The Effect of External Debt on the Economic Growth in East Africa: ARDL Bound Testing Methodology

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Abstract To attain the maximum goal of sustainable economic development, the government needs a substantial quantity of capital finance via investment expenses on infrastructural and productive capability progress. Lack of sufficient capital due to low savings, majority of developing countries seek to borrow from an outside source to bridge the resource gap. East African country's external debt outline has augmented over the decade to attain economic growth but this has terminated to low economic performance as demonstrated by high unemployment, high inflation, and elevation of the poverty rate. This has informed the requirement to conduct the present study to examine the effect of external debt on economic growth in East Africa. Utilizing ARDL bound testing approach and fixed-effect model for the period 2011-2019. Empirical results from ARDL bound testing approach fail to detect a long-term relationship between variables. However, the fixed-effect model indicates a negative and insignificant impact of exterior obligation on economic progress. An export variable was insignificant. While labor force and gross capital formation have a positive and statistically significant effect on economic growth. Therefore, the negative influence is insufficient of proper management for the funds borrowed from an external source that utilized unproductive projects. Subsequently, the administration ought accurately to apportion its outside debt for industrious investment and sustain an effective and well-organized obligation management policy.

Keywords: public external debt, export, labor force, gross capital formation, economic growth, ARDL, fixed effect model

1. Introduction

It is a universally recognized detail and that majority of the third world and emerging states are faced with the scarceness of resources to finance key infrastructure projects in their nations. For such a reason, they frequently have to pursue treasuries from internal and external sources to complement their returns from taxes and earnings from other means, which are ordinarily little when equating with other industrialized countries. As a consequence of this situation, most emergent has to the hype of debts which continuously serve as an obstruction to economic evolution and prosperity in this parts of the world.

Nevertheless, outside debt is the main source of municipal incomes, and the accumulation of exterior obligations ought not to express sluggish economic development. Indeed, a nation cannot meet its debt obligation compounded by the lack of substantial information on the nature, structure, and magnitude of external debt, Were, [1]. Solude, [2] suggested that nations borrow for two main objectives; macroeconomic justifications to either finance superior investment or higher consumption and to circumvent hard budget constraints. Therefore, this indicates that an economy borrows to boost economic progress and alleviate poverty, and he demonstrates that when debt reaches a certain extent, it becomes have opposite influence, debt servicing becomes a huge burden and nations find themselves on the unpleasant side of the debt-laffer curve, whereby the debt crowding out investment and development.

However, it has become a well-known phenomenon that the profoundly appreciative nations, specifically in Sub-Saharan Africa (SSA), need debt relief ingenuities beyond mere rearrangement to have a turn-around in their economic act and contest in contradiction of poverty. The external debt levels have been on the intensification in the historical two decades, generating anxieties between forecasters and policymakers about impending obligation anguish intimidating the area. While Africa's existing outside debt ratios assume controllably, the fast development in various nations is of anxiety, UNCTAD [3]. In contrast, for the last decades, the East African Community (EAC) has witnessed a robust growth, where per capita income outperformed the one of Sub-Saharan Africa, Babu, et al, [4]. Also, according to IMF (2014), it indicated that EAC outlook has remained optimistic whereby it ranked among the fastest-growing regions

economically for the past decades. Despite the presence of high economic growth, public debt remains one of the major challenges particularly the economic policy issues facing the EAC governments.

Also, there have been certain concern's for rapid enlargement of government expenditures of EAC over the years, many individuals contributed to the use of borrowing as one of the options by these nations to cover the deficits of the national budget as well as to balance the financial flows of state and to finance state investment. Thus, the proliferating public debt magnitudes in the region as illustrated in Table 1 initiated a greater concern among policymakers as to whether the EAC nations accumulating government debt has been mainly attributed to enhancement state expenditure over the years that is not harmonized with rising government income or the possibility that the greater public debt level to lead the stifling of economic development in the region, whereby the member nations decide to make a tremendous effort toward deepening economic and political association in the region.

Table 1. External Debt of East African Community (National Currency Billions)

Year	Ethiopia	Kenya	Rwanda	Sudan	Mozambique
2011	861	102	146	211	649
2012	105	119	181	218	747
2013	126	138	231	225	132
2014	170	169	291	218	137
2015	205	198	345	214	143
2016	235	211	432	211	144
2017	262	262	483	217	160
2018	278	307	542	215	188
2019	283	342	621	222	203

Source Data: World Development Indicators.

Nevertheless, those demonstrate that the external debt has a positive impact on the economy do that from the point view that the external debt will enhance capital inflow, when utilized for productive ventures, accelerate the foundation of economic growth, and that capital inflow might be linked with managerial know-how, technology, and individual innovators well as the capacity to interact the foreign market. Thus, the above suggestions are in line with the view of the Keynesian Theory of capital accumulation as a catalyst for economic progress. For instance, this outcome was confirmed by the significant growth of Southeast Asian, and South American nations, whereby they were able to transform their economy using external debt, Momodu, [5]. However, external debt may have a negative influence on investment via debt overhang and credit-rationing problems, which will harm economic development, Eduardo [6].

The proliferation fiscal deficit driven by the superior level of external debt servicing is the main threat to the growth of EAC, whereby a large accumulation of debt exposes the countries to a high debt burden. Not only that, most of the sampling countries suffer other macroeconomic downturns, such as high inflation, unemployment, poverty, lack of foreign investment, poor regulatory quality, and high corruption practice. Therefore, the study pursues painstakingly and empirical postulate the significant impact of East African country's external debt on their

economic development and state a logical summary. The outcome of this study will be substantial due to policy recommendations that will be offered based on its results. The upcoming section reviews several sections of literature, subdivision three focuses on the approach, and segment four displays the data analysis and clarification, while the final subdivision offers the inference and commendations.

2. Literature Review

2.1. Theoretical Literature Review

There is no clear theoretical or empirical clarification for the debt progress relationship, and the major aspects of both theoretical and empirical results indicated a negative association. The Harrod-Domar evolution model offers the greatest fundamental link among savings and the rate of economic development, whereby based on the model capital buildup in the procedure of investments is vital for development. Outside debt is perceived as wealth assisting to close the financial gap in developing nations to promote economic progress, Eaton [7]. However, the literature has stated five canals via which exterior debt might influence progress negatively. Firstly, the obligation overhang hypothesis can be well-defined as a condition in which the estimated reimbursement on foreign debt reductions short of the votive worth of the obligation, Krugman, [8].

Also, debt overhang can be dived into two major segments namely, the narrow traditional and broader versions. Next, there is a crowding-out impact of outside obligation. Debt overhaul weight on regime declines public expenditure, counting expenditure on social savings including health and education which are essential for economic output. Also, an enormous obligation burden indicates that administration short tern income must be utilized to facilitate debt, thus crowding out community investment into the economy, Yiagadeesen & Serieux, [9]. Thirdly, the growing influence of different high debt burdens via the equilibrium of expenditures account is referred to as liquidness restriction hypothesis or import comparison influence. Finally, it's essential to mention that the debt-growth canal can be traced to the straight influence of the debt assumption as postulated by Fosu [10]. Therefore, obligation overhang, the crowding-out impact, and liquidness limitation postulates indicate an indirect harmful influence of exterior debt on the economic progress via decreasing investment level.

2.2. Empirical Literature

Many prior researchers investigate the nexus between outside obligation and economic evolution, and most of those studies found inconclusive findings. Therefore, the following studies found a positive link between external debt and economic growth. For instance, a study made by Alwi et al [11] examined exterior debt and economic development in Malaysia, from 1977 to 2016 using Autoregressive regressive disturbed lag, Bound testing, and cointegration. The research initiates a positive association between external obligation and economic development. Morobh [12] investigated external debt and

economic growth in Tanzania, from 1970 to 2015 utilizing the Granger causality, cointegration, and ordinary least square. Empirical results indicated that the external debt stimulates the economic output during the study period.

Likewise, Matuko and Asafo [13] postulated external debt and economic output in Ghana, from 1970 to 2017, using cointegration, unit root test, and error correction term. Findings showed that external debt has a positive and statistically significant impact on the economic growth of Ghana. Ndubuisi [14] examined external debt and economic growth in Nigeria, from 1985-2015 employing ordinary least square, augmented Dickfullary test, Johansen cointegration, and error correction term. Results showed that external obligation has a positive and statistically substantial influence on economic progress.

Furthermore, the study made by Udeh and Onwuka [15] postulated outside debt and economic evolution in Nigeria, from 1980-2013 employing ordinary least square, augmented Dickfullary test, cointegration, and error correction term. The study found that external debt had a positive relationship with the gross domestic product in the short run. Kasidi and Said [16] investigated exterior obligation and economic development in Tanzania, from 1990 to 2010 using cointegration. The external debt was institute to have a positive and significant effect on economic progress throughout the study epoch. According to, Sulaiman and Azeez [17] postulated outside obligation and economic progress in Nigeria, from 1970 to 2010 using ordinary least square, augmented Dickyfullery test, unit root, and error correction term. Results from the error correction method indicated that the outside obligation has donated positively to economic growth.

On the other hand, various empirical papers institute a negative association between outside obligation and economic development. To illustrate, the study made by Munasinghe [18] investigated external debt and economic growth in South Asian countries, using an autoregressive disturbed lag. The study found that external debt has a negative and statistically significant influence on economic growth. Kharusi and Ada [19] postulated external debt and economic in Oman, from 1990 to 2015 using autoregressive disturbed lag and error correction term. Empirical findings showed a negative and significant impact of external debt on economic growth. Akinwunmi and Adekoya [20] examined external debt and economic output in Nigeria, from 1985 to 2015 using ordinary least square, augmented Dickyfullery test, and cointegration test. The study found that external debt has a negative influence on economic growth. Similarly, a study made by Senadza et al [21] postulated outside obligation and economic evolution in SSA nations, from 1990 to 2015 employing a generalized method of the moment. The study displayed a negative affiliation amid external obligation and economic evolution. Olasode and Babtunda [22] examined exterior debt and economic progress in Nigeria, from 1984 to 2015 using autoregressive disturbed lag, unit root, and cointegration. The study found a negative effect of outside debt on economic progress.

Nevertheless, a study made by Mowlaei and Golkhandan [23] examined external debt and economic growth in Iran, from 1980 to 2011 using Johansen cointegration and vector error correction terms. Empirical results indicate that external obligation has a negative and statistically significant influence in the long run and short run. Malik and Hayat [24] postulated exterior debt and economic evolution in Pakistan, from 1972 to 2005 utilizing ordinary least squares. Findings revealed that outside obligation is adversely and considerably associated with the economic output. Likewise, Ayadi & Ayadi [25] studied external debt and economic output, using ordinary least square and generalized least square. The negative impact of obligation on economic development is confirmed in the short run. According to, Mohamed [26] postulated exterior debt and economic output in Sudan, from 1978 to 2001 using ordinary least squares. The study found that the external debt deters economic development during the study period. Were [1] investigated external debt and economic development in Kenya, from 1970-1995 utilizing ordinary least square. Empirical outcomes revealed that exterior debt buildup has an undesirable impact on economic development.

Table 2. Literature Review for Developing Countries

Study	Country	Period	Method	Results
Govdeli [27]	Turkey	1970-2016	ARDL bounds Testing	External debt has a positive impact on economic growth
Huseyin [28]	Turkey	1970-2014	Causality Tests	External debt harms economic growth
Umutlu et al. [29]	Turkey	1990-2008	Ordinary Least Square	External debt has a positive influence on economic growth
Cicek et.al. [30]	Turkey	1990-2009	Regression analysis	External debt has a negative influence on economic growth
Senadza et.al. [21]	SSA	1990-2013	Generalize Method of Moment	The study found a negative effect of external debt on economic growth
Abdullahi et al., (2016) [31]	Ghana	1970-2104	Autoregressive Disturbed Lag	The study indicated a significant positive influence of external debt on economic output
Kasidi & Said, [16]	Tanzania	1990-2010	Cointegration, Vector Error Correction	The findings showed that external debt impact positively on the economic progress
Mwaba [32]	Uganda	1990-2010	Ordinary Least Square	Empirical findings displayed the negative impact of external debt on economic growth
Were [1]	Kenya	1970-1995	Ordinary Least Square	The findings revealed the negative influence of external debt on economic output

Source: Authors Computation.

3. Methodology

3.1. Data and Method of Analysis

The study utilized data that are secondary. The panel data was extracted from the World Development Indicators (WDI) from the World Bank Data site from 2011-2019. The approaches of investigation or estimate methods comprise the Ordinary Least Square (OLS) method, Augmented Dicky-fuller (ADF) Unit Root test, Bound Co-integration test, Normality Test, Serial Correlation LM Test, Heteroscedicity Test, Omitted Variable Test, Stability Test, and Hausman test.

3.2. Model of Specification

To examine the influence of outside obligation on economic development in East Africa countries, and exposed macroeconomic archetypal is stated subsequent Chongo, [33]; Getinet and Ersumo, [34]. The study hypothesized that external debt has a significant impact on the economic growth in East African Community (EAC). The model proxied Gross Domestic Product (GDP) as the endogenous variable to quantity economic development while Exterior Obligation (EX), Export (EXPT), Labor Force (LF), and Gross Capital Formation (GCF) represent the exogenous variables. Thus, before proceeding the coefficient in the model are B_1, $B_2 > 0$ while B_3, $B_4 < 0$.

The econometric form of the model is specified as; GDP = f (EXD, EXPT.LF, GCF)

The econometric equation becomes;

$$GDP = B_0 + B_1EXD + B_2EXPT + B_3LD + B_4GCF + e \ (1)$$

Where;

B_0 = intercept of relationship in the model/ constant
B_1-B_4 = Coefficient of each exogenous variable
e = stochastic or error term

3.3. Autoregressive Disturbed Lag

The study utilizes the Autoregrresive Disturbed Lag (ARDL) method or bond testing cointegration established by Pesaran & Shin, [35] and Pesaran et al., [36] to forecast and inspect long-run association amid the variables in the model(co-integration) and the ECM to scrutinize the impact of outside debt on the economic output in short-run(short-run dynamics). The ARDL approach has both lagged standards of the dependent variable (autoregressive) and lagged values of the independent variables (disturbed lag) as one of the illustrative variables. The ARDL or bound testing technique has various benefits over the other methods. First, the method is an abridged sole equation approach that can be applied to a small sample magnitude. Contrarily to this, the Engle-Granger approach and Johansen co-integration method forecast the long-run affiliation from a system of equations and are impartially data-concentrated. Shin & Pesaran [37] this method fallouts in unprejudiced estimates in the long run, and likewise the evaluations obtained are comparatively more effective for finite and slight sample magnitude. Certainly, this evades the complications that come as a consequence of serial connection and endogeneity [36].

Subsequent, the ARDL approach is pertinent even when the regressors are virtuously I (0) or 1(1) or reciprocally incorporated; so that it circumvents the unpredictability linked with the prior-examining for the order of incorporation of variables under the investigation. Lastly, when lag instruction of the model is received, it warrants the co-incorporation relationship to be estimated by using the OLS technique, similarly is obliging to make a difference among dependent and other explanatory variables, which endures investigating whether a long-run affiliation exists between them. In addition, in ARDL the short-run and long-run constants of the model are forecasted concurrently Pesaran & Shin. [35]. consequently, the ARDL approach to co-integration involves predicting the unimpeded ECM and it has been concluded the consequent set-up by Pesaran et al., [36]:

$$\Delta GDP = \beta0 + \beta1\Delta EXDt + \beta2\Delta EXPTt$$
$$+ \beta3\Delta LFt + \beta4\Delta GCFt + \beta5(GDP)t-1$$
$$+ \beta6\Delta(EXD)t-1 + \beta7\Delta(EXPT)t-1 \quad (2)$$
$$+ \beta8(\Delta LF) + \beta9(GCF)t-1 + ECTt-1$$

ECTt-1 is an error correction term lagged by one period.

The maximum lag criteria examination has been piloted by estimating single equation Vector Autoregressive and via the lag dimension criteria has been performed following Akaike Information Criterion (AIC) to get the highest possible lag number of each variable. Indeed, this was tracked by the forecasting of a single equation unrestricted ECM with the number of selected lags are demonstrated in equation (3). However, this equation is quite different from unimpeded ECM in equation (2) which consists of only lags of entire the variables including the dependent one.

$$\Delta GDPt = \beta0 + \sum_{i=0}^{p} \beta1\Delta(GDPt)-i + \sum_{i=0}^{p} \beta2\Delta(EXDt)-i$$

$$+ \sum_{i=0}^{p} \beta3\Delta(EXPTt)-i + \sum_{i=0}^{p} \beta4\Delta(LFt)t-i$$

$$+ \sum_{i=0}^{p} \beta5\Delta(GCFt)t-i + \beta6(GDPt)t-1 \quad (3)$$

$$+ \beta7(EXDt)t-1 + \beta8(EXPTt)t-1$$

$$+ \beta9(LFt)t-1 + \beta10(GCFt)t-1 + Vt$$

The F-statistics is institute by piloting the Wald test on the coefficient of unhindered ECT variables. It is also essential for analyzing the presence of a long-run association in the model and equated with Pesaran critical value at a 5% level of significance. Hence, if the result of F-statistics is overhead the upper bound value, we cast-off the null hypotheses of no cointegration between variables, nevertheless if it cascades under the lower bound value, we do not discard the null hypothesis of no cointegration and if it mendacities among the bounds, the outcomes are indecisive [35]. Once it is recognized that variables are cointegrated suggesting that there is a long-run or steadiness link among them, in the short-run, there may be instability. Thus, an error correction instrument is utilized to accurate the uncertainty. Therefore, once there is a validation of a long-run affiliation or co-integration of the

variables, the dynamics of the short-run can be derived by estimating ECT with underlined lags are shown in equation4.

$$\Delta GDPt = \beta 0 + \sum_{i=0}^{p} \beta 1 \Delta (GDPt) - i$$
$$+ \sum_{i=0}^{p} \beta 2 \Delta (EXDt) - i + \sum_{i=0}^{p} \beta 3 \Delta (EXPTt) - i \qquad (4)$$
$$+ \sum_{i=0}^{p} \beta 4 \Delta (LFt)t - i + \sum_{i=0}^{p} \beta 5 \Delta (GCFt)t + \delta ECTt - 1$$

Where;

Δ can be considered the first variance operator; p is the maximum lag span entire other variables continue the similar in the archetypal; ECT is the error correction term; δ in equation 5 symbolizes the speed modification while the additional constants ($\beta 1$, $\beta 2$, 3 ... $\beta 5$) of the short-run equation are coefficient linking to short-dynamics of the facsimiles convergence to equilibrium

The error correction term i s well-defined as in the succeeding equation (5):

$$ECTt = \Delta GDPt - \beta - \sum_{i=0}^{p} \beta 1 \Delta (GDPt)t - i$$
$$- \sum_{i=0}^{p} \beta 2 \Delta (EXDt)t - i - \sum_{i=0}^{p} \beta 3 \Delta (EXPTt)t - i \qquad (5)$$
$$- \sum_{i=0}^{p} \beta 4 \Delta (LPt)t - i - \sum_{i=0}^{p} \beta 5 \Delta (GCFt)t - i$$

3.4. Diagnostic Test of the Model

To exam for stationarity of a unit root test was performed using the Augmented Dickey-Fuller (ADF), (1981) [38], in this study. For example, if the variables in the model are non-stationary, it will finish with bogus regression and the examine statistics turn out to be asymptotically nonstandard. However, even if bound testing doesn't require prior examination for a unit root, in the circumstance of I (2) variables, the entire F-statistics for the existence of co-integration is not justifiable based on the suggestion of [36]. Thus, a unit root examination is in the ARDL approach might motionless be essential to guarantee that none of the variables is assimilated of order two or yonder. Hence, it's vital to understand that bound testing is established on the hypothesis that the variables are I (0), I (1), or a combination of the two, but beyond that is unacceptable. Then, the calculation was linked with Mackinnon's [39] critical values to conclude whether the series is stationary or not.

The ARDL approach goes via two steps for forecasting the long-run association prior we recognize the order of integration of entire variables [36]. First, a presence of a long-run link between all variables in the archetypal necessities is to be scrutinized. Second, the long-run and short-run constant of the variables would be projected. Therefore, we perform the next step if there is a long-run co-integration affiliation between the variables in the first stage.

Thus, the variables of curiosity in the ADF exam would be δ and the assumption (null and alternative) for the investigation has been displayed in the next format:

H0: $\delta = 0$ (i.e. it designates a unit root, and the series is non-stationary);

HA: $\delta < 0$ (i.e. it signposts no unit root problem and the series is stationary).

To conclude the lags of every variable in the ARDL archetypal, the Akaike Information Criterion (AIC) was utilized as this criteria is frequently suggested for a sample extent fewer than 80.

3.4.1. Normality Test

For analysis in the case, the series is ordinarily disseminated or not, Jarque-Bera normality exam statistic was utilized. Therefore, in the test statistic, the variance of both kurtosis and Sweness of the series from the standard dissemination was quantified. Hence, if the possible value of Jarque-Bera statistics is lesser than the 5% standard level, then the residuals are not normally disseminated, but if the probability worth of the test is greater than 5%, then we can conclude that the residuals are normally distributed.

3.4.2. Autocorrelation Test

The Breush-Godfrey serial correlation LM test was used for investigating the problem in the current study. For instance, if the likelihood value is lower than 5%, then we can discard the null hypothesis that shows that the archetypal has a serial correlation issue, or in other words, there is no serial correlation. However, if there is a serial correlation issue it can be detached from the archetypal by generating a one-period lag of the dependent variable or altering all the variables into the main variance [40].

3.4.3. Heteroscedasticity Test

Heteroscedasticity is a complication when the discrepancy of the errors is not continuous and vicissitudes over time. Indeed, this study employed the Breush-Pegan-Godfrey experiment to investigate the existence of heteroscedasticity. Therefore, if the possible value is lower than 5%, then the archetypal has a heteroscedasticity issue and vice versa.

3.4.4. Omitted Variable Testing

To examine for the variable omission, the study utilized the Ramseys Reset approach for mislaid variables. It exams in case the archetypal agonizes from omitted variable error or not. The judgment law is then to castoff the null hypothesis if the p-value is below the conservative significance worth of 5%.

3.4.5. Stability Test

The steadiness examination of the long-run coefficients utilized in this paper was CUSUM. The test figures scheme in contradiction of the critical bound of 5% significance. Therefore, if the conspiracy of these statistics leftovers inside the critical bound of the 5% level of significance, the null hypothesis that the collusive vector is identical in each epoch would not be disallowed. That is, entirely constants in the error correction archetypal are steady.

3.4.6. Hausman Test

Hausman test which was established by Huasman, [41] was intended to resolve whether to utilize fixed or

random-effect models. The experiment is indomitable to stipulate the influences specification that would harvest the maximum operative constant approximations in the model. Thus, the fixed-effect regression model allows the intercept to vary, however, it does not alter over time. Contrarily, the random-effect model bunches the cross-section and produces a mutual mean value for intercept. Hence, the Hausman test postulates the null hypothesis that indicates the random-effect model as precise against the alternative hypothesis which displays the fixed-effect model as a proper model.

3.5. Variables and Working Hypothesis

3.5.1. Dependent Variable

Gross Domestic Product (GDP): The GDP progress rate quotas the yearly economic development of a given country.

3.5.2. Independent Variables

External Debt (EXD): it indicates a nation's incapability to encounter its outside debt commitments that adversely impact economic wealth and result from obligation overhang, Shabbir [42]. The greater proportion emphasizes a nation is not manufacturing sufficient to pay off its obligation and a subordinate proportion indicates hefty economic progress to make the expenditures. Therefore, we expected this variable to hurt the economic growth [18,21].

Export (EXPT): exports are goods and services that are produced in one nation and sold to buyers in another country. Thus, many economists believe that increase in export leads to an increase in economic output because export directly links to economic development. This variable is anticipated to positively impact economic evolution [43,44].

Labor Force (LP): Labor force participation frequency refers to the active populace, who yield goods and services to fulfill their requirements of the society. Most emerging nations faced the problem of low labor force participation. Contrary, various studies show that there is a robust association between economic progress and labor force participation rate. Thus, we expected the positive influence of the labor force on economic growth, because the highly skilled labor force tends to enhance the output [45].

Gross Capital Formation (GCF): Capital formation refers to the net accompaniments of the stock of capital in the economy, which represent the real scenario of the level of investment, and investment aids to enlarge the productivity capacity which enhances the potential output. Therefore, the proxy of this variable is anticipated to positively influence economic evolution [46].

4. Result and Discussions

4.1. Unit Root Test

In panel studies, substantiating for stationarity is a precondition to escape false regression in the archetypal and therefore we require to check in case the variables are not assimilated of order two or beyond. If there is a unit root, it shows that the series underneath exploration is non-stationary whereas the deficiency of a unit root indicates that the stochastic procedure is stationary. Thus, in the ARDL archetypal, the existence of I(2) variables is no longer usable because they are established on the hypothesis that the variables I(0) or I(1). In the ARDL model, the normal Augmented Dickey-Fuller (ADF) was employed to check the instruction of assimilation of the variables. Therefore, if it's institute to be integrated of order two or beyond it is intolerable to apply a bound testing technique to the cointegration test. Table 3 displays the outcome of the ADF test.

Table 3. The Augmented Dickey-Fuller (ADF) unit root test outcome

Items	T-Statistics	Probability	Stationary
ADF Statistics	-3.124421	0.0319	I(0)
1% level	-3.588509		
5% level	-2.929734		
10% level	-2.603064		

Source: Authors computation.

Nonetheless, in the refutation of the null hypothesis verdict rule is grounded on ADF critical worth, and the judgment rule is to cast-off the null hypothesis if the outright value of t-statistics is higher than the critical one, and if this is the incident we can conclude the variable is stationary or has no unit root, but, obtain the null hypothesis if the utter value of t-statistics lower than the critical worth which demonstrates the non-stationary of variables. For example, we can see in our model that the outright figure of t-statistics which is -3.124421 is higher than the 5% level of -2.929734, thus we can conclude our model is stationary at level or I(0). The result of the ADF unit root is coherent for employing the ARDL method bounds test technique of co-integration established by Persan et al., [36].

4.2. Model Diagnostic Tests

Picking the optimum lag span of every variable in the model is essential. Mentioning this, Shine & Pesaran, [35] elucidated that for trivial sample yearly data, a highest of two lag lengths is suggested for the variables. Therefore, for that reason, Akaike Information Criteria (AIC) was utilized, and as a result, a supreme lag length of 1 was designated for the provisional ARDL model in this paper. The AIC designated the optimum lag span of every variable in the archetypal (LGDP, LEXD, LEXPT, LLF, and LGCF) as ARDL (1, 0, 0, 0, and 0). This specification of lag length allows us to obtain a valid outcome and accurate implications in the model. However, in this study different analytical experiments were performed for reliability and authentication of the forecasted long-run and short-run models. Therefore, executed experiments comprise the followings: Normality (Jaque-Bera test), functional form(Ramseys Reset test), serial correlation (Breusch-Pagan LM test), Heteroscedasticity (Breush-Pagan-Godfrey test), and CUMSUM recursive residuals were also carried out to ensure the entire steadiness of the long-run and short-run constants as suggested by Pesaran et al., [36].

Table 4. Diagnostic tests of the model

| Test statistics	LM Version	F Version
1: Serial Correlation	1.0608(0.3097)	$F(1,37) = 0.2122(0.9552)$
2: Functional Form	1.0413(0.304)	$F(1,39) = 1.0844(0.304)$
3: Normality	12.7608(0.1694)	Not appropriate
4: Heteroscedasticity	1.1246(0.3779)	$F(14,30) = 1.1255(0.3889)$
5: Hausman	P-Value =(0.0035)	Not appropriate
1: It is the Lagrange multiplier test of residual serial correlation		
2: This is the Ramseys RESET test outcome utilizing the square of the fitted values.		
3: It is based on a test of Skewness & Kurtosis of residuals in the model		
4: This is based on the regression of Squared residuals on Squared fitted values.		

Source: Authors Computation.

From Table 4, we can perceive that both the LM and F version of the figures are not adequate to discard the null hypothesis indicated for every test. The results confirm that there is no serial correlation issue, and the null hypothesis of no serial correlation of LM test is abortive to be disallowed due to that the p-value allied with the test statistics is larger than the usual significant level (0.309>0.05). Thus, the LM exam for the serial association is employed since it tenacities the disadvantage linked to the customary Durbin Watson examination static that is not appropriate once the lagged value of the dependent variable is amalgamated as a repressor in the archetypal. Additional, the Ramsey Reset test hypothesizes in case the archetypal agonize from omitted variable bias, and we failed to reject the null supposition of the Ramsey Reset method which elucidated that the model is correctly designated, it's due to the likelihood value being higher than the conservative significant value of (0.304>0.05). Therefore, this result indicates that the model did not have any omitted variable bias, and it's well specified. In contrast, other tests that we carry out consist of heteroskedasticity, and the result of the study showed that the errors are ordinarily disseminated and the archetypal doesn't experience the heteroscedasticity problem. Thus, we can see from the outcome, the null hypothesis of no heteroskedasticity is abortive to be disallowed at a 5% significant level since its p-value related is higher than the normal significant level (0.3779>0.05).

Moreover, the normality test of Jaque-Berra the study abortive to castoff the null supposition that the residuals are ordinarily disseminated because that the p-value related to the test is superior to the conservative significant value of 0.05(0.1694>0.05). Moreover, we performed Hausman, [41] to select the most accurate model in our study between random and fixed-effect models, and from the outcome of the test, it indicates the suitability of the Fixed Effect Model (FEM), after rejecting the null hypothesis and accepting alternative one based on the significant level of p-value which is (0.0035).

In addition, the durability of the archetypal for the long-run and short-run link has been identified utilizing Cumsum as recommended by Pesaran & Shin, [47] and in the exam results if the cumulative number of leftovers within between the two critical streaks the null hypothesis of the modification requirement of the model can be putative, but if the overall goes beyond between the two critical bounds there is survives sequence stricture instability issue. Thus, in our study, the Cusum of the residual are instituted inside the restrictions of the 5% significant critical bounds and it has been extended on the deduction that there is no basic unsteadiness in the model. Indeed, the model assumes to be so robust, steady, and highly effective in forecasting the short-run and long-run association among the dependent variable and the encompassed regressors. Thus, we can observe the result from the below graph.
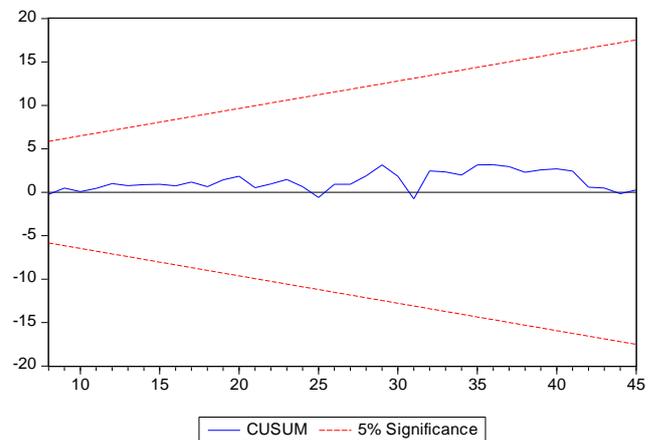
Figure 1. Cusum Result via E-Views (Source: Authors compilation)

4.3. Testing for the Long Run Link

In the procedure of utilizing the bounds testing method of co-integration, initially forecasting the ARDL archetypal indicated is obligatory. The value of f-statistics is institute through the Wald-test steered by authoritative constraints on the projected long-run constants of variables. Previously, the calculated F-statistics value is related to the inferior bound and higher bound critical values tabulated in tables of Persan et al [36] and Narayan [39]. Consequently, the inferior and superior bound values of Narayan [48] were institute suitable for trifling sample dimensions amid 30 and 80 annotations; subsequently utilized in this study.

In Table 5, the calculation of all F-statistics is indicted to be lower than the higher bound critical values at a 5% level of significance. Also, the outcomes show there is no long-run affiliation or co-integration among GDP, external debt, and other explanatory variables in the model since F-statistics are lower than both upper and lower bounds. However, we don't discard the null hypothesis but we proceed with estimating the short-run model which is Autoregressive-disturbed lag in the study.

Table 5. F-statistics for bound testing the Presence of Long-Run Association

Dependent variable	F-Statistics	Lower Bound I(0) %5	Upper Bound I(1), %5	Cointegration	Optimal lag in the model	Number of observation
LGDP	2.784184	2.86	4.01	No Cointegration	1	43
LEXD	1.622120	2.86	4.01	No Cointegration		
LEXPT	1.020256	2.86	4.01	No Cointegration		
LGCF	1.929536	2.86	4.01	No cointegration		
LLF	0.940436	2.86	4.01	No cointegration		

Source: Author Computation.

Table 6. Result of Short-run Model Specification for the preferred ARDL (1, 0, 0, 0, 0,) Model

Independent Variables	Coefficient	St.Error	T-Statistics	Probability
		Dependent Variable= DGDP		
D(LEXD(-1))	-0.081245	0.251839	0.322607	0.7488
D(LEXPT(-1))	0.186439	0.483326	0.385741	0.7018
D(LLF(-1))	0.489088	1.595479	0.306546	0.7609
D(LGCF(-1))	-0.000278	0.593614	-0.000469	0.9996
D(C)	-0.024058	0.052504	-0.458222	0.6494
R-Squared 0.0111	Adjust R-Squared -0.92983	F-Stat 0.1067(0.9794)	Durbin-Watson Test 2.3174	

Source: Authors Computation.

4.4. A Short-run Constant of ARDL Estimations

From Table 6 results endorsed that the dependent variable was well elucidated by the variables including in the archetypal, whereby the adjusted R-Squared revealed about 92% of the short-run dissimilarity in the dependent variable which is GDP is projected by the control variables in the model. Additionally, the replicas competence has been inspected by the F-statistics and based on the outcomes of P-value (0.9794) of the F-statistics specifies that the whole model was insignificant to elucidate the relationship. However, the Durbin-Watson experiment figures of (2.3174) showed that there is no series autocorrelation problem in mode1.

On the other hand, from the short-run outcome, the variable LEXD has a negative coefficient but is statistically in-significantly associated with the economic growth of East African countries during the study period. This is in line with the study made by [49,50,51] whose institute no clear association between outside debt and economic output. Similarly, other explanatory variables including LEXPT and LLP reported a positive coefficient but were statistically insignificant, while LGCF documented a negative coefficient but remain statistically insignificant. Therefore, the overall results indicated the nonexistence of any affiliation among the dependent variable and other explanatory variables regarding the short-run model of specification ARDL.

Table 7. Descriptive Statistics and Variance Inflation Factor

Variable Name	VIF	Mean	Minimum	Maximum
LEXD	1.47	10.0999	9.1646	10.5342
LEXPT	1.69	1.1826	0.8825	1.6520
LLF	1.91	1.8620	1.6963	1.9292
LGCF	2.16	1.4181	0.9165	1.7323
Mean VIF	1.81			

Source: Authors Computation.

Table 7 displays the descriptive statistics and variance inflation factor, therefore based on the result of variance inflation factor we can detect the deficiency of multicollinearity issue among the control variables since most values are below 10 percent. Farrar & Gluaber [52] demonstrated that if the value is below 10 percent it shows the absence of multicollinearity problem between the explanatory variables utilized in the study. Contrarily, descriptive statistics highlighted the average value among countries export hold the least value which is 0.88 while external debt has the maximum value which is 10.53.

Table 8. Regression Results

Items	Fixed Effect Model(FEM)
LEXD	-18000(0.828)
LEXPT	0.20809(0.103)
LLF	1.8056(0.005)**
LGCF	0.2345(0.016)**
-Cons	-139.9061(0.005)**
Observation	45
Adjust R-Square	0.0684
F-stat. F(4,36)	3.58(0.0148)**

Source: Authors Computation. *, ** and *** indicate the significant level at 10%, 5%, and 1% respectively.

Concerning the results of table-8 inveterate that the dependent variable is highly explained by the variables containing the model. To illustrate, adjust R-square displays that about 68% of variations of the dependent variable are elucidated by the explanatory variables in the archetypal. While the model capability has been inspected by the F-statistics whereby the P-value of (0.0148) of the F-statistics designates that overall the archetypal was significant and clarifies the association quite well.

However, the external debt variable has a negative and statistically insignificant influence on the economic growth of the East African region during the study period. Indeed, this is in line with the study made by [49,50,51]. There could be various reasons that could cause negative and insignificant relationships of both variables. For instance, most of the countries in the sample incurred a huge external debt, but those funds didn't go to the ideal

projects that could contribute positively the economic development. Fajana [53] suggested that incurring outside obligation is not a bad option, however, the problem ascends from mishandling of those funds. Also, the obligation overhang concept of Krugman [8] postulated that gigantic borrowing results in extraordinary appreciation, debt traps, and slows turn economic output.

Likewise, the export variable has a positive coefficient and is statistically insignificant which indicate the lack of internationalization of those nations, although most of the countries in the region characterize the export of agricultural products it's clear that they still lack behind when it comes to the exportation of goods and service at international markets, and this undoubtedly required a clear policy that motivates local producers and prevents them to face various obstacles including access to finance, usage of the latest technology, offering efficient training, social justice, and implementation of rules and regulations in a fair manner.

In contrast, the labor force has a positive and statistically significant impact on economic development, and this emphasizes that a one percent increase in the labor force will lead 1.8056 increase in economic development. Therefore, this is consistent with the study made by Ejaz, [54]; Mujahid and Zafar [55] for developing nations. Finally, gross capital formation has a positive and statistically significant effect on the economic growth of the region. To illustrate, a one percent upsurge in gross capital formation will lead to 0.2345 enlargements of economic growth. Therefore, this is in line with the study made by [36].

5. Conclusion and Policy Implications

This study aims to investigate the impact of outside debt on economic development in East Africa countries which is an essential economic subject that continuously fascinates the consideration of policymakers with the view to extending accurate policy measures that will diminish the adverse impact of exterior obligation and subsequently improve the economic growth which will lead a positive insinuation on poverty.

Nevertheless, we utilized an exposed macroeconomic archetypal which contains (LGDP, LEXD, LEXPT, LLF, and LGCF). The study period covers from 2011 to 2019. Utilizing an ARDL bounding testing approach; we were not able to create a long-run affiliation among the variable used in the model. Similarly, the estimation outcome of the short-run ARDL model failed to detect a short-run association among the variables. However, regarding the fixed-effect model, it shows outside debt (LEXD) has a negative and statistically insignificant influence on economic progress. Therefore, this might justify the presence of debt overhang influences in the region and therefore might require to have proper policies on regulating external debt burden to ensure economic output in the region. Gross Capital Formation (LGCF) and Labor Force (LLF) were the only variables found to be positively significant respectively in effecting economic development for East African Community (EAC) member countries at a 5% level of significance correspondingly. While the export variable was institute to be statistically insignificant.

Therefore, the findings determine that the EAC nations economic expansion was impacted by the gross capital formation and labor force, careful deliberation must make for any policies that might influence these two variables.

To sum up, debt management and debt reducing strategies should be implemented by EAC member nations to enhance economic development. Public debt consistency policy should be arranged and implemented as they will aid and facilitate economic progress. Similarly, gross capital formation and labor force should be stimulated by promising political stability and an effective regulatory system so that investors feel comfortable investing. Also, governments of EAC nations require to promote a policy that enhances saving interest rates to avoid heavily relying on external debt to finance projects that need gigantic capital.

References

[1] Were, M. (2001). The impact of external debt on economic growth in Kenya: An empirical assessment (No. 2001/116). WIDER discussion paper.

[2] Soludo, C. C. (2003). Debt, poverty, and inequality. Okonjo-Iweala, Soludo, and Muhtar (Eds.), The Debt Trap in Nigeria, Africa World Press NJ, 23-74.

[3] UNCTAD (2016). Economic development in Africa Report 2016. Debt dynamics and development finance in Africa. www.unctad.org/en/PublicationsLibrary/aldcafrica2016_en.pdf (Accessed 20 May 2016).

[4] Babu, J. O., Kiprop, S., Kalio, A. M., & Gisore, M. (2014). External debt and economic growth in the East Africa community. African journal of business management, 8(21), 1011-1018.

[5] Momodu, A. A. (2012). Effect of debt servicing on economic growth in Nigeria. Reiko Journals of Business and Finance, 4(3), 116-124.

[6] Eduardo, B. (1989). The Effect of External debt on Investment. Finance and Development 26(3) 17-19.

[7] Eton, J, (1995). Sovernity Debt: A Primer. The World Bank Economic Review, 7(2). http://documents. World Bank. Org/curated/425051468741322444/sovereign-debt-a primer (accessed 7 July 2021).

[8] Krugman, P. (1988). Financing vs. forgiving a debt overhang. Journal of Development Economics, 29(3), 253-268.

[9] Serieux, J., & Yiagadeesen, S. (2001). The debt service burden and growth: Evidence from low income countries. The North-South Institute, Ottawa.

[10] Fosu, A. K. (1996). The impact of external debt on economic growth in Sub-Saharan Africa. Journal of economic development, 21(1), 93-118.

[11] Alwi, S. F., Lee, H. A., Azman, N. S., & Lee, H. H. (2020). External Debts and Economic Growth in Malaysia.

[12] Marobhe, M. (2019). External debts and economic growth in Tanzania. Review of Integrative Business and Economics Research, 8(1), 64-79.

[13] Matuka, A., & Asafo, S. S. (2018). External debt and economic growth in Ghana: A co-integration and a vector error correction analysis.

[14] Ndubuisi, P. (2017). Analysis of the impact of external debt on economic growth in an emerging economy: Evidence from Nigeria. African Research Review, 11(4), 156-173.

[15] UDEH, S. N., UGWU, J. I., & Onwuka, I. O. (2016). External debt and economic growth: The Nigeria experience. *European Journal of Accounting Auditing and Finance Research*, *4*(2), 33-48.

[16] Kasidi, F., & Said, A. M. (2013). Impact of external debt on economic growth: A case study of Tanzania. Advances in Management and Applied Economics, 3(4), 59.

[17] Sulaiman, L. A., & Azeez, B. A. (2012). Effect of external debt on the economic growth of Nigeria. Journal of Economics and sustainable development, 3(8), 71-79.

[18] Munasinghe, S. D. (2020). Analysis of Public Debt on Economic Growth in South Asian Countries.

[19] Kharusi, S. A., & Ada, M. S. (2018). External debt and economic growth: The case of emerging economy. *Journal of economic integration*, *33*(1), 1141-1157.

[20] Akinwunmi, A. A., & Adekoya, R. B. (2018). Assessment of the impact of external borrowing on the economic growth of the developing countries-Nigerian Experience. Asian Business Research, 3(1), 29.

[21] Senadza, B., Fiagbe, K., & Quartey, P. (2017). The effect of external debt on economic growth in Sub-Saharan Africa. International Journal of Business and Economic Sciences Applied Research (IJBESAR), 11(1).

[22] Olasode, O. S., & Babtunde, T. S. (2016). External debts and economic growth in Nigeria: An empirical study using Autoregressive Distributed Lag Model. Available at SSRN 2801636.

[23] MOWLAEI, M., & GOLKHANDAN, A. (2014). The Impact of External Debts on Economic Growth in Iran.

[24] Malik, S., Hayat, M. K., & Hayat, M. U. (2010). External debt and economic growth: Empirical evidence from Pakistan. International Research Journal of Finance and Economics, 44(44), 1450-2887.

[25] Ayadi, F. S., & Ayadi, F. O. (2008). The impact of external debt on economic growth: A comparative study of Nigeria and South Africa. *Journal of sustainable development in Africa*, *10*(3), 234-264.

[26] Mohamed, M. A. A. (2005). The impact of external debts on economic growth: an empirical assessment of the Sudan: 1978-2001. *Eastern Africa Social Science Research Review*, *21*(2), 53-66.

[27] Gövdeli, T. (2019). External debt and economic growth in Turkey: An empirical analysis. Sosyoekonomi, 27(40), 119-130.

[28] Hüseyin, A. Ğ. I. R. (2016). TÜRKİYE'DE DIŞ BORÇLANMA VE EKONOMİK BÜYÜME İLİŞKİSİNİN NEDENSELLİK ANALİZLERİ. *Sosyal Ekonomik Araştırmalar Dergisi*, *16*(32), 214-231.

[29] Umutlu, G., Alizadeh, N., & Erkılıç, A. Y. (2011). Maliye politikası araçlarından borçlanma ve vergilerin ekonomik büyümeye etkileri.

[30] Çiçek, H., Gözegir, S., & Çevik, E. (2010). Bir maliye politikası aracı olarak borçlanma ve ekonomik büyüme ilişkisi: Türkiye örneği (1990–2009).

[31] Abdullahi, N. I., Domeher, H. D., Blay Jnr, A. V. K., Yakubu, A. M., & Musah, G. (2016). External Debt-Gdp Nexus In Ghana: An Application Of The Autoregressive Distributed Lag (ARDL) Model. *European Journal of Business, Economics and Accountancy*, *4*(6), 106-121.

[32] Mwaba, A. N. D. R. E. W. (2001, September). External debt and debt reduction measures in Uganda. In WIDER, www. Wider. unu. Edu/conference/conference2001.

[33] Chongo, M. B. (2013). An econometric analysis of the impact of public debt on economic growth: the case of Zambia (Doctoral dissertation, University of Zambia).

[34] Getinet, B., & Ersumo, F. (2020). The Impact of Public External Debt on Economic Growth in Ethiopia: The ARDL Approach to Co-integration. *Journal of Economics and Sustainable Development*, *11*(11).

[35] Pesaran, H., & Shin, Y. (1999). An autoregressive distributed lag modeling approach to cointegration "chapter 11. In Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium.

[36] Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.

[37] Pesaran, M. H., & Shin, Y. (1995). An autoregressive distributed lag modeling approach to cointegration analysis.

[38] Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 1057-1072.

[39] MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. Journal of applied econometrics, 11(6), 601-618.

[40] Gujarati, D. N., & Porter, D. C. (2004). Basic econometrics (ed.) McGraw-Hill. Irwin, a business.

[41] Hausman, J. A. (1978). Specification tests in econometrics. Econometrica: Journal of the econometric society, 1251-1271.

[42] Shabbir, S. (2013). Does external debt affect economic growth: evidence from developing countries (No. 63)? State Bank of Pakistan, Research Department.

[43] Dey, S. (2018). Relationship between Export Revenue and Gross Domestic Product in Bangladesh: An Econometric Analysis. Asian Business Review, 8(1), 1-12.

[44] Saaed, A. A. J., & Hussain, M. A. (2015). Impact of exports and imports on economic growth: Evidence from Tunisia. Journal of Emerging Trends in Educational Research and Policy Studies, 6(1), 13-21.

[45] Duval, R., Eris, M., & Furceri, D. (2010). Labour Force Participation Hysteresis in Industrial Countries: Evidence and Causesℵ.

[46] Adhikary, B. K. (2011). FDI, trade openness, capital formation, and economic growth in Bangladesh: a linkage analysis. International Journal of Business and Management, 6(1), 16.

[47] Pesaran, M. H., Shin, Y., & Smith, R. J. (1996). Testing for the existence of a Long-run Relationship' (No. 9622). Faculty of Economics, University of Cambridge.

[48] Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. Applied Economics, 37(17), 1979-1990.

[49] Afxentiou, P. C., & Serletis, A. (1996). Growth and foreign indebtedness in developing countries: an empirical study using long-term cross-country data. The Journal of developing areas, 31(1), 25-40.

[50] Cohen, D. (1993). Low Investment and Large LDC Debt in the 1980s. The American Economic Review, 437-449.

[51] Frimpong, J. M., & Oteng-Abayie, E. F. (2006). The impact of external debt on economic growth in Ghana: a cointegration analysis. Journal of Science and Technology (Ghana), 26(3), 122-131.

[52] Farrar, D. E., & Glauber, R. R. (1967). Multicollinearity in regression analysis: the problem revisited. *The Review of Economic and Statistics*, 92-107.

[53] Fajana, F. O. (1993). Nigeria's debt crisis. United Nations Economic Commission for Africa, Socio-Economic Research and Planning Division.

[54] Ejaz, M. (2007). Determinants of female labor force participation in Pakistan: An empirical analysis of PSLM (2004-05) micro data. *The Lahore Journal of Economics*, *12*(1), 203-235.

[55] Mujahid, N., & uz Zafar, N. (2012). Economic growth-female labor force participation nexus: a piece of empirical evidence for Pakistan. The Pakistan Development Review, 565-585.