



THE IMPACT OF PUBLIC EDUCATION EXPENDITURES ON GRADUATE UNEMPLOYMENT: COINTEGRATION ANALYSIS TO ETHIOPIA

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Abstract:

Unemployment is amongst most pressing economic challenges the Ethiopian economy has long been experiencing. Though the country succeeded in targeting overall unemployment most recently, graduate unemployment continued trending at higher rates over the years. We examined the impact of government education spending on the rate of graduate unemployment in Ethiopia, using yearly series of data over the periods spanning from 1991 to 2019. The results of Augmented Dickey Fuller test revealed difference stationarity for all series of interest; while the suggested order of integration was one. The results of Johnson's cointegration test indicated the existence of long-run equilibrium relationships among the variables entered the test model. In determining the impacts of inflation rate (CPI), economic growth (RGDP) and public education spending on graduate unemployment, we employed Vector Error Correction Model as it enables us capture the short-run and long-run outputs instantaneously. According to VECM regression results, inflation rate and expenditure on education were found to have significant impact on the long-run growth rate of graduate unemployment. While the inflation rate contributed positively, government expenditure has negative influence on the rate of graduate unemployment towards validating the Keynesian theory of employment. Besides, the impacts of both variables were found to persist in the short-run. Both are estimated significant and consistent in sign in the short-run. However, economic growth was found to have a trivial role in explaining the rate of graduate unemployment in both the short-run and the long-run periods. Moreover, the results of VEC causality analysis revealed a significant unidirectional causality running from economic growth towards public funds available for financing education; but no causality was suggested in reverse. We recommend a drastic measure to advance the education sector through suitable investments in a manner that will help in skills development, productivity enhancement and entrepreneurship growth.

Keywords:

Cointegration; Ethiopia; Gov't expenditure; Graduate unemployment; Impact

1. Introduction

1.1. Background of the Study

Theoretically, the intensity of education defines the development of human capital and economic productivity. Education is accredited to intensify worker's efficiency through enhancing skills and competencies across individuals. As a result, it contributes to the growth and development of the general economy; which could absorb idle capacity into the productive system, whereby reducing unemployment rate. Barro and Lee (2010) have identified three channels through which education influences productivity and economic growth. The first channel identified is efficiency of existing resources. Through its positive implication to labor productivity and efficiency of existing resources, education is argued to boost economic growth. Secondly, higher education facilitates adoption of technologies created elsewhere, facilitating domestic productivity and growth processes. Third, advanced education enables own innovation and enhances creativity, and the resulting productivity fosters economic growth. In

principle; growing productivity has potentials of absorbing idle capacity in the economy, thus reducing unemployment. The negative impulse of education to unemployment is suggested through its impact on economic productivity and growth as well (Hua, 2016; Attahir, 2016; Onodugo et al., 2017).

Grant (2017) identified two basic channels through which education contributes to employment. The first is through enhanced capacity from rising productivity. Improving technical as well as managerial efficiencies could be meant to foster productivity and economic growth, whereby leaving space for raising employment demands in the economy. The other way is associated with the role of education to enhancing creativity and entrepreneurship. The latter provides multiplier effect to education from extrabases of entrepreneurial activities, besides direct implication to enhanced self-employment. In other words, entrepreneurship serve dual purpose in the short term (self-employment and newly introduced economic base); and even beyond from medium to the longer term, from external labor employment and direct contributions to outputs.

However, the hypothetical gains from education will be achieved only if the right education is provided. Education expansions should accompany with raising productivity, skills and creativity in a manner that could foster productivity. The implication here is that, a favor should be more to schooling quality than quantity. Towards validating a premise, Hanushek and Kimko (2000) discovered momentous association between quality of education and economic growth, but insignificant impact from quantity dimension. Pirim et al. (2014) revealed that, though access to education across developing countries profoundly improved, an economic gain from widespread education is yet puny. Their explanation was that, access to education does not necessarily imply quality of education; and concluded that, it is quality that matters more. Their explanation extends to reveal profound losses from unproductive education. That is, education expenditures without achieving the intended gains in the longer-term could only produce adverse costs to the country, whereby contracting economic growth and giving rising to unemployment growth.

In Ethiopia, higher education has remarkably been expanding for the past two decades. Both the number of higher institutions as well as higher schooling has improved dramatically. There has also been concurrent growth of funds allocated to the sector during these two decades. As a result, the number of graduates from these institutions has increased enormously over the years; and at the same time graduate unemployment has continued trending at higher rates. We examine the long-run relations between expenditures on education and graduate unemployment in Ethiopia covering temporal period spanning from 1991 to 2019.

1.2. Statement of the Problem

Despite the profound developments in Ethiopian higher education, the growth of graduate unemployment continued trending at higher rates. Though the country has succeeded in reducing overall unemployment since 2003/04, the number of unemployed people from tertiary education has been increasing over the years (Nigusse and Mulugeta, 2018; UNDP, 2014; IMF, 2019). Impressive records in Ethiopia's economic growth with particular insight since 2003/04, has not been nourishing the growing job demands in the country. The observed positive trend between expanding higher education and graduate unemployment in Ethiopia, contradicts the Keynesian hypothesis claiming inverse links between education and unemployment rate. The case can be justified to poor quality of education (rated on international standards), or others restraining economic and employment growth. The present study is primarily initiated to test the validity of Keynesian employment theory; i.e., as to whether investing in education in the context of Ethiopian economy is effective in targeting unemployment. Why has graduate unemployment to Ethiopia been behaving in contrast to universal hypothesis? We were motivated to answer this research question.

Evidence on the dynamic relationships between investments in higher education and graduate unemployment remained mixed. While (Elvis, 2019; Matsumae and Hasumi; 2016; Umut, 2015; Joseph, 2016; Austin and Ogbole, 2014) found a negative and significant association between public spending and unemployment rate; still some others such as those of (Agboola et al., 2018; Attahir, 2016; Nwosa, 2014) found a positive significant impact of education spending on the rate of unemployment. On top of erratic results, Laokulrach (2013) has confirmed insignificant relationships between education and unemployment. This empirical controversy was another motivation to the present study. Thus, we aim to establish the long-run relationships between investments in education sector and the growth rate of graduate unemployment to Ethiopia.

While higher education has extensively been investigated both in academia and policy directives with particular focus to quality, graduate unemployment remained overlooked. Thus, it's indispensable to examine the dynamic implication of expanding education expenditures to graduate unemployment. Several studies such as (Amanuel, 2016; Broussar and Tsegay, 2012; Muhdin, 2016; Amenu and Fufa, 2019; Dejene, 2019) examined predictors of youth unemployment, but with education variable overlooked. It is important to note that, the term 'youth' constitutes both graduate and non-graduates. We need to disaggregate 'youth' as graduates and non-graduates, due to (Nigusse and Mulugeta, 2018) since youth need not necessarily fall under the definition of labor force. While aggregating both aspects, previous studies ended up with unreliable results, as the group may constitute those not in the labor force. Hence, the present study would be a robust improvement over existing literatures in the topic.

We therefore aim to contribute to the existing literature by redressing the methodological as well as conceptual weaknesses with previous studies. The most important consideration with the present analysis rests on the definition of graduate unemployment.

1.3. Hypothesis of the Study

We test the following hypotheses in line with Keynesian hypothesis linking government spending, unemployment rate and economic growth. Theoretically, employment serves a channel through which the positive impulse of government spending transmits to economic growth. A premise follows that, increased government spending enhances employment of more resources and then contribute positively to productivity and growth. Improving economy, in turn, creates more space for idle resources, whereby reducing unemployment. We therefore develop the following null hypotheses for this study:

- Expenditures on education has no significant impact on graduate unemployment rate in Ethiopia;
- Public spending on education does not granger cause economic growth of Ethiopia;
- Economic growth does not granger cause government expenditure on education in Ethiopia.

1.4. Objectives of the Study

The ultimate goal with the present study is to establish the long-run relations of investments in higher education and graduate unemployment in Ethiopia, using temporal data serially ranging from 1991-2019. Specifically, the following issues were addressed;

- Assessing trends of graduate unemployment and expenditures on education in Ethiopia;
- Estimating impact of education expenditure on graduate unemployment rate in Ethiopia;
- Analyzing causal relations between economic growth and gov't expenditure on education.

2. Research Design and Methodology

2.1. Research Design

As long as the present study is concerned basically with the cause-effect analysis, we employ econometric methods employing suitable regression models at various stages. Therefore, the research design adopted here is more of experimental type. Moreover, the data were collected exclusively in quantitative values. Thus, the study employs the quantitative research approach, which is common in experimental research design.

2.2. Data Source and Type

The choice of the sample period is based on the availability of yearly time series data, spanning from 1991/92 to 2018/19. The World Bank and International Monetary Fund data home pages are our data sources for all variables involved in the present study. All series were taken as annual growth rates. Thus, response variable is annual growth rate of graduate unemployment at time t . The regressors include; GDP proxied economic growth rate, inflation rate measured by the consumer price index (CPI), and the government expenditure on education. The choice of economic growth as an independent variable is due to the Keynesian hypothesis that government spending via its negative impact on unemployment rate fosters economic growth. Besides, inflation variable was also considered due to the Phillips Curve, demonstrating inverse relations between unemployment and inflation.

2.3. The Theoretical Model

The Keynesian theory of employment serves a guideline to this study. Keynesians maintain that public expenditures are effective to influencing employment and economic growth in the short-run (Casey, 2010; Anthanasios, 2011; and Kasau et al., 2015; Mankiw, 2010). The path through which economic growth could be influenced by public spending is through full-employment. The positive impulse moves to economy only after enhancing the proper utilization of idle resources (including labor input) whereby absorbing idle capacity into the production sector. Therefore, the initial impact of public spending immediately gives rise to employment rate, and then to the general economy. The assumption is based on the belief that, rising public spending will induce productive investments requiring large labor, whereby reducing the rate of unemployment in the economy. Besides, the additional labor employment produces more and contributes positively towards the economic growth. Therefore, the Keynesians postulate inverse relationships between public spending and unemployment rate (Sangkuhl, 2015; Elvis, 2019; Casey, 2010; Mankiw, 2010). According to this theory; at any given point in time unemployment is a linear negative function of government expenditures. We thus aim at examination of this hypothesis to Ethiopia.

2.4. Empirical Model: VECM Specification

Due to (Casey, 2010; Sangkuhl, 2015; Anthanasios, 2013; Elvis, 2019; Onodugo et al., 2017; Kasau et al., 2015; and Samira and Khalil, 2015), we exploit the time series dimension of our data employing the Error Correction Mechanism. A beauty with ECM rests on its instantaneous report of the short and long-run results. Thus, the function relating unemployment to spending variable specifies the dependent and independent variables is given by; $GUEMT_t = f(GEXP_t)$ (3.1)

Where GUEMT is graduate unemployment; GEXP is the government expenditure variable; and t represents time trend in a series of observation. According to the Keynesian hypothesis, the relationship in specification (3.1) above is all negative.

The autoregressive specification in ECM component is given by;

$$\left. \begin{aligned} \Delta Y_t &= \gamma_1 + \alpha_1 u_{t-1} + \sum_{i=1}^n \beta_i \Delta Y_{t-i} + \sum_{i=1}^n \delta_i \Delta X_{t-i} + \sum_{i=1}^n \Pi_i \Delta Z_{t-i} \\ \Delta X_t &= \gamma_2 + \alpha_2 u_{t-1} + \sum_{i=1}^n \Gamma_i \Delta Y_{t-i} + \sum_{i=1}^n \Omega_i \Delta X_{t-i} + \sum_{i=1}^n \Psi_i \Delta Z_{t-i} \end{aligned} \right\} \dots (3.2)$$

Note that, ECM treats all variables as endogenous. Where Δ is the first difference operator; α_i measures the speed of adjustment towards the equilibrium; coefficients of lagged terms indicate the short run effects of corresponding regressors on the associated response variable. If the α_i coefficients are negative and significant at predetermined acceptable level, it signifies the existence of systemic convergence towards the equilibrium. That is, a portion of short term deviations will restore back within a year (since we have annual observation in this study).

As long as modeling unemployment is our target, we specify ECM using our variables included in the present study as follows;

$$\Delta \ln GUEMP_t = \beta_0 + \alpha \epsilon_{t-1} + \sum_{i=1}^n \Psi_i \Delta \ln GUEMP_{t-i} + \sum_{i=1}^n \Omega_i \Delta \ln GEXPEDU_{t-i} + \sum_{i=1}^n \Pi_i \Delta \ln RGDP_{t-i} + \sum_{i=1}^n \theta_i \ln CPI_{t-i} + u_t \dots (3.3)$$

Where Δ is the first difference operator; \ln gives the natural logarithm; ϵ is the error correction term and its coefficient α measures the speed of adjustment; GUEMP is graduate unemployment rate, while Ψ measures the elasticity of various lagged terms of unemployment; GEXPEDU is government expenditure on education; RGDP is real gross domestic product; CPI is consumer price Index measuring the dynamic impact of inflation on unemployment. u_t is the white noise error in ECM regression.

However, before we proceed to the estimation of ECM, we need to confirm the necessary conditions in advance. Stationarity and cointegration tests are of the basic necessities in time series analysis. Accordingly, we have addressed the two in advanced as discussed hereunder;

2.5. Stationarity and Cointegration Tests

2.5.1. Stationarity Test

A priori with time series study is the examination of unit root properties of each series under consideration. The requirement with predictive model is that, all series should be stationary; i.e., must not contain a unit root problem.

An important condition with forecasting models is that, all variables used in the analysis should have time invariant mean and variance (Gujarati, 2004; Wooldridge, 2013). A serious emphasis also requires stability of covariance of each variable.

Stationarity conditions were examined via the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979). ADF is based on regression of the first difference of Y (ΔY_t) on a constant, time trend (Y_{t-1}) and various lags of Y , specified as follows;

$$\Delta Y_t = \alpha_0 + \gamma t + \delta Y_{t-1} + \sum_{i=1}^k \lambda_i \Delta Y_{t-i} + \varepsilon_t \dots \dots \dots (3.4)$$

Where Δ is first difference operator; α_0 is a constant; γ represents trend coefficient; t stands for time trend; and k represents lag length. Null hypothesis is, $H_0: \delta = 0$. Rejection of the null indicates the presence of unit root problem in Y . ADF is based on the t-ratio of Y_{t-1} . If it exceeds ADF critical at any one of the three benchmarks (reported at 1%, 5% or 10%), the null hypothesis will be rejected. Nevertheless, if Y_t is tested non-stationary, the first difference ΔY_t should then be tested for Stationarity using the same procedure; and the procedure will continue until it is stationary. But, in most of the cases economic and financial data are stationary at first differences.

The length of time lag in regressions of ECM and ADF models is often determined empirically; to take sufficient size so that the error term is indeed serially uncorrelated. The suitable lag (k) is set; for instance, based on minimizing Akaike Information Criterion (see Gujarati, 2004; Wooldridge, 2013; Maddala, 1992). In this paper k was determined based on AIC due to (Kasau et al., 2015; Samira and Khalil, 2015; Minyahil et al., 2016).

2.5.2. Cointegration Test

A Cointegration analysis aims to determine whether there is a long-run relationship between variables of interest. As long as the present study is intended with impact analysis, we need to examine if long term equilibrium path exists for variables entered the long-run model. If no Cointegration is confirmed, then no need to proceed further; and the analysis should be limited to the short-run behaviors of the series. Johnson's Cointegration test was employed to examine whether the variables share stable long-term equilibrium path. Johnson's Maximum Likelihood method constructs cointegrated variables directly on ML regression, rather than to rely on conventional least squares. Johnson's method for Cointegration depends on rank of the matrix formed from vectors of Cointegration equations, and, the associated characteristic roots. The test computes statistics of trace and maximum Eigen value. While trace test examine the null hypothesis that, r ($= 0, 1, 2, \dots, k-1$) Cointegration vectors exist against its alternative of k (number of variables) Cointegration vectors; the eigen value tests the null of r vectors against the alternative hypothesis that $r+1$ vectors exist. The premise is that, in a model of k endogenous variables, possibly the Cointegration rank ranges between zero to $k-1$ (Harry, 2012; Nurmadihah et al., 2011). Both statistics are directly reported in Stata command `vecrank` for Cointegration. Building on Nurmadihah et al. (2011), both test statistics are developed as follows;

$$\lambda_{\text{trace}} \left(\frac{r}{k} \right) = -T \log (1 - \hat{\lambda})$$

$$\lambda_{\text{max}} \left(\frac{r}{r+1} \right) = -T \sum_{i=r+1}^n \log (1 - \hat{\lambda}) \dots \dots \dots (3.5)$$

While the first specification in equation (3.5) gives the trace test statistic, the second expression provides the same for the maximum Eigen approach. Every notation in equation (3.5) is as defined earlier.

2.6. Diagnostic Check

Vector Error Correction Model involves basically three common post estimation tests. These are LM test for serial autocorrelation, normality and parameter stability tests. Langeragean Multiplier test for residuals autocorrelation test the hypothesis of no autocorrelation. If the probability values of the computed chi-square statistics are greater than 0.05 at various lag order, then we accept the null hypothesis. On the other hand, the residual normality conditions were examined through the statistics of Jarque-Bera test, Skewness and Kurtosis tests. In each case if the probability value exceeds the 0.05 level, then the null will be accepted (Gujarati, 2014; Wooldridge, 2013; Maddala, 1992). We have presented regression outputs on these and other necessary results under the appendix section.

2.7. Variables Definition and Expectation of their Sign

Unemployment growth rate is a response variable in the specification of ECM. According to International Labor Organization (ILO, 2014), unemployment is a condition by which people remain without a job. The definition of unemployed includes those who are economically active, but without a job and seeking for a job. The recent extension in the definition includes those individuals who have lost their jobs, and even those groups voluntarily left jobs (World Bank, 2013). Unemployment rate is, therefore, the proportion of those in labor force but who are currently without jobs.

Inflation variable was measured by using the consumer price index. Consumer Price Index (CPI) a change in the average price of consumable goods and services. It measures the positive net change in the average price of consumer goods and services. The Phillips Curve postulates a negative relationship between unemployment and inflation rates, based on the assumption that higher input prices lead to costly production and lower investment undertakings. Falling investments could give rise to unemployment upsurge. Following the Phillips curve hypothesis, we therefore expect negative impact of inflation on unemployment rate. The consideration of economic growth variable in the present study is justified due to Keynesian employment hypothesis, claiming that public spending can influence economic growth only after its initial positive impact on employment. Economic growth is measured as a percentage point change in consecutive real gross domestic products of the country. The positive impact of economic growth is expected in advance. Education expenditure includes the general government expenditure on education (current, capital, and transfers). Again, following the Keynesian claim we expect negative relationship between expenditures on education and graduate unemployment rate.

2.8. Ethical Consideration

The most important thing with research work rests on the trustworthiness of evidences provided. It then requires the reliability of data sources, method of analysis as well as transparency of researchers. To assure the reliability issues, we have provided our Stata outputs in the section for appendix. Next, the data were sourced from the WB and IMF data bases for which the copy can be submitted where and when needed. Moreover, all the materials used in this work are duly acknowledged by providing their details under the section for references.

3. Results and Discussion

3.1. Descriptive Information

3.1.1. Trends of Expenditures on Education and Graduate Unemployment Rate (1991-2019)

Figure (1) plots the natural logarithmic annual absolute terms of expenditure on education sector and the number of graduate unemployment for the sample period in Ethiopia. Throughout the sample period of this study, while government spending on education exhibited relatively stable trend, graduate unemployment has been highly volatile (figure 1). During 1991-1994, the rate of graduate unemployment has been trending slow mainly due to the relatively small number of graduates from tertiary education. Yet, public spending on education kept on rising at increasing rates. Between 1996 and 1998, graduate unemployment has exhibited continuous growth rate following gradual increase in the number of graduates and inadequate economic growth to host the galloping employment demands. However, the rate of graduate unemployment has dropped to its minimum in 2000 following by high rates till the last year of our ample period, except some improvements during 2009 to 2013. From 2014 onwards, graduate unemployment has been trending at increasing rates.

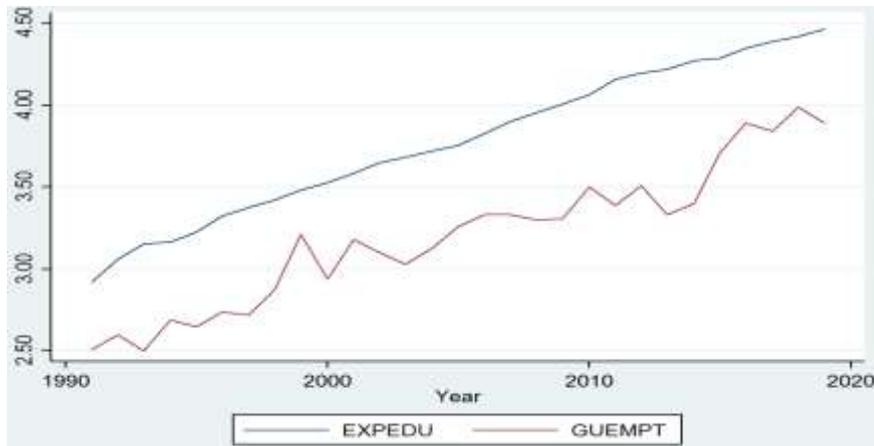


Figure (1): Trends of Education Expenditure and Graduate Unemployment
 Source: Authors' compilation based on WB (2020) & IMF (2020)

However, the growth of public spending on education has revealed quite rising rate. Despite to differences in their growth rates, both variables show some evidence of long-term relationship whereby revealing convergence during the final years of the observation period. Thus, we hope to confirm significant long-run relations between public education expenditure and graduate unemployment under inferential analysis. In other words, the figure (1) evidences the likelihood of permanent association between expenditures on education and graduate unemployment in Ethiopia.

3.1.2. Overview of Expenditures on Education and Economic Growth (1991-2019)

Here we aim at overviewing the joint trend of government expenditure on education sector and real GDP growth over the sample period of this study. This sort of analysis has been initiated to grasp evidence on the long-run relations of both variables inspired by the Keynesian theory. Keynesian economists postulate that, government expenditure through its negative impact on the rate of unemployment could foster economic growth rate (Mercan and Sezer, 2014; Elvis, 2019; Zoran, 2015; Mulugeta et al., 2012; Agboola, 2018; and Bazezew and Alemu, 2014). Intensified economic capability, in turn, creates farther employment opportunities whereby reducing the rate of unemployment. Besides, positive bidirectional causality is suggested among government spending and economic growth. Trend analysis helps understand the overview of long-term trends for both variables; at least in the directions of movements as well as the nature of cycles.

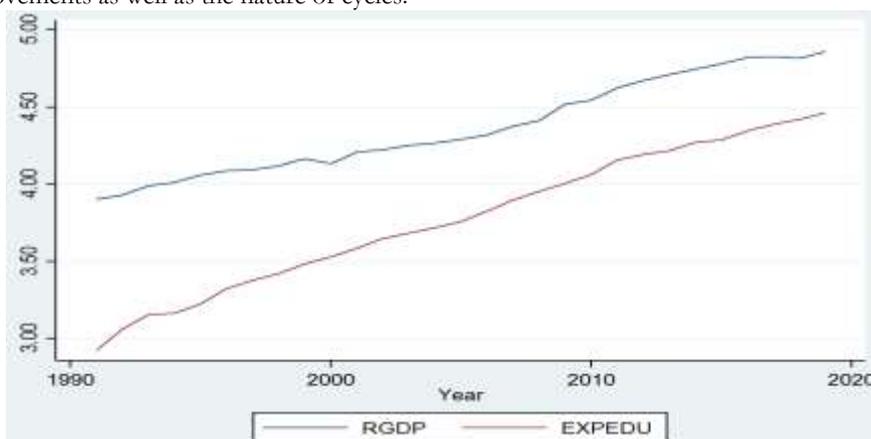


Figure (2): An Overview of Gov't Education Expenditure and Economic Growth in Ethiopia
 Source: Authors' Compilation using Stata 14 based WB and IMF data (2020)

Evident from the figure above is both variables positively trending overtime, providing evidence of long-term relations between them. The question of whether or not that observed relationship is significant could be addressed later under the section for inferential analysis. This stage we can say only that, both used to trend jointly over the sample period. Moreover, the real gross domestic product has been trending higher compared to public spending on education. It means that, throughout the observation period Ethiopian economy nurtured faster than government spending on education, though both have trended with rising rates. A little improvement in the rate of economic growth might have been contributing to the higher rate of public expenditure on education; otherwise the reverse would have explained the observed trend in line with Keynesian hypothesis. To supplement our descriptive analysis, we have computed various summary statistics of both indicators as presented hereunder:

Table (1): Descriptive Statistics of expenditure on education and graduate unemployment rate

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Spending on Education	28	1.939	32.70	-22.41	55.83
Economic Growth	28	6.987	5.95	-8.67	13.57

Source: Authors' Compilation based on (WB, 2020 & IMF, 2020)

As it can be observed from table (1), there is large difference in mean growth rates of both variables. For the sample period, Ethiopian economy has been growing on average by 7 per cent; while the average growth rate for government education expenditure was reported to be 2 per cent. Moreover, the spending variable was found to have a more volatile trend compared to RGDP. This can be understood by a large standard deviation of 32.70 for education expenditure and only 5.95 for economic growth rate, suggesting relative stability of economic growth. While economic growth exhibited relative stability, the education spending variable has been oscillating up and down, manifesting insignificant long-term relation. The same conclusion can be reached from the minimum and maximum growth rates, -22.41 and 55.83, respectively for public spending. RealGDP has been trending with a minimum of -8% and maximum of 13.57% rates over the sample period. In conclusion, irrespective of relative stability in the economic growth education expenditure was highly volatile. Hence, there might not be significant causality in either side.

3.2. Inferential Analysis

3.2.1. Unit Root Test Results

Examining the unit root properties of individual variables is a *priori* with any analysis involving time series data. Stationarity test may not be necessary if one intends not to generalize the findings out of the sample period. But, time series studies are usually aimed to predict future values, so that testing for stationarity become compulsory. In this test, we need to determine whether or not a series exhibits time invariant mean, variance and covariance over time. As we mostly are concerned with weak stationarity, the first two indicators would be sufficient. The Augmented Dickey Fuller (ADF, 1979) test was used to determine unit root properties of all variables under consideration. Table (2) reports the result:

Table (2): ADF Stationarity Test Results

Variable	At Level		First Difference		Order
	Intercept	Intercept + Trend	Intercept	Intercept + Trend	
EDUEXP _t	-1.963	-1.747	-4.057**	-4.120**	I(1)
GUEMPT _t	0.006	-1.308	-6.572**	-6.457**	I(1)
RGDP _t	-1.374	-1.934	-6.239**	-7.079**	I(1)
INF _t	-1.344	-2.336	-3.884**	-3.940**	I(1)

Source: Authors' Compilation using Stata 14 based on WB and IMF data (2020)

** Signifies rejection of the null hypothesis at 1 per cent.

As presented in table (2) above, all variables were subjected to ADF unit root test each four times. That is we have considered the intercept in the first stage and included the trend term in subsequent procedures. However, none was revealed stationary at level values; while all the four variables become stationary at their first differenced terms. The test procedure rejected the null hypothesis at 1 per cent for all variables under consideration. Under the ADF unit root test, we reject the null hypothesis of non-stationarity of a series when the computed tau statistic is greater than the ADF tau critical value. Moreover, the inclusion trend terms in ADF regression didn't improve the significance level except to minor differences in the reported coefficient for intercept alone and intercept and the trend terms. Therefore, ECM regression considers only the intercept term while estimating the parameters. Since the series are all non-stationary (integrated of order one), regression of the basic model uses the first differenced values of all variables under consideration.

3.2.2. Leg Size Determination

In time series analysis, choice of the lag size has a detrimental influence on the efficiency of regression outputs. It should not be too large, or too low; rather it is important to decide a priori on the appropriate lag size to be included in model estimation (Gujarati, 2004; Wooldridge, 2013). There are different approaches for determining the appropriate lags length in econometric analysis, which include; Final Prediction Error (FPE), Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC), Log Likelihood (LL), Sequential Modified Likelihood Ratio Test (LR) and Hannan-Quinn Information Criteria (HIC). A popular approach with empirical analysis has been to take that sizes suggested by majority of the different criteria (Attahir, 2016; Onodugo et al., 2017; Jaradat, 2013; Omitogun and Longe, 2017; Minyahil et al., 2016; Mercan and Sezer, 2014; Elvis, 2019; Zoran, 2015).

Table below presents the results for appropriate lag size determination

Table (3): Results for Appropriate lag Length Selection

Lag Order	LL	LR	P-Value	FPE	AIC	HQIC	SBIC
0	104.427	NR		6.9e-09	-7.43906	-7.38198	-7.24709
1	226.791	244.73		2.7e-12*	-15.3178*	-15.0324*	-14.358*
2	241.49	29.398*		3.2e-12	-15.2215	-14.7077	-13.4937

* reflects the appropriate lag length suggested by the criterion; where, LL: the Log Likelihood; FPE: Final Prediction Error; AIC: Akaike Information Criteria; LR: Sequential Modified Likelihood Ratio Test (LR); HQIC: Hannan-Quinn Information Criteria; and SBIC: Schwarz Information Criteria

Source: Authors Compilation using Stata 14 based on WB and IMF data (2020)

It can be seen from table (3) above that, the appropriate lag length suggested by majority of the selection criterion is one. Therefore, all subsequent analyses are carried out using the optimal lag length of one.

3.2.3. Cointegration Test Results

The most important condition in long-run analysis is cointegration test; i.e., determining whether or not variables entered the long-run model exhibit long-term relation. Johnson's cointegration methodology requires all variables to be integrated of the same order $\{I(1)\}$, which is already confirmed earlier. Thus, Johnson's approach for cointegration has been adopted in the present study.

As we have provided details under methodology section, Johnson's cointegration test uses two test statistics; the trace statistics and maximum eigen value. As evidenced with table (4) below, both the trace (λ_{trace}) and maximum eigenvalue values (λ_{max}) rejects the null hypothesis of no-cointegration, while demonstrating the presence of long-run relationships between variables of interest. The summary statistics of both tests have been reflected in the table below;

Table (4): Johnson's Unrestricted Cointegration Rank Test

Maximum Rank	λ_{max}	Critical @ 5%	λ_{trace}	Critical @ 5%
None	33.78	27.07	92.29	47.21
At most 1	27.49	20.97	58.50	29.68
At most 2	18.69	14.07	31.01	15.41
At most 3	3.76*	12.32	3.76*	12.32

* indicates rejection of the null hypothesis at 5 per cent significance level

Source: Authors' Compilation using Stata 14 based on WB and IMF data (2020)

Evident in the above table is both the trace and maximum eigen value tests rejecting the null hypothesis predicting the maximum rank of cointegration to be four. Thus, both methods suggest the maximum number of cointegrating rank to be three. There are three ways by which the variables together move longer. Both tests reject the hypothesis of no cointegration at four. Thus, there is strong evidence that variables under consideration exhibit the long-run relationships. Evidence of cointegration in the model allows estimation of long-run model to capture the long-run dynamics of individual variable in the model.

3.2.4. Results of the Long-Run Model

This time we estimate the long-run elasticity with each regressor in reference to the response variable, which in our case is public spending on education. To obtain the long-run coefficients we have estimated the error correction model as it provides us with both the short and long-run results. Parallel to regression of the spending variable on all regressors involved, the long-run parameters were exactly identified and Johnson normalization restrictions were imposed. Table below reports the long-run coefficients:

Table (5): The Long-run Elasticity Estimation Results

Independent Variables	Coef.	Std. Err.	Z-value
$\Delta \ln \text{EDUEXP}_t$	-0.2345*	0.1009	-2.32
$\Delta \ln \text{RGDP}_t$	-0.6010	0.5130	-1.17
$\Delta \ln \text{CPI}_t$	0.9912**	0.2772	3.58
Con_	-7.35		
Cointegrating term (_ce1)	-1.15	0.2477-4.64	

Global Significance: $R^2 = 0.71$ $F(4, 24) = 437.61$ [0.0000] $DW(4, 29) = 2.29$

Validity Test: Heteroskedasticity: $\text{Chi}^2(1) = 0.21$ [0.6486]; RESET: $(2, 27) = 2.19$ [0.0847]

ARCH= 3.209 [0.0733]

Diagnostic Test

Jarque-Bera test: $\text{Chi}^2(8) = 45.052$ [0.86427]

Langerange multiplier test

Skewness test: $\text{Chi}^2(4) = 18.090$ [0.74290]

$\text{Chi}^2(L1) = 23.057$ [0.1122]

Kurtosis: $\text{Chi}^2(4) = 26.962$ [0.66784]

$\text{Chi}^2(L2) = 17.91$ [0.3287]

** & *, respectively, rejects the null hypothesis at 1% and 5 per cent.

Source: Authors' Compilation using Stata 14 based WB and IMF data (2020)

As indicated in as foot notes along with the long-run results, all of validity and VECM diagnostic conditions were tested robust. Regarding overall significance of our specification, the reported coefficient of determination ($R^2 = 0.71$) is fair enough in such a large observation time series analysis, where about 71 per cent of variations in the graduate unemployment has been explained jointly by inflation rate, economic growth and government expenditure

on education. Thus, our model predicts better about graduate unemployment growth rate in Ethiopia. Moreover, the significant F-statistic also guarantees the global significance of our regression model. Besides, none of the validity and diagnostic conditions has failed the test as indicated in table (5). Corresponding regression results are presented under the section for appendix.

The coefficient of error correction term (ECT) terms has a profound implication in times series analysis via VECM methodology. As presented in table (5) above, a negative and significant coefficient of ECT is suitable as required for vigorous stability in the system. An implication with the estimated coefficient of error correction term is that, there is stable equilibrium relationship between unemployment, public spending and RGDP and inflation variables in Ethiopia; and the reported coefficient reveals the speed of adjustment towards the long-term equilibrium point. Graduate unemployment rate adjusts about 115 percent of previous year systemic distortion this year. Thus, complete adjustment takes less than a year to restore the long-run equilibrium.

Evident from table (5) is a negative and strongly significant impact of public spending on graduate unemployment rate in the long-run, demonstrating the validity of the Keynesian theory to the context of Ethiopian economy. The long-run estimate clearly elaborates the effectiveness schemes for government expenditures in significantly reducing the proportion of graduate unemployment over longer period. The long-run elasticity of public spending on education was estimated at (0.23) and significant at 5 per cent level. Graduate unemployment bounces inversely to fiscal actions in reference to education sector, and that the reaction was found to be strong. In other words, a percentage point improvement in government spending on education significantly reduces the rate of graduate unemployment by about 23% of the previous year's level; and vice versa. This finding gives empirical support to Keynesian hypothesis, positing that government spending plays profound role in lowering unemployment (Keynes, 1936; Zoran, 2015; Mohseni and Jouzaryan, 2015; Casey, 2010; Anthanasios, 2013; and Kasau et al., 2015); hence by rising productivity it fosters economic growth. Besides, this particular finding is empirically consistent with most of the previous works; such as those of (Elvis, 2019; Matsumae and Hasumi, 2016; Umut, 2015; Joseph, 2016; Austin and Ogbole, 2014). It however contradicts to (Agboola et al., 2018; Attahir, 2016; Nwosa, 2014; and Laokulrach, 2013).

There is strong evidence that inflation upsurges the growth rate of job seekers. Inflation has been important in amplifying the long-run rate of graduate unemployment in Ethiopia. We estimated a positive and strongly significant coefficient for inflation variable (table 5), whereby challenging the Phillips curve premise in this piece of effort. Phillips curve tells us that, these two key macroeconomic indicators tend to vary inversely overtime (Mankiw, 2010; Snowdon and Vane, 2005; Alisa, 2015); but we found the result contradicting this claim to Ethiopia. From our results we see that, an increase in the rate of inflation gives rise to permanent graduate unemployment. Table (5) shows a 1% increase in inflation rate raises the rate of graduate unemployment by 99 per cent. The case may be explained in two ways; firstly, through its destructive implication to agents' purchasing power, consistent inflationary pressures might have been disrupting the growth of private investments and then, adversely affect private employment (Labonte, 2016; Kevin, 2008). Secondly, large inflation may lead to high job searching costs which majorities in LDCs are unable to afford (Mohseni and Jouzaryan, 2015; Berentsen et al., 2017; Hongo et al., 2019). Both cases could positively contribute to the long-run rate of graduate unemployment. Our finding, of course, is consistent among others to (Ayesha, 2013; Umair and Ullah, 2013; Karaçor et al., 2013; Tenzin, 2019; Vermeulen, 2017; Berentsen et al., 2017).

Economic growth has no role in determination of long-run graduate unemployment rate. The long-run elasticity of RGDP was estimated at (-0.60), but insignificant at even 10 per cent level. The impact of RGDP though irrelevant has a right sign in line with the Keynesian hypothesis. Keynesian economists hold that, increase in public expenditures through enhancing effective use of idle capacity and intensifying productivity could foster economic growth (Banda, 2016; Labonte, 2016; Tenzin, 2019). The growing economy, in turn, gives opportunity for farther employment growth and the system functions in the same passion creating externalities to those in need. The ineffectiveness of economic growth in reducing unemployment has been explained in relation to mismatches in the growth rates with both indicators. Economic advancements might have not been able to satisfy excessive growth in employment demand overtime. Yet, this finding is consistent to the findings of (Schubert and Turnovsky, 2017; Adarkwa et al., 2018; khrais I., and Al-WadiM., 2016).

3.2.5. VECM Short-run Estimates

We have estimated the short-run elasticity of graduate unemployment with respect to changes in public spending on education, economic growth and inflation rate employing VEC methodology. The short-run results are presented in the table below:

Table (6): VECM Short-run Regression Results

Independent Variable	Coef.	Std. Err.	Z-value
L1. Δ lnGUEMPT _t	-0.0907	0.1728	-0.53
L1. Δ lnEDUEXP _t	-0.1303	0.0883*	-1.48
L1. Δ lnRGDP _t	1.1893	0.6935	1.71
L1. Δ lnCPI _t	0.6687	0.3015**	2.22
Con_	-0.00420.0445	0.00	
Cointegrating term (_ce1)	-1.15	0.2477	-4.64

**&*, respectively indicate significance levels at 5% and 10% level

Source: Authors' Compilation using Stata 14 based WB and IMF data (2020)

The negative impact of public education has also persisted in the short-run, demonstrating its relevance in targeting graduating unemployment permanently. The short-run elasticity of graduate unemployment to changes in public spending was negative (-0.1303) and significant at 10 per cent (table 6). This further gives empirical support to the employment theory of Keynesian economists, conjecturing the effectiveness of government expenditures in reducing employment rate. In line with this hypothesis, we found negative and significant associations between public spending on education sector and the growth rate of graduate unemployment (Keynes, 1936; Casey, 2010; Anthanasios, 2013; and Kasau et al., 2015). Moreover, this result makes empirical consistency to ((Mohseni and Jouzaryan, 2015; Berentsen et al., 2017; Adarkwa et al., 2018; khrais I., and Al-Wadi M., 2016).

Table (6) evidences the persistent impact of inflation rate in the short run, signifying its dominant role in determination of graduate unemployment both in short too. A 1 per cent increase in inflation upheld the rate of graduate unemployment by 66.87%, which is the dominant effect in the short-run. The explanations for the positive impact would be as discussed under section (4.4) and conceptually sound across economies of least developed countries like Ethiopia. The persistent impact of inflation variable has also been confirmed by (Umut, 2015; Joseph, 2016; Austin and Ogbale, 2014; Agboola et al., 2018; Attahir, 2016; Nwosa, 2014).

Economic growth was found to have a trivial role in reducing graduate unemployment in the short-run. It may be that, while economic improvements influence only a few at early stages, soon have the economy been experiencing more graduates at various levels. Over longer time horizon, the initial economic benefits could be offset by highly trending rate of unemployment. The insignificant impact of economic growth both in the short and the long-run periods has been explained in two possibilities. Firstly, domestic production sector is not able to invite the growing employment demand significantly, and that domestic education may be supported more by external aids (Agboola et al., 2018; Attahir, 2016; Nwosa, 2014; Attahir, 2016; Nwosa, 2014). Besides, the government may not have given significant attention to reduce the continuously mounting graduate unemployment rates, just by allocating significant GDP share to education sector. The latter is less likely to Ethiopian context, where the government has been committed to reduce unemployment by placing exceptional focus to education sector. The short-run elasticity in relation RGDP growth rate was consistently reported by (Mohseni and Jouzaryan, 2015; Berentsen et al., 2017; Ayesha, 2013; Umair and Ullah, 2013; Karaçor et al., 2013; Tenzin, 2019; Adarkwa et al., 2018; khrais I., and Al-Wadi M., 2016).

3.2.6. VEC Causality Analysis for Public Spending on Education and Economic Growth Rate

Keynesian economists explain the relationship between public spending and economic growth through enhanced employment of idle capacity that could help achieve full-equilibrium in the long-run. The premise is that, increased employment increases the growth of economy; and in turn, fostered economy creates more employment opportunities. Towards testing this claim in the context of Ethiopia, we used corresponding cointegration

coefficients from VECM regression, following (Labonte, 2016; Tenzin, 2019; Zoran, 2015; Mohseni and Jouzaryan, 2015; Casey, 2010).

The coefficients of cointegrating equation in VECM regression, where each variable was individually endogenous is presented in the table below.

Table (7): VEC Causality of Expenditures on Education and Economic Growth

Null Hypothesis:	ECM	Z	Decision
Education expenditures does not granger cause economic growth	-0.096	1.26	Accept
Economic growth does not Granger cause education expenditure	1.28	2.58	Reject

Source: Authors' Compilation using Stata 14 based of WB and IMF data (2020)

In VEC granger causality analysis, the decision as to whether or not to reject the null hypothesis was based the reported coefficients of various ECT. From evidences in table (7), the null of no Granger causality from public expenditures towards economic growth has been accepted, due to the insignificant coefficient of corresponding ECT at five per cent level. But, there is evidence significant Granger causality from economic growth to government expenditure on the education sector. Consequently, there is forward uni-directional causality from economic growth towards public spending on education in Ethiopia. That means, no significant causal influence has been detected from public spending on education to RGDP growth, while causality was confirmed in reverse.

The revealed trivial causality from public spending would be a bit straight. In the first place, the forward causality results are in contrast to the Keynesian hypothesis. Though public spending was effective in reducing long-run rate of graduate unemployment, the economy didn't benefit from expanding participation of graduate. The case has been associated with several possibilities; firstly, the education system might have not been contributing to skill and productivity growth of individuals (Adarkwa et al., 2018; khrais and Al-Wadi, 2016). Secondly, the possibility of mismatches in profession and work assignments may prevent individuals from giving their best of effort (Zoran, 2015; Mohseni and Jouzaryan, 2015; Agboola et al., 2018; Attahir, 2016; Nwosa, 2014; Berentsen et al., 2017; Ayesha, 2013; Banda, 2016; Labonte, 2016; Tenzin, 2019). The first case is quality issue, while the second is more of policy and technical concern.

4. Summary, Conclusions and Recommendations

4.1. Summary and Conclusions

This study was intended basically to examine the impact of government education expenditure on graduate unemployment in Ethiopia for the temporal coverage spanning from 1991 to 2019. The World Bank and International Monetary Fund data bases were the exclusive sources of the time series data set used in the present analysis. The individual annual series of data collected include; government spending on education, the number of graduate people seeking a job, RGDP and the CPI variables. The unit-root properties of individual variables were examined employing the Augmented Dickey Fuller (ADF) test, and all variables were found non-stationary. But, sequential examination proved that all were difference stationary and the order of integration was one. Johnson's cointegration test was employed to determine whether or not the variable under consideration exhibit long-run relationship. Accordingly, the presence of at least three ways that the variables in the system move jointly has been suggested, while demonstrating the existence of stable long-term relationship between the variables. Then, the study employed the Vector Error Correction Model that simultaneously reports the long-run and short-run coefficients.

Findings from the long-run model estimation reveal that, public spending on education has a negative and significant impact on graduate unemployment rate. Besides, the VECM estimates have also confirmed a negative and significant impact of public education spending on graduate unemployment growth rate. The implication follows thus that, public spending has been effective in reducing graduate unemployment growth in Ethiopia. This absolutely gives empirical support to the Keynesian theory of unemployment in the context of Ethiopian economy.

Inflation was found to have been the dominant driver of graduate unemployment both in the short-run and the long-run. We found positive and strongly significant relationships between CPI proxied inflation and graduate unemployment rates consistently. This rejects the empirical validity of the Phillips curve to the context of Ethiopian economy. We can then conclude that, the education sector of Ethiopian has not been really productive, beyond producing thousands of graduates over the years. That is due to the fact effective education would have given real impetus to economic productivity and economic growth through enhanced skills, creativity and other benefits. If these hypothetical gains were true, productivity as well as productions would have boosted profoundly following climbing skilled and creative graduates every year. If it had been a case, inflation wouldn't have space at all. Moreover, the VEC causality analysis revealed a unidirectional causality from economic growth to public spending on education. No reverse causality was evidenced. The implication is that, the government of Ethiopia has been diverting a significant share of national income growth towards the education sector. Besides, the revealed trivial backward causality from public spending to the economic growth manifests that, those expenditures have long been unproductive. In conclusion, public spending on education has no longer been effective in targeting economic growth, except the revealed successes in creating job opportunities to significant proportion of graduates over the years. However, the causality analysis provides evidence those achievements in reducing graduate unemployment rates have no role beyond. An economic gain from rising graduate employment was found to be only trivial. It further reveals that, the education system of the country has not been effective in realizing the hypothetical benefits of education.

4.2. Recommendations

We suggest the following measures that would help target lower rate of graduate unemployment and as the same time achieve economic gains from widespread provision of higher education in Ethiopia.

- ❖ Since the government of Ethiopia has been effective, at least, in reducing the rate of graduate unemployment, the recent courtesy to the education sector should be strengthened. There is a need to look for alternative source of cheap funds that could supplement domestic effort in targeting the education sector. However, the pros and cons of external funds should also be given due concern.
- ❖ There is a need for drastic measures to improve the educational sector through adequate investment in education that will help in skills development and creativity. There is a need to either revise the curriculum or give exceptional emphasis on the way of delivery so as to realize the hypothetical gains from education. Established insignificant causality from education to economic growth demonstrates that, the country's education system was ineffective producing skilled labor force, beyond certifying thousands.
- ❖ Schemes to lower the rate of dynamic inflation are much helpful in reducing graduate unemployment. Yet, readjustment in the educational system of the country in a manner that could foster skill and productivity growth through its positive implication to real production is crucial to lower inflation as well as graduate unemployment rate. Price shocks associated with real production sector necessitate larger investments in agriculture. Thus, improved domestic as well as foreign direct investment undertakings in these sectors could help target lower rate of inflation; and hence graduate unemployment.

4.3. Suggestions for the Future Studies

Due to inadequate availability of time series data (especially for graduate unemployment rate) before 1991, the present study has considered only values from 1991 onwards for all variables under consideration. Therefore, we suggest for the future work to extensively search for any extended series of all the variables so as to arrive at better conclusion.

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