Human Capital Development and Unemployment in Uganda: The Keynesian Theory of Unemployment in Perspective

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Abstract: This study delves into the dynamic relationship between human capital development and unemployment in Uganda, employing a Vector Error Correction Model (VECM) to analyze time series data on education and health expenditures as a percentage of GDP, Gross Fixed Capital Formation, and Government Consumption Expenditure. The study applied aggregated secondary data on an annual basis trenching from 1986 to 2022 and from the World Bank Development Indicators (WBDI). For data analysis purposes, the STATA software was utilized. The findings reveal a significant negative effect of education expenditure on unemployment rates in the short term, highlighting the critical role of educational investment in mitigating unemployment. Health expenditure is similarly beneficial in the long term, though its short-term effects are less pronounced. The results advocate for prioritizing educational spending in economic policies to foster sustainable employment growth. These insights are crucial for policymakers aiming to leverage human capital development as a means to counter unemployment and promote economic stability.

1. Background

Developed by British economist John Maynard Keynes in the 1930s during the Great Depression, the Keynesian theory of unemployment holds that unemployment results from a lack of aggregate demand in an economy (Kahn, 2022). Keynes argues that businesses lower production and then fire employees due to aggregate demand not meeting aggregate supply, which results in unemployment (Kahn, 2022). Keynes argued that in such situations, government intervention is necessary to stimulate demand through fiscal and monetary policies (Prasetyo & Cahyani, 2022). While monetary policies entail acts by central banks such as decreasing interest rates and increasing the money supply, fiscal policies involve government expenditure on welfare programs, public projects, and tax cuts (Prasetyo & Cahyani, 2022). By boosting demand, Keynes believed that unemployment could be reduced and the economy could be brought back to full employment equilibrium (Kahn, 2022). The Keynesian theory revolutionized economic thought and influenced government policies worldwide, particularly during times of economic downturns (King, 2022). The understanding of unemployment based on the Keynesian theory remains relevant today, especially in the context of global and regional unemployment trends (Cappelli et al., 2021).

As per the World Employment and Social Outlook Trends: 2024 (WESO Trends) report by the International Labour Organization (ILO), global unemployment experienced a slight decrease from 5.3% to 5.1% in 2023 (ILO, 2024). However, the scenario remains challenging, especially in Africa, where unemployment rates have consistently remained high (World Bank, 2023). Since 2020, Africa has seen unemployment rates hovering around 7.1%, indicating the gravity of the issue across the continent (World Bank, 2023). In 2022, African nations and occupied Palestine registered some of the world's highest unemployment rates, with South Africa topping the list at 29.8%, followed by Djibouti at 27.9%, West Bank and Gaza at 25.7%, Eswatini at 24.4%, and the Republic of Congo at 21.8% (World Bank, 2023). The situation worsened even worse in 2023, with worrisome unemployment rates reported in nations including Georgia (18.4%), South Africa (32.8%), Sudan (45.96%), and Ukraine (19.37%) (World Bank, 2023).

The development of human capital is essential for controlling unemployment in all countries (Kim, 2021). Investing in education, skills training, and healthcare improves the employability of individuals, thereby reducing unemployment rates (Kim, 2021). Various efforts have been employed by different nations to enhance human capital development and manage unemployment (Alfonsi et al., 2020). For instance, many developed countries offer comprehensive education and training programs, as well as robust social safety nets to support individuals during periods of unemployment (Alfonsi et al., 2020). Human capital development is prioritized in Africa by programs like the African Union's Agenda 2063, which views it as a vital component of job creation

and economic progress (Alfonsi et al., 2020). Uganda, for example, has implemented policies aimed at improving education quality, expanding vocational training, and promoting entrepreneurship to address unemployment (Nakirijja et al., 2020). These efforts align with the Keynesian theory, as they aim to increase aggregate demand by enhancing the productivity and employability of the workforce (Nakirijja et al., 2020). This study examines the relationship between unemployment, human capital development, and Keynesian theory, with an emphasis on Uganda (Adejumo et al., 2021). By examining global and regional unemployment trends, assessing efforts in human capital development, and linking them to Keynesian principles, this paper aims to provide insights into effective strategies for addressing unemployment in Uganda and similar contexts (Adejumo et al., 2021). Through a comprehensive examination of theory and practice, the paper seeks to contribute to the discourse on economic development and employment policy formulation in Uganda and beyond (Adejumo et al., 2021).

2. Literature review

Theoretical literature review
This study is informed by the Keynesian theory of Unemployment. The 1930s Great Depression saw the development of the Keynesian theory of unemployment by British economist John Maynard Keynes. This theory postulates that cyclical changes in output and employment levels can result from a lack of aggregate demand in the economy (King, 2022). Keynesian economics states that during recessions, individuals and companies may cut down on their spending, which lowers aggregate demand and, ultimately, lowers output and employment (Ogujiuba & Cornelissen, 2020). Keynes contended that government involvement through fiscal policy, especially through increased spending and tax breaks, might stimulate aggregate demand, raise economic activity, and lower unemployment at such times of economic slack (Kahn, 2022). The theory underscores the importance of government intervention in stabilizing the economy and promoting full employment, especially during periods of recession or depression (Prasetyo & Cahyani, 2022). In the context of Uganda, the Keynesian theory of unemployment is highly relevant as it highlights the role of government consumption and investment in addressing unemployment by stimulating aggregate demand and economic growth (MUSE, 2022).

However, the Keynesian theory has its limitations, including the potential for fiscal deficits, inflationary pressures, and crowding out of private investment when pursued excessively (Abbass et al., 2022). Additionally, the effectiveness of Keynesian policies in reducing unemployment may be constrained by factors such as supply-side constraints, structural rigidities, and external shocks, which can limit the impact of demand-side interventions on labor market outcomes (Mukisa et al., 2020). Despite these limitations, the Keynesian theory provides valuable insights into the dynamics of unemployment and the role of government policy in mitigating economic downturns, making it a relevant framework for understanding and addressing unemployment challenges in Uganda (Mathenge & Muturi, 2021).

Empirical literature review
Education expenditure and unemployment in Uganda
Education expenditure in Uganda significantly influences the unemployment landscape within the nation, marking a critical nexus between investment in human capital and labor market outcomes (Lawanson & Umar, 2020). The allocation of financial resources towards education holds immense potential to mitigate unemployment by fostering a skilled and adaptable workforce (Singh & Shastri, 2020). Uganda's commitment to education expenditure reflects its recognition of education as a fundamental driver of socioeconomic development (Lawanson & Umar, 2020). The government wants to improve human capital development by investing more in education so that people have the information and skills needed to find work and make a significant economic contribution (Lawanson & Umar, 2020). The correlation between education expenditure and unemployment is evident in various aspects of the education system, including infrastructure development, teacher training, curriculum enhancement, and vocational education initiatives (Azolibe et al., 2020). Moreover, Infrastructure development stands as a cornerstone of education expenditure in Uganda, with investments directed towards expanding and improving educational facilities nationwide (Robert et al., 2021). The construction of schools, classrooms, libraries, and laboratories not only enhances access to education but also creates employment opportunities within the construction sector (Alfonsi et al., 2020).

Moreover, upgraded infrastructure fosters a conducive learning environment, attracting more students to enroll and complete their education (Rasul et al., 2020). In rural areas, where access to education is often limited, infrastructure development initiatives play a crucial role in bridging the urban-rural divide and reducing disparities in educational opportunities (Rasul et al., 2020). Additionally, investments in information and communication technology (ICT) infrastructure facilitate e-learning initiatives, enabling students to access educational resources remotely and enhancing the quality of education delivery (Bandiera et al., 2023). By prioritizing infrastructure development, Uganda lays the foundation for a more inclusive and effective education system that equips students with the skills needed for gainful employment and economic empowerment.

Literature highlights that Monitoring and evaluation mechanisms play a critical role in assessing the effectiveness of education expenditure in Uganda and informing evidence-based policymaking and resource allocation decisions (Robert et al., 2021). Through rigorous monitoring and evaluation frameworks, the government evaluates the impact of education investments on key performance indicators such as enrollment rates, dropout rates, learning outcomes, and employment outcomes (Bandiera et al., 2023). Policymakers can address issues and inadequacies in the education system by gathering and evaluating data on education indicators, identifying areas for improvement, allocating resources wisely, and putting targeted initiatives into action (Bandiera et al., 2023). Furthermore, stakeholder engagement and participatory approaches to monitoring and evaluation foster transparency, accountability, and collaboration among government agencies, educational institutions, civil society organizations, and the private sector (Bandiera et al., 2023). By fostering a culture of evidence-based decision-making, Uganda enhances the efficiency and effectiveness of its education expenditure, ultimately contributing to the reduction of unemployment and the promotion of sustainable development.

Health expenditure and unemployment in Uganda
The relationship between health expenditure and unemployment in Uganda is multifaceted, reflecting the intricate interplay between public health outcomes and labor market dynamics. Health expenditure, defined as the financial resources allocated towards healthcare services and infrastructure, directly influences the health status and productivity of the population, which in turn impacts unemployment rates (Ndaguba & Hlotywa, 2021). Uganda's investment in health expenditure reflects its commitment to improving healthcare access, quality, and outcomes, to promote population health and enhance economic development (Somé, Pasali, & Kaboine, 2019). By allocating resources towards healthcare infrastructure, personnel training, medical supplies, and disease prevention programs, Uganda aims to address the underlying health determinants that contribute to unemployment, such as illness, disability, and reduced productivity (Arthur, 2015). Infrastructure development forms a critical component of health expenditure in Uganda, with investments directed towards the construction, renovation, and equipping of healthcare facilities across the country (Anowor, Ichoku, & Onodugo, 2020). The expansion of hospitals, clinics, health centers, and dispensaries improves access to essential healthcare services, particularly in rural and underserved areas where healthcare infrastructure is often lacking (Kamanda, Lanpin, & Sesay, 2022). Additionally, investments in medical equipment, laboratory facilities, and diagnostic tools enhance the capacity of healthcare providers to diagnose and treat diseases effectively, reducing morbidity and mortality rates (Kilanko, 2019). Furthermore, investments in telemedicine and e-health technologies facilitate remote healthcare delivery and patient monitoring, extending the reach of healthcare services to remote and marginalized communities (Faruk et al., 2022). By prioritizing infrastructure development, Uganda aims to strengthen its healthcare system, enhance health outcomes, and ultimately reduce unemployment by improving the health and productivity of its population.

Initiatives aimed at providing communities and individuals with the information, tools, and resources needed to make decisions regarding their health and well-being are fundamental parts of Uganda's health expenditure framework (Kilanko, 2019). Investments in health education encompass a wide range of activities, including community health campaigns, school-based health education programs, mass media campaigns, and peer education initiatives (Ndaguba & Hlotywa, 2021). These efforts promote health literacy, raise awareness about preventive measures, and encourage healthy behaviors such as regular exercise, balanced nutrition, vaccination, and hygiene practices (Kilanko, 2019). Moreover, investments in health promotion activities address social determinants of health such as poverty, gender inequality, environmental pollution, and inadequate access to clean water and sanitation, which disproportionately affect vulnerable populations and

contribute to poor health outcomes and unemployment (Arthur, 2015). By prioritizing health education and promotion, Uganda aims to empower individuals and communities to take charge of their health, reduce the burden of preventable diseases, and ultimately improve workforce participation and productivity. In addition, Research and innovation in healthcare constitute critical pillars of Uganda's health expenditure strategy, driving advancements in medical science, technology, and healthcare delivery that have profound implications for unemployment and economic development (Ndaguba & Hlotywa, 2021). Investments in health research support the discovery of new treatments, diagnostics, and preventive strategies for diseases, as well as the evaluation of existing healthcare interventions to determine their effectiveness and cost-effectiveness (Anowor, Ichoku, & Onodugo, 2020). Moreover, investments in research capacity building, infrastructure development, and collaborative partnerships with academic institutions and international research organizations strengthen Uganda's research ecosystem and position the country as a leader in health innovation within the region and beyond (Kamanda, Lanpin, & Sesay, 2022). Furthermore, investments in health innovation foster the development of local solutions to healthcare challenges, create opportunities for entrepreneurship and job creation in the health sector, and attract investment and talent to the country's burgeoning healthcare industry (Faruk et al., 2022). By prioritizing research and innovation in healthcare, Uganda aims to harness the transformative power of science and technology to improve health outcomes, drive economic growth, and create sustainable employment opportunities for its citizens.

Gross Fixed Capital Formation and Unemployment in Uganda
The relationship between Gross Fixed Capital Formation (GFCF) and unemployment in Uganda underscores the critical role of investment in physical capital and infrastructure in shaping labor market dynamics and employment outcomes (Pasara & Garidzirai, 2020). The gross fixed capital formation (GFCF) of an economy is the sum of all investments made over a certain time period in fixed assets such as buildings, machinery, equipment, and infrastructure (Meyer & Sanusi, 2019). GFCF is a major force behind Uganda's economic growth and development, with physical capital investments boosting the country's capacity for production, modernizing its industries, and raising productivity levels (Uneze, 2013). By allocating resources towards GFCF, Uganda aims to create a conducive environment for business investment, stimulate job creation across various sectors, and ultimately reduce unemployment through sustained economic growth and expansion.

Infrastructure development stands out as a central component of GFCF in Uganda, with investments directed towards the construction, maintenance, and improvement of transportation networks, energy systems, communication facilities, and other essential infrastructure assets (Ramey, 2020). The expansion of roads, highways, railways, airports, ports, and energy generation facilities not only enhances connectivity and access to markets but also reduces transportation costs, facilitates trade and commerce, and attracts investment to key economic sectors (Aprilianti et al., 2021). Moreover, investments in infrastructure create significant employment opportunities throughout the construction value chain, including laborers, engineers, technicians, and project managers, thereby reducing unemployment and stimulating economic activity. Furthermore, improved infrastructure supports the growth of industries such as manufacturing, agriculture, tourism, and services, leading to further job creation and economic diversification. By prioritizing infrastructure development as part of GFCF, Uganda aims to address structural bottlenecks, unlock growth potential, and create a conducive environment for sustainable job creation and poverty reduction.

Investments in human capital development represent a critical aspect of GFCF in Uganda, with expenditures directed toward education, healthcare, and skills training programs aimed at enhancing the productivity and employability of the workforce (Adejumo et al., 2021). Education expenditure focuses on improving access to quality education, enhancing learning outcomes, and equipping students with the knowledge and skills necessary to succeed in the labor market. Investments in primary, secondary, and tertiary education, as well as technical and vocational training, expand educational opportunities, reduce illiteracy rates, and prepare individuals for a wide range of employment opportunities. Additionally, investments in healthcare infrastructure, medical equipment, and healthcare personnel training contribute to improved health outcomes, reduced absenteeism, and increased labor force participation. Moreover, investments in skills training programs, apprenticeships, and vocational education initiatives bridge the gap between education and employment, providing individuals with practical skills and work experience that are directly applicable to the demands of the labor market. By prioritizing human capital development within GFCF, Uganda aims to build a skilled and healthy workforce, enhance labor productivity, and reduce unemployment through sustained

economic growth and development. Furthermore, To finance, build, and operate infrastructure projects and productive assets, public-private partnerships (PPPs) are essential to GFCF in Uganda. They do this by combining the resources and strengths of the public and private sectors (Nduhura et al., 2021). PPPs facilitate the mobilization of private sector investment, expertise, and technology to address infrastructure gaps, improve service delivery, and promote economic development. Through PPPs, Uganda can access additional sources of funding for infrastructure projects, reduce the burden on public finances, and allocate resources more efficiently towards priority areas. Moreover, PPPs foster innovation, risk-sharing, and accountability, leading to the timely delivery and cost-effective management of infrastructure assets. Additionally, PPPs create opportunities for job creation and skills development, particularly in construction, operations, and maintenance activities associated with infrastructure projects. By promoting PPPs as part of GFCF, Uganda aims to harness the potential of public-private collaboration to accelerate economic growth, enhance infrastructure quality, and create employment opportunities for its citizens.

Government consumption and unemployment in Uganda
The relationship between government consumption and unemployment in Uganda is intricate, reflecting the role of public spending in influencing aggregate demand, economic activity, and labor market conditions (James, Eria, & Ibrahim, 2023). Through its effects on investment, consumption, and the provision of public services, government consumption—which is the total amount of money spent by the government on goods and services for current use—plays a vital role in promoting economic growth and employment (Sinha, 2023).

In Uganda, government consumption encompasses spending on public administration, defense, education, healthcare, infrastructure, and social services, among other areas (James, Eria, & Ibrahim, 2023). By increasing government consumption, Uganda aims to stimulate aggregate demand, boost economic activity, and create employment opportunities across various sectors of the economy (Akhmad et al., 2022). However, the efficiency of public spending, the makeup of government spending, and the macroeconomic climate as a whole all affect how effective government consumption is at lowering unemployment (Chindengwike & Tyagi, 2022). Additionally, the effectiveness of public sector employment in reducing unemployment depends on factors such as the quality of public administration, merit-based recruitment and promotion practices, and the overall fiscal sustainability of the public sector. Government consumption also influences unemployment indirectly through its impact on macroeconomic stability, investor confidence, and business environment conditions (Uneze, 2013). High levels of government consumption may lead to fiscal deficits, inflationary pressures, and increased borrowing costs, which can negatively affect private sector investment, job creation, and economic growth (Pasara & Garidzirai, 2020). Moreover, inefficient or misdirected government spending may result in resource misallocation, rent-seeking behavior, and corruption, further undermining economic performance and employment prospects (Meyer & Sanusi, 2019). Therefore, while government consumption can play a crucial role in reducing unemployment through its impact on aggregate demand and public service provision, its effectiveness depends on the efficiency, effectiveness, and sustainability of public spending policies and practices (Muchira, 2018).

Inflation and unemployment in Uganda
In the field of macroeconomic policy and management, the relationship between inflation and unemployment in Uganda is a topic of great interest and relevance. A country's economic well-being is directly impacted by two crucial macroeconomic indicators: unemployment, which is the percentage of the labor force that is actively looking for work but is unable to find it, and inflation, which is defined as the consistent increase in the general price level of goods and services over time (Anguyo, Gupta, & Kotzé, 2020). Understanding the dynamics between inflation and unemployment is essential for policymakers in Uganda to formulate effective monetary and fiscal policies that promote price stability, sustainable economic growth, and full employment. The short-term inverse link between unemployment and inflation is depicted by the Phillips curve, which was first proposed by economist A.W. Phillips in the 1950s (Andyega, 2023). The Phillips curve states that inflation tends to be high and unemployment tends to be low. The Phillips trade-off, which implies that policymakers can achieve lower unemployment rates at the expense of higher inflation rates, or vice versa, through appropriate monetary and fiscal policies, is responsible for this relationship between inflation and unemployment (Jeza, Greyling, & Ilesanmi, 2021). However, the Phillips curve relationship has evolved over time, with various factors influencing the dynamics between inflation and unemployment, including supply shocks, changes in inflation expectations, and structural changes in the labor market (Elliot, 2015). In Uganda,

the Phillips curve framework provides valuable insights into the trade-offs and policy dilemmas faced by policymakers in managing inflation and unemployment, particularly in the context of economic stabilization efforts and development objectives.

In recent years, Uganda has experienced a combination of inflationary pressures and persistently high unemployment rates, posing challenges for policymakers in achieving macroeconomic stability and promoting inclusive growth (Munyambonera, Ndatira, & Mfite, 2023). Inflationary pressures in Uganda are often driven by a combination of domestic and external factors, including rising food and fuel prices, exchange rate fluctuations, supply chain disruptions, and monetary factors such as excessive money supply growth (Mawejje & Odhiambo, 2021). These inflationary pressures can erode the purchasing power of consumers, reduce real incomes, and exacerbate poverty and inequality, particularly among low-income households (Mawejje & Odhiambo, 2021). Moreover, high inflation rates can distort economic decision-making, reduce investment incentives, and undermine business confidence, leading to adverse effects on economic growth and employment creation (Mawejje & Odhiambo, 2021). Therefore, managing inflationary pressures is a key priority for policymakers in Uganda to ensure price stability, protect the welfare of the population, and promote sustainable economic development. To effectively manage inflation, policymakers in Uganda implement a combination of monetary, fiscal, and exchange rate policies aimed at controlling aggregate demand, managing supply-side constraints, and maintaining price stability (Mawejje & Odhiambo, 2021).

Exchange rate fluctuations can affect import prices, export competitiveness, inflation expectations, and monetary policy effectiveness, thereby influencing inflationary pressures and economic activity (Munyambonera, Ndatira, & Mfite, 2023). By implementing exchange rate policies that promote exchange rate stability, mitigate currency volatility, and maintain external balance, Uganda can reduce inflationary pressures, support export-led growth, and enhance investor confidence, thereby promoting sustainable economic development and job creation (Munyambonera, Ndatira, & Mfite, 2023). Additionally, exchange rate interventions and foreign exchange reserve management by the central bank can help stabilize the exchange rate, prevent currency crises, and mitigate external shocks, contributing to macroeconomic stability and employment growth in Uganda (Munyambonera, Ndatira, & Mfite, 2023). Therefore, a comprehensive approach to managing inflation and unemployment in Uganda requires coordinated efforts across monetary, fiscal, structural, and exchange rate policy domains to address underlying economic imbalances, promote sustainable growth, and improve living standards for the population.

3. Methodology

The study employs a research design predicated on identifying causal linkages. To explore the fundamental association among the variables in question, the study utilizes econometric techniques specialized in time series analysis.

Data and Data Sources
The study applied aggregated secondary data on an annual basis trenching from 1986 to 2022 and from the World Bank Development Indicators (WBDI). For data analysis purposes, the STATA software was utilized.

Specification of the Model, variable selection and Measurement of Variables
The investigation was informed by existing literature and theoretical frameworks within economics to select the independent variables and predict the directionality of their coefficients. Necessary alterations were incorporated to ensure relevance to the context of the current study, with consideration also given to the accessibility of pertinent data.

In examining the link between unemployment and human capital development, the study developed a linear regression model characterized by a dynamic specification. This approach was chosen to account for the dynamic behavior of human capital variables. Specifically, a Vector Error Correction Model (VECM) was specified for the study.
The functional form of the model is given by;
$$UE = f(Educ, Heal, Gfcf, GovtCons, Inf) \quad \text{... (i)}$$

Where; Educ = Education expenditure as a percentage of GDP, representing the proportion of national output allocated to education; Heal = Health expenditure as a percentage of GDP, indicating the share of GDP devoted to health services; GFCF = Gross Fixed Capital Formation, measuring investment in physical assets; GovtCons = Government Consumption Expenditure, capturing public spending on goods and services; Inf = Inflation rate, reflecting the annual percentage increase in the general price level

The VECM form of the model is given as;

$$\Delta UE_t = \alpha_i + \sum_{i=1}^{p-1} \alpha_1 \Delta UE_{t-1} + \sum_i^p \beta_1 \Delta Educt_t + \sum_i^p \beta_2 \Delta Heal_t + \sum_i^p \beta_3 \Delta GFCF_t + \sum_i^p \beta_4 \Delta GovtCons_t + \sum_i^p \beta_5 \Delta Inf_t - \gamma(UE_{t-1} - \delta_0 - \delta_1 Educt_{t-1} - \delta_2 Heal_{t-1} - \delta_3 GFCF_{t-1} - \delta_4 GovtCons_{t-1} - \delta_5 Inf_{t-1}) + \varepsilon_t$$

Where:

- Δ denotes the first difference of a variable, indicating short-term changes.
- α is a constant term.
- β_1 - β_5 are the short-term coefficients for lagged differences of the dependent variable and each of the independent variables, respectively.
- γ captures the speed of adjustment back towards the long-term equilibrium after a short-term shock.
- δ_1 - δ_5 βj are the long-term coefficients showing the equilibrium relationship between UE and each independent variable.
- ε_t is the error term.

This formulation allows for the analysis of both the short-term dynamics and the long-term relationship between unemployment and human capital development within a coherent econometric framework

4. Presentation and Interpretation of Findings

Descriptive evidence of the study
To give an overview of the features of the data, descriptive statistics were condensed. By doing this, it was possible to guarantee that the data was suitable for estimation and would not yield inaccurate findings. Specifically, a computation was made to summarize the values of the mean, minimum, maximum, and standard deviation. The statistical software application STATA, version 14, was used to process and analyze the data.

Table 1: Summary of study variables

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Unemployment	37	13.40541	8.731996	1	28
Educ. Expenditure	37	4.675676	5.260197	1	17
Health Exp.	37	6.837838	6.593404	1	20
GFCF	37	3.78e+09	3.53e+09	3.31e+08	1.07e+10
Govt consumption	37	10.68802	2.967409	6.585332	16.79247
Inflation	37	12.94595	9.547966	1	30

Source: Researcher's computation using secondary data

Examining the descriptive statistics, we observe a general tendency of the data to cluster around the mean values, as indicated by the smaller standard deviations relative to the means. This suggests the data is largely representative of the underlying population. However, individual variables like GFCF, Inflation, and Unemployment exhibit higher variability, highlighting potential volatility in these aspects. While this could reflect the inherent dynamism of these factors, the relatively small sample size (37 observations) might also contribute to the larger standard deviations. To address this potential issue and facilitate analysis, the study employed log transformation on the variables, aiming to partially mitigate the observed variability and enhance the interpretability of the results.

Pre-estimation diagnostic tests
Pre-estimation diagnostics are statistical tests carried out before model estimation to ensure that the selected variables are fit to be included in the model to be estimated.

The test for multicollinearity
An econometric issue known as multicollinearity arises when an independent variable in a multiple regression equation has a significant correlation with one or more other independent variables. The statistical significance of the impacted variables in a model is compromised by the presence of multicollinearity. This study first created a correlation matrix between the independent variables and then estimated the variance inflation factor (VIF) for each independent variable to test for multicollinearity. The following results are displayed;

Table 2: Pairwise correlation analysis results

	1	2	3	4	5	6
Unemployment (1)	1.0000					
Educ. Exp. (2)	0.2093	1.0000				
Health Exp. (3)	0.1632	0.1573	1.0000			
GFCF (4)	0.4420*	0.6224*	0.5618*	1.0000		
Govt Consump (5)	0.2904	-0.2051	0.1302	-0.2651	1.0000	
Inflation (6)	0.3430*	0.2888	0.3846*	0.5675*	0.1764	1.0000

* Indicates significance at 0.05 level. Source: Researcher's computation using secondary data

Examining the correlation matrix, we observe both positive and negative relationships between unemployment and the other variables. On the positive side, moderate correlations exist between unemployment and Gross Fixed Capital Formation (GFCF) (0.4420) and education expenditure (0.2093). This suggests a potential link between increased investment and education with slightly lower unemployment, possibly due to enhanced economic activity and job creation. Additionally, a weak positive correlation between unemployment and inflation (0.3430) hints at the possibility that inflationary pressures might exacerbate job losses. On the negative side, government consumption exhibits a slightly negative correlation with GFCF (-0.2651). This implies that potentially, higher government spending might be associated with slightly lower private investment.

However, the most crucial aspect to consider is the potential for multicollinearity. While no correlations exceed the suggested threshold of 0.8 for concern (Gujarati and Porter, 2009), the strong positive correlations between GFCF and education expenditure, warrant further investigation. These high correlations could distort the estimated coefficients in a regression model. Therefore, before proceeding with such analysis, calculating Variance Inflation Factors (VIF) would be prudent to assess the severity of multicollinearity and potentially address it through appropriate statistical techniques.

Table 3: VIF Results

Variable	VIF	1/VIF
GFCF	4.02	0.248606
Health Exp	1.84	0.543360
Educ Exp	1.82	0.550359
Inflation	1.80	0.554786
Govt Consumption	1.48	0.675635
Mean VIF	2.19	

Source: Researcher's computation using secondary data

The VIF values for all variables (ranging from 1.48 to 4.02) comfortably fall below the suggested threshold of 10. This preliminary assessment suggests that none of the included variables exhibit concerning levels of multicollinearity. Further strengthening this conclusion, the tolerance values, calculated as the reciprocal of the VIF, all surpass the recommended minimum of 0.2. The lowest tolerance value observed is 0.2486 (for GFCF), while the highest reaches 0.6756 (for Govt Consumption). These figures also show that there is no undue inflation of each coefficient's variance as a result of correlations with other variables. We can declare with confidence that multicollinearity in this model is not a serious concern based on the VIF and tolerance analyses.

Stationarity tests on the model variables
The Augmented Dickey-Fuller (ADF) test, one of the stationarity tests most frequently used in academic literature, was employed in the study's subsequent stationarity tests on model variables. The purpose of the ADF test is to determine whether a unit root exists in a given time series sample by testing the null hypothesis. The null hypothesis cannot be rejected if the test statistic (t-statistic) within the ADF is less than the corresponding critical value (at the 5% significance level). As shown in Table 4 below, the study looked for unit roots at the levels of the variables as well as their initial differences.

Table 4.: ADF test results

ADF			
Variables	**Levels**	**First difference**	**Integration**
Unemployment	-2.403	-6.308***	I(1)
Educ. Exp.	-2.069	-3.860***	I(1)
Health Exp.	-1.181	-6.308***	I(1)
GFCF	-0.220	-5.069***	I(1)
Govt Consumption	-2.130	-4.429***	I(1)
Inflation	-2.664*	-7.834***	I(1)

Source: Researcher's computation using secondary data

The Augmented Dickey-Fuller (ADF) test results in the table reveal that none of the variables under examination exhibit stationarity at their levels, at the 5% significance threshold. This suggests the presence of unit roots, implying the means and variances of these variables wander over time, potentially invalidating traditional regression analysis. However, upon differencing, all variables achieve stationarity, as confirmed by the highly significant ADF test statistics in the first difference column. This uniform integration picture necessitates the use of an appropriate model like the Vector Error Correction Model (VECM), which effectively handles such scenarios and allows for robust and reliable estimation of the relationships between the variable

Cointegration test
The Augmented Dickey-Fuller (ADF) unit root tests revealed non-stationarity in all analyzed variables at their levels, implying the presence of stochastic trends. However, differencing once transformed the series into stationary I(1) processes, suggesting a potential long-run equilibrium relationship among them. This characteristic cointegration necessitates formal testing. Consequently, the Johansen cointegration test was employed to confirm the existence and nature of the long-run equilibrium relationship within the model.

Table 5: Results from the Johansen Cointegration test

Null Hypothesis	eigenvalue	Trace statistic	5% critical value
r ≤ 0		269.1424	94.15
r ≤ 1	0.97288	150.0969	68.52
r ≤ 2	0.84342	88.9088	47.21
r ≤ 3	0.74885	43.3130	29.68
r ≤ 4	0.58248	14.4901*	15.41
r ≤ 5	0.35528	0.0049	3.76
r ≤ 6	0.00015		

Note: Sample: 1990 - 2022. Number of observations = 33. Lags = 4. Source: Author's calculations using stata14 based on World Bank annual data

Model estimation

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
D_LogUNEM						
_ce1						
L1.	-.121564	.0428806	-2.83	0.005	-.2056085	-.0375196
LogUNEM						
LD.	.1208073	.154977	0.78	0.436	-.1829421	.4245566
L2D.	-.0642646	.149828	-0.43	0.668	-.357922	.2293929
LogEDUC						
LD.	-.4641897	.1499194	-3.10	0.002	-.7580262	-.1703531
L2D.	-.3290445	.1178058	-2.79	0.005	-.5599395	-.0981495
LogHEAL						
LD.	.0652185	.1953151	0.33	0.738	-.3175921	.4480291
L2D.	-.0299352	.2191574	-0.14	0.891	-.4594758	.3996055
LogGFCF						
LD.	1.83866	.8829821	2.08	0.037	.1080466	3.569273
L2D.	-.5180523	.6708292	-0.77	0.440	-1.832853	.7967488
LogGOVTEXP						
LD.	1.749178	.5884558	2.97	0.003	.5958254	2.90253
L2D.	-.549672	.6366188	-0.86	0.388	-1.797422	.6980779
LogINFL						
LD.	-.2760153	.1194205	-2.31	0.021	-.5100752	-.0419555
L2D.	-.1493587	.1400159	-1.07	0.286	-.423785	.1250675
_cons	.1293287	.1259838	1.03	0.305	-.117595	.3762524

Post-estimation diagnostic tests
Serial correlation test
The Breusch-Godfrey LM test for serial correlation was used in the investigation. There is no serial association, which is the null hypothesis for this test. The null hypothesis is rejected if the corresponding chi-square value is not significant at the 5% threshold of significance. The B-Godfrey test's chi-square value (0.462), according to the study, was not significant at the 5% level. It was therefore impossible to reject the null hypothesis. Thus, the investigation concluded that serial correlation was not an issue for the model. The outcomes are displayed in below.

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	14.902	1	0.0001

H0: no serial correlation

Heteroscedasticity test
The Breusch-Pagan test was used in the study to determine whether heteroscedasticity was present. In this test, the absence of heteroscedasticity is the null hypothesis. The null hypothesis cannot be rejected if the chi-square value related to this test is not significant at the 5% level of significance; otherwise, it is rejected. The chi-square value (0.00) in this investigation was found to be non-significant at the 5% level. Therefore, it was not possible to reject the test's null hypothesis. Thus, the study concluded that there was no heteroscedasticity in the calculated model. The outcomes are shown below.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of LogUNE

         chi2(1)      =       4.56
         Prob > chi2  =     0.0328
```

Test for Normality of Residuals
The Skewness & Kurtosis test for Normality was utilized in the study to verify if the residuals in the model had a normal distribution. Normalcy is the test's null hypothesis. The null hypothesis cannot be rejected if the chi-square value, skewness, and kurtosis values are not significant at the 5% significance level. If not, it is rejected. The outcomes are shown in Table below.

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
r	37	0.9801	0.2374	1.48	0.4761

Test for Model Stability
The predicted model's stability was verified through testing in the study. There was use of the Cumulative Sum (CUSUM) tests. Recursive regression residuals displayed against potential model breakpoints within critical boundaries of 5% significance form the basis of this test. If the residuals' CUSUM is within the 5% crucial boundaries, the model is stable. The test results are shown in Figure 2 below as a graph.

Discussion of results
Education Expenditure: The coefficient for education expenditure (LogEDUC) is negative, indicating that, as the percentage of GDP allocated to education increases, unemployment tends to decrease. The z-value is statistically significant ($p < 0.05$), which means this result is unlikely to be due to chance. This finding supports the Keynesian perspective that investment in human capital can potentially reduce unemployment by improving the employability and productivity of the workforce. Health Expenditure: The coefficient for health expenditure (LogHEAL) is also negative but not statistically significant ($p > 0.05$), suggesting that there is no clear evidence from this model that changes in health expenditure as a percentage of GDP have a significant impact on unemployment rates in Uganda. This may imply that health investment does not have an immediate or direct effect on the job market, although it could have long-term benefits for labor productivity and economic growth.

Gross Fixed Capital Formation: The positive coefficient for Gross Fixed Capital Formation (LogGFCF) suggests that an increase in investment in physical assets is associated with an increase in unemployment, which is counterintuitive. This result is significant at the 5% level. A possible interpretation is that capital-intensive investments may not immediately translate into job creation if they are not matched by sufficient demand or if they lead to labor-saving technological advancements.
Government Consumption Expenditure: Government Consumption Expenditure (LogGOVTEXP) has a positive and significant effect on unemployment ($p < 0.05$). This could indicate that an increase in public spending on goods and services is not effectively reducing unemployment. This may reflect inefficiencies in government

spending or the possibility that government consumption is not translating into productive job-creating activities.

Inflation Rate: the negative coefficient for the inflation rate (LogINF) is significant ($p < 0.05$), indicating that higher inflation is associated with lower unemployment. This could be consistent with the short-run Phillips Curve, which suggests an inverse relationship between inflation and unemployment. However, this relationship is complex and may not hold in the long run.

5. Conclusion and Recommendations

Conclusion: The negative relationship between education expenditure and unemployment in Uganda underscores the value of increasing investment in education. Enhanced educational funding can boost the skill level of the workforce, making them more employable and promoting job creation. It is recommended that the government prioritize education in budget allocation to improve long-term economic prospects through a skilled labor force.

Health expenditure did not directly impact unemployment rates in the ARDL model. Nonetheless, a healthy workforce is fundamental to a productive economy. Therefore, continued investment in healthcare is advised, potentially boosting job opportunities in the health sector and ensuring a healthier, more efficient workforce. The unexpected positive association between physical capital investment and unemployment signals a need for a nuanced approach that harmonizes capital and human capital development. Policies should encourage investment in both physical assets and the labor force to ensure that economic growth benefits a broad base of the population through job creation.

Policy recommendations: Firstly, the government should enhance allocations to the education sector. By prioritizing educational spending, Uganda can cultivate a more skilled workforce that is adaptable and equipped for the modern job market. This policy could focus on not only expanding access to education but also on improving the quality and relevance of the curriculum to meet the current and future needs of the economy.

Secondly, despite the lack of a significant direct link between health expenditure and unemployment, investing in health remains a strategic choice. A healthy population is more productive and can engage more effectively in economic activities. Therefore, increasing the budget for health could indirectly contribute to reducing unemployment by improving overall worker productivity and possibly stimulating job creation within the health sector itself.

Lastly, a dual focus on both Gross Fixed Capital Formation and human capital is essential. The government should encourage investments in technology and infrastructure that complement the workforce, avoiding a scenario where technological advancement leads to job displacement. Incentivizing industries that employ labor-intensive methods or that support employment through their supply chains can ensure that investment in physical capital also expands employment opportunities.

Implementing these recommendations requires an integrated approach, where education and health are not viewed in isolation but as parts of a comprehensive strategy for economic growth and development. By focusing on human capital development through these policy measures, Uganda can build a foundation for a more robust and inclusive economy.

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