is also of particular interest in African countries because it represents a source of external financing of the health care systems. The aim is to reveal how foreign health aid effects public health care expenditure in developing countries. Of the few studies on the determinants of health care expenditure in African countries foreign aid has been used as an explanatory variable and came up to be a positive and significant variable. Gbesemete and Gerdtham (1992) incorporated per capita foreign health aid in their study of determinants of health care expenditure based on 30 African countries inclusive of Zimbabwe and found it to be positive and statically

significant in determining health care expenditure. This study therefore, expects per capita foreign health aid to be positively related to public health care expenditure.

3.2.5 Public education expenditure (INE)

Public education expenditure is observed as the nucleus for human capital investment. (Capolupo, 2000) postulated that the more the government expenditure is apportioned to education, the faster the economy develops. These skills and knowledge acquired through education are responsible for the increase in the labour productive through a higher cognitive capacity which then increase economic growth. Increase in public health care is seen by building more academic institutions, providing scholarships and subsidizing manpower development funds among others. In this study public education expenditure is seen as an important explanatory variable due to its credit of the long observed fact that less attention on education and training have revealed to be one of the most serious constraints to economic growth and development in Zimbabwe (Naiman and Watkins ,1999).

3.3 Estimation methods

3.3.1 Vector Error Correction Model

It is also essential to begin by analysing the time series properties of the data. As the VECM specification only applies to cointegrated series, the Johansen cointegration test is runned first. The idea of cointegration entails that a set of variables be integrated of the same order and their linear combination must be stationary, thus I (0). If the series do not follow the same order of integration, then there can be no meaningful relationship among them. We therefore proceed to test for cointegration if series have the same order of integration. Cointegration merely means looking for a long run equilibrium relationship among non-stationary variables. Therefore, the performance of cointegration method requires the prior check for stationarity of data. The cointegration method being used is the Johansen cointegration method.

Vector Error Correction Model is used mainly for reconciling short run behavior of a variable with its long run behavior (Gujarati,2004). The choice of this estimation technique is due to the fact that the variables are integrated at the same order. Vector Error correction model (VECM) help to estimate the short run relationship of variables after determining the presence of cointegration once the optimal lag is identified. The main objective of the VECM is to indicate the speed of adjustment from the short-run equilibrium to the long-run equilibrium state.

The estimation technique used in this model are:

(i) The time series data used in this study is first determined if its stationary. Some of the data tend to be non-stationary hence estimating a model with non- stationery data will result in a spirus regression (Granger and Newbold, 1974).

(ii) Test the presence of cointegration between the series of the same order and thus form a cointegration equation. Variables should be integrated in the same order Aremu (2009). A set of variable is said to be cointergrated if a linear combination of the variable results in the stationary process that is I(0).For a regression relation to be meaningful various series must be cointegrated however if the equation holds its unit's roots properties misleading regression will be obtained.

(iii) The test deals with the null hypothesis that there is co-intergration against an alternative that there exist no co-intergration. If co-intergration exist hence construct the ECM to model shortrun dynamic relationship with long run equilibrium.

The error correction term should be statistically significant and should have a negative coefficient. A highly significant error correction term is a further confirmation of the existence of a long run relationship among the series under concern.

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3.3.2 Assumptions Underlying Regression Analysis

i) The model is linear in parameters

ii) Explanatory variables are non-stochastic that is they are fixed in repeated samplings

iii) The error terms are normally distributed with zero mean and constant variance

$\mu_i \sim N(0, \delta^2)$

iv) The error terms are uncorrelated that is E (ei ,ej)=0

3.3.3 Descriptive statistics

Mean, mode, median, range and standard deviation are some of the summary statistics which are going to be used they make information quick and simple to work on. The minimum and maximum are least and greatest elements which help to identify if there are outliers in the data used.

3.3.4 Specification tests

3.3.4.1 F Value and Prob (F)

F-statistic is a measure of the overall significance of the estimated regression model. F value is the ratio of the mean regression sum of squares divided by the mean error sum of squares. Its value will range from zero to an arbitrarily large number when F-statistic provides a test of the null hypothesis that the true slope coefficients are simultaneously zero. Example if Prob (F) calculated is 0.03 it means that there are 3 chances in 100 that all regression parameters are zero. This had been considered to test whether economic growth (GDP) is linearly related to all of its explanatory variables which are public expenditure on health, inflation foreign health aid and public expenditure on education, labor force. If the F –value computed exceeds the critical F-value from the F –table at the percent level of significance, we reject H0: otherwise we do not reject it.

3.3.4.2 Goodness of fit (R^2 test)

R^2 test displays the proportion in the dependence variable which is explained by the explanatory variables. It defines exactly how well the data outfits a statistical model. It is a straight measure of how fit the observed outcomes are replicated by the model as the percentage of total variations of the conclusion explained by the model. It is denoted as

R^2= ESS/TSS

Where ESS are the Explained Sum of Squares

TSS is the Total Sum of Squares

3.4 Diagnostic checking

3.4.1. Stationarity Tests

Stationarity is whereby the mean and the variance do not vary over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. It is important to do away with stationarity as is it will allow studying the behavior not for the period under consideration only but for the future understanding of the behavior which is essential for predictions.

Augmented Dickey-Fuller Test is used to test for stationarity. Unit root test on all variables is done to define their time series properties. It is done to avoid the problem of false regression when non-stationary series are estimated in their levels in stochastic models (Badawi, 2003). The Augmented Dickey Fuller (ADF) tests that take into account the possibility of structural breaks in the time

series are used to analyze the time series properties of these series. The study will perform stationarity tests to determine if the variables are on the same wave length.

3.4.2 Autocorrelation

Autocorrelation is tested under the null hypothesis that there is no autocorrelation and alternative hypothesis of autocorrelation. Autocorrelation refers to a situation where error terms from different time periods are correlated which is the correlation of a series with its own past and future values. Autocorrelation occurs in time series when the errors associated with observations in a given time period carry over into the future time periods. It is also sometimes called 'lagged correlation' or 'serial correlation'. To test for auto-correlation one can use the VEC Residual Serial Correlation LM test. We therefore, reject the null hypothesis when the p-values are above 5% level of significance.

3.4.3 Multicollinearity

Multicollinearity is tested under the null hypothesis that there is no multicollinearity against an alternative that there is multicollinearity. Multicollinearity is the presence of linear relationship among the explanatory variables. It occurs when all explanatory variables in a model are highly correlated. It is tested using the Variance Inflation Factor (VIF). It provides a measure of multicollinearity among the independent variables in a multiple regression model. A high VIF indicates that the associated independent variable is highly collinear with the other variables in the model. VIF >10 is an indicatior of multicollinearity.

3.4.4 Heteroscedasticity

Heteroscedasticity is tested under the null hypothesis that there is no heteroscedasticity against an alternative of heteroscedasticity. Heteroscedasticity is whereby the variance of error term are not

equal. The effect of heteroscedasticity is that it affects confidence intervals, t-test, F-test because variance of error term is magnified. This can be caused by outliers in the sample data, omission of an important variable (model specification error) and skewness in the distribution of regressors included in the model. The VEC Residual Heteroscedasticity test is used to test for heteroscedasticity. Heteroscedasticity destroys the efficiency component of the OLS estimator since it will no longer have minimum variance. Symbolically it can be shown as E (ui) = δi^2.

3.4.5 Normality test

Normality test is tested under the null hypothesis that the variables are normaly distributed against an alternative hypothesis that variables are not normall distributed. The Jarque –Bera statistic is used to test for normality. The Jarque-Bera statistic follows a null hypothesis of normally distributed errors. If variables are normally distributed a histogram which is bell- shaped should be identified and the Jarque-Bera statistic should.

3.4.6 Model Specification test

Under the VECM assumptions, the regression model is runned in order to test for the presence of a long run relationship between variables. The purpose is to indicate the speed of adjustment from the short-run equilibrium to the long run equilibrium. The co-integration method being used is the Johansen co-integration method. The idea of cointegration entails that a set of variables be integrated of the same order and their linear combination must be stationary, thus I (0). If the series do not follow the same order of integration, then there can be no meaningful relationship among them.

3.4.7 Limitation of estimation technique

We can only conduct VECM for the series which are stations in their differences (I)1. There is much debate on how the lag lengths should be determined. Also, it is possible to end up with a model including numerous explanatory variables, with different signs, which has implications for degrees of freedom.

3.5 Data type, sources and problems

Data was obtained from ZIMSTATS, World Bank, IMF and the Ministry of Health Library. The study used annual time series data covering the period from 1985 to 2018 using secondary data obtained. Due to inadequate monitoring of the economy, inaccurate reporting and also the removal of zeros by the reserve bank the data has got problems in terms of quality, consistency, accuracy and reliability. Hence it makes it difficult for the researcher to use the real values and hence opt to use data expressed in US dollars.

3.6 Summary

The methodology of the research is highlighted in this chapter, the methodology includes the research approach that the study used, the research strategy adopted during the course of the research and the research design used throughout the research. The model is formulated based on the theoretical literature and empirical literature reviewed in chapter two. The results will be outlined in the following chapter where E-views Version 7 was used in the regression analysis.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS PRESENTATION

4.0 Introduction

This chapter outlines the findings and results of the study. It is from these findings that conclusions will be drawn on the impact of public health expenditure on the economic growth in Zimbabwe (1990). E-views 7 (statistical package) was used to estimate these effects. Statistical and economic interpretations of the results will be discussed. The chapter presents the model estimation and interpretation of the significance of the model as well as the results of the diagnostic test and that of the regression. The results of the Vector Error Correction Model (VECM) were presented and analysed. These results answer all research questions in as far as the relationship between public health care expenditure and economic growth are concerned.

4.1 Normality Test

Table 4.1 Descriptive Statistics

	INPERCAP GDP	INPHE	ININF	INFHAID	INE
Mean	867.9180	3.658646	22.81321	12.13796	26.64462
Median	671.5990	2.723180	1.634950	5.365500	44.21345
Maximum	1954.653	10.47584	222.7500	51.46860	44.45638
Minimum	356.6932	0.005670	-37.20000	1.072800	1.544060

Std. Dev.	427.7286	3.305350	57.68123	13.35099	19.10396
Skewness	0.831609	0.604846	2.076037	1.261638	-0.204915
Kurtosis	2.501302	2.035571	6.699051	3.655765	1.156528
Jarque-Bera	3.894368	3.091573	39.94181	8.779397	4.606536
Probability	0.142675	0.213144	0.000000	0.012404	0.099932
Sum	26905.46	113.4180	707.2095	376.2768	825.9833
Sum Sq. Dev.	5488551.	327.7601	99813.74	5347.466	10948.84
Observations	31	31	31	31	31

Table 4.1 shows the summary statistics that include measures of central tendency, showing the generally used descriptive statistics consisting of the mean, maximum, standard deviation among other known measures of dispersion. The minimum and maximum values help in checking out outliers in the data, these are the least and greatest elements of a set respectively. The data have 31 observations for each and every variable. For all variables there are no outliers as shown by the smaller gaps between the minimum and the maximum values. PHE is positively skewed, however inflation is negatively skewed.

GDP per capita has the highest standard deviation of 427.7286 which indicates that data is spread out 31 over a large range of values. PHE has the lowest standard deviation of 3.305350 which indicates variability in the dependent variable. The lower the standard deviation indicates that the data tend to be very close to mean, high standard deviation indicates that the data is spread out on a very large range of values. The measure of skewness shows that all other variables are positively skewed except for inflation. However, probability ranges from 0 to 1, it deals with the likelihood of occurrence, also the Jarque-Bera test is used to test for the hold of the normality under the null hypothesis of normality.

4.2. Multicollinearity

Table 4.2 Variance Inflation Factor

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	54452.40	36.77009	NA
INPHE	809.7032	13.09981	5.780932
ININF	0.482556	1.218779	1.049190
INFHAID	8.765301	1.893051	1.021012
INE	23.96081	17.20137	5.714596

Multicollinearity is tested under the null hypothesis of no multicollinearity and against an alternative hypothesis that there is multicollinearity. It is a situation where the explanatory variables are highly inter-correlated. Multicollinearity is tested using VIF. In the 4.4 table above, all the variables have values below 10 meaning that no strong relationship exists between variables and that there is no multicollinearity. This means that there is no linear relationship among the explanatory variables and it is easy to establish the influence of each one variable on other. We then fail to reject H0 and conclude that there is no multicollinearity between the variables and reject H1 that there is multicollinearity.

4.3 Unit Root Test

4.3.1 Stationary results

It has been proposed through research by Granger et al, (1974) that the major problems associated with time series data analysis is obtaining false results due to the non-stationarity of data. It is vital to establish whether or not the data is stationary before estimating any econometric model involving time series data. Meaningful estimates would be obtained if the data is stationary, hence all convectional techniques of estimation becomes valid. Statistical tests done on such estimates will be appropriate as noted by Gujarati (2004).

Since this study uses time series data, the researcher used unit root tests to check stationarity of the variables and present the stationarity results. The Augmented Dickey-Fuller Test Equation for Stationarity showed that all variables were stationary variables at first difference. Hence, the unit root tests imply that all variables are integrated of order 1. At level, no variable was stationary. However, the variables become stationery after first differencing.

Table 4.3 Stationarity test at level

Variable	ADF Statistics	1% Critical Value	5% Critical value	Conclusion
PERCAPGDP	-1.428933	-3.670170	-2.963972	Non Stationary
PHE	-1.283998	-3.670170	-2.963972	Non Stationary
INF	-2.364028	-3.670170	-2.963972	Non Stationary
FHAID	-2.526479	-3.711457	-2.981038	Non Stationary
E	-1.104009	-3.670170	-2.963972	Non Stationary

Table 4.3.1 Stationarity test at first difference

Variable	ADF Statistics	1% Critical Value	5 % Critical Value	Conclusion
PERCAPGDP	-5.912551	-3.679322	-2.967767	Stationary
PHE	-5.769025	-3.679322	-2.967767	Stationary
INF	-3.801607	-3.699871	-2.976263	Stationary
FHAID	-5.621291	-3.699871	-2.976263	Stationary
E	-5.367976	-3.679322	-2.967767	Stationary

4.4 Johansen Co-integration

Testing for unit root using the argumented dicke fuller test shows that the variables are stationary at first difference, hence according to Granger and Newbold (1977) estimating the parameters using the OLS may results in spurious regression coefficient and therefore produces misleading decisions as the variables are non-stationary. When the variables are stationary if any cointergration is obtained among them hence a long run relationship can be safely estimated without a nonsensical regression. The data conforms for integration because the residual term is stationary at level and the variables are integrated of the same order. Therefore, the presence of cointegration relationships amongst variables implies the estimation of ECM to determine the dynamic behavior of the growth equation. Johansen test for cointegration is used to determine if there exists any relationship among variables.

Table 4.4 Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Trace	0.05

No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.760229	88.12134	69.81889	0.0009
At most 1	0.620014	46.70733	47.85613	0.0638
At most 2	0.345265	18.64631	29.79707	0.5185
At most 3	0.188291	6.364093	15.49471	0.6525
At most 4	0.010779	0.314299	3.841466	0.5751

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.760229	41.41401	33.87687	0.0052
At most 1 *	0.620014	28.06102	27.58434	0.0434
At most 2	0.345265	12.28222	21.13162	0.5201
At most 3	0.188291	6.049795	14.26460	0.6068
At most 4	0.010779	0.314299	3.841466	0.5751

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The Johansen cointegration test under the Trace statistic shows 1 cointegration equation at 5% level of significance. The Trace static is 88.12134 and the critical value is 69.81889 therefore in our decision criteria once the Trace static is greater than the 5% critical value we reject the null hypothesis. Also the p-value is significant thus it is lower than 1%. We reject the null hypothesis that there is no cointegration in this model. If series are cointegrated, it means they exhibit a long-run relationship therefore the appropriate estimation technique is the VECM. Under the Max-Eigen statistic the Long run test indicates 2 cointegrating equations at 5% significance level.

4.5 Vector Error Correction Model

Table 4.5 Vector Error Correlation Model (VECM)

Cointegrating Eq:	CointEq1
INPERCAPGDP(-1)	1.000000
INPHE(-1)	-127.5198
	(36.9193)
	[-3.45402]
ININF(-1)	-9.383350
	(1.44934)

	[-6.47424]
INFHAID(-1)	20.63062
	(5.20549)
	[3.96324]
INE(-1)	1.963940
	(5.47952)
	[0.35841]
C	-573.2209

Error Correction:	D(INPERCAPGDP)	D(INPHE)	D(ININF)	D(INFHAID)	D(INE)
CointEq1	-0.370500	-0.005035	0.136713	0.020275	0.016870
	(0.09578)	(0.00192)	(0.04939)	(0.01340)	(0.00917)
	[-3.86834]	[-2.62413]	[2.76778]	[1.51360]	[1.83981]
D(INPERCAPGDP(-1))	-0.198333	0.009332	-0.024519	-0.035762	-0.026503
	(0.20253)	(0.00406)	(0.10445)	(0.02832)	(0.01939)
	[-0.97929]	[2.29990]	[-0.23475]	[-1.26255]	[-1.36689]

D(INPERCAPGDP(-2))	-0.003674	0.000161	0.013294	-0.006441	-0.003150
	(0.10298)	(0.00206)	(0.05311)	(0.01440)	(0.00986)
	[-0.03568]	[0.07784]	[0.25033]	[-0.44725]	[-0.31954]
D(INPHE(-1))	-2.851651	-1.012092	29.88479	3.888174	3.277041
	(24.3904)	(0.48865)	(12.5787)	(3.41115)	(2.33502)
	[-0.11692]	[-2.07119]	[2.37582]	[1.13984]	[1.40343]
D(INPHE(-2))	-4.439514	-1.628662	3.097465	5.393126	4.717484
	(24.5920)	(0.49269)	(12.6827)	(3.43935)	(2.35432)
	[-0.18053]	[-3.30566]	[0.24423]	[1.56807]	[2.00376]
D(ININF(-1))	-3.386259	-0.032368	0.644424	-0.016408	0.153025
	(0.73642)	(0.01475)	(0.37979)	(0.10299)	(0.07050)
	[-4.59826]	[-2.19386]	[1.69679]	[-0.15931]	[2.17052]
D(ININF(-2))	-2.361171	-0.009595	0.764997	0.138432	0.057270
	(0.67241)	(0.01347)	(0.34678)	(0.09404)	(0.06437)
	[-3.51151]	[-0.71228]	[2.20602]	[1.47204]	[0.88966]
D(INFHAID(-1))	2.506043	0.075184	-1.809180	-0.662831	-0.257757

	(1.84706)	(0.03701)	(0.95257)	(0.25832)	(0.17683)
	[1.35677]	[2.03173]	[-1.89926]	[-2.56590]	[-1.45766]
D(INFHAID(-2))	1.637631	0.058772	0.246603	-0.912673	-0.181814
	(1.83845)	(0.03683)	(0.94813)	(0.25712)	(0.17600)
	[0.89077]	[1.59564]	[0.26009]	[-3.54961]	[-1.03301]
D(INE(-1))	-7.404338	0.006931	1.335205	-0.178305	0.001777
	(3.88382)	(0.07781)	(2.00298)	(0.54318)	(0.37182)
	[-1.90646]	[0.08907]	[0.66661]	[-0.32826]	[0.00478]
D(INE(-2))	2.742370	-0.124174	0.205838	0.282811	0.450293
	(4.19090)	(0.08396)	(2.16134)	(0.58612)	(0.40122)
	[0.65436]	[-1.47892]	[0.09524]	[0.48251]	[1.12232]
C	33.60863	0.381016	3.012998	1.554897	-1.258160
	(19.1726)	(0.38412)	(9.88777)	(2.68141)	(1.83549)
	[1.75295]	[0.99193]	[0.30472]	[0.57988]	[-0.68546]
R-squared	0.906609	0.568021	0.626795	0.638141	0.425025
Adj. R-squared	0.842402	0.271036	0.370217	0.389363	0.029729
Sum sq. resids	146175.3	58.67237	38878.30	2859.160	1339.728
S.E. equation	95.58219	1.914947	49.29395	13.36778	9.150574

F-statistic	14.12018	1.912624	2.442901	2.565105	1.075208
Log likelihood	-159.5753	-50.08698	-141.0341	-104.4954	-93.88252
Akaike AIC	12.25538	4.434784	10.93101	8.321098	7.563037
Schwarz SC	12.82632	5.005729	11.50195	8.892043	8.133982
Mean dependent	18.17281	0.266257	8.062500	0.473704	-0.701672
S.D. dependent	240.7696	2.242868	62.11524	17.10676	9.289704

Table 4.5.1 Speed of Adjustment

Ideally, every speed of adjustment is -0.05 0r less, thus more negative. This means that you can say it is significant at the 5% level. Therefore, if the speed of adjustment products is positive (above 0) this means that your VECM continues to move away from long-run equilibrium after experiencing a shock, instead of converging back to it. Most important is the dependent variable.

Speed of adjustment = coefficient of the variable in the cointegrating equation x coefficient of the ECT

Variable	Coefficient in ECT	Coefficient of ECT where variable is Dependent variable	Product = speed of adjustment
InPerCapGDP	1.000	-0.370500	-0.3705
InPHE	-127.5198	0.005035	-0.6421
InINF	-9.383350	0.136713	-1.2828

InFHAID	20.63062	0.020275	0.4183
InE	1.963940	0.016870	0.0331

InPercapGDP has negative speed of adjustment product of -0.3705 thus it is statistically significant at 5% it is less than -0.05, therefore it is statistically significant at 37%. InPHE has a negative speed of adjustment product of -0.6421 it is statistically significant at 5% it is less than -0.05, therefore it is statistically significant at 64%. Also, InINF has a negative speed of adjustment product of -1.2828 it is statistically significant at 5% it is less than -0.05, therefore it is statistically significant at 128%. This means that these variables have a long run relationship. However, inFHAID and InE have positive values and are not statistically significant thus continues to move away from long-run equilibrium after experiencing a shock, instead of converging back to it.

R-squared = 0.906609

This means the independent variables explain 90.66% of the variations in the per capita GDP. The remaining 9.34 is therefore, explained outside of the model.

4.6 Stability Tests

4.6.1 Normality Test

Normality is tested under the null hypothesis that the residuals are normally distributed against an alternative hypothesis that residuals are not normally distributed. For normal distribution the residuals are supposed to be greater than 10% (0.1) thus significance level hence we then fail to reject the null hypothesis and conclude that the model is normally distributed.

Table 4.6 Normality Test: VEC Residual Normality Tests

Component	Jarque-Bera	Df	Prob.
1	0.521475	2	0.7705
2	3.805692	2	0.1491
3	0.270967	2	0.8733
4	1.800531	2	0.4065
5	53.75063	2	0.0000
Joint	60.14929	10	0.0000

The first variable which is PercapGDP, the residuals are normally distributed at 77% there are greater than 10%. PHE which is the second variable is also normally distributed at 14% it is greater than 10%. Inf which is the fouth variable is also normally distributed at 87% it is greater than 10%. The fourth variable which is FHAID is also normally distributed at 40% however, the firth variable which is E is not normally distributed thus it is less than 10%. Therefore, the overall model is not normally distributed is less than 10%

4.6.2 Autocorrelation

Table 4.6.1 Autocorrelation: VEC Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	22.34022	0.6160
2	15.99338	0.9150

3	23.68395	0.5377
4	24.81781	0.4726
5	21.59444	0.6590
6	29.77036	0.2330
7	17.81657	0.8501
8	27.08810	0.3515
9	31.71663	0.1664
10	16.17219	0.9096
11	15.34287	0.9330
12	33.27081	0.1244

Probs from chi-square with 25 df.

Autocorrelation is tested under the null hypothesis that there is no autocorrelation against an alternative hypothesis that there is autocorrelation. The results from table 4.8 shows that, there is no problem of autocorrelation according to VEC Serial Correlation LM tests. The P-Values are above 5% (0.05) level of significance meaning that we fail to reject the H0 of autocorrelation and conclude that there is no autocorrelation.

4.6.3 Heteroscedasticity

Table 4.6.2 Heteroscedasticity: VEC Residual Heteroscedasticity Tests

Joint test:

Chi-sq	df	Prob.
319.6466	330	0.6485

Heteroskedasticity is tested under the null hypothesis that there is no heteroskedasticity against an alternative hypothesis that there is heteroscedasticity. Therefore the results from table 4.6.2 shows that, there is no problem of heteroskedasticity according to VEC Residual Heteroscedasticity tests. The P-Values are above 5% (0.05) level of significance meaning that we fail to reject the H0 of no heteroscedasticity and conclude that there is no homoscedasticity.

4.7 Goodness of fit (R^2)

The coefficient of determination (R^2) shows the proportion of total variation explained by changes in any of the factors affecting public health care expenditure on economic growth included in the model. The (R^2) value of 0.906609 shows that 90.66% of the variation in economic growth is explained by the outlined factors. The remaining 9.34% is explained by other factors not included in the model, which may be captured by the error term.

4.8 Chapter Summary

The results of the model illustrated that serial correlation problem was tested using the VEC Residual Serial Correlation LM tests and concluded that there was no serial correlation in the residuals and the descriptive statistics specifies that the residuals are normally distributed. Heteroscedasticity results indicated that there is no problem of heteroscedasticity according to VEC Residual Heteroscedasticity tests. The variance inflation factor results show consistence with the short run and long run relationship of variables. From the estimation, it can be said that there exists a long run relationship between economic growth and its factors which include public health expenditure and inflation in explaining economic growth while, foreign health aid and public

education expenditure can move away from long run equilibrium after experiencing a shock, instead of converging back to it.

The findings of this study seem to correspond with that of early studies thus implying that an increase in public health expenditure, inflation, foreign health aid and public education expenditure will lead to an increase in resources allocated towards per capita GDP. These findings create a base of policy formulation that will improve child mortalities, morbidities and life expectancies given an unstable economy like that of Zimbabwe. Therefore, chapter 5 will recommend on these policies

CHAPTER 5

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.0 Introduction

This chapter focuses on the major findings drawn from the study and provides a precise summary of the study. It also, avails conclusions which reckon the research objectives drawn as well as suggestions for further study. It also includes some recommendations to help increase public health expenditure in Zimbabwe. This chapter also states possible policies which should be implemented to improve public health expenditure in Zimbabwe. This research is carried out for the period of 1990 up to 2020.

5.1 Summary

The main aim of the study was to find the impact of public health expenditure on economic growth and to also assess this impact using other specified explanatory variables for the period 1990 up to 2020 using Vector Error Correlation Model (VECM) to estimate the relationship. In the first chapter of this research the researcher briefly looked at the background of public health expenditure and its impact on economic growth. The null hypothesis that public health expenditure and inflation are statistically significant variables, while foreign health aid and public health expenditure are not statistically significant variables in explaining per capita GDP in the long run.

After establishing the objectives of the research, the researcher went on in chapter two to look at related theoretical and empirical literature on the subject of public health care expenditure theories. Chapter two also reviewed some empirical researches done by other scholars in other countries on

the impact of public health care expenditure on economic growth. The empirical researches in chapter two formed the basis of the methodology adopted in chapter three of this research.

Chapter three looked at the methodology used in the determination of the impact of public health expenditure model in Zimbabwe. The chapter focused on the VECM model and secondary methods used to collect data that were used in the research. The chapter also revealed the VECM regression model that was used to test for the relationship between economic growth and explanatory variables. Results obtained from the research were presented and analyzed in chapter four.

The results obtained from carrying out the research were presented in chapter four of the research, which looked at data presentation and analysis. Results were presented in tabular form and from E-Views printouts. The results obtained showed that public health expenditure and inflation are statistically significant variables in explaining economic growth. This was done statistically through the use of E-Views package. After realizing these relationships, policy recommendations based on these results will be presented in this chapter.

5.2 Conclusions

The main objective of this study is to determine the effect of public health expenditure on economic growth in Zimbabwe. The results of this study suggest that public health expenditure enhances per capita GDP in Zimbabwe both in the long run and short run. The model used in this study, the coefficients of public health expenditure and inflation were found to be growth enhancing in Zimbabwe both in the long run and short run. Foreign health aid and public education expenditure were found to be positive which means that VECM continues to move away from long run equilibrium after experiencing a shock, instead of converging back to it.

The results clearly show that there is a positive relationship between public health care expenditure and economic growth. The results were also supported by the endogenous growth model which

postulated that large government spending enhances economic growth. This is prior to the study done by Zon and Muysken (2001) carried out their study on the relationship between health status and economic growth.

5.3 Policy recommendations

Observing the results discussed in chapter four, recommendations have also been made to help achieve a higher and sustained per capita GDP growth in Zimbabwe. The variable public health care expenditure PHC has a positive impact on per capita GDP, both in the short run and long run it was growth enhancing. Due to these results

- there is a need to recommend a model which enhances public health expenditure (PHE) in Zimbabwe.
- it is recommended that the government should consider health as a back bone of the economy. There is great need for the government to increase its budget allocations towards public health care expenditure. Investment in health has both backward and forward spillover effect to the economy. A healthier nation means a healthier economy since there will be an increase in life expectancy, a healthier population, healthy educated children, more hours at work hence more production leading to increased output which at the end is increased growth. Babatude (2012) postulates that better health facilitates a sound ability for workers and enterprises which as a result improve the tax base of an economy thus a better fiscal base hence better economic performance leading to poverty reduction.
- It is also important that the government should try to meet the WHO recommendations of assigining 15% of the government budgetary allocation to the health sector. In Zimbabwe the average budgetary allocation to the health sector is 2.4% which is far less than the WHO recommendations. Increasing the budgetary allocation in Zimbabwe will make government health expenditure to have a robust effect to the economy. As the economy becomes wealthier through increased national income, government expenditure on health should increase proportionally.

- More investment in health and nutrition should be done in Zimbabwe. Adequate investment in the sector will improve educational outcome as well as economic growth.
- Policies that support provision of facilities should be promoted in the country. The study also showed a positive relationship between life expectancy and economic growth.
- Hence in Zimbabwe it implies that per capita GDP growth could be achieved in Zimbabwe by increasing savings so as to raise adequate capital. In Zimbabwe there is low capital formation which results in shortage of capital due to the fact that there are low savings done. Thus, increasing savings could make adequate capital available to investors. Increasing savings could be done by increasing institute deposit insurance to safeguard depositors. This will act as an incentive for depositors to save in banks hence adequate capital can be raised which can be channeled to investors to increase their production as a result increased economic growth. Investment in agriculture and industry could be growth enhancing. When this is done it would complement with domestic investment hence accelerate economic growth.
- The government should increase remuneration of nurses so that they provide health care to the public
- In addition, the government should subsidies for research and development in Zimbabwe.

5.4 Suggestions for further studies

The researcher suggests that there is room for future research and study as the results obtained in this study should not be viewed as conclusive but as a stimulate for further research on the impact of public health expenditure on economic growth. There is also need for the government to subsidies for research and development. Also further researchers can consider the impact of private health expenditure on economic growth.

REFERENCES

Amiri, A. and Ventelou, B: Granger Causality between Total Expenditure on Health and GDP in OECD: Evidence from the Toda-Yamamoto. Econ. Ltrs., 116, 541--544 (2012).

Aranda P. 2010. The Determinants of Health and the Differences in Healthcare Expenditure among Countries J. Health Econ.15.103-118.

Aremu G. 2009. Effect of Public Health Expenditure on Economic Growth in Nigeria (1990-2004). Journal of Economic Thought, 3 (1): 65-83.

Babatude, M. A. (2012). An analysis of the Growth – Health Relationship in Nigeria – A paper presented at the center for the study of Africa economic development, Dakar, Senegal. Retrieved from http://www.google.com.ng/url?q=https://editorialexpress.com/cgi

Badawi A. 2003. "Testing stationarity in selected macroeconomic series from Sudan"; Institute for development Policy and Management, University of Manchester, UK.

Baldacci, E. et al. 2004, "Social Spending, Human Capital, and Growth in Developing Countries: Implications for Achieving the MDGs", IMF Working Paper, no. wp/04/217, Washington DC

Becker, G. S. 1967, Human Capital and the Personal Distribution of Income; An Analytical Approach (University of Michigan, Ann Arbor, Michigan). Also available in G.S Becker (1993, Human Capital, Third Edition (University of Chicago Press) p102-158.

Bentham J. 1931. Principles of Legislation, (Harcourt, Brace and Co., New York).

Blejer MI. and MS. Khan. 1984. "Government policy and private investment in developing countries". IMF Staff Papers, vol. 3 1, no. 2: 379403.

Brown and Jackson 1990, "Health- Care Costs when the Population Changes", Canadian Journal of Economics, 8, 34.

Capolupo R. 2000. "Output Taxation, Human Capital and Growth" The Manchester School 68, 166-183 Central Statistical Office (1976-2006). (Various Issues); Monthly, Quarterly and Annual.

Font and Novell. 2004. Public Health Expenditure and Spatial Interactions in a Decentralized National Health System, Health Economics, 16, pp, 291-306

Gbesemete, K.P. and Gerdtham, U.G. 1992, "Determinants of Health Care Expenditure in Africa: A Cross-Sectional Study", World Development Journal, 20, pp, 303-308

Chete and Adeoye 2002: "Human Resources Development in Africa". The Nigerian Economic Society Selected Papers for the 2002 Annual Conference. pp 79-102.

Granger, C. W.J. and Newbold, P. 1977, "Spurious Regressions in Econometrics", Journal of Econometrics, 35, 143-159.

Grossman. M. 1991. "The Human Capital Model of the Demand for Health." National Bereau of Economic research . Working Paper 7078

Gujarati D. 2004. Basic Econometrics, New Delhi: (4th ed.). Tata McGraw-Hill.

Hansen, P. and King, A. 1996, "The Determinants of Health Care Expenditure: A Cointegrating Approach", Journal of Health Economics, 15: 127-137.

Lawanson, D. I. 2009. Human Capital Investment and Economic Development in Nigeria. The Role of Education and Health, Oxford Business and Economic conference programme pp 65-70.

Lipsey, R. G. 1995. "Introduction to Positive Economics", Oxford University Press. USA

Lucas.R. 1988. "On the Mechanism of Economic Development". Journal of Monetary Economics, 22(1) p.3-42.

Mankiw N, Romer P, and Weil D. 1992. "A Contribution to the Empirics of Economic Growth." Quarterly Journal of Economics, 108(2) Mark. M. (2002) "Journal Pricing and Mergers: A Portfolio Approach," American Economic Review 92: 259–269.

Naiman R. and Watkins N. 1999. "A Survey of the Impacts of IMF Structural Adjustment in Africa: Growth, Social Spending and Debt Relief;" Centre for Economic and Policy Research

Nurudeen A, Usman A 2010. Government Expenditure and Economic Growth in Nigeria, 1970-2008; A Disaggregated Analysis. Bus. Econ. J. 4(1)

Ram R. 1986. “Government Size and Economic Growth: Framework and some Evidence from Cross-sectional and Time-series Data”. American Economic Review, Vol. 76, No. 1, March 1986.

Simon-Oke O. Olayemi, Human Capital and Industrial Productivity in Nigeria 2012 International Journal of Humanities and Social Science Vol 216 (august 2012)

Schulz, T.P. 1999. Health and Schooling Investment in Africa. Journal of Economic Perspective: 13: 335-337.

Solow, R. M. 1956. A Contribution to the Theory of Economic Growth. Quarterly Journal of Economics.

Wang, K. M. 2011. Health Care Expenditure and Economic Growth: Quantile Panel-Type Analysis. Econ. Modelling, 28, 1536--15

World Health Organization 1996, 2010, 2011, 2014. World Health Development Indicator Statistical Bulletin.

Zon. A. and Muysken. J. 2001. “Health, education and endogenous growth.” Journal of Health Economics, 20 (2), 169-185.

Appendices

Appendix A: Time Series Data

YEARS	INPERCAPGDP	INPHE	ININF	INFHAID	INE
1990	841.974	3.14364	1.35	1.3498	12.45426
1991	809.0511	3.93432	-13.14	1.419	12.45457
1992	619.3721	2.81234	-3	8.1661	22.32221
1993	591.7197	2.82342	0.38	2.24004	22.14536
1994	611.8653	2.72318	-2.76	5.20698	44.33398
1995	623.2096	2.62321	-15.23	5.6406	44.32415
1996	741.0959	2.12565	6.01	3.2872	44.21345
1997	731.9476	2.22345	-0.97	9.3933	44.23414
1998	544.9838	2.14567	28.02	27.5706	44.23421
1999	580.0706	1.06753	-13.43	27.9398	44.34215
2000	563.0575	1.00647	4.48	5.3655	44.45638
2001	568.3863	0.58796	-37.2	2.6116	44.34265
2002	530.5304	0.57876	34.45	36.6863	44.23436
2003	478.0076	0.48789	-8.57	4.8066	44.34521
2004	482.9985	0.45763	113.57	3.8574	44.35467
2005	476.5554	0.43643	-31.52	22.6468	44.34562
2006	447.8547	0.06754	32.97	51.4686	44.23456
2007	431.7873	0.04679	77.73	1.5086	44.32564
2008	356.6932	0.00567	156.96	1.0728	44.34526
2009	671.599	0.10675	7.22	1.1618	44.34562
2010	948.3315	10.47584	3.02267	5.9894	1.54406
2011	1954.653	8.081738	3.46613	2.0754	3.34276
2012	1452.968	6.918353	3.725327	3.6698	6.07021
2013	1529.998	7.110148	1.63495	3.2219	5.99598

2014	1434.896	8.133524	-0.19778	3.6327	6.13835
2015	1445.07	7.452066	-2.43097	5.7546	5.81279
2016	1464.589	7.64762	-1.54367	34.1296	5.47262
2017	1335.665	5.849775	0.893962	24.5325	5.38106
2018	1352.163	4.734331	10.61887	19.4919	3.58728
2019	1156.155	7.342787	127.95	28.9498	1.5743
2020	1128.211	10.26755	222.75	21.4298	2.6754

Appendix B: Normality Test

Descriptive Statistics

	INPERCAP GDP	INPHE	ININF	INFHAID	INE
Mean	867.9180	3.658646	22.81321	12.13796	26.64462
Median	671.5990	2.723180	1.634950	5.365500	44.21345
Maximum	1954.653	10.47584	222.7500	51.46860	44.45638
Minimum	356.6932	0.005670	-37.20000	1.072800	1.544060
Std. Dev.	427.7286	3.305350	57.68123	13.35099	19.10396
Skewness	0.831609	0.604846	2.076037	1.261638	-0.204915
Kurtosis	2.501302	2.035571	6.699051	3.655765	1.156528
Jarque-Bera	3.894368	3.091573	39.94181	8.779397	4.606536
Probability	0.142675	0.213144	0.000000	0.012404	0.099932
Sum	26905.46	113.4180	707.2095	376.2768	825.9833
Sum Sq. Dev.	5488551.	327.7601	99813.74	5347.466	10948.84
Observations	31	31	31	31	31

Appendix: C Variance Inflation Factors

Variance Inflation Factors

Date: 12/11/21 Time: 07:36

Sample: 1990 2020

Included observations: 31

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	54452.40	36.77009	NA
INPHE	809.7032	13.09981	5.780932
ININF	0.482556	1.218779	1.049190
INFHAID	8.765301	1.893051	1.021012
INE	23.96081	17.20137	5.714596

Appendix D: Unit Root Test

Stationarity at level

PERCAPGDP

Null Hypothesis: INPERCAPGDP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.428933	0.5549

Test critical values:	1% level	-3.670170
	5% level	-2.963972
	10% level	-2.621007

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INPERCAPGDP)
Method: Least Squares
Date: 12/06/21 Time: 01:13
Sample (adjusted): 1991 2020
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INPERCAPGDP(-1)	-0.142054	0.099413	-1.428933	0.1641
C	131.6001	95.29709	1.380945	0.1782

R-squared	0.067967	Mean dependent var	9.541225
Adjusted R-squared	0.034680	S.D. dependent var	235.5308
S.E. of regression	231.4107	Akaike info criterion	13.79061
Sum squared resid	1499425.	Schwarz criterion	13.88402
Log likelihood	-204.8591	Hannan-Quinn criter.	13.82049
F-statistic	2.041849	Durbin-Watson stat	2.096791
Prob(F-statistic)	0.164086		

Public health expenditure

Null Hypothesis: INPHE has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.283998	0.6237
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INPHE)

Method: Least Squares

Date: 12/06/21 Time: 01:15

Sample (adjusted): 1991 2020

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INPHE(-1)	-0.164776	0.128331	-1.283998	0.2097
C	0.804022	0.591479	1.359341	0.1849

R-squared	0.055606	Mean dependent var	0.237464
Adjusted R-squared	0.021878	S.D. dependent var	2.181424
S.E. of regression	2.157430	Akaike info criterion	4.440053
Sum squared resid	130.3261	Schwarz criterion	4.533466
Log likelihood	-64.60079	Hannan-Quinn criter.	4.469936
F-statistic	1.648651	Durbin-Watson stat	1.976353
Prob(F-statistic)	0.209666		

Inflation

Null Hypothesis: ININF has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.364028	0.1600
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ININF)

Method: Least Squares

Date: 12/06/21 Time: 01:16

Sample (adjusted): 1991 2020

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ININF(-1)	-0.545597	0.230791	-2.364028	0.0252
C	16.19065	10.85209	1.491939	0.1469

R-squared	0.166384	Mean dependent var	7.380000
Adjusted R-squared	0.136613	S.D. dependent var	60.07844
S.E. of regression	55.82407	Akaike info criterion	10.94663

Sum squared resid	87257.16	Schwarz criterion	11.04004
Log likelihood	-162.1994	Hannan-Quinn criter.	10.97651
F-statistic	5.588626	Durbin-Watson stat	1.803455
Prob(F-statistic)	0.025249		

Foreign health aid

Null Hypothesis: INFHAID has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.526479	0.1210
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFHAID)

Method: Least Squares

Date: 12/06/21 Time: 01:17

Sample (adjusted): 1995 2020

Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

INFHAID(-1)	-1.036737	0.410349	-2.526479	0.0201
D(INFHAID(-1))	0.353455	0.399031	0.885783	0.3863
D(INFHAID(-2))	0.175474	0.348995	0.502798	0.6206
D(INFHAID(-3))	0.204212	0.277734	0.735279	0.4707
D(INFHAID(-4))	0.452666	0.220359	2.054223	0.0533
C	13.05617	5.334542	2.447478	0.0237

R-squared	0.557034	Mean dependent var	0.623955
Adjusted R-squared	0.446293	S.D. dependent var	17.72406
S.E. of regression	13.18874	Akaike info criterion	8.195778
Sum squared resid	3478.857	Schwarz criterion	8.486108
Log likelihood	-100.5451	Hannan-Quinn criter.	8.279383
F-statistic	5.030041	Durbin-Watson stat	1.955896
Prob(F-statistic)	0.003814		

Public education expenditure

Null Hypothesis: INE has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.104009	0.7010
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INE)

Method: Least Squares

Date: 12/06/21 Time: 01:18

Sample (adjusted): 1991 2020

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INE(-1)	-0.099102	0.089766	-1.104009	0.2790
C	2.393752	2.974915	0.804645	0.4278

R-squared	0.041714	Mean dependent var	-0.325962
Adjusted R-squared	0.007490	S.D. dependent var	9.168970
S.E. of regression	9.134570	Akaike info criterion	7.326350
Sum squared resid	2336.330	Schwarz criterion	7.419763
Log likelihood	-107.8952	Hannan-Quinn criter.	7.356233
F-statistic	1.218836	Durbin-Watson stat	1.951561
Prob(F-statistic)	0.278987		

Stationarity at fist difference

PERCAPGDP

Null Hypothesis: D(INPERCAPGDP) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-5.912551	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INPERCAPGDP,2)

Method: Least Squares

Date: 12/06/21 Time: 01:19

Sample (adjusted): 1992 2020

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INPERCAPGDP(				
-1))	-1.128317	0.190834	-5.912551	0.0000
C	12.39567	44.97458	0.275615	0.7849

R-squared	0.564223	Mean dependent var	0.171678
Adjusted R-squared	0.548083	S.D. dependent var	359.8963
S.E. of regression	241.9395	Akaike info criterion	13.88172
Sum squared resid	1580437.	Schwarz criterion	13.97602
Log likelihood	-199.2850	Hannan-Quinn criter.	13.91126
F-statistic	34.95826	Durbin-Watson stat	1.941620
Prob(F-statistic)	0.000003		

Public health expenditure

Null Hypothesis: D(INPHE) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.769025	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INPHE,2)

Method: Least Squares

Date: 12/06/21 Time: 01:20

Sample (adjusted): 1992 2020

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INPHE(-1))	-1.130960	0.196040	-5.769025	0.0000
C	0.237350	0.416878	0.569351	0.5738

R-squared	0.552102	Mean dependent var	0.073589
Adjusted R-squared	0.535514	S.D. dependent var	3.286338
S.E. of regression	2.239746	Akaike info criterion	4.517074
Sum squared resid	135.4445	Schwarz criterion	4.611370
Log likelihood	-63.49757	Hannan-Quinn criter.	4.546606
F-statistic	33.28165	Durbin-Watson stat	1.957033
Prob(F-statistic)	0.000004		

Inflation

Null Hypothesis: D(ININF) has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.801607	0.0079
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ININF,2)

Method: Least Squares

Date: 12/06/21 Time: 01:21

Sample (adjusted): 1994 2020

Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(ININF(-1))	-2.105422	0.553824	-3.801607	0.0009
D(ININF(-1),2)	0.744264	0.446101	1.668376	0.1088
D(ININF(-2),2)	0.517336	0.239757	2.157750	0.0416
C	10.17849	11.09216	0.917629	0.3683

R-squared	0.721260	Mean dependent var	3.385926
Adjusted R-squared	0.684903	S.D. dependent var	102.1040
S.E. of regression	57.31455	Akaike info criterion	11.07094
Sum squared resid	75554.03	Schwarz criterion	11.26292
Log likelihood	-145.4577	Hannan-Quinn criter.	11.12802
F-statistic	19.83811	Durbin-Watson stat	1.588013
Prob(F-statistic)	0.000001		

Foreign health aid

Null Hypothesis: D(INFHAID) has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on AIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.621291	0.0001
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFHAID,2)

Method: Least Squares

Date: 12/06/21 Time: 01:23

Sample (adjusted): 1994 2020

Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFHAID(-1))	-2.604601	0.463346	-5.621291	0.0000
D(INFHAID(-1),2)	1.003198	0.325592	3.081150	0.0053
D(INFHAID(-2),2)	0.357515	0.196208	1.822123	0.0815
C	1.912840	2.792728	0.684936	0.5002

R-squared	0.763519	Mean dependent var	-0.059035
Adjusted R-squared	0.732674	S.D. dependent var	27.83674
S.E. of regression	14.39260	Akaike info criterion	8.307259
Sum squared resid	4764.378	Schwarz criterion	8.499235
Log likelihood	-108.1480	Hannan-Quinn criter.	8.364343
F-statistic	24.75314	Durbin-Watson stat	1.840669
Prob(F-statistic)	0.000000		

Public education expenditure

Null Hypothesis: D(INE) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.367976	0.0001

Test critical values:	1% level	-3.679322
	5% level	-2.967767
	10% level	-2.622989

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INE,2)

Method: Least Squares

Date: 12/06/21 Time: 01:24

Sample (adjusted): 1992 2020

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INE(-1))	-1.032931	0.192425	-5.367976	0.0000
C	-0.349567	1.765050	-0.198050	0.8445

R-squared	0.516261	Mean dependent var	0.037958
Adjusted R-squared	0.498344	S.D. dependent var	13.40879
S.E. of regression	9.497132	Akaike info criterion	7.406329
Sum squared resid	2435.279	Schwarz criterion	7.500625
Log likelihood	-105.3918	Hannan-Quinn criter.	7.435861
F-statistic	28.81517	Durbin-Watson stat	1.956783
Prob(F-statistic)	0.000011		

Appendix E: Co-integration Test

Date: 12/11/21 Time: 08:33

Sample (adjusted): 1992 2020

Included observations: 29 after adjustments

Trend assumption: Linear deterministic trend

Series: INPERCAPGDP INPHE ININF INFHAID INE

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.760229	88.12134	69.81889	0.0009
At most 1	0.620014	46.70733	47.85613	0.0638
At most 2	0.345265	18.64631	29.79707	0.5185
At most 3	0.188291	6.364093	15.49471	0.6525
At most 4	0.010779	0.314299	3.841466	0.5751

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.760229	41.41401	33.87687	0.0052
At most 1 *	0.620014	28.06102	27.58434	0.0434
At most 2	0.345265	12.28222	21.13162	0.5201
At most 3	0.188291	6.049795	14.26460	0.6068
At most 4	0.010779	0.314299	3.841466	0.5751

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

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

INPERCAPG				
DP	INPHE	ININF	INFHAID	INE
-0.000643	0.045125	0.015245	-0.092929	0.001664
-0.009256	1.393066	-0.007389	-0.014853	0.018662
-0.001871	-0.723623	-0.010542	-0.019287	-0.164016
-0.005574	0.544720	0.021024	0.045422	-0.016401
0.004499	-1.029556	-0.026385	-0.030061	-0.005461

Unrestricted Adjustment Coefficients (alpha):

D(INPERCA					
PGDP)	52.25692	18.84903	-31.86536	42.57798	-1.101068
D(INPHE)	0.510419	-1.328749	0.179266	0.372438	-0.032487
D(ININF)	-36.59394	-9.728039	9.655743	-3.699722	-2.707964
D(INFHAID)	8.094931	0.590823	0.159244	-4.197870	-0.656839
D(INE)	-1.442258	4.996482	2.372879	-1.260642	0.032835

1 Cointegrating Equation(s): Log likelihood-574.9458

Normalized cointegrating coefficients (standard error in parentheses)

INPERCAPG				
DP	INPHE	ININF	INFHAID	INE
1.000000	-70.15646	-23.70071	144.4771	-2.586830
	(203.612)	(6.86502)	(20.4125)	(30.7387)

Adjustment coefficients (standard error in parentheses)

D(INPERCA	
PGDP)	-0.033612
	(0.01629)
D(INPHE)	-0.000328
	(0.00027)
D(ININF)	0.023538
	(0.00548)
D(INFHAID)	-0.005207
	(0.00171)
D(INE)	0.000928
	(0.00111)

2 Cointegrating Equation(s): Log likelihood-560.9153

Normalized cointegrating coefficients (standard error in parentheses)

INPERCAPG				
DP	INPHE	ININF	INFHAID	INE
1.000000	0.000000	-45.09343	269.2346	-3.085121
		(11.9335)	(37.5284)	(20.5570)
0.000000	1.000000	-0.304929	1.778275	-0.007103
		(0.07958)	(0.25027)	(0.13709)

Adjustment coefficients (standard error in parentheses)

D(INPERCA		
PGDP)	-0.208084	28.61605
	(0.23205)	(34.8582)
D(INPHE)	0.011971	-1.828002
	(0.00286)	(0.42979)
D(ININF)	0.113583	-15.20311
	(0.07670)	(11.5218)
D(INFHAID)	-0.010676	1.188341

	(0.02459)	(3.69444)
D(INE)	-0.045321	6.895346
	(0.01264)	(1.89820)

3 Cointegrating Equation(s): Log likelihood-554.7741

Normalized cointegrating coefficients (standard error in parentheses)

INPERCAPG				
DP	INPHE	ININF	INFHAID	INE
1.000000	0.000000	0.000000	16.12801	21.91175
			(4.97843)	(2.64669)
0.000000	1.000000	0.000000	0.066729	0.161930
			(0.03157)	(0.01678)
0.000000	0.000000	1.000000	-5.612937	0.554335
			(0.80156)	(0.42613)

Adjustment coefficients (standard error in parentheses)

D(INPERCA			
PGDP)	-0.148466	51.67456	0.993296
	(0.22782)	(37.7993)	(0.48026)
D(INPHE)	0.011636	-1.957723	0.015709
	(0.00290)	(0.48053)	(0.00611)
D(ININF)	0.095518	-22.19023	-0.587772
	(0.07578)	(12.5731)	(0.15975)
D(INFHAID)	-0.010973	1.073109	0.117359
	(0.02509)	(4.16233)	(0.05288)
D(INE)	-0.049761	5.178276	-0.083921
	(0.01197)	(1.98573)	(0.02523)

4 Cointegrating Equation(s): Log likelihood-551.7492

Normalized cointegrating coefficients (standard error in parentheses)

INPERCAPG				
DP	INPHE	ININF	INFHAID	INE
1.000000	0.000000	0.000000	0.000000	21.47460
				(2.84101)
0.000000	1.000000	0.000000	0.000000	0.160121
				(0.01721)
0.000000	0.000000	1.000000	0.000000	0.706476
				(0.68643)
0.000000	0.000000	0.000000	1.000000	0.027105
				(0.12968)

Adjustment coefficients (standard error in parentheses)

D(INPERCA				
PGDP)	-0.385808	74.86763	1.888445	-2.587583
	(0.24487)	(37.0540)	(0.64613)	(2.36875)
D(INPHE)	0.009559	-1.754848	0.023539	-0.014237
	(0.00325)	(0.49119)	(0.00857)	(0.03140)
D(ININF)	0.116141	-24.20554	-0.665554	3.190849
	(0.08752)	(13.2432)	(0.23093)	(0.84660)
D(INFHAID)	0.012427	-1.213555	0.029104	-0.954776
	(0.02740)	(4.14682)	(0.07231)	(0.26509)
D(INE)	-0.042733	4.491580	-0.110425	-0.043212
	(0.01357)	(2.05376)	(0.03581)	(0.13129)

Appendix F: Vector Error Correction Model (VECM)

Vector Error Correction Estimates
Date: 12/06/21 Time: 01:05
Sample (adjusted): 1993 2020
Included observations: 28 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
INPERCAPGDP(-1)	1.000000
INPHE(-1)	-127.5198
	(36.9193)
	[-3.45402]
ININF(-1)	-9.383350
	(1.44934)
	[-6.47424]
INFHAID(-1)	20.63062
	(5.20549)
	[3.96324]
INE(-1)	1.963940
	(5.47952)
	[0.35841]
C	-573.2209

Error Correction:	D(INPERCAPGDP)	D(INPHE)	D(ININF)	D(INFHAID)	D(INE)
CointEq1	-0.370500	-0.005035	0.136713	0.020275	0.016870
	(0.09578)	(0.00192)	(0.04939)	(0.01340)	(0.00917)
	[-3.86834]	[-2.62413]	[2.76778]	[1.51360]	[1.83981]
D(INPERCAPGDP(-1))	-0.198333	0.009332	-0.024519	-0.035762	-0.026503
	(0.20253)	(0.00406)	(0.10445)	(0.02832)	(0.01939)
	[-0.97929]	[2.29990]	[-0.23475]	[-1.26255]	[-1.36689]
D(INPERCAPGDP(-2))	-0.003674	0.000161	0.013294	-0.006441	-0.003150
	(0.10298)	(0.00206)	(0.05311)	(0.01440)	(0.00986)
	[-0.03568]	[0.07784]	[0.25033]	[-0.44725]	[-0.31954]
D(INPHE(-1))	-2.851651	-1.012092	29.88479	3.888174	3.277041
	(24.3904)	(0.48865)	(12.5787)	(3.41115)	(2.33502)
	[-0.11692]	[-2.07119]	[2.37582]	[1.13984]	[1.40343]
D(INPHE(-2))	-4.439514	-1.628662	3.097465	5.393126	4.717484
	(24.5920)	(0.49269)	(12.6827)	(3.43935)	(2.35432)
	[-0.18053]	[-3.30566]	[0.24423]	[1.56807]	[2.00376]
D(ININF(-1))	-3.386259	-0.032368	0.644424	-0.016408	0.153025
	(0.73642)	(0.01475)	(0.37979)	(0.10299)	(0.07050)
	[-4.59826]	[-2.19386]	[1.69679]	[-0.15931]	[2.17052]
D(ININF(-2))	-2.361171	-0.009595	0.764997	0.138432	0.057270
	(0.67241)	(0.01347)	(0.34678)	(0.09404)	(0.06437)

	[-3.51151]	[-0.71228]	[2.20602]	[1.47204]	[0.88966]
D(INFHAID(-1))	2.506043	0.075184	-1.809180	-0.662831	-0.257757
	(1.84706)	(0.03701)	(0.95257)	(0.25832)	(0.17683)
	[1.35677]	[2.03173]	[-1.89926]	[-2.56590]	[-1.45766]
D(INFHAID(-2))	1.637631	0.058772	0.246603	-0.912673	-0.181814
	(1.83845)	(0.03683)	(0.94813)	(0.25712)	(0.17600)
	[0.89077]	[1.59564]	[0.26009]	[-3.54961]	[-1.03301]
D(INE(-1))	-7.404338	0.006931	1.335205	-0.178305	0.001777
	(3.88382)	(0.07781)	(2.00298)	(0.54318)	(0.37182)
	[-1.90646]	[0.08907]	[0.66661]	[-0.32826]	[0.00478]
D(INE(-2))	2.742370	-0.124174	0.205838	0.282811	0.450293
	(4.19090)	(0.08396)	(2.16134)	(0.58612)	(0.40122)
	[0.65436]	[-1.47892]	[0.09524]	[0.48251]	[1.12232]
C	33.60863	0.381016	3.012998	1.554897	-1.258160
	(19.1726)	(0.38412)	(9.88777)	(2.68141)	(1.83549)
	[1.75295]	[0.99193]	[0.30472]	[0.57988]	[-0.68546]
R-squared	0.906609	0.568021	0.626795	0.638141	0.425025
Adj. R-squared	0.842402	0.271036	0.370217	0.389363	0.029729
Sum sq. resids	146175.3	58.67237	38878.30	2859.160	1339.728
S.E. equation	95.58219	1.914947	49.29395	13.36778	9.150574
F-statistic	14.12018	1.912624	2.442901	2.565105	1.075208
Log likelihood	-159.5753	-50.08698	-141.0341	-104.4954	-93.88252
Akaike AIC	12.25538	4.434784	10.93101	8.321098	7.563037
Schwarz SC	12.82632	5.005729	11.50195	8.892043	8.133982
Mean dependent	18.17281	0.266257	8.062500	0.473704	-0.701672

S.D. dependent	240.7696	2.242868	62.11524	17.10676	9.289704

Determinant resid covariance (dof adj.)	1.86E+11
Determinant resid covariance	1.13E+10
Log likelihood	-522.7526
Akaike information criterion	41.98233
Schwarz criterion	45.07495

Appendix G: Stability Tests

(i) Normality Test

VEC Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: residuals are multivariate normal

Date: 12/06/21 Time: 01:06

Sample: 1990 2020

Included observations: 28

Component	Skewness	Chi-sq	df	Prob.
1	0.233887	0.255282	1	0.6134
2	0.833706	3.243642	1	0.0717
3	-0.113894	0.060536	1	0.8057
4	0.602858	1.696041	1	0.1928
5	1.808255	15.25901	1	0.0001
Joint		20.51451	5	0.0010

Component	Kurtosis	Chi-sq	df	Prob.
1	2.522333	0.266193	1	0.6059
2	3.694087	0.562049	1	0.4534
3	2.575301	0.210431	1	0.6464
4	3.299270	0.104490	1	0.7465
5	8.743938	38.49162	1	0.0000
Joint		39.63479	5	0.0000

Component	Jarque-Bera	df	Prob.
1	0.521475	2	0.7705
2	3.805692	2	0.1491
3	0.270967	2	0.8733
4	1.800531	2	0.4065
5	53.75063	2	0.0000
Joint	60.14929	10	0.0000

(ii) Autocorrelation

VEC Residual Serial Correlation

LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 12/06/21 Time: 01:09

Sample: 1990 2020

Included observations: 28

Lags	LM-Stat	Prob
1	22.34022	0.6160
2	15.99338	0.9150
3	23.68395	0.5377
4	24.81781	0.4726
5	21.59444	0.6590
6	29.77036	0.2330
7	17.81657	0.8501
8	27.08810	0.3515
9	31.71663	0.1664
10	16.17219	0.9096
11	15.34287	0.9330
12	33.27081	0.1244

Probs from chi-square with 25 df.

(ii) Heteroscedasticity

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Date: 12/06/21 Time: 01:10

Sample: 1990 2020

Included observations: 28

Joint test:

Chi-sq	df	Prob.
319.6466	330	0.6485

Individual components:

Dependent	R-squared	F(22,5)	Prob.	Chi-sq(22)	Prob.
res1*res1	0.601252	0.342693	0.9639	16.83505	0.7724
res2*res2	0.932518	3.140653	0.1035	26.11052	0.2470
res3*res3	0.934574	3.246469	0.0972	26.16807	0.2445
res4*res4	0.759394	0.717313	0.7350	21.26304	0.5045
res5*res5	0.930976	3.065371	0.1083	26.06732	0.2488
res2*res1	0.890830	1.854545	0.2555	24.94323	0.2998
res3*res1	0.751062	0.685697	0.7566	21.02974	0.5189
res3*res2	0.827900	1.093312	0.5103	23.18120	0.3916
res4*res1	0.617379	0.366717	0.9540	17.28661	0.7473
res4*res2	0.767190	0.748942	0.7136	21.48131	0.4912
res4*res3	0.429763	0.171286	0.9986	12.03336	0.9567
res5*res1	0.833971	1.141604	0.4868	23.35120	0.3821
res5*res2	0.979640	10.93529	0.0073	27.42991	0.1954
res5*res3	0.796322	0.888568	0.6239	22.29700	0.4423
res5*res4	0.865668	1.464602	0.3587	24.23871	0.3348