

BINDURA UNIVERSITY OF SCIENCE EDUCATION



**ASSESSING THE IMPACT OF PUBLIC EDUCATION EXPENDITURE ON
ECONOMIC GROWTH IN ZIMBABWE (1994 TO 2024)**

Submitted by

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**A DISSERTATION / THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE HONOURS DEGREE IN ECONOMICS OF
BINDUIRA UNIVERSITY OF SCIENCE EDUCATION. FACULTY OF
COMMERCE**

JUNE 2025

RELEASE FORM

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REG NUMBER: B213505B

TITLE PROJECT: ASSESSING THE IMPACT OF PUBLIC
EDUCATION EXPENDITURE ON ECONOMIC
GROWTH IN ZIMBABWE (SINCE 1994 TO 2024).

DEGREE: BACHELOR OF SCIENCE (HONOURS)
DEGREE IN ECONOMICS

YEAR GRANTED: 2025

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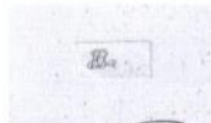
In partial fulfillment of the requirements for the Bachelor of Science (Honors) Degree in Economics at Bindura University of Science Education, Palmer Mubako submitted a dissertation titled "Assessing the impact of public education expenditure on economic growth in Zimbabwe (1994 to 2024)," which the undersigned certifies they oversaw.

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DEDICATION

I dedicate this dissertation to my family, whose unwavering support and encouragement have been my guiding light throughout my life. To my grandmother Gertrude Muchenje and my mother Loveness Muchenje, whose love and sacrifices have shaped me into the man I am today, and to God Almighty for working in me to will and to act to fulfill his good purpose.

ABSTRACT

The connection between education spending and economic development remains an important issue, particularly in Zimbabwe where high literacy rates (around 90%) have not translated into consistent economic performance. This study examines the impact of government education spending on Zimbabwe's economic growth from 1994 to 2024. The research analyses education expenditure as a percentage of GDP using the Cobb-Douglas production function approach. An ordinary least squares regression method was applied to examine the relationship between education spending and economic growth.

The data analysis showed a significant positive relationship between education expenditure and economic growth, which is consistent with findings from Chandra (2011) showing a positive and significant impact of government education spending on economic growth in Bangladesh. As recommended by international bodies, the study suggests that Zimbabwean policymakers increase annual education budget allocation to at least 20%. However, the key to achieving good results lies in directing funding towards areas of greatest impact, such as teacher training and support and classroom materials.

ACKNOWLEDGEMENTS

I would like to express my deepest my deepest gratitude to my supervisor, Mr. Mandaza, for his exceptional guidance, support and expertise throughout this dissertation and to Bindura University of Science Education for giving me an opportunity to study with their prestigious institution. I am also sincerely grateful to all the lecturers for their contributions and support throughout the degree programme. I would also like to acknowledge the pioneers of this work whose work guided me in writing this dissertation. I would like to extend my sincere gratitude to my family, particularly Loveness, Merit and Samantha for their unwavering support patience and understating. Their love and support have sustained me throughout this process.

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LIST OF ACRONYMS

ADF	Augmented Dickey-Fuller
BLUE	Best Linear Unbiased Estimator
CUSUM	Cumulative Sum
GDP	Gross Domestic Product
GCF	GROSS CAPITAL FORMATION
IMF	International Monetary Fund
SADC	Southern African Development Community
TEACH	Teacher Effectiveness and Equitable Access for all Children
NGO	Non-Governmental Organization
VIF	Variance inflation Factor
UNICEF	United Nation International Children's Emergency Fund
UNESCO	Nations' Educational Scientific and Cultural Organization

CHAPTER I

INDRODUCTION

1.0 Introduction

The study of what determines economic growth has been a central focus in economics since Adam Smith published "The Wealth of Nations" in 1776. Among the various factors influencing economic growth, human capital has emerged as a critical component. Economic theories have emphasized the roles of human and physical capital in influencing economic performance and productivity, especially those formulated by Robert Solow. In addition to looking at other factors that influence economic growth, this study attempts to find out how public education spending affects GDP growth.

1.1 Background of study

The relationship between education and economic growth has been a cornerstone of development economics since Theodore Schultz (1961) and Gary Becker (1964) pioneered human capital theory. The endogenous growth models of Romer (1990) and Lucas (1988) further cemented education's role as a driver of technological progress and productivity. Cross-country studies consistently demonstrate that nations with higher education attainment levels achieve 0.3-0.5% faster annual GDP growth (Barro, 2013). However, this relationship exhibits contextual nuances. While East Asian economies leveraged education for rapid industrialization (World Bank, 1993), some African nations face paradoxes where education investments fail to yield proportional growth dividends (Psacharopoulos & Patrinos, 2018).

In Sub-Saharan Africa, education accounts for 18-25% of GDP growth variance (UNESCO, 2021). The Southern African Development Community (SADC) reveals divergent outcomes: Botswana and Mauritius show strong education-growth linkages through skills-intensive sectors (AfDB, 2020), whereas Zimbabwe and Malawi demonstrate weaker correlations due to structural constraints. This disparity underscores the critical role of institutional and macroeconomic factors in mediating education's impact.

Post-independence Zimbabwe (1980-1990) exemplified successful education-led development, expanding literacy from 45% to 92% while achieving 4.2% average annual GDP growth (ZIMSTAT, 2012). The education sector absorbed 22% of the national budget (UNDP, 1995), creating Africa's most skilled workforce (World Bank, 1998). However, the 2000-2008 crisis period saw education's share plummet to 8% of GDP amidst hyperinflation (IMF, 2009), with GDP contracting by 40%. The 2009-2013 recovery period restored education spending to 15% of GDP under the Short-Term Emergency Recovery Program (STERP), yet growth remained at 2.1% annually (RBZ, 2014).

Despite maintaining 92% literacy (ZIMSTAT, 2022), economic growth averaged just 1.8% during 1994-2023 (World Bank, 2023). This contrasts sharply with human capital theory predictions and regional peers, leaving these anomalies:

- **Quality-Quantity Disconnect:** While primary enrolment reaches 98%, only 12% of graduates possess STEM skills needed for industrialization (MOESAC, 2023).
- **Fiscal Inefficiency:** Each 1% increase in education spending correlates with just 0.2% GDP growth versus SADC's 0.5% average (AfDB, 2023).
- **Labour Market Duality:** 63% of university graduates work in informal sectors (ILO, 2023), indicating severe skills-job mismatches.

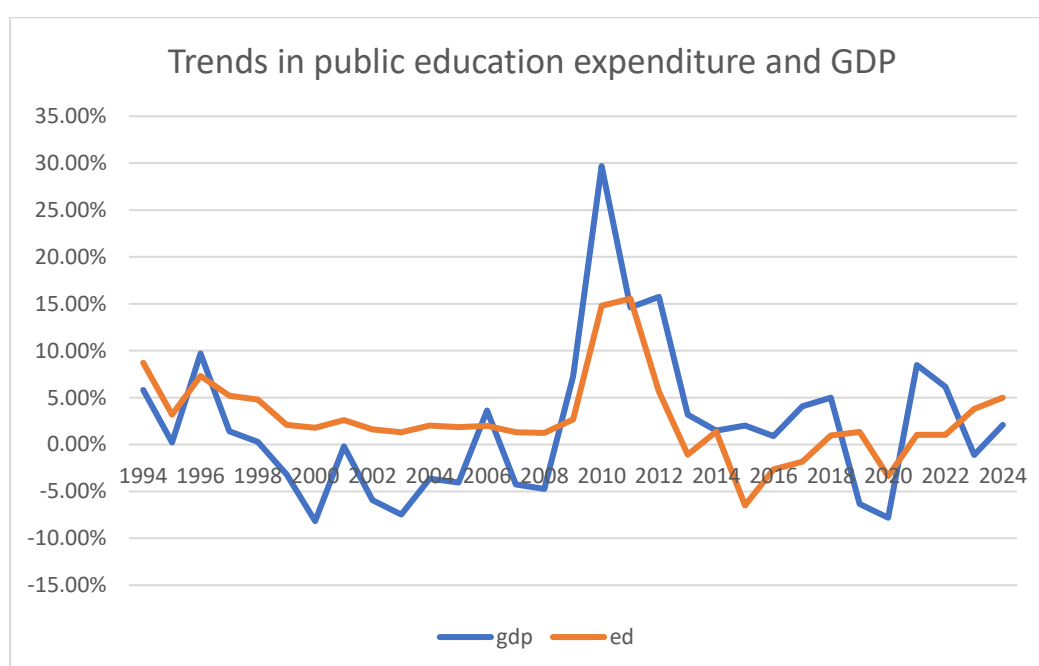
Over the last three decades (1994 to 2024), the country has faced severe economic challenges that include hyperinflation, unemployment, and a GDP decline. These issues have raised questions about the effectiveness of human capital investment, particularly in education, as a catalyst for economic recovery. Despite the critical importance of education in fostering human capital, much of the existing literature has focused on

health as a principal economic growth driver, often neglecting the substantial impact of educational investments.

1.1.1 General profile of the country

The diagram below shows the trends in public education and GDP from 1994 to 2024.

Figure 1: Trends in public education and GDP [Chart showing trends in public education expenditure and GDP from 1994-2024]



As illustrated in Figure 1.1 above, Zimbabwe's education spending fell sharply from 8.7% (1994) to 1.3% (2005) reflecting fiscal constraints during economic crisis. From 2006 to 2024 expenditure fluctuated wildly, with extreme highs of 15.56% and lows of -6.49% in 2022. Throughout the period (1994 to 2024) Education expenditure allocations often fell short of UNESCO's 15–20% recommendation. On the other hand, there were severe GDP growth contractions 1998 to 2008 linked to hyperinflation and political instability. Post 2009 there was a brief recovery in 2011, likely due to dollarization, then followed by erratic growth including negative years (-7.82% in 2018). From 2020 to 2024 growth remained weak but less erratic averaging 2 to 6

percent. Notably, some periods of GDP expansion have coincided with higher education allocations.

1.2 Problem Statement

Despite Zimbabwe's significant investment in education since independence, the country's economic growth has been inconsistent and often hindered by severe crises, raising concerns about the efficacy of public education expenditure in driving economic growth. Despite high literacy rates (around 90%) from past investments, the country's economic performance has been volatile, with GDP growth fluctuating between -7.8% and 8.4% over the period. Therefore, a comprehensive assessment of the impact of public education expenditure on Zimbabwe's economic growth from 1994 to 2024 is necessary to identify the underlying factors contributing to this disconnection.

1.3 Research objectives

- To analyse the effects of public education expenditure on Zimbabwe's economic growth.
- To identify other key determinants of the economic growth of Zimbabwe.
- To show Zimbabwe's GDP trends in relation to the education sector.

1.4 Research questions

- What is the effect of public education expenditure on Zimbabwe's economic growth?
- What other key factors influence economic the growth of Zimbabwe?
- What are Zimbabwe's GDP trends in relation to the education sector?

1.5 Statement of the hypothesis

H₀: increase in public education expenditure increases Zimbabwe's economic growth.

H₁: There is no significant relationship between public education expenditure and Zimbabwe's economic growth.

1.6 Purpose of the study

- The research will contribute to understanding how public education expenditure can help achieve quality Education and Economic Growth. (Sustainable Development Goals)
- The study will also inform the development of policies and programs aimed at improving education outcomes and promoting economic growth in Zimbabwe.
- The research can provide evidence-based recommendations for the Zimbabwean government to optimize public education expenditure and promote economic growth.

1.7 Assumptions

- Positive relationship between education expenditure and economic Growth.
- Public education spending reduces income inequality, which indirectly supports economic growth by creating a more inclusive economy.
- Beyond a certain threshold, additional public education expenditure may yield diminishing returns in terms of economic growth (Diminishing returns to education expenditure).
- Higher public education expenditure leads to increased employment opportunities, which in turn drives economic growth.

1.8 Delimitations

- Use of Secondary Data
- The study focuses on public education expenditure and does not include private education spending or informal education systems.
- The study is limited to Zimbabwe and does not compare or generalize findings to other countries.
- The study uses the translog model regression analysis to analyse the relationship between education expenditure and economic growth, rather than qualitative approaches.

1.9 Limitations

- The study will not focus much on the effects of public policies on public expenditure decisions. The author will acknowledge policy impacts qualitatively by referencing major education reforms in the discussion section.
- Data issues regarding quality, consistency, correctness, and reliability are particularly severe in less developed countries. Zimbabwe is included. Zimbabwe included. The author did extensive research and obtained data from trusted sources such as World Bank, Macrotrends, IMF and ZIMSTAT.

1.10 Definition of terms

- **Economic Growth** is a sustained increase in a country's productive output productive capacity, resulting in higher output and better standards of living

- **Gross Domestic Product** is the monetary value of all final goods and services produced within a country's borders during a period of time, typically a specific year or a quarter.

1.11 Summary

This chapter includes the study's background, which gives the study's context and briefly discusses some of the associated topics. It also includes the problem statement, which illustrates the issue that the study is trying to answer. It also includes the study's objectives, research questions, and hypothesis statement. Additionally, chapter one discusses the study's assumptions, constraints, and boundaries. The study's second chapter, which includes the literature review, is introduced in this chapter.

CHAPTER II

LITERATURE REVIEW

2.0 Introduction

In this chapter the author reviews theories and other studies that have been carried out in the similar field. This chapter will dwell on, both theoretical and empirical literature.

2.1 Theoretical literature review

The relationship between government spending and economic growth has been explained by a variety of hypotheses that have been produced thus far. These consist of endogenous growth theory, Wagner's law, Keynesian theory, and human capital theory.

2.1.1 Human capital theory

In the 1960s, Schultz created the human capital theory in an attempt to explain the financial benefits of boosting agricultural productivity through education spending. The argument was rationally extended to demonstrate how increased productivity is a direct result of greater education and how this has a substantial positive impact on the overall economy (Iheoma, 2014). By arguing that spending on education is an investment in human capital since people cannot be separated from their abilities, knowledge, or values in the same way that we can separate them from their material possessions, Becker (1993) expanded on Schultz's arguments.

Thus, government spending on the provision of education can be considered as a key basis on which balanced and sustainable economic growth can be reached. Amakom (2010) suggested that the core theme of the human capital theory is that investment in human capital through education is a vital factor for economic success.

2.1.2 The Keynesian Theory

Keynes argued that because government spending increases the economy's aggregate demand, it has a positive correlation with economic growth. According to him, government spending is an exogenous element that may be used as a tool for policy to promote economic expansion. Through the multiplier effect, a rise in government consumption boosts employment, investment, and profitability (Sachs J.D. and Larrain F. 1993). Keynes created the theory to address the consequences of the Great Depression, which lasted from 1929 to the 1930s (Keynes 1964).

2.1.3 Wagner's Law

A theory by Adolph Wagner (1883), also known as law of increasing state activities. According to this idea, which is valid for all nations, economic expansion causes a rise in government activity, which raises government spending. In a nutshell, this hypothesis highlights the positive correlation between economic growth and public spending. Therefore, the Zimbabwean economy will benefit from higher public education spending.

2.1.4 Endogenous Growth Theory

This theory, which was first introduced by Romer (1986) and Lucas (1988), posits that economic growth is the result of technological advancement. Specifically, it contends that the capacity of an economic agent to effectively utilize its productive resources over time is complemented by the development of good human capital. This is primarily due

to the ability to adapt to rapid structural changes in the production processes and manage and administer newly established production facilities more efficiently.

2.2 Empirical literature review

Empirical studies present mixed findings on the relationship between government spending and growth. Blenney et al. (2001) used panel data from 1970 to 1995 using the OLS and General Least Square (GLS) methods to examine the relationship between government spending and economic development in 22 Organization for Economic Cooperation and Development (OECD) nations. They came to the conclusion that the only government spending that affects economic growth is productive spending. Despite making up a larger share of public consumption, they discovered that health and education were important. However, African nations were not the study's primary emphasis. Additionally, because OLS is susceptible to endogeneity, it is not the ideal approach for panel data.

Diamond (1989) studied 42 developing countries and found that social spending impacts short-term growth, whereas Blejer and Khan (1994) concluded that government expenditures competing with the private sector stifle growth. This suggests that public spending either complements or crowds out private investment, with complementary spending being more beneficial for growth. Mohsin and Villanueva (1991) attributed Africa's sluggish per capita GDP growth to high population growth, low investment in physical and human capital, macroeconomic instability, and declining productivity. Key underlying issues included inefficient projects, shrinking export sectors, underinvestment in human capital, and fiscal mismanagement. Falling export revenues forced governments to cut spending on capital formation, education, and healthcare, harming productivity while continuing to fund inefficient enterprises.

The relationship between public education spending and economic growth remains contested. Gemmell (1996) found that in low-income countries, a 1% increase in education expenditure as a share of GDP correlated with a 0.3% rise in annual GDP growth over 1970–1990, mediated through improved labour productivity. Using the overlapping generations model to examine the relationship between public education

expenditure and economic growth, and panel data from 23 countries Blankenau et al. (2007) demonstrated that education investments yield higher growth returns in economies with complementary infrastructure, with elasticity estimates of 0.4–0.6 in middle-income nations. Hanushek & Woessmann (2015) established that education (quality) (measured by PISA scores) explains 30% of GDP growth variance more than expenditure levels alone. This underscores Zimbabwe's challenge of high literacy (98%) but low learning outcomes (SACMEQ, 2017). Rodrik (2016) emphasized that education-growth linkages weaken in unstable macroeconomic environments, as seen in Zimbabwe's inflation-affected education budget execution (World Bank, 2023).

Kabunga (2015) used the ARDL model to examine the connection between economic growth and education spending in Mauritius. He discovered a favourable long-term correlation between economic growth and public education spending. (Mukidir-Al-Mukit, 2012) discovered that public spending on education has a favourable and noteworthy effect on Bangladesh's long-term economic growth. A 1% increase in public spending on education raises GDP per capita by 0.34% over the long run, according to the study, which used econometric modelling with time series data from 1995 to 2009. According to Chandra (2011), there is a connection between economic growth and education spending. It has been found that this causality is reciprocal. In other words, economic growth is fuelled by public education spending, and education spending in turn fuels economic expansion. He investigated this relationship in India using the Cobb Douglas function. Mujuki and Masaviru (2012) examined the effects of Kenya's public spending components on economic growth between 1972 and 2008. They came to the conclusion that spending on education had a big impact on growth.

Using both quantitative and qualitative methodologies, Nurudeen and Usman (2018) investigated the Nigerian government's expenditures on education and their effects on the country's economy. They applied error correction and co-integration techniques. Spending on education and the expansion of the Nigerian economy were shown to be unrelated. However, in order to achieve a desired rise in productivity through a competent and high-quality workforce that would ensure sustainable economic growth, the document recommended significant investments at all levels of the education system. Eggoh et al. (2015) used cross-sectional and dynamic panel estimate methodologies to examine the association between economic growth and human capital

(as determined by factors related to health and education) for 49 African nations between 1996 and 2010. The findings indicated that public education investment has a detrimental effect on economic expansion.

I believe that higher education expenditure strengthens economic growth through multiple linkages such as improved labour efficiency, technological advancement, and higher earning potential leading to greater long-term productivity (Hanushek & Woessmann, 2008). This only works under the condition that the education investments align with labour market demands.

2.3 Gap analysis

While substantial research exists on human capital's role in economic development, there is a notable gap in literature specifically addressing the effects of public education expenditure on Zimbabwe's economic growth trajectory. There is a lack of substantial studies focusing on the period between 1994 and 2024, thereby limiting understanding of recent trends and impacts. Furthermore, the majority of existing research on education expenditure and economic growth focuses on developed and emerging economies, leaving a knowledge gap on Sub-Saharan African countries like Zimbabwe. Even more importantly, Zimbabwe's unique economic and socio-political context, including hyperinflation and economic crises, requires a tailored analysis. This study aims to bridge these gaps by investigating the impact of public education expenditure on Zimbabwe's economic growth (1994-2024).

CHAPTER III

METHODOLOGY

3.0 Introduction

The approach and model specification are discussed next in this chapter. The research design will be emphasized by the investigator.

3.0 Research design

The research will make use of secondary data collected from World Bank, IMF, Macrotrends and Zimbabwe National Statistics Agent (ZIMSTAT). E-views will be used to estimate the model specified.

3.1.1 Model specification

The basic methodological approach and model follows the leads of Charles Cobb and Paul Douglas (1947). The model will employ a translog production function. This approach allows for greater flexibility in capturing the interactions between different inputs, making it a suitable choice for this analysis. The translog model not only generalizes the Cobb-Douglas framework but also accommodates varying elasticity of substitution between inputs, which is particularly relevant in the context of Zimbabwe's evolving economic landscape. The name translog stands for 'transcendental logarithmic'.

$$GDP = f(L, K) \dots\dots\dots (1)$$

Economic growth is the function of labor and capital

$$GDP = \lambda L^\alpha K^\beta \dots\dots\dots (2)$$

Where λ is the total factor productivity.

L= percentage changes in Labor Force

K= percentage changes in Gross Fixed Capital Formation

GDP = is growth domestic product

α and β are output elasticities.

λ the total factor productivity is defined as follows.

$$\lambda = L_A K_A \dots\dots\dots (3)$$

Public education expenditure affects economic growth through labor productivity thus

$$L_A = f(E, H) \dots\dots\dots (4)$$

Where:

E= percentage change in public education expenditure

H= percentage in public health care expenditure

Substituting equation 4 into 3, the total factor productivity will be

$$\lambda = f(E, H, A^1) \dots\dots\dots (5)$$

Where A^1 is all other factors that affect total factor productivity that are not E and H

Substituting equation 5 into equation 2

$$GDP = f(E, H, A^1 L, K)$$

The following equation includes the parameter coefficients to be estimated

$$GDP = A^1, E^\varepsilon, H, L^\alpha, K^\beta \dots\dots\dots (6)$$

equation 6 can best be portrayed in the form of changes in the variables as below

$$\Delta GDP = A^1, \Delta E^\varepsilon, \Delta H^\sigma, \Delta L^\alpha, \Delta K^\beta \dots\dots\dots (7)$$

Thus, in its linear form equation 7 can be represented as below

$$\ln \Delta GDP = \ln A^1 + \varepsilon \ln \Delta E + \delta \ln \Delta H + \beta \ln \Delta K + \alpha \ln \Delta L + \mu$$

Where $\ln \Delta GDP$ is natural log of economic growth

$\ln A^1$ Is our constant term

$\ln \Delta E$ is natural log of public education expenditure

$\ln \Delta H$ is natural log of public health care expenditure

$\ln \Delta K$ is natural log of Gross Fixed Capital Formation

$\ln \Delta L$ is natural log of the labor force

μ is error term

$\varepsilon, \delta, \beta$ and α 's, = are elasticities of the variables E, H, K and L respectively

3.2 Description and justification of variables

3.2.1 Economic growth ΔGDP

GDP growth is a common and universal metric used to assess economic success in all nations. The Gross Domestic Product (ΔGDP) change as a percentage is used to

measure economic growth. Since it represents domestic productive capacity, the gross domestic product variable is incorporated into this model. The demand for commodities produced in the economy rises when output increases. This increases the profitability of future investments. In response, investors raise their capital. Therefore, according to Hadjimichael (1995), ΔGDP growth is a reliable indicator of economic growth.

3.2.2 Public education expenditure ΔE

Spending on education is thought to be the main driver of investments in human capital. The economy grows more quickly when the government spends more on education (Capolupo, 2000; Glomm and Ravikumar, 2001). The significance of public education spending in this analysis stems from the long-held belief that a lack of focus on education and training has been one of the biggest obstacles to Zimbabwe's economic development and progress (Neiman and Watkins, 1999). Therefore, the proposed correlation between public education investment and economic growth is affirmative.

3.2.3 Labor force ΔL

The economy is likely to produce more if the labour force is large and fully employed. This study uses labour force participation rate changes expressed as percentages. Accordingly, it is assumed that labour force growth and economic growth are positively correlated (Mark, 2002). A high unemployment rate adversely affects economic growth.

3.2.4 Gross fixed capital formation ΔK

Gross fixed capital formation is used to estimate investment. The potential differential impact on economic growth is examined using the investment variable. Given that it increases the long-term rate of economic growth, it is a crucial element of the economy that requires the attention it requires. According to Khan and Reinhart (1990), private investment is crucial for creating economic growth. One of the main factors influencing

economic growth is investment since it increases output by generating more jobs, which in turn leads to the production of more goods. As a result of increased investment expenditures, a portion of each additional worker's income is spent and the remainder is saved. This keeps going until the initial investment is recovered. As a result, the link between gross fixed capital formation and economic growth can be described as positive.

3.2.5 Public healthcare expenditure ΔH

Given the research's focus on public education expenditure's impact on economic growth in Zimbabwe (1994–2024), controlling for public healthcare expenditure is essential because of theoretical linkages between health and education in human capital formation. Human capital theory (Schultz, 1961; Becker, 1964) posits that health and education are interdependent drivers of productivity. A healthy population results in a productive workforce, which is anticipated to boost economic growth by increasing access to health care and, consequently, a productive and healthy workforce.

3.3 Research instruments

3.3.1 Mathematical tools

Ordinary Least Square (OLS) estimation techniques for single equations will be used in this investigation. This technique was chosen because it is easy to use, convenient, and has been utilized successfully in other research of a similar nature. Cobbs and Douglas used statistical fitting least squares regression of their production function to explain the statistical evidence that seemed to indicate that labour and capital shares of total output in industrialized countries remained consistent throughout time. Furthermore, this method yields BLUE parameter estimates, making them the best, unbiased, and linear estimators. As long as the OLS assumptions are met, Stock (1987) demonstrated that the OLS estimators of the coefficients have a desired quality called super-consistency. E-views is the statistical software that will be utilized.

3.3.2 Assumptions underlying regression analysis

- a) The dependent variables are non-random and are observed with negligible error
- b) The error terms are normally distributed random variables with mean zero and constant variance.
- c) The error terms are uncorrelated.

3.3.3 Summary statistics

Summary statistics are going to be used to summarize data in order to communicate the largest percentage change as simple as possible. The information is given in quick and simple descriptions such as mean, median, mode, range, and the standard deviation.

3.3.4 Diagnostic checking

The researcher will use the diagnostic tests listed below prior to running the regression. Before the model can be utilized for forecasting, its estimated adequacy must be assessed. These are the diagnostic tests that will be performed.

- Unit Root Test (Dickey Fuller)
- Autocorrelation Test
- Multicollinearity

3.3.4.1 Unit root test

As contemporary time series modelling has advanced, all variables are subjected to a unit root test in order to ascertain their time series characteristics. When estimating the levels of non-stationary series in stochastic models, this is done to prevent erroneous regression (Badawi, 2003). Thus, figuring out the macroeconomic variables' sequence of integration aids in model identification. The time series attributes of these series are analysed using the Augmented Dickey Fuller (ADF) tests, which account for the potential for structural breaks in the time series. Standard tests for unit roots, such the ADF test put forward by Dickey and Fuller (1979), are used to test the order of integration of variables.

3.3.4.2 Autocorrelation test

Autocorrelation is the association between a series and its own historical and projected values is known. "Lagged correlation" or "serial correlation" are other terms for autocorrelation, which is the correlation between individuals in a sequence of numbers arranged chronologically. A certain type of "persistence"—the propensity of a system to hold steady from one observation to the next—could be seen as positive autocorrelation. Because autocorrelation reduces the amount of independent data, it makes applying statistical tests more difficult. Finding significant covariance or correlation between time series can also be made more difficult by autocorrelation. Because future values of an autocorrelated time series depend on present and past values, autocorrelation can be used to make predictions. Autocorrelation is tested using a Durbin Watson statistic. Errors with a first-order autoregressive process can be found using the Durbin-Watson test statistic. Additionally, this statistic serves as a useful generic test for model misspecification (Gujarati 1995).

3.3.4.3 Multicollinearity test

Multicollinearity happens when predictor variables in a regression model are highly correlated, which leading to unreliable coefficient estimates and inflated standard errors. Common diagnostic tests include Variance Inflation Factor (VIF), which measures how much the variance of a coefficient increases due to multicollinearity. A $VIF > 5-10$ indicates high multicollinearity.

3.4 Summary

The method taken by Charles Cobb and Paul Douglas will be applied to evaluate how public education spending affects economic expansion. Since public healthcare and education spending have an impact on labour, one of the elements in the Cob-Douglas function, percentage changes in these two variables were added to the Cob-Douglas function. Capital (ΔK) will be explained by changes in Gross Fixed Capital Formation as a percentage. The role of economic growth was explained by each of these factors. We examine the impact of these factors on economic growth in the upcoming chapter, highlighting the importance of funding public education.

CHAPTER IV

DATA ANALYSIS AND RESULTS PRESENTATION

4.0 Introduction

Using the equations from the previous chapter, the research findings are presented and interpreted in this chapter. Model estimation and the assessment of the model's relevance are the main topics of this chapter.

4.1 Summary statistics

Table 1: Summary statistics

	ED	GDP	H	K	L
Mean	2.735484	2.605128	4.229032	12.29092	0.983548
Median	1.850000	1.400000	4.000000	12.70000	0.220000
Maximum	15.56000	45.66000	8.900000	16.00000	15.40000
Minimum	-6.490000	-8.170000	1.200000	3.327242	-0.670000
Std. Dev.	4.480366	10.07574	1.809798	2.688624	3.152331
Probability	0.002405	0.000000	0.308372	0.002983	0.000000
Observations	31	31	31	31	31

The lower differences between the minimum and maximum values for every variable—aside from GDP—indicate that there are no outliers. With the largest standard deviation of 10.07574, GDP shows that the data is dispersed throughout a wide range of values.

The reduced standard deviations for capital, labour, health, and education demonstrate how reliable these factors are at explaining fluctuations in Zimbabwe's economic growth.

4.2 Diagnostic tests

4.2.1 Unit root test

Table 2: Unit root tests

variables	ADF	1%	5%	10%	Order
	Test statistic	critical value	critical value	critical value	of integration
ΔGDP	-3.497502	-3.67017	-2.963972	-2.621007	1(0)
ΔE	-2.93375	-3.67017	-2.963972	-2.621007	1(0)
ΔH	-3.636624	-3.670170	-2.963972	-2.621007	1(0)
ΔL	-5.075900	-3.670170	-2.963972	-2.621007	1(0)
ΔK	-3.214525	-3.670170	-2.963972	-2.621007	1(0)

4.2.2 Autocorrelation

The Durbin Watson statistic, which is nearer the critical number of 2, is 1.915457. This suggests that autocorrelation is not present. Current and past values have no bearing on future values. The regression analysis in chapter 4.3.1 illustrates this.

4.2.3 Multicollinearity

Table 3: VIF

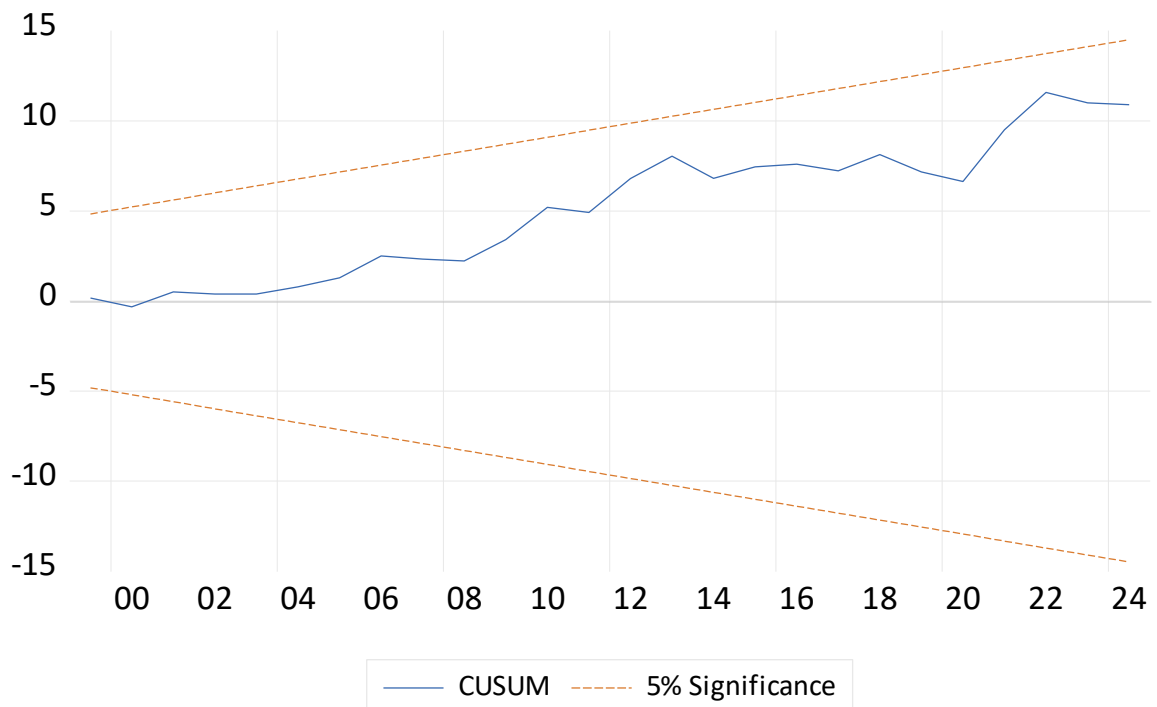
Variance Inflation Factors Sample: 1994 2024 Included observations: 31

Variable	Coefficient	Uncentered	Cantered
	Variance	VIF	VIF
ED	0.115978	3.883097	2.803284
H	0.451736	11.83400	1.781591
K	0.211520	41.59905	1.841090
L	0.140189	1.846149	1.677413
C	37.16281	46.23940	NA

The cantered VIF shows there's no multicollinearity since the values are below the threshold of 5-10.

4.2.4 CUSUM test

Figure 2: CUSUM TEST [Chart showing CUSUM test results with confidence boundaries]



The CUSUM line stayed within the 5% significance boundaries which indicates stability of the model parameters over the period.

4.3 Estimation of results.

4.3.1 Regression analysis.

Table 4: OLS results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ED	0.73166	0.34056	2.14843	0.0412
H	1.65941	0.67211	2.46894	0.0204
K	-1.0091	0.45991	-2.1941	0.0374
L	1.75917	0.37442	4.69842	0.0001
C	4.25871	6.09613	0.69859	0.491

R-squared 0.787306

Adjusted R-squared 0.754583

F-statistic 24.06028

Prob(F-statistic) 0.0000

Durbin-Watson stat 1.915457

The regression equation can be written as:

$$\text{GDP} = 4.258705 + 0.731659 \text{ ED} + 1.659407 \text{ H} + 1.759173 \text{ L} - 1.009114 \text{ K}$$

The coefficient of ED is 0.731659, indicating a positive relationship between education expenditure and GDP. For every unit increase in ED, GDP is expected to increase by approximately 0.731659 units, ceteris paribus. The p-value associated with ED is 0.0412, which is less than the typical significance level of 0.05, indicating that the coefficient is statistically significant. These results align with the author's expectations and what other researchers found in this area of study. According to a study by Chandra (2011), economic growth is caused by spending on education, however this effect takes

time to materialize. Additionally, (Kabunga, 2015) discovered a favourable long-term correlation between economic growth and public education spending. Additionally, it supports the findings of Mukidir-Al-Mukit (2012), which show that public investment on education has a favourable and significant impact on Bangladesh's long-term economic growth.

The coefficient of H is 1.659407, suggesting a positive relationship between health expenditure and GDP. The p-value is 0.0160, indicating statistical significance at the 5% level. This concurs with (Schultz, 1961; Becker, 1964) that health is a driver of productivity. A healthy population results in a productive workforce, which is anticipated to boost economic growth by increasing access to health care and, consequently, a productive and healthy workforce.

The coefficient of L is 1.759173, indicating a positive relationship between labour and GDP. The p-value is 0.0001 indicating statistical significance at the 5% level. This agrees with the findings of (M. A. Adawo 2010) that labour contributes very highly to growth, showing that a unit increase in labour propels growth 11.5 times.

The coefficient of K is -1.009114, suggesting a negative relationship between gross fixed capital formation and GDP. However, the p-value is 0.0374, which is less than 0.05, indicating that the coefficient is statistically significant. These results are in disagreement with the author's expectations. (Ncanywa & Makhenyane, 2014) from their analysis found that investment activities can be a tool both in the long and short run to boost the economy and also (Beddies 1999) found a positive relationship.

The constant term is 4.258705, and its p-value is 0.4910, indicating that it is not statistically significant.

The R-squared value is 0.787306, indicating that approximately 78.73% of the variation in GDP is explained by the independent variables. The adjusted R-squared value 0.754583 suggests that the model still explains a significant portion of variance in GDP.

The F-statistic is 24.06028, indicating that the overall model is statistically significant.

These results suggest that education expenditure (ED) has a positive and statistically significant impact on GDP in Zimbabwe from 1994 to 2024. This finding supports the idea that investing in education can contribute to economic growth. The significance of

H and L also highlight the importance of human capital and labour in economic growth. The regression analysis provides evidence that education expenditure has a positive impact on economic growth in Zimbabwe. The findings have implications for policymakers and stakeholders seeking to promote economic development through education investments. However, the insignificance of constant C and capital K indicate that other factors could provide additional insights.

4.4 Summary

It is evident from the model estimation that public education spending and economic growth are positively correlated. Therefore, investing in education has an impact on human capital and economic growth. An increase in funding for public education will significantly boost economic expansion.

CHAPTER V

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This is the final chapter of the research. This chapter provides a summary of the findings of the regression results and provides policy recommendations to address issues that have been identified.

5.1 Study summary and conclusion

With a dataset spanning from 1994 to 2024, this paper offers the findings of an empirical analysis conducted to determine the effect of public education spending on economic growth in Zimbabwe. The World Bank Databank, Macrotrends, ZIMSTATS, and the IMF provided the majority of the data used in the study. The study's goal was accomplished by breaking it up into five chapters. The statistical program used to produce the regression findings using the Cobb Douglas model was EViews 12. The study's goal was to examine how public education spending affected economic development from 1994 to 2024 while accounting for other growth-influencing factors.

The research demonstrates the importance of human capital in Zimbabwe's economic growth. It found that public education spending was both positive and statistically significant, indicating that it has a positive impact on economic growth. According to Mandela (1990) and UNESCO (2015), "the most effective tool for driving sustainable economic development is education." Therefore, an increase in public education spending leads to an increase in economic growth in Zimbabwe.

5.2 Policy recommendations

Based on the conclusions above. There is need for Zimbabwe to give more weight to public education expenditure. Education expenditure should be perceived as an investment in human capital that promotes economic growth. Zimbabwe increase education budget. It should allocate at least 20 % as recommended by international bodies including UNESCO.

To achieve optimum allocation, funding should be directed towards areas with greatest impact such as teacher training and classroom materials especially in rural areas. The Ministry of Primary and Secondary Education should implement a comprehensive school financing policy to ensure sustainable funding for basic education.

Secondly, there is need for teacher training and Support. The country should invest in pre-service and in-service teacher training to improve teaching quality and skills. Teachers' salaries and working need to be improved to boost teacher morale and retention. Partnering with organizations li UNICEF and the Education Development Trust to implement programs like TEACH could also help.

Furthermore, school infrastructure should be improved. The government should ensure schools have adequate facilities including textbooks labs, libraries and technology. Road networks also need attention to ensure access to schools for students in rural areas. There is also a need to support inclusive education polices to ensure all students' including those with disabilities have equal access to education.

Lastly, the government should provide opportunities for adults to continue their education and training. Zimbabwe should also strengthen non-formal education. It should expand and strengthen no-formal education programs to cater to out-of-school youth and adults. This will increase human capital.

5.3 Suggestions for further studies

Further research should give more attention to the effects of public policies on public expenditure decisions and other determinants of economic growth apart from human

capital such as financial markets, financial flows, foreign debts, political sanctions and technology. Further studies should also consider the effect of infrastructure spending on economic growth.

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APPENDICES

Data used

YEAR	gdp	ed	k	l	h
1994	5.8	8.7	15.8	1.38	6.8
1995	0.2	3.2	14.8	0.45	2.5
1996	9.7	7.3	15.7	8.9	5.6
1997	1.4	5.2	15.1	1.19	4.2
1998	0.27	4.8	14.6	0.5	4
1999	-3.21	2.11	14.02	0.22	3.8
2000	-8.17	1.8	13.7	-0.67	3.6
2001	-0.19	2.6	13.9	0.3	4
2002	-5.94	1.6	13.3	0.12	2.8
2003	-7.46	1.3	12.7	-0.1	1.8
2004	-3.64	2.01	13	0.21	2.1
2005	-4.06	1.85	8.8	0.14	1.2
2006	3.62	2	14	1.45	4.68
2007	-4.27	1.3	12	-0.55	4.1
2008	-4.74	1.25	10	-0.67	3.8
2009	7.27	2.67	11.6	1.34	5.6
2010	45.66	14.8	16	15.4	8.9
2011	14.62021	15.56	14.63471	0.29	8.08
2012	15.74488	5.65	12.14834	0.37	6.3
2013	3.196731	-1.09	9.181371	0.38	2.1
2014	1.484543	1.36	9.609292	0.33	6.2
2015	2.02365	-6.49	9.995567	0.2	5.9
2016	0.900955	-2.66	9.807839	0.19	4.5
2017	4.080264	-1.83	3.327242	-0.11	3.8
2018	5.009867	0.98	11.04831	-0.32	4.67
2019	-6.33245	1.34	10.69935	-0.41	3.23
2020	-7.81695	-3.37	10.04608	-0.53	2.95

2021	8.468017	1.04	12.40706	-0.63	2.79
2022	6.139263	1.02	11.29332	-0.15	2.1
2023	-1.1	3.8	13.8	0.25	4.8
2024	2.1	5	14	1.02	4.2

Appendix II: Summary Statistics

	ED	GDP	H	K	L
Mean	2.735484	2.605128	4.229032	12.29092	0.983548
Median	1.850000	1.400000	4.000000	12.70000	0.220000
Maximum	15.56000	45.66000	8.900000	16.00000	15.40000
Minimum	-6.490000	-8.170000	1.200000	3.327242	-0.670000
Std. Dev.	4.480366	10.07574	1.809798	2.688624	3.152331
Skewness	1.084732	2.592574	0.668869	-1.126489	3.740624
Kurtosis	5.151896	11.86016	3.179044	4.981887	16.45353
Jarque-Bera	12.06059	136.1265	2.352897	11.62989	306.0818
Probability	0.002405	0.000000	0.308372	0.002983	0.000000
Observations	31	31	31	31	31

Appendix III: Unit root test

GDP

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.497502	0.0151
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

Education

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.933750	0.0533
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

Health

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.636624	0.0108
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

Capital

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.214525	0.0290
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

Labor

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.075900	0.0003
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

Appendix III: OLS results

Dependent Variable: GDP

Method: Least Squares

Sample: 1994 2024

Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ED	0.731659	0.340556	2.148426	0.0412
H	1.659407	0.672113	2.468941	0.0204
K	-1.009114	0.459913	-2.194140	0.0374
L	1.759173	0.374418	4.698422	0.0001
C	4.258705	6.096131	0.698592	0.4910
R-squared	0.787306	Mean dependent var	2.605128	
Adjusted R-squared	0.754583	S.D. dependent var	10.07574	
S.E. of regression	4.991477	Akaike info criterion	6.200031	
Sum squared resid	647.7858	Schwarz criterion	6.431319	
Log likelihood	-91.10047	Hannan-Quinn criter.	6.275425	
F-statistic	24.06028	Durbin-Watson stat	1.915457	
Prob(F-statistic)	0.000000			

Appendix III: VIF

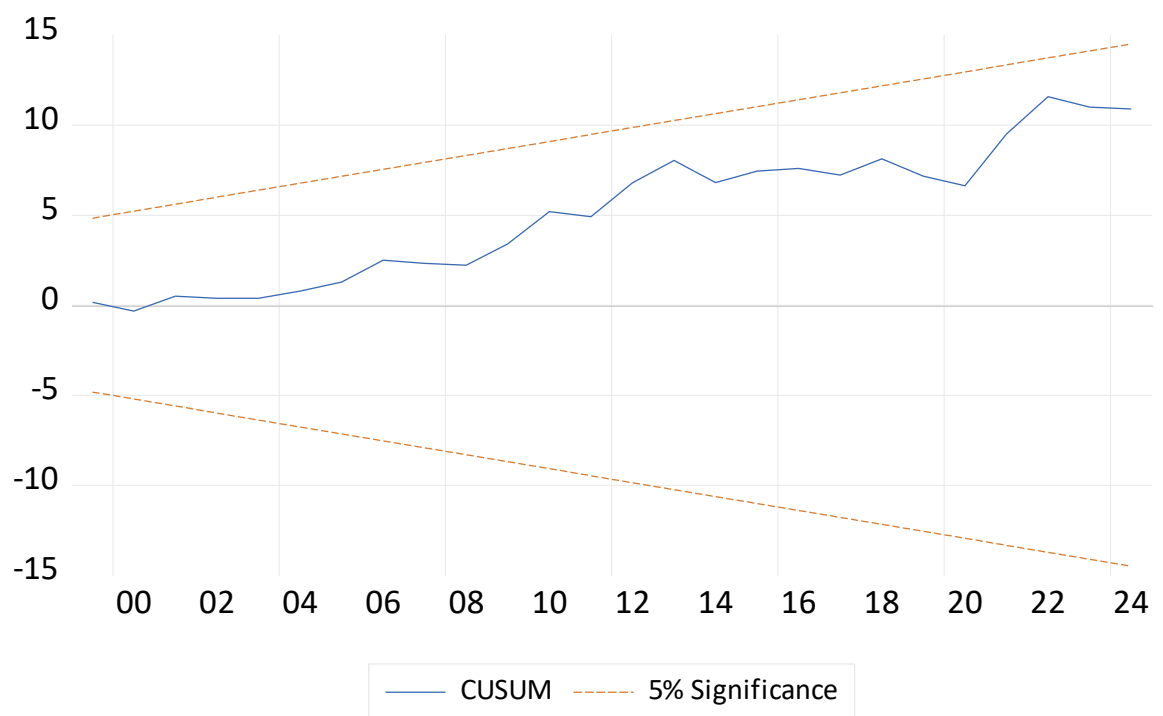
Variance Inflation Factors

Sample: 1994 2024

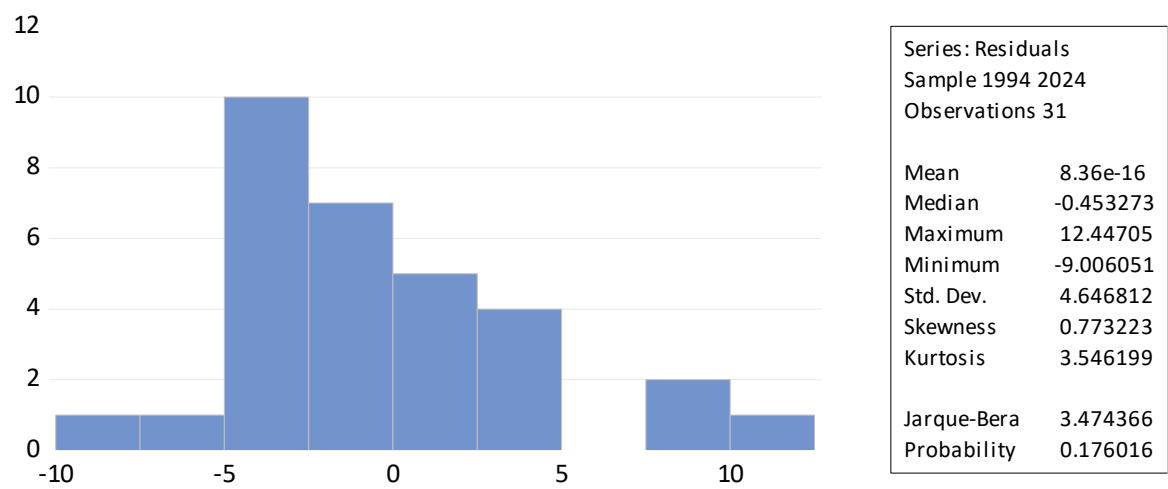
Included observations: 31

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
ED	0.115978	3.883097	2.803284
H	0.451736	11.83400	1.781591
K	0.211520	41.59905	1.841090
L	0.140189	1.846149	1.677413
C	37.16281	46.23940	NA

Appendix IV: CUSUM TEST



Appendix V: Normality



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