The correlation between unemployment and economic growth in Ethiopia

Wondimu Woldemichael Woldegiorgis

Department of Economics, Bonga University, Ethiopia

* E-mail: Wonde12abeba@gmail.com

Abstract

Ethiopia's economic progress is impeded by unemployment as a serious issue. Applying the Johansson co integration and vector error correlation methods, as well as 40-year(1983-2022) yearly time series data, this study experimentally investigates the correlation between unemployment and economic growth. As a result, a 1% rise in unemployment causes the real GDP to fall by roughly 0.03%, indicating that unemployment has a statistically significant negative influence on economic growth. In order to mitigate the adverse effects of unemployment and broaden the pool of employment-generating mechanisms by augmenting investments in sectors other than agriculture that employ a greater labor force the study advocates for the adoption of additional mechanisms for creating jobs, addressing the shortcomings of the labor market, and enhancing labor force productivity through improved policies and increased sectoral linkages.

1. INTRODUCTION

Unemployment and economic growth are two crucial indicators that reflect the overall health of an economy. In the case of Ethiopia, understanding the relationship between these two factors is essential for policymakers to implement effective strategies to promote sustainable development and improve living standards for its citizens.

Ethiopia has been facing significant challenges in addressing unemployment. According to the World Bank, the unemployment rate in Ethiopia was estimated at 19.1% in 2020 (World Bank, 2021). The high unemployment rate is a concern as it not only affects individuals' livelihoods but also hinders overall economic progress.

On the other hand, Ethiopia has experienced notable economic growth over the past decade. The country has been one of the fastest-growing economies in Africa, with an average annual GDP growth rate of around 9% from 2010 to 2019 (World Bank, 2021). This economic growth has been driven by various factors such as investments in infrastructure, agriculture, and manufacturing.

There is a complex relationship between unemployment and economic growth. High levels of unemployment can be detrimental to economic growth as it leads to lower consumer spending, reduced productivity, and social unrest. Conversely, strong economic growth can create job opportunities and reduce unemployment rates.

Several studies have explored the correlation between unemployment and economic growth in Ethiopia. Abebe et al. (2018) found a negative relationship between unemployment and economic growth in Ethiopia. The authors highlighted the need for targeted policies to address unemployment challenges while fostering sustainable economic growth. Generally, understanding the correlation between unemployment and economic growth is essential for policymakers in Ethiopia to design effective strategies that promote job creation and sustainable development.

2. REVIEW OF RELATED LITERATURES

According to Keynes (1936), a deficiency of expenditures in an economy results in a fall in aggregate demand, which in turn causes unemployment, economics, economies grow when there is a healthy level of output supported by an adequate level of economic expenditures.

According to the perspectives of classical economics, the need for labor is a derived need that results from the shrinking share of the labor marginal product. Because the amount demanded of labor will decrease as wages rise, the demand curve is a negative function of real pay. Conventional wisdom dictates that employment should rise and the unemployment rate should fall in a nation where economic growth is more rapid. The Viewpoints of Classical Economics: It is not possible to sustain an economic growth model that is dependent on foreign capital movements driven by consumption rather than employment. All unemployment whether in the labor market or other resource markets, ought to be regarded as voluntary, according to classical economists. Because they won't settle for less pay, workers who are unemployed voluntarily are unemployed. According to classical economics,

boosting aggregate demand can quickly bring unemployment down below the natural rate. But, once wages eventually stabilize and unemployment returns to its historical level, inflation will rise (Adam Smith, 1776).

Arthur Okun (1962) looked into how unemployment affected the US economy's growth. Improvements in output level were suggested by the outcome, which showed a substantial negative correlation (Prachowney, 1993). In ten carefully chosen industrialized nations, Seyfried (2005) examined the relationship between employment and economic growth from 1990 to 2003. Based on a one percent rise in economic growth, unemployment decreases to 0.61 percent, indicating a negative relationship between economic growth and unemployment.

Husain et al. (2010) used VECM and Johansen co integration to investigate the relationship between unemployment and economic growth in Pakistan from 1972 to 2006. The outcome confirms the presence of the negative relationship between unemployment and economic growth in the short and long terms.

Using yearly time series data (1970-2000) using a three-stage least square (3SLS) estimation, Osinubi (2005) also looked into the effects of economic growth on unemployment and poverty in Nigeria. The research employed a selection of variables, including changes in real GDP, savings, labor stoppages, trade disputes, money supply, exchange rate, inflation, and the index of petroleum and agricultural production. The findings demonstrated a negative relationship between poverty and growth and a positive relationship between unemployment and growth.

Using ordinary least squares, Noor et al.(2007) looked into how Bangladesh's unemployment rate was affected by economic growth between 1970 and 2004. The outcome suggests that economic expansion has a detrimental effect on unemployment. In this research, the dependent variable is Real GDP (RGDP), which serves as a stand-in for economic growth. The independent variables are Population Growth Rate (POPGR), Employment per Total Population (EPTP), Total Investment (SINV), and Unemployment (UEMP).

Figure 2.1: Conceptual framework
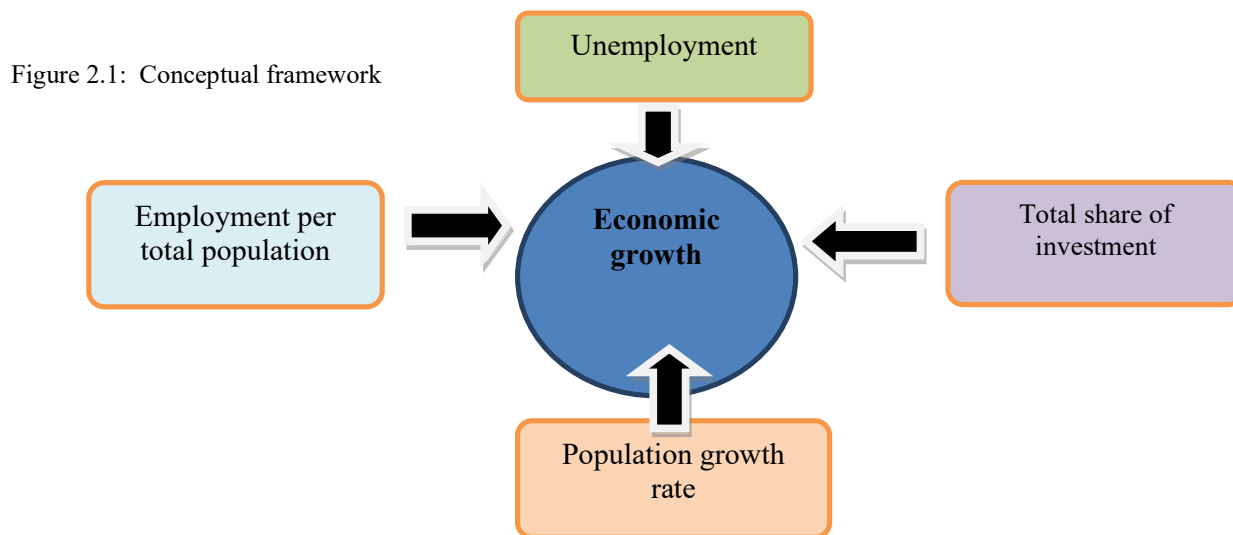
Source: Adapted from Mundi (2014)

3. RESEARCH METHODOLOGY

Time series study design was employed by the investigator. to investigate how Ethiopia's economic growth is affected by unemployment. Secondary data sources are used by us. Secondary data is gathered using this technique of data collection from secondary sources. For our research, we use a variety of secondary data collection methods, including the internet, CSA annual reports, published books, and journals. The National Bank of Ethiopia, The Next Generation Pen World Table, and the World Bank's WDI databases provided annual time series data for the fiscal years 1974–2013. These data were used to investigate the connection between Ethiopia's economic growth and unemployment.

Applying the Johansen co integration and Vector Error Correction methods, this study uses 40 years' worth of annual time series data (1983to 2022) to experimentally analyze the relationship between unemployment and economic growth.3.4. Estimation Technique

The estimation method consists of three primary steps after the model is specified. To verify that variables are stationary, the first method is the Augmented Dickey-Fuller (ADF) approach. The second is the Johansen strategy using Vector Auto Regression (VAR) and Co integration for the long run dynamics. Lastly, to capture the short run dynamics, the Vector Error Correction (VECM) analysis is used.

Model one: - RGDP $= f$ (UEMP) --- (1)

Where: UEMP $= f$ (SINV, EPTP, POPGR).

Model two: - RGDP $= f$ (SINV, EPTP, POPGR) -- (2)

RGDPt$= \beta$UEMPt + μt -- (1.1)

RGDPt $= \beta1$SINVt + $\beta2$EPTPt + $\beta3$POPGRt + μt ----------------- (2.1)

When every variable is converted to log form, the model shown above (1a and 2a) written as:

LnRGDPt$= \beta1ln$UEMPt $+\varepsilon$t ---------------------- (1.2)

$LnRGDPt = \beta1ln$SINVt + $\beta2ln$EPTPt + $\beta3ln$POPGRt $+\varepsilon$t---------- (2.1)

Where: μ: is the error term (white noise), andα & β's: are parameters that measure coefficient   of explanatory variables that measures the extent of which economic growth changes as a result of a unit change in the respective explanatory variables.

RGDP or GDP =is dependent variable represent economic growth.

UNEMP= unemployment.

SINV=   total share investment.

EPTP=   employment per total population.

POPGR= population growth rate.

Table 3.1 Summary of variable description

Variable	Proxy	Expected sign	Measurement
Economic growth	GDP(RGDP)		Per capital income
Unemployment	UNEMP	_	Unemployment rate
Total share investment	SINV	+	Gross capital formation percentage of GDP
Population growth rate	POPGR	-	% change in size of population in a year (Natural increase Net in migration/population size)
Employment per total population	EPTP	+	Employment-population ratio

Hypothesis and Testing

Stationary test

To determine if each variable is stationary and what the order of integration (lag length) is, the Augmented Dickey-Fuller (ADF) test is used. The right lag duration is determined by either the Akanke Information Criterion (AIC) or the Schwartz Criterion (SC).The updated version of DF is called ADF. The first order autoregressive model for the simplest DF test is as follows:

Yt $= \beta$Yt-1 + μt --- (3)

An auto-correlated error term will result from the variable following a higher order [>I (1)] auto-regressive process. usage of DF was thus broken. The error terms will not be white noise, making it difficult to employ DF when auto-correlated errors are present. More lags in the dependent variable's first differences were added to the DF model in order to address this shortcoming. Augmented Dickey Fuller (ADF) is the term for this. Consequently, the aforementioned equation was rewritten by deducting the lag value from each side. Therefore, deducting Yt-1 from both sides results in:

Yt - Yt-1 $= \beta$Yt-1 - Yt-1 + μt or simply written as

$\Delta Yt = (\beta-1) Yt-1 + \mu t$ which can further be simplified as

$\Delta Yt = \gamma Yt-1 + \mu t$ where $\gamma = (\beta-1)$ -------------------------------------- (3.1)

The parameter γ is the subject of the stationary test. It is implied that the variable Yt is not stationary if $\gamma = 0$ or $(\beta = 1)$. The following is the formulation of the hypothesis:

H0: $\gamma = 0$ or $(\beta = 1)$

H1: $\gamma < 0$ or $(\beta < 1)$

It suggests using the regression model to test for the presence of a unit root by include both an intercept and a time trend. The variable is non-stationary against the alternative stationary in both tests, according to the null hypothesis. Only when there is substantial evidence against the null hypothesis at the traditional significance thresholds is it rejected. When only an intercept is included, the usual form of the ADF equation is as follows:

$\Delta Yt = \alpha + \gamma Yt-1 + \varepsilon t$ --- (3.2)

Long Run Dynamics

One can pursue what is referred to as co integration in order to acquire both the short- and long-term connection. The existence of long-term relationships in the system is shown by co-integration between the variables. Multiple co-integration relationships can be estimated and tested for in a single step using the Johansen (1988) approach. Furthermore, it permits model estimation without requiring the variables to be classified as endogenous or exogenous beforehand. The variables in the model are represented by a vector of possibly endogenous variables under this procedure. This process begins with the following formulation of the unconstrained vector autoregressive (VAR) model, taking into account the 'p' delays of Yt: One can pursue what is referred to as co integration in order to acquire both the short- and long-term connection. The existence of long-term relationships in the system is shown by co-integration between the variables. Multiple co-integration relationships can be estimated and tested for in a single step using the Johansen (1988) approach. Furthermore, it permits model estimation without requiring the variables to be classified as endogenous or exogenous beforehand. The variables in the model are represented by a vector of possibly endogenous variables under this procedure. This process begins with the following formulation of the unconstrained vector autoregressive (VAR) model, taking into account the 'p' delays of Yt:

$Yt = A1Yt-1 + A2Yt-2 + … + ApYt-p + BXt + \varepsilon t$ ---------------------- (3.3)

Where Yt is a k-vector of the I(1) endogenous variables, that is, the differenced or integrated of order one.

A d-vector of exogenous deterministic variables is represented by Xt.

A1... Ap and B are matrices of coefficients that need to be estimated. It's a vector of innovations that might be contemporaneously associated, but it's also uncorrelated with all of the variables on the right side and with its own lagged values. Given that the majority of economic time series are non-stationary, the VAR model mentioned above is typically estimated in its first-difference form as follows:

$\Delta Yt = \Gamma1\Delta Yt-1 + \Gamma2\Delta Yt-2 + … + \Gamma p-1\Delta Yt-p + BXt + \varepsilon t$ --------------------------------------- (3.4)

Then, simplifying the above equation gives:

□Y t□□□Y t-1 □□□□i□□Y t-1□□□BXt□□□□□ -- (3.4.1)

□□□□□□□□□□□

Short Run Dynamics

The VECM will represent two time series in assessing their short run qualities if they are co-integrated, or if a long-run relationship exists between them (Engle-Granger, 1987). For both bivariate and multivariate models, the vector error correction model (VECM) general form is as follows:

$\Delta ln RGDPt = \alpha0 + \Sigma ki=1 \beta0\Delta ln UEMPt + \Sigma ki=1 \beta1\Delta ln UEMPt-1 + \Sigma ki=1 \alpha1\Delta ln RGDPt-1 + ECTt-1 + vt$ ---- (3.5)

$\Delta ln RGDPt = \beta0 + \Sigma ki=1 \alpha1\Delta ln RGDPt-1 + \Sigma ki=1 \beta1\Delta ln POPGRt + \Sigma ki=1 \beta2\Delta ln SINVt + \Sigma ki=1 \beta3\Delta ln EPRt + ECTt-1 + vt$ -------------------- (3.5.1)

In this case, Δ represents the initial difference operator, is the error correction term lag by one period, is the error correction term's short-run coefficient $(-1 < \gamma < 0)$, and vt stands for the corresponding model's white noise terms. For the system to converge to equilibrium, the coefficient of vt needs to have a negative sign. The magnitude of the error correction term, which signifies the rate of adaptation towards the equilibrium state, in that Little values that approach zero suggest that the economic agents eliminate a significant portion of the disequilibrium during each period. Greater values that approach 0 signify a sluggish adjustment. Less than negative two, or extremely small values, signify an overshooting of the economic equilibrium. Positive numbers would suggest that the

system deviates from the path of long-term equilibrium.

4. Major Findings

4.1 Stationary Result

The logarithm (ln) of each variable was calculated before the stationary or unit root tests because, in accordance with Maddala (1992), log variables provide elasticity, lessen the effect of outliers, and smooth out time series. Therefore, the time series features of the data are analyzed using the "ADF" and "PP" tests to all the variables in levels and in first difference; first, "without trend (intercept only)" and subsequently, "with trend (intercept and trend)" before performing the long run estimation among the variables. The alternative hypothesis is that the series is stationary (has no unit root) while the null hypothesis is that the series has a unit root (is non-stationary). The table below provides a summary of the outcome.

ADF Test Result

At Level		At 1st Difference	
Without trend	With trend	Without trend	With trend
LRGDP -3.615588	-4.226815	-3.639407	-4.252879
LUEMP -3.615588	-4.219126	-3.615588	-4.219126
LSINV -3.610453	-4.243644	-3.621023	-4.226815
LPGR -3.670170	-4.296729	-3.639407	-4.309824
LEPTP -3.615588	-4.219126	-3.615588	-4.219126

PP TEST

PPTest Result

At Level		At 1st Difference	
Without trend	With trend	Without trend	With trend
LRGDP -3.610453	-4.211868	-3.615588	-4.219126
LUEMP -3.610453	-4.211868	-3.615588	-4.219126
LSINV -3.610453	-4.211868	-2.941145*	-3.533083*
LPGR -2.938987*	-3.529758*	-3.615588	-4.219126
LEPTP -3.610453	-4.211868	-2.941145*	-4.219126

Source: - EVIew for version 10
(coefficient is significant at 1% significance level * 5%)

All of the variables are stationary at first difference, as demonstrated by the results of the aforementioned "ADF" and "PP" tests of unit root. Checking the long-term relationship between the variables is therefore the next step. This study's chosen variables all have mutual orders of integration, which supports the application of the Johansen technique.

4.2. The Long Run Dynamics

Determining an adequate length to be employed in the VAR and VECM estimation is the first step towards the co integration analysis in the Johansson maximum likelihood approach. The Akaike Information Criterion (AIC) result showed that "lag 3" was chosen for model one and "lag 2" for model two. The following table summarizes the long-term relationships of the variables under both Botsh models one and two, based on the results of the Johansen test of co-integration:

Table 2: Johansen co integration test result
a. Co integration result for model one test

Hypotheses		Eigen value	Johannes test statics			
Ho	H1		(λ max)	critical value 5%	(λ trace)	critical value 5%
r=0	r≥1	0.450288	21.54096	14.26460	21.55923	15. 9471
r≤1	r≥2	0.000507	0.018267	3.841466	0.018267	3.841466

b. co intrgration test result for model two

r=0	**r≥1**	**0.858539**	**72.36205**	**27.58434**	**110.5218**	**47.85613**
r≤1	r≥2	0.493128	25.14141	21.13162	38.15971	29.79707
r≤2	r≥3	0.290431	12.69460	14.26460	13.01830	15.49471
r≤3	r≥4	0.008711	0.323707	3.841466	0.3270	3.841466

Source: - E Views version 10.

Note: - indicates the number of co-integrating relationships; r Number of lags used in the analysis: 3 for table 2(a), and 2 for table 2(b);

Determining an adequate length to be employed in the VAR and VECM estimation is the first step towards the co integration analysis in the Johansson maximum likelihood approach. The Akaike Information Criterion (AIC) result showed that "lag 3" was chosen for model one and "lag 2" for model two. The following table summarizes the long-term relationships of the variables under both Botsh models one and two, based on the results of the Johansen test of co-integration:

Table 3: Normalized cointegrating coefficents

Normalized cointegrating coefficients (standard error in parentheses)

LRGDP	LUEMP
1.000000	-0.036230
	(0.41618)

Adjustment coefficients (standard error in parentheses)	
D(LRGDP)	-1.393460
	(0.34898)
D(LUEMP)	-0.165019
	(0.04811)

Source: - E Views version 10.

Determining an adequate length to be employed in the VAR and VECM estimation is the first step towards the co integration analysis in the Johansson maximum likelihood approach. The Akaike Information Criterion (AIC) result showed that "lag 3" was chosen for model one and "lag 2" for model two. The following table summarizes the long-term relationships of the variables under both Botsh models one and two, based on the results of the Johansen test of co-integration:

Table 4:- VAR estimation for model one

LRGDP	Coefficient	Standard error	t-statistics
LRGDP(-1)	0.475090	0.18111	2.62321
LUEMP(-1)	-1.510123	1.31756	-1.14615
LRGDP(-2)	-0.226670	0.20914	-1.08384
LUEMP(-2)	1.756614	2.10742	0.83354
LRGDP(-3)	-0.186405	0.19099	-0.97600
LUEMP(-3)		1.30694	-0.58280
	-0.761678		
constant	2.416926	0.72202	3.34744

R-squared	0.313336	0.967774
Adj. R-squared	0.176003	0.961328
Sum sq. resides	14.85283	0.269651
S.E. equation	0.703629	0.094807
F-statistic	2.281580	150.1523
Log likelihood	-35.61527	38.54783
Akaike AIC	2.303528	-1.705288
Schwarz SC	2.608296	-1.400520
Mean dependent	1.772754	1.480894
S.D. dependent	0.775142	0.482108

|	
Determinant reside covariance (dof adj.)	0.004378
Determinant reside covariance	0.002878
Log likelihood	3.232784
Akaike information criterion	0.582012
Schwarz criterion	1.191548

Source: - E VIews version 10.

The result indicates that both unemployment and real GDP are statistically significant under all specified three lags. Hence, the coefficients of this value could also be explained in elasticity concept as if they have an impact on the current period. In all the three lag periods, unemployment and real GDP have a significant impact on the current period.

According to the above result, real GDP of the previous one and three lag period shows a positive influence to the current period while the second lag period have a negative sign. Concerning Unemployment, the first and second lag periods have a negative impact to the current period while in the third lag period it has a positive sign. This could be attributed to the fact that the longer the period people become unemployed, the more they become fade up of waiting for employers to get a job and engage in other alternatives of income generation mechanisms like going to other countries outside Ethiopia.

AS the Economist (2011) indicated, or engaging themselves in other sources such as the informal sectors. In line with this argument, Mulu (2007) indicated that, the informal sector is a large source of employment and livelihood. Similarly, according to the ILO (2002) estimates, informal employment, outside of agriculture, comprised employment in informal enterprises that are small and or unregistered, and wage employment (i.e. without secure contracts, worker benefits, or social protection)

Represents nearly half or more of the non- agricultural employment in developing countries. Although this is the case, they begin generating income on the area they engaged themselves in that may contribute for the betterment of their livelihood.

Fig 1.for model one
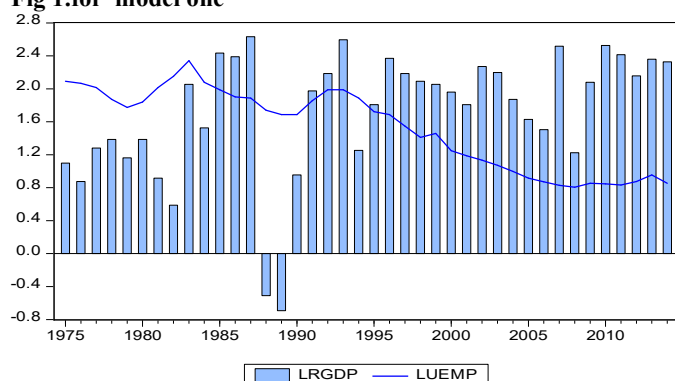
Source: - own computation using E Views for Windows package version 10

Table 5: Normalized co integrating coefficient for model two

Normalized cointegrating coefficients (standard error in parentheses)

LRGDP	LEPTP	LPGRTP	LNINV
1.000000	302.2309	22.85430	0.755372
	(85.8181)	(2.22593)	(0.14670)

Adjustment coefficients (standard error in parentheses)

D(LRGDP)	-0.022591
	(0.03238)
D(LEPTP)	-0.000505
	(0.00014)
D(LPGRATE)	-0.005023
	(0.00062)
D(LSINV)	0.015427
	(0.03728)

2 Co integrating Equation(s):	Log likelihood 193.7103

Normalized co integrating coefficients (standard error in parentheses)

LRGDP	LEPTP	LPGRATE	LSINV
1.000000	0.000000	1.172065	-0.048112
		(0.43137)	(0.03335)
0.000000	1.000000	0.071741	0.002659
		(0.00582)	(0.00045)

Adjustment coefficients (standard error in parentheses)

D(LRGDP)	-1.192038	27.67614
	(0.26770)	(10.8523)

D(LEPTP)	0.001154	-0.201579
	(0.00153)	(0.06210)
D(LPGRATE)	-0.009265	-1.392841
	(0.00666)	(0.27002)
D(LSINV)	0.680317	-14.95466
	(0.38236)	(15.5002)

3 Co integrating Equation(s):	Log likelihood	200.0576	

Normalized co integrating coefficients (standard error in parentheses)

LRGDP	LEPTP	LPTPOP	LSINV
1.000000	0.000000	0.000000	-0.113265
			(0.03412)
0.000000	1.000000	0.000000	-0.001329
			(0.00064)
0.000000	0.000000	1.000000	0.055588
			(0.01141)

Adjustment coefficients (standard error in parentheses)

|			
D(LRGDP)	-1.191270	28.70617	0.598587
	(0.26835)	(27.3563)	(0.66734)
D(LEPTP)	0.000873	-0.577323	-0.016841
	(0.00133)	(0.13529)	(0.00330)
D(LPTPOP	-0.008303	-0.102602	-0.097968
	(0.00613)	(0.62462)	(0.01524)
D(LSINV)	0.691070	-0.532838	-0.132243
	(0.38214)	(38.9568)	(0.95032)

Source: - E Views version 10

The long run coefficients of model two are displayed in the above table as a consequence. According to the elasticity idea, this means that a 1% increase in total investment (private and public) and population causes real GDP to rise by 0.755% and 22.85%, respectively. Likewise, a 1% rise in the proportion of employed individuals to the entire population results in a 302.2309% increase in the real GDP.

Therefore, increased investment in the nation and employment relative to the entire population are crucial in the long run because they help the nation's productive and active workforce make up for the growing number of unemployed individuals. Enhancing its productivity is also necessary to maintain the above favorable impact on the nation's economic growth, in addition to making it more accessible to the working class by generating additional job possibilities. Other earlier research projects could provide more support for this. According to Denu et al. (2005), for instance, Ethiopia's labor market was described as having "disguised unemployment" because there were many individuals filling few jobs, which resulted in low productivity. Additionally, Photious (2004) discovered that 50% of the working population in rural Ethiopia consisted of unpaid family laborers.

Fig 2: For model two
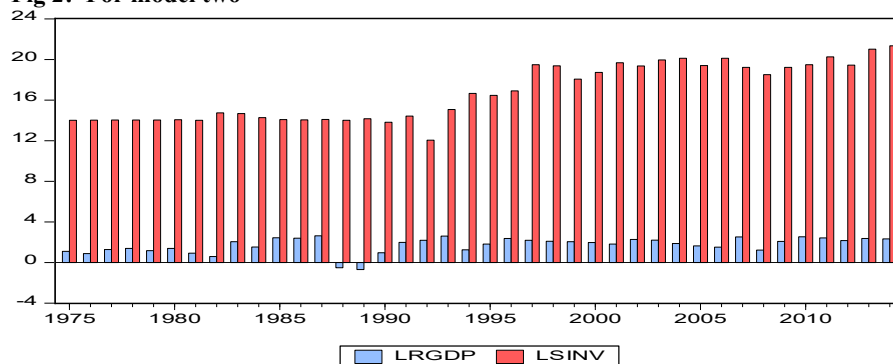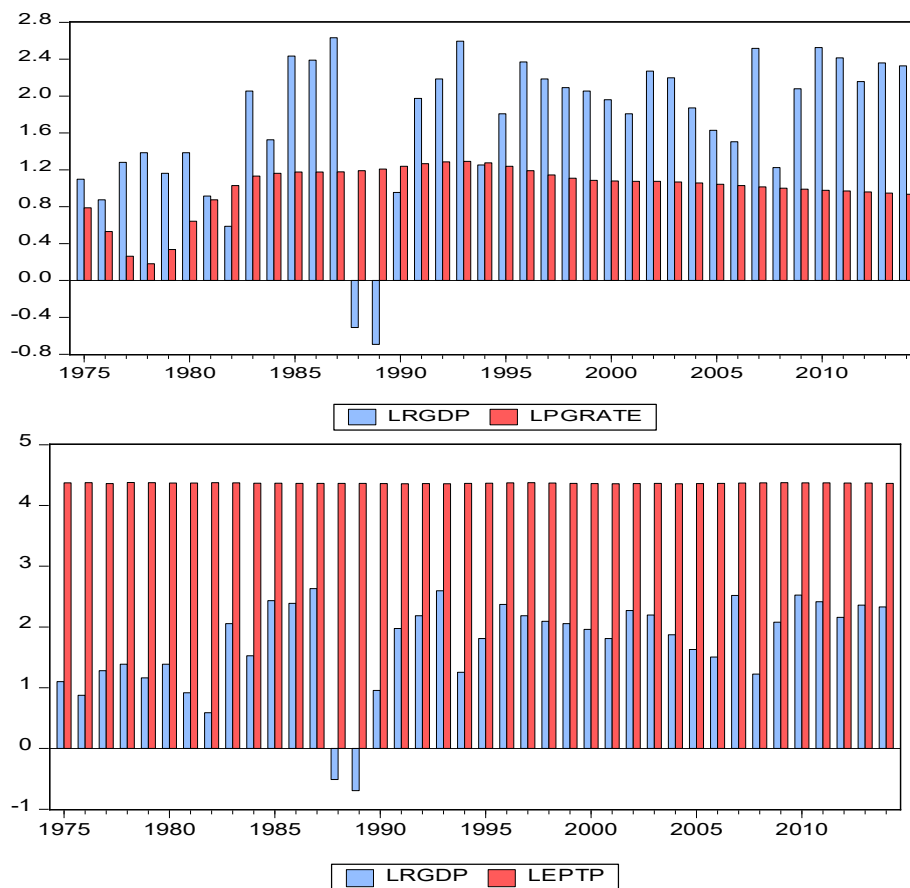
Source: - own computation using E Views for Windows package version 10

Table 6:- VAR estimation for the multivariate system

LRGDP	Coefficients	Standard Error
LRGDP(-1)	0.411838	0.17325
LPTPOP(-1)	0.013552	0.014890
LEPTP(-1)	26.15526	26.0637
LSINV(-1)	0.005638	0.12255
LRGDP(-2)	-0.310027	0.17482
LPTPOP(-2)	-0.070911	0.028193
LEPTP(-2)	0.972793	1.22903
LSINV(-2)	0.0084570	0.12190
CONSTANT	-98.62900	105.587

R-squared	0.367278	0.465720	0.981563	0.897961
Adj. R-squared	0.192734	0.318333	0.976477	0.869813
Sum sq. resides	13.83506	0.000692	0.046762	28.79482
S.E. equation	0.690703	0.004886	0.040156	0.996456
F-statistic	2.104213	3.159838	192.9889	31.90073
Log likelihood	-34.72245	153.4281	73.38535	-48.64924
Akaike AIC	2.301181	-7.601477	-3.388702	3.034170
Schwarz SC	2.689031	-7.213627	-3.000853	3.422020
Mean dependent	1.759811	4.366027	1.023795	16.90372

S.D. dependent	0.768747	0.005918	0.261818	2.761683

Determinant reside covariance (df adj.)	1.75E-08
Determinant reside covariance	5.94E-09
Log likelihood	144.1966
Akaike information criterion	-5.694560
Schwarz criterion	-4.143162
Number of coefficients	36

Source: - E Views version 10

The above result indicates that only real GDP and the population result came statistically significant at one and one percent significance level. Hence, real GDP at lag one and two is statistically significant with positive impact, by 41% and negative 31% respectively, on the current period. On the other hand, the result indicates the population at lag two negatively affects the current period by 3%.

The remaining variables are not statistically significant that means their lagged or previous period values do not have high impact on the current period..

4.3. Short Run Dynamics

As the Johansen co integration result indicated existence of long run relation among the variables, VECM can be applied in order to evaluate the short run properties of both model one and two respectively

Table 7:- VECM estimation for the bi-variant system

D(LRGDP)	Coefficient	Standard Error
C(1)	-1.061912	0.32502
D(LRGDP(-1))	0.498315	0.28565
D(LUEMP(-1))	-1.049257	1.32398
D(LRGDP(-2))	0.284151	0.23871
D(LUEMP(-2))	0.232879	1.38269
D(LRGDP(-3))	0.051276	0.20799
D(LUEMP(-3))	1.382981	1.30960
c	0.024444	0.13699

R-squared	0.419558	0.456794
Adj. R-squared	0.274447	0.320992
Sum sq. reside	14.07630	0.215034
S.E. equation	0.709031	0.087634
F-statistic	2.891298	3.363688
Log likelihood	-34.17931	41.08683
Akaike AIC	2.343295	-1.838157
Schwarz SC	2.695188	-1.486264
Mean dependent	0.026166	-0.028261

Determinant reside covariance (dof adj.)	0.003778
Determinant reside covariance	0.002285
Log likelihood	7.297688
Akaike information criterion	0.594573

| Schwarz criterion | | 1.386332 |

The outcome shows that the real GDP's one- and three-year lagged values have a one percent statistically significant impact on the current real GDP. According to the elasticity idea, the present real GDP is positively impacted by a 1% increase in the real GDP of the lagged one, two, and three years by 0.49% and 0.28%, respectively. In contrast, the lag period's unemployment rate of 1% is statistically significant.

Table 8:- VECM estimation for the multivariate system

D(LRGDP)	Coefficients	Standard Error
C(1)	-0.022591	0.03238
D(LRGDP(-1))		0.18640
	-0.152821	
D(LPTPOP(-1))	-3.195771	3.47939
D(LEPTP(-1))	28.50375	32.4685
D(LSINV(-1))	0.171748	0.034752
D(LRGDP(-2))		0.18388
	-0.208538	
D(LPTPOP(-2))	3.502258	3.38019
D(LEPTP(-2))	10.57181	31.7025
D(LSINV(-2))	0.052203	0.16548
C	0.071247	0.15593

R-squared	0.125882	0.963515	0.428837	0.182494
Adj. R-squared	-0.165491	0.951354	0.238449	-0.090007
Sum sq. reside	21.20358	0.007780	0.000423	28.10576
S.E. equation	0.886181	0.016974	0.003959	1.020272
F-statistic	0.432029	79.22653	2.252441	0.669700
Log likelihood	-42.20089	104.1419	158.0061	-47.41427
Akaike AIC	2.821670	-5.088753	-8.000332	3.103474
Schwarz SC	3.257053	-4.653370	-7.564949	3.538857
Mean dependent	0.028306	0.018209	0.000103	0.197656
S.D. dependent	0.820858	0.076961	0.004536	0.977240

Determinant reside covariance (dof adj.)	2.32E-09
Determinant reside covariance	6.57E-10
Log likelihood	181.1395
Akaike information criterion	-7.412949
Schwarz criterion	-5.497262
Number of coefficients	44

Nearly all of the variables with the specified lag time have a significant short-term influence on the current period, as the above table illustrates. It appears that employment in the year before had no effect on the current period because the number of employed individuals per total population in lag period one was not statistically significant.

5. Conclusions and Recommendations

In any economy, unemployment is a major problem. Negative effects result from it for the unemployed, who have weaker possibilities of finding new employment and feel less comfortable about their ability to hold onto their current positions in the future. In Ethiopia, one of the main obstacles to economic growth is unemployment. This study uses a 40-year (1983-2022) yearly time series of data using the Johansen co integration and vector error correction methods to experimentally investigate the effect of unemployment on the nation's economic growth. According to the findings, a 1% rise in unemployment causes the real GDP to fall by roughly 0.03%, demonstrating the statistically significant negative impact of unemployment on Ethiopia's economic growth.

These days, unemployment is one of the most expensive problems facing Ethiopia and the entire world. Its negative effects on the nation's economic growth are compounded by other factors such as a high rate of population increase, low employment to population ratio, poor income, and low investment. High unemployment is a sign of underutilization of human capital, a crucial resource for economic expansion. Though it is not currently practiced widely for the reasons listed in the recommendation below, the availability of job opportunities can lessen the impact of unemployment in Ethiopia. Lastly, the government's most important contribution. In order to reduce unemployment, the study suggests addressing the shortcomings of the labor market and boosting labor force productivity through higher levels of education and training, skills, and access to capital and productive assets that will allow the underprivileged to take advantage of opportunities for employment. The majority of the workforce in the nation works in agriculture, thus developing value chains and other policies that encourage more investment and employment will help to improve agricultural production and strengthen its ties to other industries. More methods for creating jobs must be implemented since the degree to which economic growth lowers poverty depends on how much it expands work opportunities and how much it allows the underprivileged to participate in the economy and benefit from increased employment prospects.

6. References

Abebe, A., et al. (2018). The correlation between unemployment and economic growth: Evidence from Ethiopia. *Journal of Ethiopian Economics*, 15(2), 45-58.

Arthur Okun (1962) investigated the relation between unemployment and economic growth of USA

Dickey, D.A., and Fuller, W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of American Statistical Association, 74, 427 – 431.

Dickey, D.A., and Fuller, W.A. (1981).The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. Econometrics, Vol. 49, PP.1057 -1072.

Engle, Robert F., and C.W.J. Granger (1987). Co integration and Error Correction: Representation, Estimation, and Testing. Econometrical, Vol. 55, No. 2. PP.251-276. Available at http://ideas.repec.org/a/ecm/emetrp/v55y1987i2p251-76.html

Index Mundi (2014). Ethiopia – Labor Force. Retrieved fro http://www.indexmundi.com/facts/ethiopia. Accessed: 2014-05-03.

Johansen, S. and Juselius, K. (1990). Maximum likelihood estimation and inference on co integration with applications to the demand for money. Oxford Bulletin of Economics & Statistics, vol. 52, no. 2, pp. 169-210

Johansen, S. (1988).Statistical Analysis of Co integration Vectors. Journal of Dynamics and Control, Volume.12, no. 2-3, PP.231-254.

Noor, Z. M., Nor, N. M., and Ghani, J. A. (2007). The Relationship between Output and Unemployment in Malaysia: Does Okun's Law exist? Int. Journal of Economics and Management, 1(3), 337-344.

Okun, Arthur M. (1962). Potential GNP: Its Measurement and Significance. Cowles Foundation. New Haven: CT: Yale University. Paper 190.

Seyfried, W. (2004).Examining the relationship between employment and economic growth in ten largest states. Southwestern Economic Review, 1-12.