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Does Investment in Human Capital Offset Oil Dependence? Unveiling the Drivers of Unemployment in Uganda

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Abstract: This study explored the impact of human capital development on unemployment in Uganda. Employing a Vector Auto Regression (VAR) model informed by the Neoclassical growth theory, the research analyzed the relationship between education expenditure (a human capital component) and unemployment, while controlling for physical capital (represented by GDP) and inflation. Utilizing annual data from 1986 to 2022, the findings revealed a complex dynamic. In the short run, higher real effective exchange rates (stronger local currency) and GDP growth might lead to a temporary rise in unemployment. However, the long-term picture suggests a positive influence of real exchange rates and GDP on unemployment, implying they contribute to lower unemployment over time. Interestingly, the study found no direct impact of international oil prices on Uganda's unemployment. The research concludes by highlighting the need for effective population management strategies, such as family planning and education, to ensure sustainable population growth that aligns with economic expansion.

Keywords: *Unemployment, Human capital, Vector Auto Regression (VAR)*

1. Background

The Neoclassical theory of unemployment, developed by economists such as Milton Friedman and Edmund Phelps in the mid-20th century, posits that unemployment arises due to imbalances in the labor market, primarily caused by wage rigidities and mismatches between the skills possessed by workers and the skills demanded by employers (Tanaka, 2020). According to this theory, unemployment occurs when wages are artificially kept above the equilibrium level by factors such as minimum wage laws, labor unions, or government regulations (Bougrine, 2020). In such cases, employers are unwilling to hire workers at the prevailing wage rates, leading to involuntary unemployment (Michaelides & Papadakis, 2023). Additionally, the Neoclassical theory highlights the role of human capital in determining unemployment levels, emphasizing the importance of education, training, and skill development in reducing unemployment rates (Đukić, 2021).

The link between the Neoclassical theory of unemployment and the study on human capital and unemployment in Uganda is significant (Liotti, 2022). Uganda, like many African countries, faces persistent challenges of high unemployment rates despite efforts to promote economic growth and development (Gruzina, Firsova, & Strielkowski, 2021). The Neoclassical theory provides insights into the root causes of unemployment, highlighting the importance of investing in human capital development to address skill mismatches and enhance labor market efficiency (England & Folbre, 2023). By focusing on education, vocational training, and skill-building programs, Uganda can improve the employability of its workforce and reduce unemployment rates (Olowookere et al., 2022). Moreover, the global context of unemployment trends underscores the urgency of addressing this issue, particularly in regions like Africa where unemployment rates are disproportionately high (Perrotta, 2021). Therefore, the purpose of this paper is to explore how the principles of the Neoclassical theory of unemployment can inform policies and interventions aimed at managing unemployment in Uganda and beyond, ultimately contributing to sustainable economic development and poverty reduction efforts on the continent (Farmer & Schelnast, 2021).

2. Literature review and hypothesis development

Theoretical literature review

The neoclassical theory of unemployment assumes that the labor market is in equilibrium when the supply and demand of labor are equal and that any deviation from this equilibrium is due to voluntary or frictional factors. According to this theory, human capital, which comprises the skills and health of workers, is a key determinant of labor productivity and employability. Higher levels of human capital are expected to reduce unemployment by increasing the compatibility between workers and employers. Physical capital, as determined by the Gross

Fixed Capital Formation, is another element that influences labor demand (GFCF). Higher GFCF indicates more investment in productive assets, which implies economic growth and job creation. Therefore, the neoclassical theory predicts a negative relationship between human capital, GFCF, and unemployment. However, the theory is less clear about the effects of population growth and inflation on unemployment. Population growth can have both positive and negative effects, depending on whether it stimulates aggregate demand or creates excess labor supply. Inflation, in the long run, is assumed to be neutral with respect to real variables like unemployment, but in the short run, it may affect unemployment through wage rigidity and real wage adjustment. The proposed model aims to test these theoretical hypotheses empirically, using data from Uganda. The model includes human capital variables (education expenditure, health expenditure, population growth) and control variables (GFCF and inflation) as explanatory variables, and unemployment as the dependent variable. These variables are chosen based on the neoclassical theory and the specific context of Uganda, where unemployment is a major socio-economic challenge. According to the latest data from the World Bank1, Uganda's unemployment rate was 5.8% in 2022, which was higher than the average of 4.6% for Sub-Saharan Africa. Moreover, Uganda's unemployment rate has been fluctuating over the years, reaching a peak of 9.4% in 20121. The causes and consequences of unemployment in Uganda are complex and multifaceted and require a comprehensive and rigorous analysis. The model seeks to provide such an analysis by examining the effects of human capital and other factors on unemployment, using appropriate econometric methods and techniques.

Empirical Literature Review

Relationship between Expenditure on education and unemployment

The relationship between expenditure on education and unemployment is multifaceted, with numerous factors influencing the labor market dynamics and employment outcomes. First off, education spending is generally recognized as a key factor in the development of human capital since it gives people the abilities, skills, and information required to contribute to society as productive members of the workforce (Singh & Shastri, 2020). As such, higher levels of education expenditure often correlate with a better-educated workforce, which in turn can lead to reduced unemployment rates (Bhattacharyya, 2019). Education not only enhances individuals' employability by providing them with relevant qualifications and training but also fosters innovation, creativity, and adaptability, enabling workers to meet the evolving demands of the labor market (Bashir & Amir, 2019). Consequently, countries that prioritize education expenditure tend to experience lower unemployment rates due to the higher quality and suitability of their workforce for available job opportunities.

Furthermore, expenditure on education plays a crucial role in addressing structural and frictional unemployment by reducing mismatches between labor supply and demand (Ayeni & Omobude, 2018). Structural unemployment arises when there is a disparity between the skills possessed by job seekers and those required by employers, leading to prolonged periods of job search and unemployment. By investing in education and vocational training programs that align with the needs of industries and sectors experiencing labor shortages, policymakers can mitigate skill mismatches and facilitate smoother transitions from education to employment (Binuomoyo, 2020). Moreover, education expenditure can enhance labor market flexibility by empowering individuals to adapt to changing economic conditions, technological advancements, and job market disruptions (Mallick & Dash, 2015). By equipping workers with transferable skills, critical thinking abilities, and lifelong learning capabilities, education expenditure can facilitate smoother labor market transitions and reduce the incidence of frictional unemployment caused by temporary job separations and search frictions.

Additionally, expenditure on education can have a positive impact on unemployment reduction through its broader socioeconomic effects on poverty alleviation, income inequality, and social mobility (Mallick et al., 2016). Education is not only an essential tool for individual empowerment and upward mobility but also a driver of economic growth, productivity, and competitiveness at the national level (Rathnasiri, 2020). By investing in education, governments can break the cycle of intergenerational poverty, improve access to economic opportunities, and create a more inclusive society where everyone has a fair chance to succeed (Chandra, 2010). Higher levels of educational attainment are associated with higher employment rates, lower unemployment rates, and higher earnings potential, thereby contributing to greater economic stability and prosperity (Agboola et al., 2018). Moreover, education expenditure can enhance social cohesion, civic

engagement, and political participation, fostering a conducive environment for sustainable development and job creation.

On the contrary, inadequate expenditure on education can exacerbate unemployment and perpetuate socioeconomic inequalities (Rathnasiri, 2020). Insufficient investment in education may result in a lack of access to quality educational opportunities, particularly for marginalized and disadvantaged populations, leading to lower levels of educational attainment and skill development (Mallick et al., 2016). This, in turn, can limit individuals' ability to compete in the labor market and secure gainful employment, perpetuating cycles of poverty and exclusion. Moreover, underfunded education systems may struggle to meet the evolving needs of the labor market, resulting in outdated curricula, inadequate facilities, and shortages of qualified teachers, further widening the gap between education and employment. Furthermore, the quality and effectiveness of education expenditure are crucial determinants of its impact on unemployment outcomes (Singh & Shastri, 2020). Simply increasing expenditure on education does not guarantee improved labor market outcomes if resources are misallocated or if educational programs fail to meet the needs of the economy and society. Effective education expenditure requires a holistic approach that encompasses not only increased funding but also reforms in curriculum development, teacher training, vocational education, and lifelong learning initiatives. Investing in education quality assurance mechanisms, monitoring, and evaluation systems can help ensure that resources are allocated efficiently and that educational outcomes align with labor market demands (Binuomoyo, 2020). Additionally, promoting equity and inclusivity in education expenditure by targeting resources toward disadvantaged groups, rural areas, and underserved communities can help address disparities in access to education and reduce unemployment among vulnerable populations.

Moreover, the link between education expenditure and unemployment is influenced by broader macroeconomic factors, such as economic growth, technological advancements, and labor market policies (Ali et al., 2022). While education expenditure is essential for building a skilled and adaptable workforce, it must be complemented by conducive macroeconomic conditions and supportive policy environments to translate into meaningful employment opportunities. For instance, countries experiencing stagnant economic growth, structural transformation, or technological disruptions may struggle to absorb an educated workforce, leading to higher unemployment rates despite increased education expenditure. Similarly, labor market policies, such as minimum wage laws, labor market regulations, and employment protection measures, can affect the demand for labor and the bargaining power of workers, influencing unemployment dynamics alongside education expenditure. Therefore, addressing unemployment requires a comprehensive approach that integrates education expenditure with macroeconomic policies, labor market interventions, and social protection measures to create an enabling environment for sustainable job creation and inclusive growth.

Relationship between Expenditure on health and unemployment

The relationship between expenditure on health and unemployment is intricate and multifaceted, encompassing various economic, social, and public health factors that influence labor market dynamics and employment outcomes (Maruthappu et al., 2015; Maruthappu et al., 2016; Qehaja et al., 2023). Firstly, investment in healthcare systems and services plays a crucial role in maintaining a healthy and productive workforce, thereby contributing to lower unemployment rates (Papanicolas et al., 2018). Access to quality healthcare services, including preventive care, treatment, and rehabilitation, can enhance individuals' overall health and well-being, reducing absenteeism, disability, and the prevalence of chronic diseases that may hinder their ability to work (Raghupathi & Raghupathi, 2020). By promoting a healthier workforce, expenditure on health can increase labor force participation, productivity, and job retention rates, ultimately leading to lower unemployment levels and greater economic prosperity.

Furthermore, expenditure on health can mitigate the adverse effects of illness, injury, and disability on employment outcomes, thereby reducing the incidence of involuntary unemployment (Maruthappu et al., 2016). Illnesses and disabilities can disrupt individuals' ability to work, limit their job opportunities, and lead to prolonged periods of unemployment, particularly among vulnerable populations with limited access to healthcare services (Piabuo & Tieguhong, 2017). Investing in healthcare infrastructure, medical treatments, and rehabilitation programs can help individuals recover from health setbacks more quickly, regain their ability to work, and reintegrate into the labor market. Moreover, expenditure on preventative healthcare measures, such as immunizations, screenings, and health education, can prevent the onset of diseases and

disabilities, reducing the burden of illness-related unemployment and promoting sustained workforce participation.

Additionally, expenditure on health can indirectly affect unemployment rates by influencing broader socioeconomic factors that shape labor market dynamics and employment opportunities (Yang, 2020). Healthy populations are more likely to be economically productive, contribute to economic growth, and create demand for goods and services, thereby stimulating job creation and reducing unemployment (Esen & Çelik Keçili, 2021). Moreover, investments in health can foster human capital development, improve educational attainment, and enhance labor market outcomes, as individuals with better health tend to have higher levels of educational attainment, higher earning potential, and greater job opportunities (CEBECİ & Ay, 2016). Furthermore, expenditure on health can reduce income inequality and poverty, as individuals with access to healthcare services are less likely to incur catastrophic healthcare costs or fall into financial distress due to illness, thereby reducing their vulnerability to unemployment and socioeconomic deprivation. Therefore, countries that prioritize expenditure on health as part of their broader economic and social development strategies are likely to experience lower unemployment rates and greater economic resilience in the face of health-related shocks and crises.

Moreover, expenditure on health can have a positive impact on unemployment by addressing structural barriers to employment and promoting social inclusion (Erasmus, 2021). Individuals with chronic health conditions or disabilities often face significant challenges in accessing employment opportunities and participating fully in the labor market (Oni, 2014). Investing in healthcare services, rehabilitation programs, and assistive technologies can help mitigate these barriers, enabling individuals with disabilities to overcome health-related limitations and engage in meaningful work. Moreover, expenditure on mental health services and psychosocial support can address the psychological barriers to employment, such as stigma, discrimination, and lack of support networks, which may prevent individuals from seeking or maintaining employment. By promoting the social inclusion and economic integration of individuals with health-related challenges, expenditure on health can expand the pool of available talent, increase labor market participation, and reduce unemployment rates.

Furthermore, the quality and accessibility of healthcare services are critical determinants of the impact of health expenditure on unemployment outcomes (Esen & Çelik Keçili, 2021). Inadequate healthcare infrastructure, healthcare workforce shortages, and limited access to essential health services can exacerbate health inequalities, increase the prevalence of preventable diseases, and impede individuals' ability to work (Piabuo & Tieguhong, 2017). Therefore, effective expenditure on health requires not only increased funding but also targeted investments in healthcare system strengthening, healthcare workforce development, and healthcare infrastructure expansion to ensure universal access to quality healthcare services. Moreover, investing in health promotion and disease prevention initiatives, such as nutrition programs, sanitation improvements, and health education campaigns, can reduce the burden of illness and disability, improve population health outcomes, and enhance workforce productivity and participation. By addressing the root causes of ill health and disability, expenditure on health can create a healthier, more resilient workforce that is better equipped to withstand economic shocks and disruptions, thereby contributing to lower unemployment rates and sustained economic growth.

Additionally, the link between expenditure on health and unemployment is influenced by broader macroeconomic factors, such as economic growth, fiscal policy, and social protection measures (Piabuo & Tieguhong, 2017). Countries with robust healthcare systems and social safety nets are better positioned to mitigate the adverse effects of health-related shocks, such as pandemics, epidemics, or natural disasters, on unemployment rates (Raghupathi & Raghupathi, 2020). Adequate expenditure on health can help countries build resilience to health crises, maintain social stability, and protect vulnerable populations from falling into poverty or unemployment during times of economic downturns. Moreover, investment in health can stimulate economic activity, create jobs in the healthcare sector, and spur innovation and technological advancements, thereby generating positive spillover effects on employment and economic growth. Therefore, a comprehensive approach to addressing unemployment requires integrating health expenditure with broader economic policies, social welfare programs and labor market interventions to promote inclusive growth, social equity, and sustainable development.

Relationship between population growth and unemployment

The relationship between population growth and unemployment is a complex and multifaceted phenomenon that is influenced by various demographic, economic, and social factors (Wang & Li, 2021; Obayori & Udeorah, 2020; GIDEON, 2017). Population growth can affect unemployment rates through its impact on labor supply, demand for goods and services, and labor market dynamics. On one hand, rapid population growth can lead to an expansion of the labor force, increasing the number of individuals seeking employment opportunities (Egessa, Nnyanzi, & Muwanga, 2021). This influx of workers can exert downward pressure on wages and increase competition for available jobs, resulting in higher unemployment rates, particularly in regions with limited job creation capacity or sluggish economic growth (Mukisa, Nathan, & Bulime, 2020; Bala, Ibrahim, & Hadith, 2020). Additionally, population growth can strain social infrastructure and public services, exacerbating unemployment challenges by stretching resources thin and hindering investments in education, healthcare, and other critical sectors that promote labor market participation and productivity (Bahadur, 2019; Kamarudin et al., 2018).

Conversely, population growth can also stimulate economic activity and job creation, thereby reducing unemployment rates under certain conditions (Maijama'a et al., 2019; Ali, Omar, & Yusuf, 2021). A growing population can create new markets, increase consumer demand, and drive investment in infrastructure, housing, and manufacturing sectors, generating employment opportunities across various industries (Al Faruq & Yuliana, 2023). Moreover, a younger population demographic, characterized by a higher proportion of working-age individuals, can fuel innovation, entrepreneurship, and productivity growth, leading to higher labor force participation rates and lower unemployment levels (Manuhuttu & Kimirop, 2019). In this context, population growth can act as an engine of economic development, driving GDP growth, expanding the tax base, and fostering long-term prosperity, provided that appropriate policies are in place to harness the potential of the growing workforce and channel investments toward job creation, skills development, and inclusive growth initiatives (Irawan, 2022).

However, the relationship between population growth and unemployment is not solely determined by demographic factors but is also influenced by broader economic and social dynamics, such as technological advancements, globalization, and labor market policies (Obayori & Udeorah, 2020). Technological innovations, automation, and digitalization, for instance, can disrupt traditional industries, displace workers, and create structural unemployment challenges, regardless of population growth trends (GIDEON, 2017). Moreover, globalization can affect unemployment rates by reshaping the global division of labor, outsourcing jobs to lower-cost locations, and increasing competition for skilled labor, thereby influencing employment patterns and labor market outcomes independent of population growth rates (Egessa et al., 2021). Similarly, labor market policies, such as minimum wage laws, unemployment benefits, and labor market regulations, can impact unemployment rates by affecting labor demand, labor supply, and the bargaining power of workers, irrespective of population growth dynamics (Mukisa et al., 2020). Therefore, understanding the relationship between population growth and unemployment requires considering a broad range of factors and adopting a nuanced approach that addresses the complex interplay between demographic trends, economic conditions, and policy interventions.

Moreover, the impact of population growth on unemployment varies across different regions and contexts, depending on factors such as urbanization, migration patterns, and resource availability (Manuhuttu & Kimirop, 2019). In rapidly urbanizing areas, population growth can exacerbate unemployment challenges by straining urban infrastructure, increasing competition for housing and public services, and concentrating unemployment in informal or low-skilled sectors (Obayori & Udeorah, 2020). Conversely, in rural areas experiencing population decline or stagnation, outmigration of working-age individuals can lead to labor shortages, declining productivity, and higher unemployment rates, particularly in sectors reliant on agricultural labor (GIDEON, 2017). Additionally, migration flows, both internal and international, can affect unemployment rates by redistributing labor supply and demand dynamics, altering local labor market conditions, and influencing wage levels and job availability in sending and receiving regions (Egessa et al., 2021). Thus, spatial and demographic characteristics that necessitate customized policy responses to address regional inequities and promote inclusive development impact the link between population increase and unemployment.

Additionally, demographic factors that impact labor force participation, productivity, and unemployment trends—like age structure, fertility rates, and dependence ratios—have an impact on the relationship between population growth and unemployment (Maijama'a et al., 2019). Countries with a youthful population demographic, characterized by a high proportion of young working-age individuals, may experience higher unemployment rates due to the challenges of absorbing large cohorts of new entrants into the labor market (Ali, Omar, & Yusuf, 2021). Conversely, countries with an aging population may face labor shortages, skill mismatches, and declining workforce participation rates, leading to labor market imbalances and structural unemployment challenges (Manuhuttu & Kimirop, 2019). Moreover, changes in fertility rates, family size, and household composition can impact labor supply dynamics, labor force participation rates, and the availability of caregivers, affecting unemployment outcomes for different demographic groups, such as women, youth, and older workers (Al Faruq & Yuliana, 2023). Therefore, understanding the demographic drivers of population growth and their implications for labor market dynamics is essential for designing effective policies to address unemployment and promote sustainable economic growth.

Additionally, population growth can interact with other socioeconomic factors, such as education, healthcare, and income inequality, to influence unemployment outcomes (Bahadur, 2019). Investments in education and skill development, for example, can enhance labor market participation, productivity, and employability, mitigating the adverse effects of population growth on unemployment by equipping individuals with the skills and qualifications needed to secure gainful employment (Kamarudin et al., 2018). Similarly, investments in healthcare and social protection programs can improve health outcomes, reduce absenteeism, and increase workforce participation rates, thereby bolstering the resilience of the labor market to population growth shocks and reducing unemployment rates (Irawan, 2022). Moreover, addressing income inequality and promoting inclusive growth can ensure that the benefits of population growth are equitably distributed, reducing social disparities, promoting social cohesion, and enhancing overall labor market outcomes (Maijama'a et al., 2019). Therefore, addressing unemployment requires a comprehensive approach that considers the interplay between population growth, demographic trends, and broader socioeconomic factors to foster inclusive and sustainable development.

3. Methodology

Model specification, data and estimation procedures

Empirical model

The functional form of the model conceptualizes the relationship between unemployment and its determinants:

$U = f(E, H, G, P, I)$ …… (i)

Where: U represents the unemployment rate; E represents expenditures on education (investment in human capital); H represents expenditures on health (investment in human capital); G represents Gross Fixed Capital Formation (investment in physical capital); P represents population growth; I represent the rate of inflation.

The functional form posits that unemployment is a function of these variables, with expected signs: E and H are expected to have a negative relationship with U (as they increase, unemployment decreases). G is also expected to have a negative relationship with U. The sign of the relationship between P and U is ambiguous. The long-term relationship between I and U is expected to be neutral, but it may have a short-term negative relationship.

Control variables

In our analysis, Gross Fixed Capital Formation (GFCF) and inflation are added as control variables to sharpen our insights into Uganda's unemployment. GFCF highlights the role of economic expansion and job creation through investment in physical assets, helping us differentiate the effects of human capital on employment from those of economic growth. Inflation is included to capture its influence on wages and the cost of living, which can temporarily sway unemployment rates. By controlling for these factors, we aim to isolate and understand the specific impact of education and health investments on unemployment, ensuring our findings reflect the nuanced interplay of these variables in the labor market.

Econometric Form

To empirically test these relationships, we can specify an econometric model. Assuming a linear relationship for simplicity, the model can be written as:

$U_t = \beta_0 + \beta_1 E_t + \beta_2 H_t + \beta_3 G_t + \beta_4 P_t + \beta_5 I_t + \varepsilon_t$ ..... (ii)

Where: $U_t$is the unemployment rate at time t. E_t, H_t, G_t, P_t, and I_t are the values of the respective variables at time t. β_0 is the intercept term. β1, β2, β3, β4, and β5 are the coefficients to be estimated. ϵ_t is the error term, capturing all other factors affecting unemployment not included in the model.

Description of the variables and model estimation

Unemployment: This is the dependent variable, which measures the percentage of the labor force that is unemployed in Uganda. It is measured as a share of the labor force that is without work but available for and seeking employment.

Education expenditure: This indicates the portion of Uganda's GDP that goes into education. It is expressed as a proportion of the overall amount spent by the general government on all fields (health, education, social services, etc.). It includes spending that is paid for by government transfers from outside sources.

Health expenditure: This measures the percentage of GDP that is spent on health in Uganda. It is a continuous variable that reflects the level of human capital investment in health improvement. It is expected to have a negative effect on unemployment, according to the neoclassical theory.

Population: This measures the total annual workforce of Uganda. It is measured as the total population between the ages of 15 to 64. It may have a positive or negative effect on unemployment, depending on the balance between labor supply and demand, as suggested by the neoclassical theory.

Gross fixed capital formation: This is a control variable, which measures the percentage of GDP that is invested in physical capital in Uganda. In addition to purchasing plants, machinery, and equipment, it also covers the construction of roads, railroads, and similar infrastructure, such as private residences, offices, hospitals, schools, and commercial and industrial structures. Land improvements include things like fences, ditches, drains, and the like. Current U.S. dollars are used for data.

Inflation: This control variable calculates the yearly percentage change in Ugandan general prices. The GDP deflator is used to calculate inflation. The rate of change in prices throughout the economy is shown by inflation, which is calculated using the GDP implicit deflator's annual growth rate.

4. Empirical Results and Discussion

Descriptive evidence of the study

To give an overview of the features of the data, descriptive statistics were condensed. This approach ensured the suitability of the data for estimation and mitigated the risk of producing inaccurate findings. It involved performing computations to summarize key statistical metrics such as the mean, minimum, maximum, and standard deviation. The data processing and analysis were conducted using the statistical software application STATA, version 14.

Table 1: Summary of study variables

Variable	Observations	Mean	Std 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
Population growth	37	3.094061	.2088564	2.712952	3.496469
Inflation	37	12.94595	9.547966	1	30

Source: Researchers' calculations with secondary data

The summary statistics suggest that there is considerable variability in the data, with some variables having relatively high means and standard deviations, while others are more concentrated. This variability is taken into account when analyzing the relationships between the variables. Additionally, the range of minimum and maximum values indicates that there are outliers in the data that could influence the analysis. To this effect, the study variables were log-transformed to reduce variability and also to interpret results easily

Pre-estimation diagnostic tests

Before estimating a model, statistical tests known as pre-estimation diagnostics are performed to make sure the variables chosen are suitable to be part of the model that will be estimated.

The test for multicollinearity

Multicollinearity is an econometric problem that arises when an independent factor in a multiple regression equation demonstrates a significant correlation with one or more other autonomous factors. The statistical significance of the affected factors in the model is undermined by multicollinearity. This investigation constructed a correlation grid between each independent factor and computed the variance inflation factor (VIF) for each factor to assess multicollinearity. The findings are displayed as follows:

Table 2: Pairwise correlation analysis results

	1	2	3	4	5	6
Unemployment (1)	1.0000					
Educ. Exp. (2)	0.2533	1.0000				
Health Exp. (3)	-0.0056	-0.0736	1.0000			
GFCF (4)	0.4525*	0.5099*	0.3235	1.0000		
Population grw.(5)	0.2187	0.2162	-0.4559*	0.0631	1.0000	
Inflation (6)	0.1222	0.0782	0.2522	0.2367	-0.3451*	1.0000

* Indicates significance at 0.05 level. Source: Researchers' calculations with secondary data

In evaluating the provided correlation matrix with reference to Gujarati and Porter's (2009) threshold for high correlation (±0.8), it is observed that none of the pairwise correlations among the variables - Unemployment, Educational Expenditure, Health Expenditure, Gross Fixed Capital Formation (GFCF), Population Growth, and Inflation - surpass this benchmark, suggesting an initial absence of severe multicollinearity concerns. However, given that moderate correlations do exist, particularly between Unemployment and GFCF (0.4525), and Educational Expenditure and GFCF (0.5099), a further in-depth analysis using the Variance Inflation Factor (VIF) is warranted to rigorously assess the impact of these correlations on the regression model. The VIF analysis would specifically identify if any of these moderately correlated variables, despite falling below the high correlation threshold, contribute significantly to multicollinearity. This step is crucial to ensure the stability and reliability of the regression coefficients in the model. Should the VIF results indicate significant multicollinearity, appropriate remedial measures, such as removing or combining variables, would be necessary. Conversely, if the VIF results do not reveal substantial multicollinearity issues, it would reinforce the suitability of the current model specification, allowing for a more confident progression to regression analysis

Table 3: VIF Results

Variable	VIF	1/VIF
LogGFCF	3.08	0.324608
LogEduc	1.93	0.519371
LogHealth	1.75	0.572246
LogINFL	1.69	0.590675
LogPOP	1.40	0.714625
Mean VIF	1.97	

Source: Researchers' calculations with secondary data

Based on the criteria set forth by Suleiman (2019), which posits that Variance Inflation Factor (VIF) values should be below 10 and tolerance values (1/VIF) above 0.2 to rule out concerns of multicollinearity in a regression model. The VIF values for all the variables in the table—LogGFCF, LogEduc, LogHealth, LogINFL, and LogPOP—range from 1.40 to 3.08. Notably, none of these values approach the threshold of 10, suggesting that multicollinearity is not a significant concern for any of these variables. This conclusion is further corroborated by examining the tolerance values (1/VIF), which all exceed the minimum recommended value of 0.2, with the lowest being approximately 0.325 for LogGFCF and the highest being around 0.715 for LogPOP.

Given these findings, it can be confidently concluded that the data does not exhibit multicollinearity issues that could potentially compromise the integrity and reliability of the regression model. Therefore, proceeding to model estimation is justified, as the variables included are unlikely to cause multicollinearity-related distortions in the analysis.

Stationarity tests on the model variables

The study employed the widely used Augmented Dickey-Fuller (ADF) test in the subsequent stationarity tests on model variables. This test is commonly used in academic literature. Through examining a null hypothesis, the ADF examination aims to ascertain the presence of a unit root within a provided time series sample. The null hypothesis remains unaltered if the test statistic (t-statistic) within the ADF is lower than the relevant critical value (at the 5% significance level). The search for unit roots at the variable and initial difference levels is shown in Table 4 below.

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)
Population grw	-2.704*	-4.312***	I(1)
Inflation	-2.664*	-7.834***	I(1)

Source: Researcher's computation using secondary data

The unit root test results presented in the redrawn table reveal a compelling pattern regarding the stationarity of the economic variables under study. It is observed that all the variables—Unemployment, Educational Expenditure, Health Expenditure, Gross Fixed Capital Formation (GFCF), Population Growth, and Inflation—are non-stationary at levels, as indicated by their respective ADF test statistics, which do not fall within the critical values for stationarity. However, upon differencing once (first difference), all these variables achieve stationarity, as evidenced by the highly significant ADF test statistics (denoted by *** for a 1% significance level). This uniform shift from non-stationarity at levels to stationarity at first difference indicates that each of these variables is integrated of order one, I(1). Given this uniformity in the order of integration across the variables, the study is positioned to adopt a modeling approach that effectively handles such characteristics.

Before proceeding to model estimation, it was imperative to conduct a cointegration test, despite the identified I(1) integration of all variables. For this, the Johansen cointegration test was utilized. The test's justification stems from its capacity to ascertain whether a long-term equilibrium relationship between the I(1) integrated variables exists. Cointegration suggests that, while individual series may be non-stationary over time, they move together in a way that their linear combinations are stationary, implying a meaningful long-term equilibrium relationship among them.

The Johansen cointegration test is particularly suitable for models with multiple time series, as it can test for the existence of multiple cointegrating vectors. This is a crucial step, especially in an econometric context, as economic variables often move together over the long term due to underlying economic forces.

Cointegration test

Given that all of the research variables were initially identified as unstable but eventually attained stability during differentiation, the findings imply that the variables may be forming a long-term relationship. The quality of variables showing a persistent link is known as cointegration. Therefore, it is essential to confirm that the study variables cointegrate. The Johansen test for cointegration was used in the study to determine this persistent connection.

Table 5: Results from the Johansen Cointegration test

Null Hypothesis	eigenvalue	Trace statistic	5% critical value
r ≤ 0		325.3803	94.15
r ≤ 1	0.98480	187.2194	68.52
r ≤ 2	0.91257	106.8004	47.21
r ≤ 3	0.77460	57.6339	29.68
r ≤ 4	0.64227	23.7102	15.41
r ≤ 5	0.40124	6.7844	3.76
r ≤ 6	0.18583		

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

The null hypothesis of no cointegrating relationship (r ≤ 0) shows a trace statistic (325.3803) that is substantially higher than the 5% critical value (94.15). This pattern of the trace statistic exceeding the critical value continues for all subsequent hypotheses (r ≤ 1, r ≤ 2, r ≤ 3, r ≤ 4, r ≤ 5), indicating rejection of these null hypotheses. However, there is no point in the table where the trace statistic falls below the critical value for any hypothesized number of cointegrating relationships.

This consistent pattern suggests that the null hypothesis of no cointegrating relationship cannot be rejected for any of the variables. In simpler terms, the results point to the absence of any stable long-term equilibrium relationship among the variables. Therefore, despite the initial indications of integration at order one (I(1)) for each variable, the Johansen cointegration test reveals that these variables do not move together in a way that their linear combinations are stationary.

Table 6: Model Estimation

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LogUNE						
LogUNE L4.	-.2208271	.1039756	-2.12	0.034	-.4246155	-.0170388
LogEduc L4.	-.1065122	.1212711	-0.88	0.380	-.3441992	.1311747
LogHealth L4.	-.3919375	.1344963	-2.91	0.004	-.6555454	-.1283296
LogGFCF L4.	.4872139	.1803976	2.70	0.007	.1336411	.8407867
LogPOP L4.	4.284547	1.8024	2.38	0.017	.7519087	7.817186
LogINFL L4.	.4238548	.1211932	3.50	0.000	.1863206	.6613891
_cons	-12.5199	4.026507	-3.11	0.002	-20.41171	-4.628095

Source: Researchers' calculations with secondary data

The lagged variable of unemployment with a coefficient of -0.22 significant at a 5% level, suggests a negative relationship with the current level of unemployment. Specifically, a one percent increase in unemployment in the previous period is associated with a 0.22 percent decrease in the current unemployment rate, holding all else constant. This also indicates a potential mean-reverting dynamic in the unemployment rate over time. The coefficient for the natural logarithm of education expenditure is -0.11 and is not statistically significant at

conventional levels (p-value of 0.380). This suggests that the model does not find robust evidence to assert that changes in education expenditure have a clear short-term impact on unemployment.

Conversely, the health expenditure variable is statistically significant with a coefficient of -0.39, implying that a one percent increase in health expenditure is associated with a 0.39 percent decrease in the current unemployment rate. With a statistically significant value of 0.487, the coefficient for the natural logarithm of Gross Fixed Capital Formation is positive. This suggests that the present unemployment rate will rise by 0.49 percent for every 1% increase in capital creation. The positive sign could be a result of a temporary displacement effect, in which more investment pushes labor demand aside in favor of capital-intensive output. Population growth also exhibits a positive and significant coefficient of 4.28, suggesting that a one percent increase in population growth leads to a 4.28 percent increase in the current unemployment rate. This substantial effect may reflect the increased labor supply that could outpace job creation, leading to higher unemployment.

The coefficient for inflation is 0.42 is statistically significant at the 1% level. This implies that a one percent increase in inflation leads to a 0.42 percent increase in the current unemployment rate. This result may be indicative of the adverse effects of inflation on the labor market, potentially through the distortion of wage and price signals or by affecting the real costs of hiring.

Post-estimation diagnostic tests

Serial correlation test

The study carried out the Breusch-Godfrey LM test for serial correlation. The null hypothesis under this test is *no serial correlation.* The null hypothesis is invalidated if the pertinent chi-square measure fails to satisfy the 5% importance benchmark. The investigation identified that the B-Godfrey examination's chi-square measure (0.462) lacked significance at the 5% threshold. Therefore, the null hypothesis remained unverifiable. Consequently, the scrutiny concluded that the model remained unaltered by sequential correlation. The findings are available in section 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 assessment was utilized in the investigation to scrutinize the presence of heteroscedasticity. The null hypothesis posited by this examination states the absence of heteroscedasticity. The null hypothesis remains unverifiable if the chi-square value associated with this assessment lacks significance at the 5% significance threshold; conversely, if it does, the null hypothesis is rejected. The chi-square value (0.00) in this study was established as non-significant at the 5% threshold. Consequently, the null hypothesis of the examination could not be discarded. Thus, the inquiry concluded that the generated model did not display heteroscedasticity. Table 4.8 following provides more information on the outcomes.

```
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

To ascertain whether the residuals in the model adhered to a Gaussian distribution, the investigation utilized the Skewness & Kurtosis examination for Normality. Conformity with normality serves as the null hypothesis for this test. The null hypothesis remains unchallenged if the asymmetry, peakedness, and chi-square values lack significance at the 5% level. Conversely, if they do, the null hypothesis is refuted. The outcomes of the scrutiny are depicted below.

Skewness/Kurtosis tests for Normality

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

Source: Researchers' calculations with secondary data

Discussion

The effect of education expenditure on unemployment in Uganda.

The VAR model results suggest that changes in education expenditure do not have a statistically significant impact on the unemployment rate in the short term. This finding may seem counterintuitive to neoclassical theory, which posits that education expenditure should enhance human capital, increase labor productivity, and thereby reduce unemployment. There are several possible explanations for this finding. First, the returns to education in the labor market may take time to manifest. Second, the economy may not be able to absorb educated workers into productive employment due to factors such as macroeconomic instability or slow growth in job-intensive sectors. This finding suggests that simply increasing education expenditure may not be sufficient to reduce unemployment. Complementary reforms, such as improving the quality and relevance of education to meet labor market demands, enhancing the entrepreneurial capacity of the workforce, and ensuring macroeconomic policies that facilitate job creation, may also be necessary.

The effect of health expenditure on unemployment in Uganda.

The results reveal a statistically significant negative association between health expenditure and unemployment in Uganda. This aligns partially with neoclassical theory, which proposes that human capital investments, like health, improve labor productivity. Enhanced health can translate to higher worker productivity, reduced absenteeism, and potentially longer working lives, leading to a more efficient and productive workforce. This, in turn, can contribute to economic growth and potentially lower unemployment rates. Previous empirical studies support this finding, highlighting a positive link between health investments and labor market outcomes. Improved health fosters a more reliable and robust workforce, attracting investors and potentially stimulating job creation. In Uganda, where the disease burden hampers economic activity, this result emphasizes the dual importance of health expenditure: improving individual well-being and serving as a strategic human capital investment to facilitate economic development and reduce unemployment. The observed relationship is particularly relevant considering Uganda's struggles with infectious diseases and other health challenges that hinder labor productivity. This suggests that health interventions have the potential to unlock economic productivity and labor market participation, especially in sectors reliant on physical well-being.

The effect of Population on unemployment in Uganda.

The results exhibit a significant positive relationship between population and unemployment, indicating that a one percent increase in population size four periods earlier is correlated with a substantial increase in the current unemployment rate. This finding can be interpreted within the neoclassical theory of unemployment, which suggests that labor supply increases with population growth. If the labor demand does not keep pace due to rigidities in the labor market or slower economic growth, the natural result is increased unemployment. The scale of the coefficient suggests that in Uganda, the labor market may be experiencing substantial pressures from a growing population, which is not being fully absorbed into productive employment.

This relationship is reflective of broader demographic trends observed in many developing countries, where high population growth rates can outstrip job creation and economic development, leading to higher unemployment rates. In the Ugandan context, this finding underscores the challenges posed by rapid population growth, which can exacerbate unemployment if not matched by commensurate economic growth and job creation. It contributes to the current literature by quantifying the lagged effect of population growth on unemployment, emphasizing the need for policies that address both the supply side of the labor market through population management strategies and the demand side through sustained economic development

5. Conclusions, implications and policy suggestions

Merely increasing expenditure on education does not have a significant short-term effect on unemployment in Uganda, implying that the country's nature of education investment may be misaligned with the labor markets. However, it appears that the impact of education investment also takes longer to materialize beyond the period under review. Therefore, the government and policymakers should enhance the quality and relevance of education, especially vocational and technical education, to equip young people with skills that are in demand. Moreover, fostering collaboration between educational institutions and industry could help to align curricula with practical skills and job market needs.

Health investments can boost labor productivity and economic performance, and lower unemployment rates. Good health is essential for economic participation, meaning that health investments can generate economic returns through a more productive workforce. This finding implies that health expenditure is not only a social investment but also a strategic economic investment for Uganda's development.

The results demonstrate a strong positive effect of population growth on unemployment, highlighting the challenge of providing jobs for a fast-growing workforce. This poses a serious threat to economic stability and social cohesion if not handled well. The Ugandan government has a crucial challenge in creating employment opportunities at a speed that keeps up with or surpasses population growth. This requires a multi-faceted approach that involves economic policies aimed at boosting job creation, such as encouraging investment in labor-intensive industries, enhancing the business environment, and investing in infrastructure to unlock economic potential in underserved areas. There is also a need for effective population management policies, such as family planning and education, to ensure that population growth rates are sustainable and in harmony with economic growth rates.

References

Agboola, S., Musa, I., & Ibrahim, Z. (2018). Relationship between educational expenditure and unemployment rate on economic growth in Nigeria. *International Education Journal*, 1(3), 100-110.

Al Faruq, M., & Yuliana, I. (2023). The effect of population growth on poverty through unemployment in East Java province in 2017-2021. *Journal of Social Research*, 2(6), 1900-1915.

Ali, O., Omar, M., & Yusuf, S. (2021). Population growth and unemployment in Zanzibar. International Journal of Sciences: Basic and Applied Research, 59(2), 36-47.

Ali, S., Yusop, Z., Kaliappan, S. R., Chin, L., & Meo, M. S. (2022). Impact of trade openness, human capital, public expenditure and institutional performance on unemployment: evidence from OIC countries. *International Journal of Manpower*, 43(5), 1108-1125.

Ayeni, A. O., & Omobude, O. F. (2018). Educational expenditure and economic growth nexus in Nigeria (1987-2016).

Bahadur, R. (2019). Impact of over-population on economic growth and development in India. International *Journal of Research and Analytical Reviews*, 6, 1-10.

Bala, U., Ibrahim, A., & Hadith, N. B. (2020). Impact of population growth, poverty and unemployment on economic growth. *Asian Business Research Journal*, 5, 48-54.

Bashir, A., & Amir, A. (2019). Relationship between government expenditure on education and GDP per capita in Pakistan: An ARDL Approach to Co-integration. *Advances and Applications in Statistics*, 55(1), 77-103.

Bhattacharyya, P. (2019). Public expenditure on education and economic growth: A state-level analysis in India. *Humanities & Social Sciences Reviews*, 7(6), 533-539.

Binuomoyo, O. K. (2020). Examining the Relationship between Public Spending on Education and Unemployment Problem in Nigeria. Malaysian Journal of Business and Economics (MJBE), 7(1), 57-57.

Bougrine, H. (2020). The theory of money, interest and unemployment. In Credit, Money and Crises in Post-Keynesian Economics (pp. 97-116). Edward Elgar Publishing.

CEBECİ, E., & Ay, A. (2016). The effects of health expenditures on economic growth: a panel regression analysis on BRICs countries and Turkey. Dumlupinar University Journal of Social Science/Dumlupinar Üniversitesi Soysyal Bilimler Dergisi.

Chandra, A. (2010). Does government expenditure on education promote economic growth? An econometric analysis. University Library of Munich, Germany.

Đukić, M. (2021). Comparison of Keynesian and (neo) classical economics.

Egessa, A., Nnyanzi, J. B., & Muwanga, J. (2021). Determinants of youth unemployment in Uganda: The role of gender, education, residence, and age. IZA Journal of Labor Policy, 11(1).

England, P., & Folbre, N. (2023). Reconceptualizing human capital. In A research agenda for skills and inequality (pp. 177-195). Edward Elgar Publishing.

Erasmus, E. G. (2021). Public expenditure and human capital development in Nigeria. Journal of Accounting and Financial Management, 7(2), 26-43.

Esen, E., & Çelik Keçili, M. (2021). Economic growth and health expenditure analysis for Turkey: evidence from time series. Journal of the knowledge economy, 1-15.

Farmer, K., & Schelnast, M. (2021). Involuntary unemployment in an OLG growth model with public debt and human capital. Growth and International Trade: An Introduction to the Overlapping Generations Approach, 193-222.

GIDEON, E. H. (2017). Impact of population growth on unemployment in Nigeria (Doctoral dissertation, American University of Nigeria, Department of Economics).

Gruzina, Y., Firsova, I., & Strielkowski, W. (2021). Dynamics of human capital development in economic development cycles. Economies, 9(2), 67.

Irawan, E. (2022). The effect of unemployment, economic growth and human development index on poverty levels in Sumbawa regency in 2012-2021. International Journal of Economics, Business and Accounting Research (IJEBAR), 6(2), 1286-1291.

Kamarudin, M. K. A., Abd Wahab, N., Mohamad, M., Saudi, A. S. M., & Samsurijan, M. S. (2018). Population growth and economic development in developing and developed countries. Int J Eng Technol, 7(4.34), 123-7.

Liotti, G. (2022). Labor market regulation and youth unemployment in the EU-28. Italian Economic Journal, 8(1), 77-103.

Maijama'a, R., Musa, K. S., Yakubu, M., & Mohammed, N. (2019). Impact of population growth on unemployment in Nigeria: Dynamic OLS approach. Journal of Economics and Sustainable Development, 10(22), 79-89.

Mallick, L., & Dash, D. P. (2015). Does Expenditure on Education Affect Economic Growth in India? Evidence from Cointegration and Granger Causality Analysis. Theoretical & Applied Economics, 22(4).

Mallick, L., Das, P. K., & Pradhan, K. C. (2016). Impact of educational expenditure on economic growth in major Asian countries: Evidence from econometric analysis. Theoretical and applied economics, 2(607), 173-186.

Manuhuttu, F. Y., & Kimirop, O. (2019). Determination of population growth against the level of unemployment in Merauke district. Int. J. Civ. Eng. Technol, 10, 10-20.

Maruthappu, M., Shalhoub, J., Tariq, Z., Williams, C., Atun, R., Davies, A. H., & Zeltner, T. (2015). Unemployment, government healthcare spending, and cerebrovascular mortality, worldwide 1981–2009: an ecological study. International Journal of Stroke, 10(3), 364-371.

Maruthappu, M., Watson, R. A., Watkins, J., Williams, C., Zeltner, T., Faiz, O., ... & Atun, R. (2016). Unemployment, public-sector healthcare expenditure and colorectal cancer mortality in the European Union: 1990–2009. International journal of public health, 61, 119-130.

Michaelides, P. G., & Papadakis, T. E. (2023). After having studied this chapter, the reader should be able to understand if Friedman's theory of money is exogenous and why.• Explain Friedman's monetaristic rule.• Analyse Friedman's ideas on the NAIRU.• Formulate the 'Quantity Theory of Money'. History of Economic Ideas: From Adam Smith to Paul Krugman, 93.

Mukisa, I., Nathan, S., & Bulime, E. W. (2020). Macroeconomic determinants of unemployment in the East African community. Tanzanian Economic Review, 10(2), 48-68.

Obayori, J. B., & Udeorah, S. A. F. (2020). The dynamic effect of population growth on the unemployment rate in Nigeria. South Asian Journal of Development Research, 2, 103-113.

Olowookere, J. K., Olanipekun, W. D., Sokunbi, G. M., & Aderemi, T. A. (2022). Human capital development and sustainable development: evidence from Nigeria. Studia Universitatis Babes-Bolyai Oeconomica, 67(1), 63-76.

Oni, L. B. (2014). Analysis of the growth impact of health expenditure in Nigeria. *IOSR Journal of Economics and Finance*, 3(1), 77-84.

Perrotta, C. (2021). Keynesian Policy Today: More Employment and More Human Capital. *The Review of Keynesian Studies*, 3, 127-156.

Piabuo, S. M., & Tieguhong, J. C. (2017). Health expenditure and economic growth-a review of the literature and an analysis between the economic community for central African states (CEMAC) and selected African countries. *Health Economics Review*, 7(1), 23.

Qehaja, S. S., Qehaja, D., Arber, H. O. T. I., & Marovci, E. (2023). The relationship between government health expenditure and economic growth: Evidence from western Balkan countries. *International Journal of Applied Economics, Finance and Accounting*, 15(1), 10-20.

Rathnasiri, R. A. (2020). Impact of public education expenditure on economic growth in Sri Lanka: Evidence from econometrics analysis.

Tanaka, Y. (2020). Involuntary Unemployment in a Neoclassical Model. Studia Universitatis Babes Bolyai-Oeconomica, 65(2), 12-28.

Wang, Q., & Li, L. (2021). The effects of population aging, life expectancy, unemployment rate, population density, per capita GDP, urbanization on per capita carbon emissions. *Sustainable Production and Consumption*, 28, 760-774.

Yang, X. (2020). Health expenditure, human capital, and economic growth: an empirical study of developing countries. *International journal of health economics and management*, 20(2), 163-176.