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Effects of macroeconomic variables on unemployment in Kenya

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Abstract

Unemployment remains a major global challenge, with uneven progress across regions towards the 3% target. In Kenya, despite various interventions since independence, the issue remains unresolved and persistent. The aim of the study was to examine the effects of macroeconomic variables (economic growth, lending rate, development expenditure, and VAT) on unemployment in Kenya and provide empirical insights for designing policies to create employment. The study employed a time series research design to assess how changes in the macroeconomic variables under review influenced unemployment. The study adopted a two-regime Markov switching model with all parameters switching on secondary data for the period 1991-2024. Regime 1 represents a period of stagnating unemployment, while regime 2 represents a period of trend unemployment. The findings established that in both regimes, while economic growth significantly reduced unemployment, development expenditure was found to significantly increase unemployment. Conversely, the lending rate reduced unemployment, but the effect was only significant in regime 2. Similarly, VAT significantly increased unemployment only in regime 2. The findings imply that policymakers should promote sustainable and inclusive growth, while strategically allocating development funds to sectors that are labor-intensive and have high employment potential to create more employment opportunities and reduce unemployment. Additionally, they should enhance access to credit and consider targeted VAT reforms, such as exemptions or reductions of VAT rates, especially during periods of trend unemployment.

Keywords: Kenya, macroeconomic variables, unemployment, Markov switching model, regimes, time series design, Keynesian theory.

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Contents

Contribution of this paper to the literature

This paper contributes to the existing literature by utilizing the Markov switching model to examine the effects of macroeconomic variables on unemployment in Kenya. This study narrows its focus to VAT, development expenditure, and lending rates, in contrast to previous studies that examined broader indicators such as taxation, government expenditure, and general interest rates.

1. Introduction

Unemployment remains a persistent global challenge and a key concern for policymakers. In tracking progress towards achieving SDG Goal 8, specific thresholds have been established. The target is considered met if the unemployment rate is 3% or less (United Nations, 2022). However, Sodergren, Kettler, Sulak, and Payne (2023) report that this target remains unmet both globally and across all regions.

Although the global unemployment rate appears to be low, significant regional disparities exist. Asia and the Pacific are relatively close to achieving the target, while the Arab States and Africa lag far behind due to high and increasing unemployment, as shown in Figure 1.

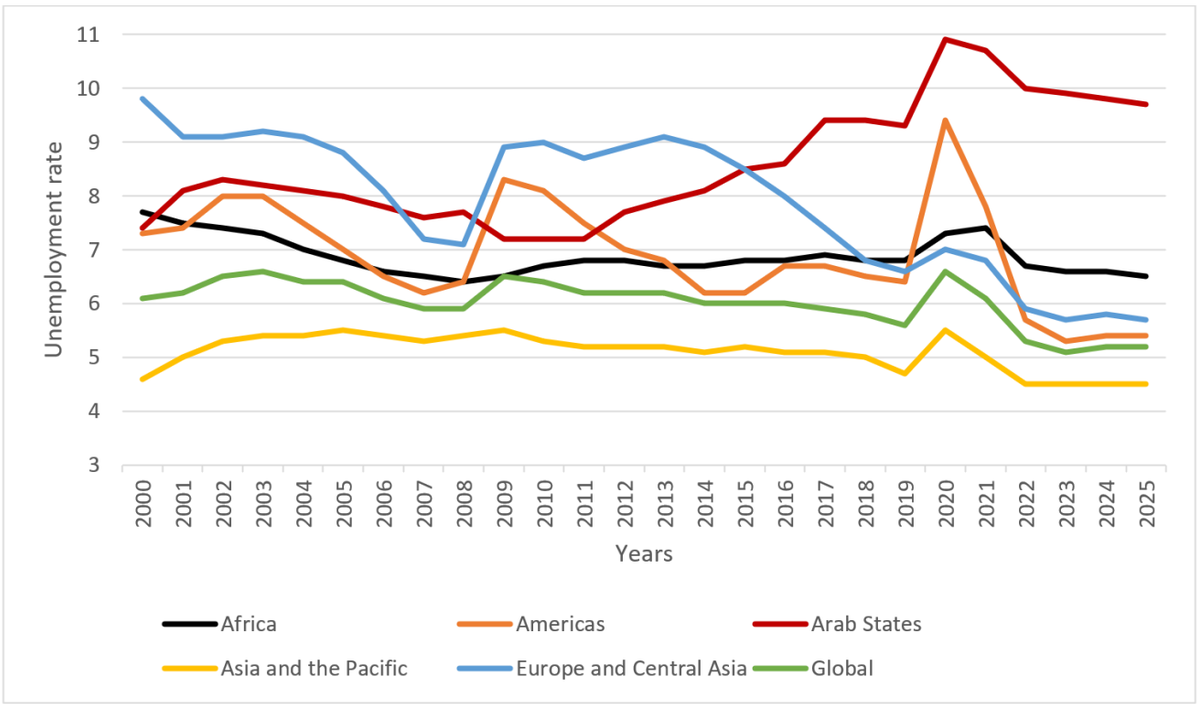

Figure 1. Trends of global and regional unemployment rates.

Source: ILO database.

Since independence, some of the interventions undertaken by Kenya to address unemployment included short-term employment interventions, such as public works programs and targeted youth funds, while medium-term strategies focused on sectoral policy reforms. These were complemented by broader macroeconomic initiatives to modernize agriculture, boost industrialization, and improve labour market efficiency through education and regulatory updates (Omondi, 2013).

Despite adopting these interventions, Kenya experienced a sharp and unexplained increase in the unemployment rate since 2017, which peaked in 2021 as shown in Figure 2.

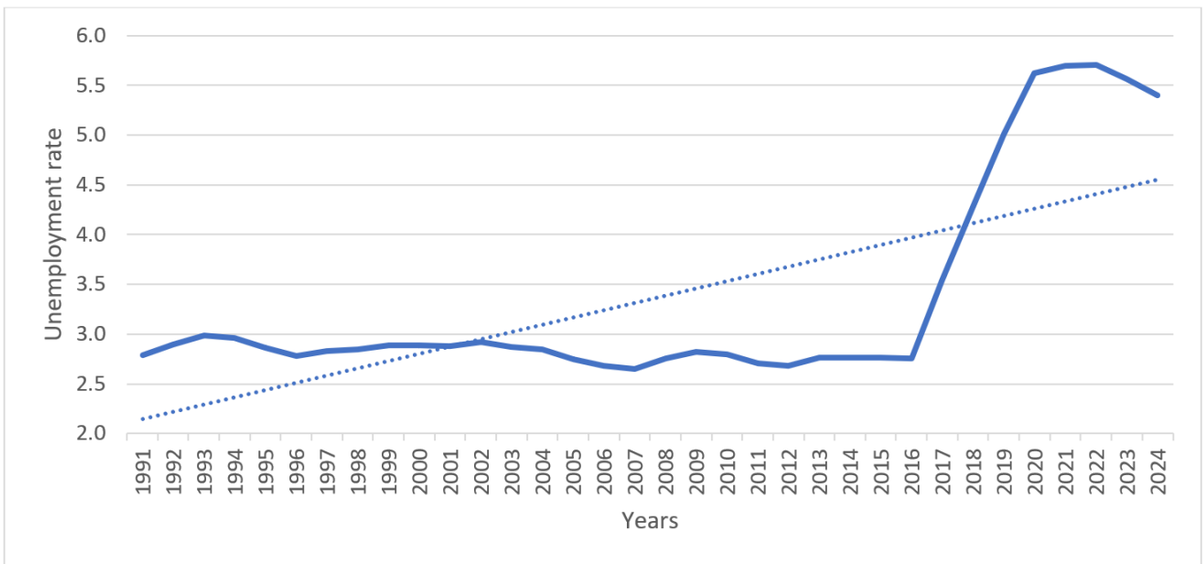

Figure 2. Trend of Kenya's unemployment rate from 1991 to 2024.

Source: World Bank data bank.

While factors like public sector downsizing, election uncertainty, development plan blueprints, and pandemics such as COVID-19 provide partial context, the precise impact of key macroeconomic drivers on unemployment in Kenya remains unclear. For instance, the sharp unemployment spike between 2017 and 2022 occurred despite favorable macroeconomic indicators; rising development expenditure, stable VAT rates, and falling lending rates, as shown in Figure 3. This may indicate a disconnect between macroeconomic performance and labour market outcomes, suggesting deeper investigations into how macroeconomic variables interact to influence unemployment in the Kenyan context.

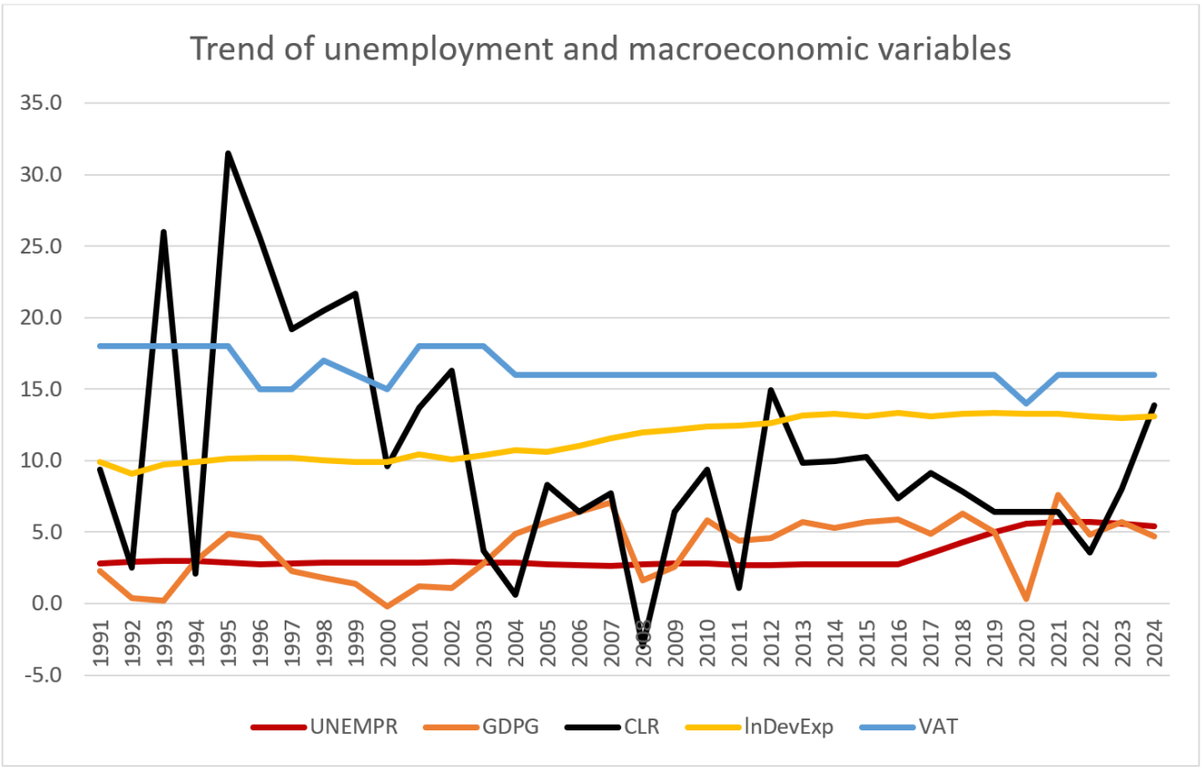

Figure 3. Trend of Kenya's unemployment rate and macroeconomic variables under review.

Despite extensive research, no consensus exists on the precise impact of the variables above on unemployment. Furthermore, previous studies have focused on broad policy tools such as overall tax revenue, government expenditure, and general interest rates. Therefore, this study fills the gap by providing a deeper empirical analysis of how VAT, development expenditure, and the commercial lending rate influence unemployment trends in Kenya.

The general aim of this study is to determine the effect of the selected macroeconomic variables on unemployment in Kenya. To achieve this, the study will be guided by four specific objectives: first, to determine the effect of commercial lending rates on unemployment; second, to examine the impact of development expenditure; third, to evaluate the influence of Value Added Tax (VAT); and finally, to analyze the effect of economic growth on unemployment trends in Kenya.

2. Literature Review

The study was guided by Keynesian theory and Okun's law. Keynesian theory postulates that, in the short run, employment is determined by effective demand, implying that unemployment is caused by a deficiency in aggregate demand. Since labour demand is a 'derived' demand, high unemployment can be solved by increasing the demand for goods through an increase in disposable income, a reduction in interest rates, and increasing government spending. On the other hand, Okun's law was used to investigate the link between the unemployment rate and economic growth. The theory argues that a 3 per cent increase in output reduces the unemployment rate by 1 per cent.

2.1. Empirical Literature

Several studies have been conducted in an attempt to understand the impacts of macroeconomic variables on the unemployment rate using different methodologies and empirical approaches.

2.1.1. Lending Rate and Unemployment Rate

Lloyd (2024) studied the effects of inflation, GDP, interest rate, and policy rate on unemployment in Ghana using time series data for the period 2000-2021. The study employed a multiple regression analysis and found that the lending rate had a positive and significant effect on unemployment. Musiita, Kijjambu, and Katarangi (2024), using annual data from 1987 to 2019, analyzed the impacts of input costs (lending rate, global crude oil prices, and GDP) on unemployment in Uganda. The study employed the Autoregressive Distributed Lag (ARDL) model and found that lending rates had a short-term negative impact on unemployment, while in the long run, a positive relationship was established between the lending rate and unemployment. Chinonye (2021) studied the impact of fiscal (government expenditure and taxes) and monetary policy (interest rate and money supply) on unemployment in Nigeria. The study utilized a Vector Autoregressive model on time series data for the period 1981-2020 and found that interest rates had a negative and significant effect on unemployment at lag 2. Maijama'a and Musa (2021) in the study on the nexus between crude oil, interest rates, and unemployment in Nigeria applied Toda and

Yamamoto's long-run Granger causality on time series data from 1991 to 2019. The findings indicated a one-way causality running from unemployment to interest rates. Mahadika and Wibowo (2021) assessed the influence of monetary policy (real interest rate, real exchange rate) and economic growth on the unemployment rate in Indonesia using time series data for the period spanning 1975-2016. The study employed Autoregressive Distributed Lag (ARDL) and established that the real interest rate at lag 1 had a negative and significant effect on the unemployment rate in the short run. AboElsoud, AlQudah, and Paparas (2021) examined the dynamic relationship between London Interbank Offered Rate (LIBOR), the unemployment rate, and economic growth in the United Kingdom. The study employed the Vector Autoregressive model and Granger causality test on quarterly data for the period 1992 to 2016 and established no short-run relationship between LIBOR and the unemployment rate. Furthermore, the Granger causality test indicated no directional causality between LIBOR and unemployment.

2.1.2 Economic Growth and Unemployment Rate

Abdisalan (2024) empirically examined the relationship between GDP and unemployment in Somalia using secondary data from 2000 to 2021. The study applied Ordinary Least Squares (OLS) and established that economic growth had a negative and insignificant effect on unemployment. In addition, modified ordinary least squares (FMOLS), canonical cointegrating regression (CCR), and dynamic ordinary least squares (DOLS) were employed, and the relationship between the GDP gap and unemployment was not strong enough to be considered statistically significant. Lestari (2023) assessed the effect of economic growth and labor force on unemployment in Langsa City, Indonesia. The study employed multiple linear regression analysis on secondary data spanning 2011-2020 and found that economic growth had a negative and insignificant effect on unemployment. Tembo (2023) studied the effects of economic growth, real effective exchange rate, external debt, and inflation rate on unemployment in Zambia. The study used Vector Error Correction Model (VECM) on quarterly time series data from 1990 to 2020, and findings revealed that in the short run, economic growth had a negative significant effect on unemployment at lag 2. Chenini, Ayad, Attouchi, and Dahmani (2023) analyzed the existence of Okun's law in Algeria from 1970 to 2020. The study employed both the gap and differences model and established that economic growth had no significant effect on unemployment. Leasiwal, Oppier, Tutupoho, and Palloma (2022) investigated the effect of economic growth, minimum wage, and the human development index on unemployment in Indonesia by utilizing secondary data from 2001 to 2020. The study employed Vector Error Correction Model (VECM), and the findings showed that both in the short and long run, economic growth had a positive and significant impact on the unemployment rate. Sotonye, Zeb-Obipi, and Konya (2021) examined the effect of Gross National Product (GNP), Gross Domestic Product (GDP), and Per Capita Income (PCI) on unemployment reduction in Nigeria using time series data for the period 1995-2019. The study employed Ordinary Least Squares and established that Gross Domestic Product (GDP) had a positive but insignificant effect on unemployment. Hjazeen, Seraj, and Ozdeser (2021) examined the relationship between the unemployment rate, economic growth, education, female population, and urban population in Jordan. The study employed Auto-regressive distributed lag (ARDL) model on data spanning 1991–2019 and established that economic growth had a negative and statistically significant effect on unemployment. Katumo and Maingi (2020) analyzed the relationship between youth unemployment and economic growth, inflation rate, FDI, and minimum wage. The study employed the Granger causality test and regression analysis on secondary data for the period 1991-2015 and found a unidirectional relationship between youth unemployment and economic growth, with causality running from economic growth to youth unemployment, while regression output indicated that economic growth had positive and significant effects on youth unemployment. Usha (2020) assessed the relationship between unemployment and economic growth in Mauritius. The study adopted Autoregressive distributed lag (ARDL), ARDL error-correction model (ARDL-ECM) using the ordinary least squares (OLS) approach and Okun's law-gap version on annual data for the period spanning 1983-2017. The findings indicated that both in the long run and short run, there is a negative and insignificant relationship between economic growth and unemployment, whereas Okun's coefficient predicted that a 4 percent increase in GDP would reduce unemployment by 1 percent.

2.1.3. Development Expenditure and Unemployment Rate

Wandile, Semosa, and Ogujiuba (2024), in a study on the effect of socio-economic variables (government expenditure, economic growth, and population growth) on unemployment in South Africa, a Vector Error Correction Model (VECM) was employed on time series data covering the years 1980 to 2020. The findings established a positive and significant effect of government expenditure on unemployment. Ibrahim (2023) examined the impact of fiscal policy tools (Tax revenue, government expenditure, Foreign direct investment (FDI), and domestic investment) on the unemployment rate in Nigeria between 1991 and 2021. The study applied the Autoregressive Distributed Lag Model (ARDL) and established that in the long run, government expenditure had a positive and significant effect on unemployment. In the short run, lagged government expenditure had a positive impact on the unemployment rate. Hammad et al. (2023) assessed the effect of public spending on the unemployment rate in Iraq using quarterly time series data for the period 2004-2021. The study used the autoregressive distributed lag model (ARDL) and found that in the short run, public spending had a positive and insignificant effect on unemployment at lags 1 and 2. However, at lags 3 and 4, public spending had a negative and insignificant effect on unemployment. Further, in the long run, public spending had a negative and insignificant effect on unemployment. Kinuthia (2022) assessed the validity of the Phillips curve in the Kenyan economy by examining the effect of inflation, money supply, and government expenditure on unemployment. The study employed Auto-Regressive Distributed Lag (ARDL) and Error Correction Model (ECM) on annual secondary time series data from 1991 to 2020. Government expenditure had a negative and insignificant effect in the short run, while in the long run, it had a positive but insignificant effect on unemployment. Enyoghasim and Hycenth (2022) analyzed the effect of fiscal policy tools (inflation rate, interest rate spread, gross fixed capital formation, government recurrent expenditure, government capital expenditure, and debt servicing) on unemployment in Nigeria by applying Autoregressive Distributed Lag (ARDL) on annual data for the period 1981 to 2011. The

findings indicated a negative and insignificant effect of government recurrent expenditure on unemployment, while government capital expenditure had a positive and significant effect on unemployment. Abdullahi and Haruna (2021) studied the impact of fiscal policy instruments (external debt, recurrent expenditure, capital expenditure, and tax revenue) on unemployment in Nigeria using data from 1986 to 2020, and employed the Autoregressive Distributed Lag (ARDL) model. The results revealed that recurrent expenditure had a positive but insignificant effect, while capital expenditure had a positive and significant impact on unemployment in Nigeria. Mungai and Korir (2020) analyzed the effect of fiscal policy (government expenditure), inflation, population, and economic growth on unemployment in Kenya using time series data over the period 1986-2017. The study employed OLS and found that government expenditure had a positive and significant effect on unemployment. Saraireh (2020) empirically examined the effect of government expenditure, private investment, development assistance, and Gross Fixed Capital Formation (GFCF) on unemployment in Jordan. The study utilized autoregressive distributed lag (ARDL) on annual data for the period 1990 to 2019, and findings revealed that in the long run, government expenditure had a negative and significant effect on unemployment, while in the short run, it had a positive and significant effect on unemployment.

2.1.4 VAT on Unemployment

Olabiyi, Etong, Olaniyan, and Akinrinde (2024) assessed the impacts of VAT on unemployment in Nigeria but included the inflation rate and manufacturing output as control variables. The study employed the ARDL model on time series data for the period 1994-2021 and found that, in the short run, VAT had positive and significant effects on unemployment, while in the long run, VAT had a negative and significant effect on unemployment. Peter, Olaolu, and Nneka (2021) focused on the effects of tax revenues (with VAT as one of the variables) on unemployment in Nigeria. The study utilized ARDL-ECM on secondary data spanning 1994-2020 and established that VAT had a positive and significant effect on the unemployment rate in Nigeria. Kadenge (2021) assessed the effects of taxes (VAT, income tax, customs, and excise duty) on economic performance in Kenya. The study employed OLS on secondary data for the period 2010-2020 and found that VAT could reduce unemployment through its positive and insignificant effects on GDP. Enueshike, Dele, and Nwala (2021) examined the effect of tax revenue (corporate taxes, customs tax, excise duty, and VAT) on unemployment in Nigeria from 1994 to 2020. The study used ARDL-Error Correction Model (ECM) and established that VAT had a positive and significant effect on unemployment in Nigeria. Anichebe (2019) examined the effect of tax policy (specifically company income tax, personal income tax, and customs and excise duty) on unemployment in Nigeria. The study employed OLS on time series data from 1981 to 2017 and established a positive and significant effect of VAT on the unemployment rate.

3. Methodology

The study employed a time series research design due to its suitability in detecting long-term patterns and the impact of policy changes and economic shocks. This will enable the study to examine how macroeconomic variables influence unemployment trends over the review period.

3.1. Model Specification

Unemployment was defined as a function of lending rate, VAT, development expenditure, and economic growth, as shown below:

$$\text{Unemployment} = \text{f(lending rate, VAT, development expenditure, economic growth)} \quad (1)$$

Log transformation was applied to the development expenditure to reduce data skewness.

The study employed time series data, and Equation 1 will be rewritten as:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + ln\beta_4 X_{4t} + \varepsilon,\ \varepsilon \sim N(0, \delta^2) \quad (2)$$

Where:

Y represents unemployment, X_1 represents the commercial lending rate, X_2 represents the log of development expenditure, X_3 represents the economic growth rate, and X_4 represents VAT.

To correct the autocorrelation issue, an AR (1) term was introduced into Equation 2 and rewritten as:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \emptyset Y_{t-1} + \varepsilon \quad (3)$$

Since a break was anticipated, the study employed a Markov switching model (Hamilton, 1989) to account for the break. Let S_t represent the unobserved state. A Markov switching linear model can be stated as follows:

$$Y_{st} = \beta_{0,st} + \beta_{1,st} X_{1t} + \beta_{2,st} X_{2t} + \beta_{3,st} X_{3t} + \beta_{4,st} X_{4t} + \emptyset_{st} Y_{t-1} + \varepsilon_{it}, \quad \varepsilon_{ti} \sim N(0, \sigma_{st}^2). \quad (4)$$

Where;

$$S_t \epsilon \{1 \dots K\} \quad (5)$$

Assuming there are K interdependent regimes and that the Markov property holds, such that the future state S_{t+1} depends only on the current state S_t, then a first-order Markov process's transition probabilities will be given as:

$$P(S_{t+1} = j | S_t = i) = P_{ij} \quad (6)$$

Under the assumptions given, the aggregated state transitions will be described with a transition probability matrix:

$$P = \left[\begin{pmatrix} p_{i1} & \cdots & p_{1i} \\ \vdots & \ddots & \vdots \\ p_{1i} & \cdots & p_{ii} \end{pmatrix}\right] \quad (7)$$

The transition probability matrix and the coefficients of the Markov switching model were estimated using the maximum likelihood method with the EM algorithm.

3.2. Data Type and Data Sources

This study employed secondary data from multiple sources between 1991 and 2024. Unemployment rates were obtained from the World Bank Development Indicators database, while data on economic growth, lending rates and government expenditure were sourced from the annual Economic Survey reports published by the Kenya

National Bureau of Statistics (KNBS). For Value-Added Tax (VAT) rates, the study compiled a comprehensive time series by combining three sources: Karingi and Wanjala (2005) provided historical VAT data for 1991–2004, Omondi (2020) covered 2005–2016, and more recent records (2016–2024) were extracted from KRA.

3.3. Data Analysis

3.3.1. Pre-Estimation Tests

These are tests conducted on the data before fitting the model. Descriptive statistics provided an overview of the observed data and included: means, standard deviations, minimums, and maximums. Since the study employed time series data, a stationarity test was conducted. A stationarity test is done to prevent spurious results and help guide the model to be applied in the study. The study employed the Phillips-Perron test to assess the stationarity of the variables.

A structural break test was conducted using the Bai-Perron test due to its ability to detect multiple breaks. The optimal number of breaks was selected via the lowest BIC value.

3.3.2. Post-Estimation Test

After model estimation, post-estimation tests were conducted to ensure the reliability and validity of the model, as they influence the accuracy and usefulness of the estimates. To assess the validity of the Markov Switching model, various diagnostic tests were performed. The Ljung-Box test was employed to test for autocorrelation since it can detect higher-order autocorrelation. The normality assumption was tested using the Jarque-Bera test. The ARCH test was used to check for ARCH effects on both residuals and squared residuals of the Markov switching model. To check if the coefficients are significantly different, 95% confidence intervals were computed for each coefficient in regimes 1 and 2.

4. Results and Discussion

Table 1 gives the descriptive summary on key variables under review, including measures of central tendency (mean and median), and variability (minimum, maximum, and standard deviation).

Table 1. Descriptive statistics of the variables for the period 1991-2024.

	Economic growth rate	Lending rate	Development expenditure	VAT	Unemployment rate
Minimum	-0.200	-3.000	9076	14.00	2.650
Maximum	7.600	31.500	133655	18.00	5.707
Mean	3.847	10.380	239682	16.35	3.352
Median	4.650	8.720	625780	16.00	2.855
Standard deviation	2.208	7.799	1.460	1.041	1.054

The analyzed variables displayed a wide range of volatility, with VAT and unemployment rates remaining relatively stable while commercial lending rates were highly volatile. Economic growth averaged 3.9%, with its peak of 7.6% attributed to post-lockdown recovery and its low of -0.2% caused by sectoral poor performance and high inflation. The lending rate averaged 10.4%, swinging from -3% to 31.5%, and development expenditure also showed significant variation between its high and low points. Finally, the VAT rate demonstrated low volatility, fluctuating only between 14% and 18% with an average of 16.4%.

The results of the Phillips-Perron (PP) test are presented in Table 2. The results indicate that economic growth, lending rate, and VAT were stationary at the level, while development expenditure became stationary only after first differencing. However, after differencing the unemployment rate ten times, it remained non-stationary. This suggests a potential structural break in the unemployment rate data.

Table 2. Results of stationarity test.

Variable	Phillips-Perron statistic at level	Phillips-Perron statistic after differencing	P-value at level	P-value after differencing	Order of integration
Unemployment	-1.200	-4.071	0.883	0.873	Unknown
Economic growth	-24.888		0.01		I(0)
Lending rate	-5.218		0.01		I(0)
VAT	-20.631		0.026		I(0)
Development expenditure	-8.087	-42.094	0.613	0.01	I(1)

Given the unemployment rate's persistent non-stationarity despite differencing, the study employed the Bai-Perron multiple structural break test to identify structural breaks in the unemployment rate series and the results are presented in Table 3.

Table 3. Results of the structural break test.

Breaks (m)	Breakdates	RSS	BIC
0	-	36.672	106.113
1	2017	2.313	19.201
2	2012, 2017	2.275	25.696
3	2004, 2012, 2017	2.165	31.067
4	1995, 2004, 2012, 2017	2.161	38.048
5	1995, 2000, 2005, 2012, 2017	2.173	45.289

Model selection criteria indicated a single statistically significant breakpoint in 2017, supported by a BIC value of 19.201 (the lowest) and a significant reduction in the Residual Sum of Squares (RSS) observed between the null model (m = 0) and the single-break model (m = 1).

4.1. Markov Switching Model

A Markov switching model was fitted to capture potential regime-dependent dynamics in the data. A baseline linear regression model was fitted to the data before estimating a Markov switching model, and results are presented in Table 4.

Table 4. Results of the Baseline Linear Regression model.

Variables	Estimate	Std. error	t-value	P-value
Intercept	-2.016	4.219	-0.478	0.636
GDPG	-0.104	0.092	-1.132	0.267
CLR	0.005	0.022	0.218	0.829
lnDevExp	0.494	0.167	2.963	0.006 **
VAT	-0.0004	0.183	-0.002	0.998
AIC=97.903		**BIC**=107.062		**log Lik.** = -42.952
Residual standard error: 0.927				

Note: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

A two-regime MS-AR model with all parameters switching was fitted. Regime 1 indicates a period of stagnating unemployment, whereas regime 2 represents a period of trend unemployment. Table 5 presents the results of the fitted Markov Switching model.

Table 5. Results of Markov switching model with all variables switching.

Regime 1 model				
Variables	**Estimate**	**Std. Error**	**t-value**	**P-values**
Intercept (S)	-0.042	0.174	-0.261	0.812
GDPG (S)	-0.026	0.004	-6.023	1.709e-09 ***
CLR (S)	-0.001	0.001	-0.889	0.374
lnDevExp (S)	0.026	0.01	3.321	0.001 ***
VAT(S)	0.002	0.008	0.200	0.841
UNEMPR_1(S)	0.94	0.010	95.959	< 2.2e-16 ***
Residual standard error: 0.03521215				
Note: S=switching implying that the variable is switching				
Regime 2 model				
Variables	**Estimate**	**Std. Error**	**t-value**	**P values**
Intercept (S)	-21.209	0.218	-97.513	< 2.2e-16 ***
GDPG (S)	-0.066	0.009	-7.152	8.540e-13 ***
CLR (S)	-0.020	0.005	-4.533	5.807e-06 ***
lnDevExp (S)	1.682	0.028	59.660	< 2.2e-16 ***
VAT(S)	0.079	0.030	2.629	0.009 **
UNEMPR_1(S)	0.703	0.009	76.424	< 2.2e-16 ***
Residual standard error: 0.006				
AIC= -104.642 BIC= -44.77				
Transition probability matrix				
	Regime 1	**Regime 2**		
Regime 1	0.924	0.283		
Regime 2	0.076	0.717		

Note: S=switching implying that the variable is switching

Diagnostic checks were performed on the model assumptions to ensure that the results were valid and reliable, and the results are presented in Table 6. The results show that the model satisfied all the assumptions.

Table 6. Diagnostic test results for the Markov switching model with all variables switching.

Diagnostic Test	Statistic	P-value	Conclusion
Normality	0.559	0.756	Residuals normally distributed
Autocorrelation	12.297	0.266	No Autocorrelation
ARCH test on residuals	8.701	0.728	No ARCH effect on residuals
ARCH test on squared residuals	7.117	0.850	No ARCH effect on squared residuals

The study proceeded to interpret the model since it satisfied all the assumptions. The Markov switching model equation is given by:

$$\text{UNEMP}_t = -0.042 - 0.026\text{GDPG}_t - 0.001\text{CLR}_t + 0.026\text{lnDevExp}_t + 0.002\text{VAT}_t + 0.940\text{UNEMP}_{t-1}, S_t = 1 \quad (8)$$

$$\text{UNEMP}_t = -21.21 - 0.066\text{GDPG}_t - 0.020\text{CLR}_t + 1.682\text{lnDevExp}_t + 0.079\text{VAT}_t + 0.703\text{UNEMP}_{t-1}, S_t = 2 \quad (9)$$

Holding other factors constant, a 1% increase in economic growth reduces unemployment by 0.026% and 0.066% in Regime 1 and Regime 2, respectively. While economic growth is significant in both regimes, it has a stronger impact on unemployment in Regime 2 compared to Regime 1.

The lending rate coefficients of -0.001 in Regime 1 and -0.020 in Regime 2 imply that an increase in the lending rate by 1% decreases the unemployment rate by 0.001% in Regime 1 and 0.020% in Regime 2, holding other factors constant. The lending rate was statistically significant in Regime 2 but insignificant in Regime 1.

An increase in development expenditure by 1% increased unemployment by 0.00026% in regime 1 and 0.0168% in regime 2, holding other factors constant. It was significant at 0.05 in both regimes.

On the other hand, an increase in VAT rate by 1% in Regime 1 and Regime 2 increased unemployment by 0.0016% and 0.079%, respectively. However, the impact of VAT on unemployment is significant in Regime 2 at 0.05 but insignificant in Regime 1.

In regime 1, unemployment in the previous period increases current unemployment by 0.94%, and by 0.70% in regime 2. Both effects are significant at the 0.05 level in both regimes.

The transition probability matrix in Table 5 indicates that when the process is in regime 1, the probability of remaining in that regime is 92.4%, while the probability of transitioning to regime 2 is 28.3%. Conversely, when the process is in regime 2, the probability of remaining in regime 2 is 71.7%, while the probability of transitioning to regime 1 is 7.6%. Furthermore, the expected duration for regimes 1 and 2 is 13.6 and 3.5 periods, respectively. This suggests that regime 1 is highly persistent, whereas regime 2 is short-lived.

Significant differences in parameter estimates across regimes were assessed using 95% confidence intervals, and the results are presented in Table 7.

Table 7. A 95% non-overlapping confidence interval.

Variable	Regime 1 CI [Lower, upper]	Regime 2 CI [Lower, upper]	Decision	Conclusion
Intercept	[-20.72, -20.00]	[-0.38, 0.26]	No Overlap in CI	Significant difference
GDPG	[-0.075, -0.064]	[-0.035, -0.018]	No Overlap in CI	Significant difference
CLR	[-0.014, -0.010]	[-0.002, 0.001]	No Overlap in CI	Significant difference
LnDevExp	[1.59, 1.61]	[0.013, 0.044]	No Overlap in CI	Significant difference
VAT	[0.074, 0.105]	[0.013, 0.016]	No Overlap in CI	Significant difference
UNEMPR_1	[0.707, 0.725]	[0.919, 0.958]	No Overlap in CI	Significant difference

The results on unemployment rate projections, presented in Table 8, show a slow and consistent decline in unemployment rates over the next 5 years. On the other hand, regime probability estimates indicate that while unemployment is likely to stay in the stagnating regime, the probability falls while the probability of shifting to the trend regime increases.

Table 8. 5-year period unemployment rate and probabilities forecast.

Unemployment rate forecast				
Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**
-0.0378	-0.036	-0.035	-0.035	-0.034
Regime probabilities forecast				
	Regime 1		**Regime 2**	
Period 1	0.766		0.234	
Period 2	0.653		0.347	
Period 3	0.593		0.408	
Period 4	0.557		0.443	
Period 5	0.536		0.464	

5. Discussion

5.1. Economic Growth Rate and Unemployment

The study found that economic growth had a negative and statistically significant effect on unemployment in both regimes. This is consistent with Okun's Law, which suggests that an increase in economic growth results in the creation of jobs and lower unemployment rates. The results align with findings of Tembo (2023), Leasiwal et al. (2022), and Hjazeen et al. (2021).

5.2. Commercial Lending Rate and Unemployment

Contrary to the economic theory that a high lending rate increases the unemployment rate, the study established that a high commercial lending rate significantly reduced unemployment only in Regime 2. This may be attributed to improved access to credit through the growth of digital loans, mobile money, and the 2019 repeal of the 2016 interest rate cap. The results agree with the findings of Musiita et al. (2024) and Chinonye (2021).

5.3. Development Expenditure and Unemployment

Development expenditure had a positive and significant effect on unemployment in both regimes, with a stronger effect in Regime 2. This contradicts Keynesian theory, which postulates that an increase in government expenditure could reduce unemployment by boosting demand. The positive effect may be attributed to lag effects, mostly due to the time lag between project implementation and results realization in the form of job creation. Further, funds may be allocated to capital-intensive projects. In addition, some projects provide short-term employment opportunities or jobs dominated by foreigners, or projects are stalled, further increasing unemployment. The results align with the findings of Wandile et al. (2024), Ibrahim (2023), Enyoghasim and Hycenth (2022), Abdullahi and Haruna (2021), and Mungai and Korir (2020).

5.4. VAT and Unemployment

VAT had a positive effect on unemployment, though statistically significant only in Regime 2. The results align with economic theory that a high VAT rate reduces consumer spending by decreasing purchasing power,

thus causing firms to cut production and lay off workers, increasing unemployment. The results resonate with the findings of Peter et al. (2021), Enueshike et al. (2021), and Anichebe (2019).

6. Conclusions

Economic growth significantly reduces unemployment in both regimes, highlighting the crucial role played in job creation. Therefore, policymakers should prioritize growth-led policies. On the other hand, lending rates were found to reduce unemployment in both regimes, although the effect was significant only in regime 2. This suggests that increased access to credit facilities may offset the traditional adverse effect of high lending rates. Contrary to Keynesian theory, development expenditure significantly increased unemployment in both regimes. This may indicate inefficiencies in development expenditure, possibly due to time lag or allocation of funds to capital-intensive projects or projects that generate short-term employment. VAT rates were found to increase unemployment; however, the effect was significant only in Regime 2. This suggests VAT can be harmful during trend unemployment, as it reduces demand. The non-overlapping confidence intervals, which confirmed that all coefficients differ significantly between Regime 1 and Regime 2, underscore that unemployment in Kenya varies depending on the state of the economy. Hence, uniform policy measures may not be effective in addressing unemployment across different regimes. Furthermore, based on the forecast, the study concludes that although a slow but steady decline in the unemployment rate is expected over the next 5 years, the probability of Kenya switching to trend unemployment in the next 5 years is increasing. This calls for long-term policies that will ensure the decline in unemployment is sustained and inclusive.

7. Recommendations

The study examined the impact of lending rates, development expenditure, VAT, and economic growth on unemployment in Kenya from 1991 to 2024. Based on the findings, the study proposes several key recommendations. First, policymakers should implement growth-led policies designed to promote sustainable and inclusive economic expansion, with a specific priority given to sectors that have a high capacity for labour absorption. To further stimulate job growth, targeted VAT reforms such as introducing exemptions or reducing rates during periods of high unemployment could boost consumption and create jobs. Furthermore, development funds must be strategically allocated to labour-intensive sectors with high employment potential. This should be accompanied by robust frameworks for project monitoring, assessment, and transparency to ensure that public investment effectively translates into tangible job creation. In the financial sector, efforts should focus on promoting financial inclusion and implementing targeted credit policies, such as lowering lending rates for high-employment-potential sectors during economic downturns. The analysis also reveals a significant difference in variable coefficients between economic regimes, suggesting that policymakers should adopt flexible, regime-specific measures rather than applying uniform policies. Finally, given the forecast of only a slow decline in the unemployment rate over the next five years, proactive policies are urgently needed to accelerate this projected decrease and achieve a more rapid improvement in the labour market.

In light of these findings, future studies should undertake a comparative analysis of the effects of these macroeconomic variables on unemployment, consider how other types of taxes (corporate tax and Pay As You Earn) affect unemployment, and examine how interest rates (commercial bank rates such as savings and deposit rates, and overdraft and central bank rates such as treasury bill rates, Central Bank Rate (CBR), repo rates, and interbank rates) influence unemployment.

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