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The Impact of Foreign Aid on Economic Growth in Ethiopia

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Abstract

This study analyzes the impact of foreign aid on economic growth in Ethiopia based on time series annual data for the period of 1974 to 2017. Autoregressive distributed lag Approach to Co-integration and Error Correction Model was applied in order to investigate the long-run and short-run relationship between dependent and the independent variables. The empirical results from econometrics model reveal that foreign aid has negative impact on economic growth in both long run and short run and statistically significant at 1 percent significant level. The negative and significant error correction term shows that the short run disequilibrium adjusts to its long run equilibrium by 84.6 percent each year. The important policy implication of this study suggests that more effort has to be made to improve the negative impact of foreign aid, mainly because of existence of poor institutional arrangement that contributes the fund to unproductive sectors. The government has to ensure, a close monitoring and consistent management strategies, which is used to avoid misallocation and mismanagement problems and has to ensure that foreign aid is linked to the productive sectors to optimize the benefits.

Keywords: - Economic Growth; Foreign Aid; Autoregressive-Distributed Lag Model; Ethiopia

1 Introduction

Despite massive flow of foreign aid to developing countries, the economic growth achieved and living condition which is assumed to be highly affected by inflow of foreign aid by many sub-Saharan African countries and has not been satisfactory and remained poor. The scenario in Ethiopia is not different from the other developing countries. These gaps have explained in different empirical literatures conducted by various researchers (Admasu, 2017; Haile, 2015; Ketsia, 2010; Tasew, 2011). However, the actual role of foreign capital inflow has been remained an area of controversy.

The question on whether or not foreign aid flow is harmful to economic growth has recently been a subject of intense debate to policy makers and macro economists. Since, the returns to aid are believed by some to be negative in the long run because the increased inflows of aid defeat their original purpose and these allow disbursements to be wasted in inefficient economic activities. Thus, the long run negative returns of aid indicate that a country has potentially received "too much aid" (Tasew, 2011).

In recent years, Ethiopia has been one of the major recipients of international aid from different countries and organizations. However, it is evident that despite notable donor intervention in the country's economic activities, less economic growth and poverty remain inherent for many years and the actual role of foreign aid has not significant impact on Ethiopian economic growth (Haile, 2015).

There are different studies conducted on the impact of foreign aid flow to developing countries (e.g. Adeola, 2017; Ketsia, 2010; Mallik, 2007; Rachael, 2011; Vilaphonh, 2002; Ndambiri H.K et al., 2012). However, most of these studies were dominated by cross-country growth regression analysis by using

various techniques in sub-Saharan Africa countries by assuming that countries are homogenous in terms of economic structure and policy reactions. As, countries are heterogeneous, the dominated cross country regression analysis have produced mixed results and failed to produce any conclusive result for single country.

Despite this paradoxical scenario, there are different conflicting perspectives regarding the impact of foreign aid on economic growth in Ethiopia. However, to solve the gap; various studies were conducted on the impact of foreign aid inflows on Ethiopian economic growth and extensively explained in various empirical literatures using different econometric approaches: (e.g. Sintayehu, 2007; Admasu, 2017; Haile, 2015; Lul, 2011; Tofik, 2012; Tasew, 2011); Tewodros, 2015) have conducted in this area by using different techniques. Their results show that aid has negative impact on economic growth of Ethiopia. However, despite aid has been increasing from time to time, the results of studies so far done were controversial.

As most of the aid-growth study is dominated by cross country regression analysis, country specific studies are relatively few in number and these studies so far done have mixed results. This needs to conduct additional research to investigate and identify the problems encountered in this area to fill the indicated gaps. Second; in Ethiopia nowadays foreign aid flow is significantly increasing; but, most country specific studies result revealed that the flow of foreign aid has negative effect on the economic growth of Ethiopia in the long run. Due to this, authors motivated is to conduct country specific research by undertaking advanced time series data using Autoregressive Distributed Lag (ARDL) approach to bridge the research gap of country specific studies in this area and identify the impact of foreign aid on economic growth of Ethiopia. The objective of the present study was to analyze the short run and long run impact of foreign aid on economic growth of Ethiopian between the periods of 1974 - 2017 through applying the ARDL model.

2. Theories of Economic Growth

The process of economic growth and the sources of differences in economic performance across nations are some of the most interesting, important and challenging areas in modern social science. Economic growth is an increase in per capita output/income over a period of time (I.e, the increase in the production of goods and services over time), which is usually a year. This creates differences in living standards among countries of the world in regards to nutrition, life expectancy, literacy, infant mortality and other direct measures of well- being.

The analysis of the process of economic growth was a central feature of the work of the classical economists, as represented chiefly by Adam Smith, Thomas Malthus, David Ricardo, and Karl Marx were all concerned with the growth of the economy. According to A. Smith (1776), the importance of 'invisible hand' (the force of supply/demand in a competitive market, specialization/division of labor, accumulation of physical capital/investment and technological progress were the most determinants of economic growth in the long term and hence the prosperity of nations. Economists, like, Smith (1776), Malthus (1798) and David (1817) contributed to the economic growth in the classical theory. Besides, Ramsey (1928) and Schumpeter (1934) provided basic ingredients for economic growth theories. Regarding modern growth theory, Ramesy (1928) considered as the starting point in terms of a chronological perspective. These theories were also briefly described in the book of Barro & Sala-i-Martin (2004). Domar (1946) and Harrod (1939) attempted to integrate Keynesian analysis with components of economic growth (cited in Barro & Sala-i-Martin, 2004). Others also like, Solow (1956) and Swan (1956) made the most important contributions to the economic growth and the neoclassical form of the production function was the major aspects of their model. This form assume that there is diminishing returns to each input, constant returns to scale and some positive and smooth elasticity of substitution between the inputs Admasu (2017).

Around the second half of the 20th century, the neoclassical theory explained economic growth theory mainly developed by Solow (1956) and Swan (1956). During this period, the differences in living

standards among countries were analyzed by the neoclassical growth theory. This concept is known as convergence theory – states that countries with low gross domestic product (GDP) per capita level grow faster and reach the growth level of rich countries, while the growth of rich countries is slower (Barro, 1996; Barro & Sala-i-Martin, 2010).

2.1 The neo-classical theory of Growth

School of thoughts and theories on economic growth can be traced back to the classical economists of the eighteenth and nineteenth century, whose works are briefly reviewed alongside the transition to neo classical growth theory. The basic framework of neoclassical growth models was first developed by Robert Solow (1956) and Trevor Swan (1956). This neo-classical model states that, at any point in time, the total output of the economy depends on the quality and quantity of physical capital employed, the quantity of labor employed and the average level of skills of the labor force. However, once the economy reaches the full equilibrium level, additional growth in the stock of capital per worker will only take place if productivity increases, either through enhanced capital stock or through improvements in the quality of the labor force.

The basic assumptions of the Solow model include constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labor. And his basic question was "what are the main determinants of economic growth in the long term". Based on Solow growth model, high investment rate (saving rate), high level of technology, skilled human capital, low level of population growth rate and low rate of capital depreciation are the most determinants of economic growth in long run.

According to this simple mathematical model, economic growth can be measured as follows.

$$\Delta Yt = \frac{\partial Y \Delta Kt}{\Delta Kt} + \frac{\partial Y \Delta Lt}{\partial L} + \frac{\partial Y \Delta At}{\partial A} \qquad [1]$$

When we divide both sides of [1] by *Yt*, it becomes that:-

$$\frac{\Delta Yt}{\Delta Yt} = \frac{\partial Y \Delta Kt}{\Delta Kt \Delta Yt} + \frac{\partial Y \Delta Lt}{\partial L \Delta Yt} + \frac{\partial Y \Delta At}{\partial A \Delta Yt} \qquad [2]$$

The above equation decomposes GDP growth into portions that can be attributed to growth in the capital stock, the labor force, and the technology level. Then

$$\frac{\partial Y}{\partial K} * \frac{\Delta Kt}{\Delta Yt} = \frac{\partial Y}{\partial K} * \frac{Kt}{Yt} * \frac{\Delta K}{Kt} = ßK \frac{\Delta K}{Kt} = ßKgK$$

Using same methodology for labor and technology, reduced form of Equation [2] in growth form is as follows.

$$gy = ßKgK + ßLgL + ßAgA \qquad [3]$$

Or

$$ßAgA = gy - (ßKgK + ßLgL) \qquad [4]$$

Since the Solow's growth model assumption was constant return to scale and perfect competitive market, the summation of the share of capital and labor is a unity. So if share of capital is βk, then the share of labor is 1- βk = βL and the above equation can be rewrite as

$$ßAgA = gy - (ßKgK + (1 - ßk)gL) \qquad [5]$$

Where *gy* represents growth rate of real GDP; *gk* represents growth rate of physical capital; *gL* represents growth rate of human capital; *gA* represents growth rate of technology and *βk*, βL, *βA* are the marginal elasticity of capital, labor force and technology respectively. So if we have observations on the growth rate of output, the labor force, and the capital stock, we can have an estimate on the growth rate of total factor productivity. Equation [4] defines as the "Solow residual" in its long run growth model.

According the neo classical theory of growth, the model makes three important forecasts. First, increasing capital relative to labor creates economic growth, since people can be more productive given more capital. Second, poor countries with less capital per person grow faster because each investment in capital produces a higher return than rich countries with sufficient capital. Third, because of diminishing returns to capital, economies eventually reach a point where any increase in capital no longer creates economic growth and which is called a steady state.

3. Methodology

3.1 Model Specification and Estimation Procedures

3.1.1 Model Specification

Macroeconomic theory has identified various factors that influence the growth of a country from the classical, neo classical and the new growth theories. These factors include natural resources, investment, human capital, innovation, technology, economic policies, foreign aid, trade openness, institutional framework, foreign direct investment, political factors, socio-cultural factors, geography, demography and many others (Tewodros, 2015).

In this particular research, in order to examine the empirical evidence of foreign aid impact on Ethiopian economic growth, the study considers some of these factors. As we discussed in the theoretical model (section 2), origin of the econometric model is extended neo-classical growth model to examine the relationships between foreign aid and economic growth. In this paper it is driven as:

$$Y = f\,(GK,\ LF) \qquad [6]$$

Where Y denotes a proxy for economic growth; Gk denotes physical capital, and Lf denotes human capital.

Following broadly the approach of extended neo-classical growth model, we specify the economic growth function for Ethiopia as follows: Real GDP is a function of; physical capital, foreign aid, external debt, human capital, exports of goods and service, and general inflation rate. Similar studies were applied this economic function to analyze macroeconomic determinants of economic growth in Ghana, India and Ethiopia respectively (Patrick Enu et al., 2013; Biswas and Saha, 2014; Tewodros, 2015). Therefore, based on this theoretical framework developed, the mathematical relationship between real GDP and its

components in this model expressed as empirically estimable log-linear type of model is specified as follows:

$$Y = f\,(GK, AID, EXD, EXHE, EXT, INF) \qquad [7]$$

where *Y* denotes a proxy for change in real GDP growth; *GK* denotes gross capital formation; *AID* denotes foreign aid; *EXD* denotes external debt; *EXHE* denotes expenditure for human capital formation/health and education; *EXT* denotes export of total goods and services, and *INF* denotes general inflation rate.

As Benoit (2011) recommended, the next step is expressing the variables into logarithmical form in a regression model. From the beginning the researchers transformed all the variables under study into Log data to avoid heteroscedasticity (Gujarati, 2004) and to show elasticity of the variables; the growth function of equation [**7**] becomes:

$$\Delta lnRGDPt = \beta 0 + \beta 1 lnGK(t-1) + \beta 2 lnAID(t-1) + \beta 3 lnEXD(t-1) + \beta 4 lnEXHE\ (t-1) + \beta 5 lnEXT(t-1) + \beta 6 INF(t-1) + \varepsilon t \qquad [8]$$

where lnRGDPt represents natural logarithm of real gross domestic product (GDP); lnGKt represent natural logarithm for physical capital (formally gross investment); lnAIDt represents natural logarithm of foreign aid; lnEXDt represents natural logarithm of external debt; lnEXHEt represents natural logarithm for human capital formation proxies by expenditure to health and education; lnEXTt stands for natural logarithm of total export; INFt stands for general inflation rate; ln denotes natural logarithm εt denotes standard error term, and $\beta 0, \beta 1, \beta 2\ \beta 3,\ \beta 4, \beta 5\ and\ \beta 6$ are coefficients that measure long run and short run relationship of independent variables with real GDP in this specified model.

3.1.2 Estimation Procedure

3.1.2.1 Unit Root Test

The study applies time series economic data, testing the variables for stationarity in econometric analysis. Time series data are rarely stationary in level forms. It is fundamental to test for the statistical properties

of variables when dealing with time series data. There are three reasons for which it is essential. *First*, the non-stationary series can strongly influence its behavior and properties. *Second*, it helps to avoid spurious regression that results from non-stationary data. *Third*, the standard assumptions of distribution will not be valid for non-stationary variables. The unit root tests will be used to check the stationarity of the variables and to check none of the variables are not order two (I.e. I (2)), which is precondition to apply Autoregressive-Distributed Lag (ARDL) model (Pesaran et al., 2001).

The most popular strategy for testing the unit root is the augmented Dickey–Fuller (ADF) **test** and Philips–Perron (PP) tests (Nkoro & Uko, 2016). Both ADF and PP tests have been used to determine the degree of stationarity. Non-stationarity can be tested by using ADF test and PP test. Therefore, it is necessary to test for time series variables before running any sort of regression analysis.

To ensure reliable result of test for stationarity, the study will first investigate the time series properties of the data by using both Augmented Dickey-Fuller (ADF) test and Philip-Perron (PP) tests. The testing procedure for the ADF unit root test is specified as follows:

$$\Delta Yt = \alpha + \sigma t + \gamma Yt\text{-}\ 1 + \sum_{i=0}^{p} \lambda \Delta Yt - i + \varepsilon t \qquad [9]$$

Where Yt is a time series variables under consideration in this model at time t, t is a time trend variable; Δ denotes the first difference operator; εt is the error term; p is the optimal lag length of each variable chosen such that first-differenced terms make εt a white noise.

Thus, the ADF test takes hypothesis: – H0: $\gamma = 0$ (time series has a unit root)

H1: $\gamma \neq 0$ (time series has no unit root)

If the t value or t-statistic is more negative than the critical values, the null hypothesis (I.e. H0) is rejected and the conclusion is that the series is stationary. Conversely, if the t-statistic is less negative than the critical values, the null hypothesis is accepted and the conclusion is that the series is non-stationary.

3.2 Data and Variables

The study was based on time series country level macro-data covering the period from 1974 to 2017. The choice of the period is based on the availability of relevant data for the study. The data were collected from National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MoFED), Central Statistical Agency (CSA), and International Monetary Fund (IMF). The dependent variable is real GDP and the independent variables are: - Physical capital accumulation; Foreign Aid; External Debt; Human capital Formation; Exports of goods and service and Inflation rate. Except inflation all are measured in Millions of Ethiopian Birr (the official currency of Ethiopia).

The independent variables considered are physical capital accumulation; foreign aid; external debt; human capital formation; exports of goods & service and inflation rate are used for analysis to investigate and identify its impacts on the dependent variable real growth domestic product (GDP) by using ARDL model. Econometricians and other scholars have developed several methods to conduct time series analysis. A large number of past studies have used the Johansen co-integration and Engle-Granger causality technique to determine the long-term relationships between variables of interest. In fact, this remains the technique of choice for many researchers who argue that, Autoregressive-Distributed Lag (ARDL) model is the most accurate method to apply for I [1] variables.

4. Results and Discussion

4.1 Econometric model Testing

4.1.1 The Unit Root Test Analysis

Before testing of co-integration, all the series are tested for stationarity. Augmented Dickey Fuller (ADF) test is employed, all the variables entered in the regression should be integrated; either order zero [i.e. I(0)]; order one [i.e. I(1)] or a mixture of order zero [i.e. I(0)] and order one [i.e. I(1)] but not any order two [i.e. I(2)]. As depicted in the table 1; first it is tested with constant but no trend, and then it is tested

with constant and trend. The result in the following tables shows that there is mixtures of order zero [i.e. I(0)] and order one [i.e. I (1)] but not any order two [i.e. I (2)].

Table 1: Augmented Dickey Fuller Unit Root Test

Augmented Dickey Fuller Test Statistic (ADF Test)		
Variables (At level and 1st difference)	***t-statistics (with intercept but no trend)***	***t-statistics (with intercept and trend)***
LNRGDP	*4.474246****	*0.686007*
Δ LNRGDP	*-2.003811*	*-6.946330 ****
LNGK	*1.915614*	*-0.521410*
Δ LNGK	*-8.009173****	*-8.721917****
LNAID	*-1.069158*	*-1.819566*
Δ LNAID	*-6.476680****	*-6.471244****
LNEXD	*-0.705581*	*-3.093499*
Δ LNEXD	*-5.365769****	*-5.299030****
LNEXHE	*1.581999*	*-1.388201*
Δ LNEXHE	*-4.301148****	*-4.847467****
LNEXT	*0.488362*	*-1.993923*
Δ LNEXT	*-5.689342****	*-5.812262****
INF	*-2.175149*	*-2.242205*
Δ INF	*-8.816405****	*-8.698005****
Test critical Values at		
1% [***]	*-3.600987*	*-4.198503*
5% [**]	*-2.935001*	*-3.523623*
10% [*]	*-2.605836*	*-3.192902*
Note: The rejection of the null hypothesis is based on MacKinnon (1996) critical values		

Source: own computation using Eviews9

Akaike information criterion (AIC) is used to determine the lag length while testing the stationarity of all variables. The ***, ** and * sign indicates the rejection of the null hypothesis of non-stationary at 1%, 5% and 10% significant level respectively.

The unit root test result in the table 1, confirms that, real GDP is stationary at level with intercept [i.e. I (1)] but it is non- stationary at level with intercept and trend [i.e. I (0)]. While, at first difference with intercept it is non-stationary [i.e. I (0)], but with intercept and trend it is stationary [i.e. I (1)]. The unit root test result in the table 1, also confirms that, explanatory variables are non-stationary [i.e. I (0)] at levels and stationary [i.e. I (1)] at their first differences. Meaning that variables included in this model

are integrated of order zeros [i.e. I (0)] and order one [i.e. I (1)], but not any order two [i.e. I(2)] which is not desirable in this model.

4.1.2 Diagnostic Test and Model Stability

Model stability and diagnostic checking to detect serial correlation (Brush & Godfray LM test), functional form (Ramsey's RESET), conflict to normality (Jaque-Bera test) and heteroscedasticity (Breusch-Pagan-Godfrey test) were performed. Accordingly, the following table presents the diagnostic tests result.

Table 2: Diagnostic test for the Long Run ARDL (1, 0, 0, 2, 2, 0, 0)

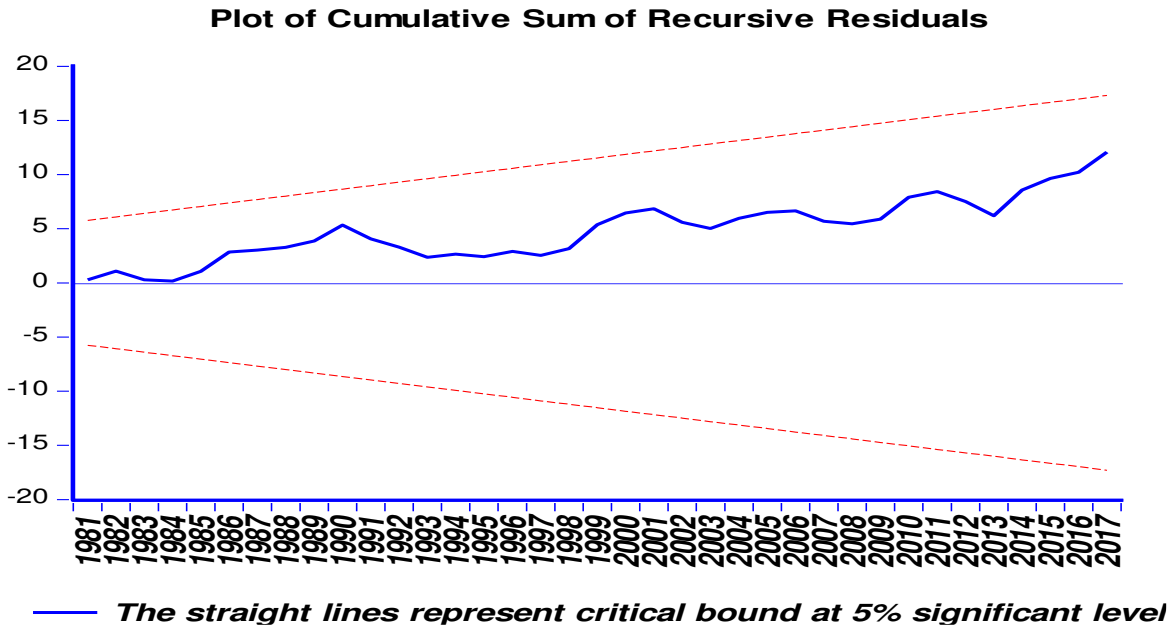
Test Statistics	**LM Version**	**F Version**
Serial Correlation	CHSQ(1) = 3.9989[0.1354]**	F(1, 35) = 1.7495 [0.1887]**
Functional Form	CHSQ(1) = 5.8677[0.0532]**	F (1, 35) = 2.4965 [0.0969]**
Normality	CHSQ(2) = 0.23279 [0.890122] **	Not applicable
Heteroscedasticity	CHSQ(1) = 8.1414 [0.2279] **	F(1, 37) = 1.4001 [0.2406] **

Source: own computation using Eviews9

Table 2 indicates that the long run ARDL model estimated in this study passes all the diagnostic tests. This is because the p-value associated with both the LM version and the F version of the statistic was unable to reject the null hypothesis specified for each test. Therefore based on the result of the test both LM and F versions of the statistic indicate that there is no serial correlation problem; the model is correctly specified; the errors are normally distributed and there is no heteroscedasticity problem in the model.

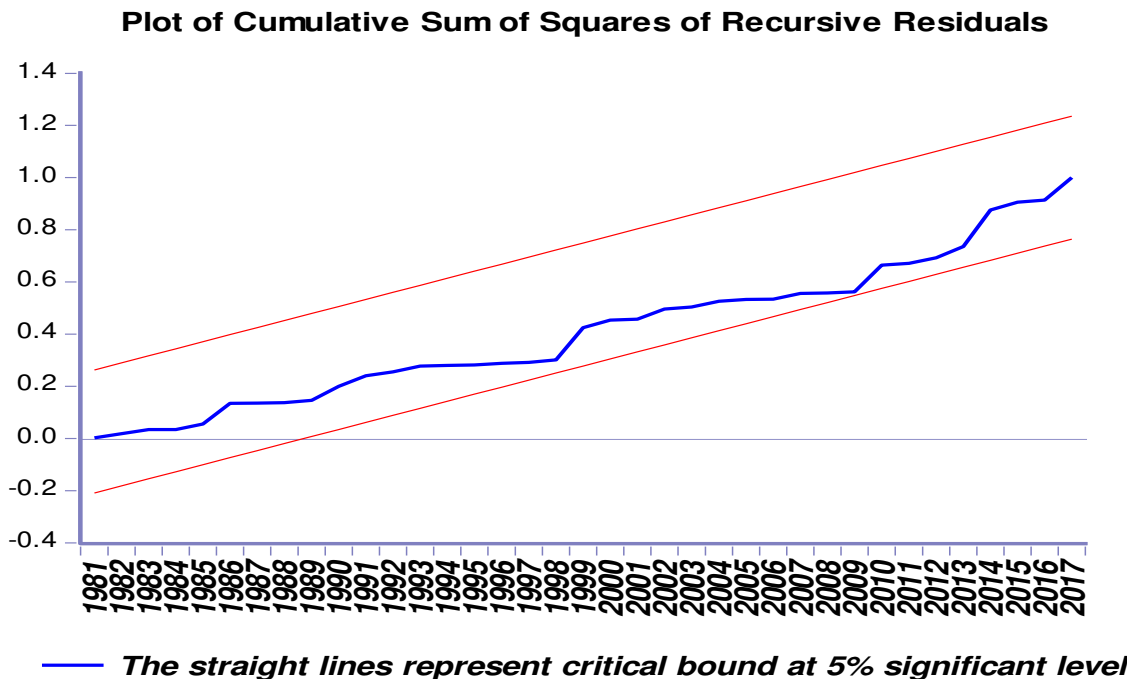
In addition to the above diagnostic tests, the overall stability of short-run and long-run coefficients is also tested by employing cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) tests.

Figure 1: Plot of Cumulative Sum of Recursive residuals



Source: own computation using Eviews9

Figure 2: Plot of Cumulative Sum of Squares of Recursive residuals



Source: own computation using Eviews9

The results of both CUSUM and CUSUMSQ test figures 1 and 2 showed that; the plot of the CUSUM recursive residual test statistic did not cross the critical limits. Similarly, the CUSUMSQ recursive

residual test statistic shows that the graphs do not cross the lower and upper critical limits, instead moves between the critical bounds. This implies that to conclude there is no structural instability in the model during the period under investigation. Thus, the model appears to be stable in estimating long run and short run relationship between variables. In addition to the model stability 99.8 percent of the model has been explained by the regressors, hence, the results of the estimated model are reliable and efficient.

4.1.3 Long Run ARDL Bounds Tests for Co-integration

The bounds test approach of co-integration is estimating the ARDL model specified in equation [7] using the appropriate lag-length selection criterion. It is run to check the joint significant of the coefficients in the specified conditional ARDL model.

The Wald test is conducted by imposing restrictions on the estimated long-run coefficients of all lagged level variables (real GDP, gross capital formation, foreign aid, external debt, expenditure for education and health, total export and general inflation) in equation [8]. The computed F-statistic value is compared with the lower and upper bound critical values provided by Pesaran et al. (2001) and Narayan (2005). It should exceed the cross-validation (CV) to establish the long run relationship of the series. As it is depicted below in the table, with an intercept and trend, the calculated F statistics is 9.388.

Table 3: Bound Test for Co-integration Analysis

Description	Values
Number of observations	44
Optimal lag length of the model	2
Calculated F-statistic	9.388

Source: - Wald test is own computation by using Eviews9

The computed F-statistic value is compared with the lower bound and upper bound critical values tabulated in Table 3 CI (III) case IV of Pesaran, Shin, and Smith (2001) and Appendix-X case V of Narayan (2005).

Table 4: Pesaran et al. (2001) and Narayan (2005) Lower and Upper Bound Critical Values

Description	**Value at 1% significance level**		**Value at 5% significance level**		**Value at 10% significance level**	
	*Lower bound, **I(0)***	*Upper bound **I(1)***	*Lower bound **I(0)***	*Upper bound **I(1)***	*Lower bound **I(0)***	*Upper bound **I(1)***
Pesaran (2001) critical values for K=6	3.60	4.90	2.87	4.00	2.53	3.59
Narayan (2005) critical values for K=6	4.53	6.26	3.33	4.70	2.387	3.671

Source: - Pesaran, Shin, and Smith (2001) and Narayan (2005) tables

As it is depicted in the above table, the value of significance level at 1%, 5% and 10% are tabulated, based on Pesaran, Shin, and Smith (2001) and Narayan (2005) lower and upper bound critical values. The critical values reported for Pesaran et al. (2001) are the case with unrestricted intercept and no trend (case III). However, in this study we have been used Narayan (2005) which is developed based on 30 to 80 observations as we discussed earlier in the third part of this study.

Null hypothesis

- $ß1 = ß1 = ß2 = ß3 = ß4 = ß5 = ß6 = ß7 = 0$ (there is no long-run relationship)

Alternative

- $ß1 \neq ß2 \neq ß3 \neq ß4 \neq ß5 \neq ß6 \neq ß7 \neq \mathbf{0}$ (there is long-run relationship)

Accordingly, the value of the calculated F-statistics 9.388 is higher than Pesaran et al. (2001) and Narayan (2005) lower and upper bound critical values. This implies that the null hypothesis of no long-run relationship is rejected; rather accept the alternative hypothesis (there is long-run relationship) based on the Pesaran, Shin, and Smith (2001) and Narayan (2005) upper bound critical values at 1% level of significance. Therefore, there is an evidence for a long run relationship among economic growth and variables in the model.

4.1.4 Long Run ARDL Model Estimation

The bound test for co-integration test, model stability and diagnostic test results indicates us the existence of a long-run relationship between real GDP and independent variables. The next step is running the appropriate ARDL model to find out the long run coefficients and estimated long-run relationships

between the dependent and independent variables. The estimated coefficients are reported in the table 5. In doing so, the Akaike information criterion (AIC) is chosen with two maximum lag order and found the ARDL (*1, 0, 0, 2, 2, 0,* 0) equation. The F-statistic indicates that the model is statistically significant as a whole and the R-squared value of the estimated model reveals that 99.8 percent of the variation in real GDP is substantially explained by the variables included in the model. Because of the Durbin Watson statistic value is two and greater than the upper critical value of DW-test, there is no spurious relationship between the variables (there is no serial autocorrelation).

Table 5: Estimated Long Run Coefficients Using the ARDL Approach

ARDL (1, 0, 0, 2, 2, 0, 0), selected based on Akaike information criterion (AIC) **Dependent variable is *lnRGDP*** **44** observations used for estimation from **1974** to **2017**			
Regressors	**Coefficients**	**ST. Error**	**T-Ratio [Prob]**
lnGK	*0.277782*	*0.044000*	*6.313209* ***[0.0000]******
lnAID	*-0.058661*	*0.018955*	*-3.094804* ***[0.0042]******
lnEXD	*-0.089451*	*0.015507*	*-5.768575* ***[0.0000]******
lnEXHE	*0.397666*	*0.034984*	*11.367015* ***[0.0000]******
lnEXT	*-0.098263*	*0.031894*	*-3.080921* ***[0.0044]******
INF	*0.001433*	*0.000925*	*1.548245* ***[0.1320]***
C	*8.603722*	*0.402023*	*21.401095* ***[0.0000]******

R-squared	***0.998319***	Mean dependent variable	12.32627
Adjusted R-squared	0.997703	S.D. dependent variable	0.711583
S.E. of regression	0.034107	Akaike info criterion	-3.683677
Sum squared residual	0.034898	Schwarz criterion	-3.187199
Log likelihood	89.35721	DW-statistics	***2.297730***
F-statistic	1619.671 ***[0.000]***		

Source: Author's Calculation by using Eviews9

*Note: The ***, ** and * sign indicates the significance of the coefficients at 1, 5 and 10 percent, significant level respectively.*

As the long run estimated result of the above table 5, showed, the estimated coefficients of gross capital formation has an expected positive sign and statistically significant at one percent significant level, the positive coefficients of estimated long run result of gross capital formation is; in-line with the theory of economic growth; which states that capital formation is the major determinates of economic growth (Keynesian theory of growth, solow's theory of growth). Moreover, this study's result is consistence with study of (Biswas and Saha, 2014) in India; (Ndambiri H.K. et al., 2012) and (Patrick Enu et al.,

2013) in Africa; (Tadesse, 2011) and (Tewodros, 2015) in Ethiopia. In the long run, holding other things constant, a one percent change in gross capital formation which is proxied by gross investment brought to approximately 0.2778 percent change in real GDP during the study period.

Foreign aid is the central variable in this study, as it is shown in the table above; it has negative impact on Ethiopian economic growth and it was statistically significant at one percent significant level. The negative coefficient of the empirical result of foreign aid is also consistence with the study of (Tasew, 2011; Tofik, 2012; Haile, 2015; Kidanemariam, 2015; and Admasu, 2017) in Ethiopia. The long run result shows that, a one percent increase in foreign aid in the long run, which is holding other things constant, has resulted in 0.0587 percent decrease in real GDP during the study period. There might be two possible reasons behind the negative impact result of foreign aid on economic growth of Ethiopia.

I) In the first case, this may be that the inflow of foreign aid received in the form of grants and loan spent to use for daily expense on consumption of goods and services and help the society in reducing poverty rather than building a fixed investment, which is used to accelerating economic growth. If so, it does not have any impact on Ethiopian economic growth due to no value add to macroeconomic growth.

II) The second reason behind the negative impact result of foreign aid may be associated with the data inconsistency, which we took from two organizations (NBE and MoFED annual time series data ranging from 1974- 2017).

The other variable is the debt burden, which is measured by total external debt. It has an expected significant negative relationship with real GDP at one percent significant level. The estimated coefficient of the long-run relationship shows that a one percent increase in the external debt holding other things constant, leads to approximately 0.0895 percent decrease in real GDP in the long-run during the study period. This result indicates that the existence of debt overhang problem in the country during the study periods.

The negative impact of external debt on economic growth might be linked with the low domestic saving rate in the country. As a result, to finance the government investment especially for the mega project, the Ethiopian government borrows from different external financial institutions and governments; this implies that the government with heavy debt burden. In order to pay the debt service the government must be forced to increase taxes and encourage domestic saving system in the future.

The long run coefficient of human capital formation/expenditures for education and health revealed that, has an expected long run positive impact on the Ethiopian economy growth and statistically significant at one percent significant level. A one percent increase in human capital formation which is proxied by expenditures to education and health in the long run, holding other things constant, has resulted in 0.3977 percent change in real GDP during the study period.

It is consistent with the endogenous growth theories (mainly advocated and/or developed by (Lucas, 1988), (Romer, 1990) which argue that improvement in human capital (skilled and healthy workers) leads to productivity improvement that enhances output. In addition this research result is similar with the results found by (Tadesse, 2011; and Tewodros, 2015).

The result of this study revealed that; total exports of goods and service has a significant negative impact on Ethiopian economic growth. This negative coefficient might be associated with more than 68 percent of export level in the country comes from agricultural primary product, which suffered from international price shock. Moreover, the insignificant impact of this result is in line with the research conducted in Ethiopia by (Gezehegn, 2012; and Tewodros, 2015), they found that, the insignificant impact of total exports of goods and service on Ethiopian economic growth while there is an inverse relationship between economic growth and export volatility. Furthermore, this implies that the unexpected significant negative sign impact on economic growth in the long run.

General inflation rate in the table 5 shows that unexpected positive impact on Ethiopian economic growth. However, it is not statistically significant at one percent significant level. From the descriptive and econometric result we can understand that, inflation does not harm the economic growth significantly

during the study period; moreover, the results of this study also consistent with (Tewodros, 2015). Finally, the long run estimated model presented approximately as follow with figures in the parenthesis indicates calculated t-value.

*LNRGDP= 8.60+0.28*LNGK-0.06*LNAID-0.09*LNEXD+0.40*LNEXHE-0.09*LNEXT+ 0.001*INF*
(21.4) (6.3) (-3.1) (-5.7) (11.3) (-3.1) (1.5)

4.1.5 Short Run Error Correction Estimates

The short run error correction estimation is a one lagged period residual obtained from the estimated dynamic long run model. The coefficient of the error correction term (ECM) indicates how quickly variables converge to equilibrium.

Moreover, it should have a negative sign and statistically significant at a standard significant level (i.e. p-value should be less than 0.05). The coefficient of determination (R-squared) explains that about 72.5% of variation in GDP is attributed to variations in the explanatory variables in the short-run model. In addition, the DW statistic does not suggest autocorrelation and the F-statistic is quite robust.

Table 6: Error Correction representation for the Selected ARDL model

ARDL (1, 0, 2, 2, 2, 0, 0) selected based on Akaike information criterion (AIC) **Dependent variable is *dlnRGDP*** **44** observations used for estimation from **1974** to **2017**			
Regressors	**Coefficients**	**ST. Error**	**T-Ratio [Prob]**
dlnGK	*0.209950*	*0.041867*	*5.014652**[0.0000]******
dlnAID	*-0.100715*	*0.024522*	*-4.107118**[0.0003]******
dlnEXD	*-0.055339*	*0.020850*	*-2.654178**[0.0123]*****
dlnEXD1	*0.037657*	*0.020241*	*1.860387**[0.0720]***
dlnEXHE	*0.286488*	*0.076431*	*3.748301**[0.0007]******
dlnEXHE1	*-0.010221*	*0.074436*	*-0.137308**[0.8916]***
dlnEXT	*-0.077853*	*0.058948*	*-1.320711**[0.1960]***
dINF	*0.001976*	*0.000602*	*3.282269**[0.0025]******
dCONS	*0.012666*	*0.012750*	*0.993398**[0.3280]***
ECM(-1)	*-0.846502*	*0.192044*	*-4.407857**[0.000]******

ECM *= LNRGDP - 0.28*LNGK + 0.06*LNAID + 0.09*LNEXD - 0.40*LNEXHE + 0.09*LNEXT - 0.001*INF - 8.60*constant*			
R-squared	***0.72467***	*Mean dependent variable*	*0.05634*
Adjusted R-squared	*0.64724*	*S.D. dependent variable*	*0.06551*
S.E. of regression	*0.03891*	*Akaike info criterion*	*-3.45091*
Sum squared residual	*0.04845*	*Schwarz criterion*	*-3.03718*
Log likelihood	*82.46902*	*DW-statistics*	***1.76595***
F-statistic	*9.3583* ***[0.000]***		

Source: own computation by using Eview9

****, ** and * indicates that the series are significant at 1, 5 and 10 percent, respectively.*

The coefficient of the lagged error-correction coefficient, estimated at -0.8465 is highly significant, has the correct negative sign, and imply a very high speed of adjustment to equilibrium. According to Bannerjee et al. (2003) as cited by (Kidanemarim, 2014; and Tewodros, 2015), the highly significant error correction term further confirms the existence of a stable long-run relationship among the variables. Moreover, the coefficient of the error term (*ECM-1*) implies that the deviation from long run equilibrium level of real GDP in the current period is corrected by 84.65 percent in the next period to bring back equilibrium when there is a shock to a steady state relationship among the variables.

As Chandran et al. (2010), which is quoted in (Tewodros, 2015), the long run effect of the model can be captured by the error term (ECM). Thus, in the long run *LNGK, LNAID, LNEXD, LNEXHE, LNEXT* and *INF* granger cause *LNRGDP* (i.e. unidirectional causality). Not only this but also in applying autoregressive distributed lag (ARDL) model, does not require testing for granger causality since, it considers an endogenity problem in the model (Wessene, 2014).

Most of the results are similar in both long-run and short-run. Capital formation/gross investment has a significant positive impact on economic growth with expected coefficient sign in the short run at **one** percent significance level in the short term. This shows that, holding other things remain constant a one percent increase in capital formation will result approximately in twenty one percent increases in real GDP in the short run during the study period.

Foreign aid is similar to in the long run model has significant negative impact on Ethiopian economic growth with unexpected coefficient sign and statistically significant at one percent significance level, in the short term. As a result holding other things constant a one percent increase in foreign aid will result in approximately ten percent decreases in real GDP in the short run.

The estimated external debt variable in the short-run is found similar to the long run effect, to have an expected negative relationship with real GDP and statistically significant at five percent significance level. As a result holding other things constant a one percent increase in external debt will result in approximately a one percent decline in the real GDP in the short run. However, the one year lag result value indicates that unexpected positive impact on real GDP, but it is not significant. The short run external debt effect indicates that, in Ethiopia under the study periods is permanent as well as transitory and overhang occurs both in short and long run.

This is also consistent with the result of long-run model and also it is consistent with (Wessene, 2014; and Tewodros, 2015) studies for Ethiopia. According to their result, the reason behind the negative impact on economic growth in the short run might be the improper management of external debt which might also the case in this study.

Human capital formation/expenditures to health and education/ showed similar result with the long-run, has significant positive impact on Ethiopian economic growth and statistically significant at one percent significance level, in the short term. As a result holding other things constant a one percent increases in human capital expenditure will result in approximately twenty nine percent increases in real GDP in the short run.

Total exports of goods and service has still unexpected negative impact on Ethiopian economic growth both in the long run and short run model. However, unlike the long run in the short term, it is not statistically significant at 5 percent significance level. This indicates that, there is a negative relationship between export and Ethiopian economic growth, both in the long run and short run during the study period.

The general inflation rate has unexpected positive impact on Ethiopian economic growth and statistically significant at one percent significance level, unlike positive insignificant impact in the long run. We can conclude from this result, whether in the long run or in the short run, general inflation rate, does not have significant (both negative and positive) impact on the Ethiopian economic growth under the study period.

5 Conclusion and Policy Recommendation

In line with the main objective of this research conclusions are drawn to policy makers, researchers and other concerned bodies; as well as recommendations are forwarded.

5.1 Conclusion

The general objective of this study is to analyze the impact of foreign aid on economic growth of Ethiopian for the period 1974 to 2017 by employing ARDL model; using real GDP, as a proxy for economic growth. The long run and short run ECM model results show that a one percent increase in foreign aid, holding other things constant, has resulted in 0.0587 and 0.101 percent decrease in real GDP during the study period respectively. Hence, it is concluded that; there might be possible reason behind the negative impact result of foreign aid on Ethiopian economic growth. This might be that the inflow of foreign aid received in the form of grants and loan spent to use for daily expense on consumption of goods and services and help the society in reducing poverty rather than building a fixed investment, which is used to accelerating economic growth.

5.2 Policy Recommendation

The country's economic strategy should be more on structural transformation/industrialization than heavy dependence on agriculture. The dependence on agriculture in turn diverts the original purpose of foreign aid to individual consumptions when drought occurred. The government should work more effort to improve the negative impact of foreign aid on real GDP growth of Ethiopia. Thus; the study recommends that Ethiopia's government has to ensure that, foreign aid is linked to productive sectors

and has to pursue policies device to reduce its over-reliance on foreign aid. The government should work to bridge gaps of the financial source by setting policies to increase domestic saving which is believed as a back bone of growth. This includes increase saving mobilization like selling of government Bonds, expanding financial institutions and strengthening existing saving tools; such as strengthening both private and government workers social security scheme, strengthening saving for housing program and for investment equipment scheme.

List of abbreviations

ARDL	Autoregressive Distributed Lag
GDP	Gross domestic product
ADF	Augmented Dickey-Fuller (ADF) test
PP	Philip-Perron test
NBE	National Bank of Ethiopia
MoFED	Ministry of Finance and Economic Development
CSA	Central Statistical Agency (CSA),
IMF	International Monetary Fund
AIC	Akaike information criterion
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative sum of squares
CV	Cross-validation

Declarations

Availability of data and material

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of interest

The authors declare that they have no conflict of interest.

Funding

The authors received no funding for this work.

Authors' contributions

The first author visualized the concept of this paper, collected data, analysed the data and drafted the paper. The second author, clearly designed this article and approved the final version of the manuscript.

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Appendices

Appendix I: Estimating the optimal order of VAR

VAR Lag Order Selection Criteria

Endogenous variables: LNRGDP LNGK LNAID LNEXD LNEXHE LNEXT INF

Exogenous variables: C

Sample: 1974 2017

Included observations: 44

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-191.7097	NA	4.87e-05	9.935485	10.23104	10.04235
1	51.87551	389.7363	3.01e-09	0.206225	2.570656*	1.061128
2	89.97861	47.62887	6.54e-09	0.751070	5.184378	2.354014
3	156.5457	59.91042	5.41e-09	-0.127287	6.374899	2.223698
4	294.3761	75.80670*	3.65e-10*	-4.568805*	4.002258	-1.469779*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

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Appendix II: Variable Addition Test (OLS case)

Dependent variable is DLNRGDP

List of the variables added to the regression:

LNRGDP (-1) LNGK (-1) LNAID (-1) LNEXD (-1) LNEXHE (-1) LNEXT (-1) INF (-1)

44 observations used for estimation from 1974 to 2017

Regressorss	Coefficients	Standard error	T-ratio	Probability
DLNRGDP(-1)	0.243693	0.278681	0.874450	0.3977
DLNRGDP(-2)	-0.255801	0.201581	-1.268971	0.2267
DLNGK(-1)	-0.202101	0.136565	-1.479890	0.1627
DLNGK(-2)	-0.104219	0.089041	-1.170454	0.2628
DLNAID(-1)	0.009261	0.036862	0.251239	0.8056
DLNAID(-2)	0.016717	0.039523	0.422973	0.6792
DLNEXD(-1)	0.036107	0.037306	0.967864	0.3508
DLNEXD(-2)	0.032630	0.030453	1.071494	0.3034
DLNEXHE(-1)	-0.106136	0.141242	-0.751446	0.4658
DLNEXHE(-2)	-0.178493	0.114760	-1.555365	0.1439
DLNEXT(-1)	6.90E-05	0.062831	0.001098	0.9991
DLNEXT(-2)	0.006358	0.061949	0.102635	0.9198
DINF(-1)	-0.002474	0.001641	-1.507385	0.1556
DINF(-2)	-4.17E-05	0.000913	-0.045630	0.9643
LNRGDP(-1)	-1.134579	0.372569	-3.045282	0.0094
LNGK(-1)	0.491741	0.143134	3.435533	0.0044
LNAID(-1)	-0.043854	0.055221	-0.794146	0.4414
LNEXD(-1)	-0.064144	0.042918	-1.494547	0.1589
LNEXHE(-1)	0.285963	0.194401	1.470994	0.1651
LNEXT(-1)	-0.040818	0.061090	-0.668158	0.5157
INF(-1)	0.005536	0.003201	1.729747	0.1073
C	7.837333	3.647870	2.148468	0.0511

* *Joint test of zero restrictions on the coefficients of additional variables:*

* *Lagrange Multiplier Statistic* *CHSQ (7)* = 65.71797 *[0.000]*

* *Likelihood Ratio Statistic* *CHSQ (7)* = 89.35721 *[0.000]*

* F Statistic F (7, 15) = 9.388 [0.000]

****

Appendix III: Diagnostic Test for the Long Run

Autoregressive Distributed Lag Estimates

ARDL (1, 0, 0, 2, 2, 0, 0) selected based on Akaike Information Criterion

Test Statistics	*LM Version*	*F Version*
Serial Correlation	CHSQ(1) = 3.9989 [0.1354]	F(1, 35) = 1.7495 [0.1887]
Functional Form	CHSQ(1) = 5.8677 [0.0532]	F (1, 35) = 2.4965 [0.0969]
Normality	CHSQ(2) = 0.23279 [0.890122]	Not applicable
Heteroscedasticity	CHSQ(1) = 8.1414 [0.2279]	F(1, 37) = 1.4001

Lagrange multiplier test of residual serial correlation
Ramsey's RESET test using the square of the fitted values
Based on a test of skewness and kurtosis of residuals
Based on the regression of squared residuals on squared fitted values

****

R-Squared	*0.998319*	*R-Squared*	0.997703
S.E of Regression	0.034107	*F-stat. F (14, 23)*	1619.671 *[0.000]*
Mean of Dependent Variable	12.32627	*S.D of Dependent Variable*	0.711583
Residual Sum of Squares	0.034898	*Equation Log-Likelihood*	89.35721
Akaike Info.Criterion	-3.683677	*Schwarez Bayesian Criterion*	-3.187199
DW-statistic	*2.297730*		

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Appendix IV: Estimated Long Run Coefficients using the ARDL Approach

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ARDL (1, 0, 0, 2, 2, 0, 0), selected based on Akaike information criterion (AIC) Dependent variable is *lnRGDP*

44 observations used for estimation from 1974 to 2017

****

Regressorss	Coefficients	Standard error	T-ratio	Probability
LNGK	*0.277782*	*0.044000*	*6.313209*	*0.0000*
LNAID	*-0.058661*	*0.018955*	*-3.094804*	*0.0042*
LNEXD	*-0.089451*	*0.015507*	*-5.768575*	*0.0000*
LNEXHE	*0.397666*	*0.034984*	*11.367015*	*0.0000*
LNEXT	*-0.098263*	*0.031894*	*-3.080921*	*0.0044*
INF	*0.001433*	*0.000925*	*1.548245*	*0.1320*
C	*8.603722*	*0.402023*	*21.401095*	*0.0000*

R-squared	*0.998319*	Mean dependent variable	12.32627
Adjusted R-squared	0.997703	S.D. dependent variable	0.711583
S.E. of regression	0.034107	Akaike info criterion	-3.683677
Sum squared residual	0.034898	Schwarz criterion	-3.187199
Log likelihood	89.35721	DW-statistics	*2.297730*
F-statistic	1619.671 *[0.000]*		

****

Appendix V: Error Correction Representation for the Selected ARDL Model

****

ARDL (1, 0, 2, 2, 2, 0, 0) selected based on Akaike information criterion (AIC) Dependent variable is *dlnRGDP*

44 observations used for estimation from 1974 to 2017

****

Regressorss	Coefficients	Standard error	T-ratio	Probability
dlnGK	*0.209950*	*0.041867*	*5.014652*	*0.0000*
dlnAID	*-0.100715*	*0.024522*	*-4.107118*	*0.0003*
dlnEXD	*-0.055339*	*0.020850*	*-2.654178*	*0.0123*
dlnEXD1	*0.037657*	*0.020241*	*1.860387*	*0.0720*
dlnEXHE	*0.286488*	*0.076431*	*3.748301*	*0.0007*
dlnEXHE1	*-0.010221*	*0.074436*	*-0.137308*	*0.8916*
dlnEXT	*-0.077853*	*0.058948*	*-1.320711*	*0.1960*
dINF	*0.001976*	*0.000602*	*3.282269*	*0.0025*
dCONS	*0.012666*	*0.012750*	*0.993398*	*0.3280*
ECM(-1)	*-0.846502*	*0.192044*	*-4.407857*	*0.000*

*ECM = LNRGDP - 0.28*LNGK + 0.06*LNAID + 0.09*LNEXD - 0.40*LNEXHE + 0.09*LNEXT - 0.001*INF - 8.60*constant*

****

R-squared	*0.72467*	*Mean dependent variable*	*0.05634*
Adjusted R-squared	*0.64724*	*S.D. dependent variable*	*0.06551*
S.E. of regression	*0.03891*	*Akaike info criterion*	*-3.45091*
Sum squared residual	*0.04845*	*Schwarz criterion*	*-3.03718*
Log likelihood	*82.46902*	*DW-statistics*	*1.76595*
F-statistic	*9.3583 [0.000]*		

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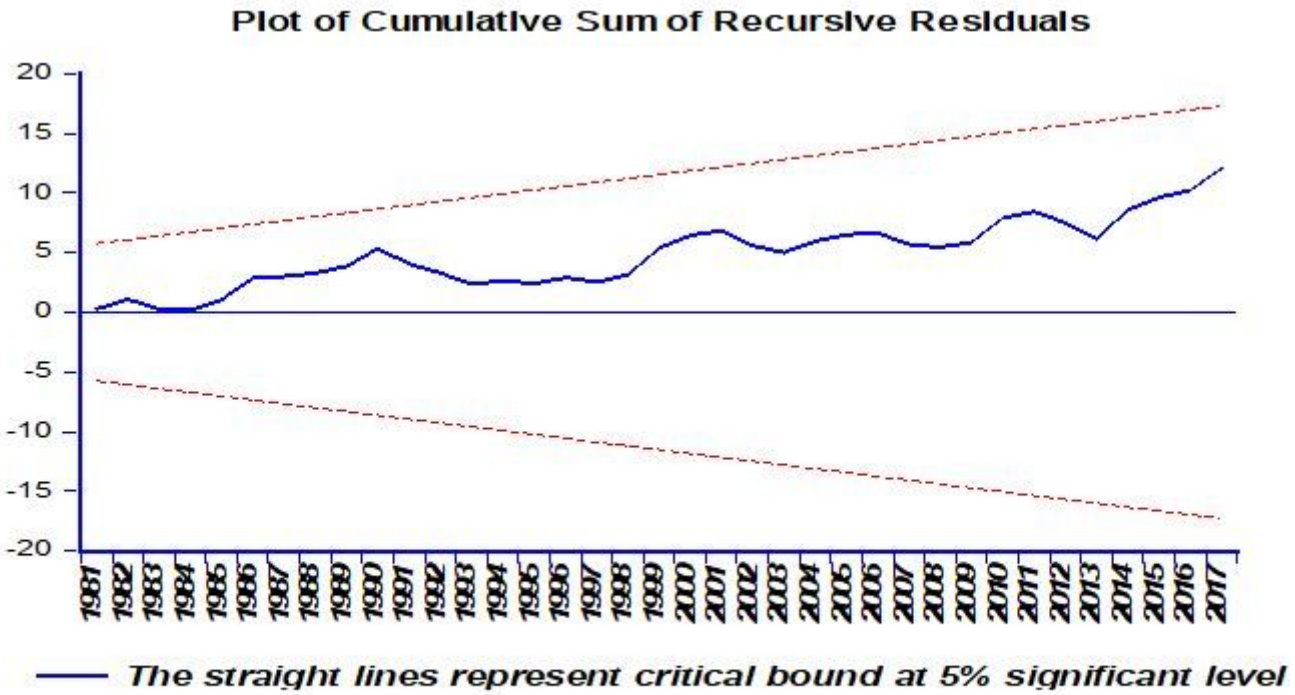
R-Squared and R-Bar-Squared measures refer to the dependent variable DLNRGDP and in cases where the error correction model is highly Restricted, these measures could become negative.

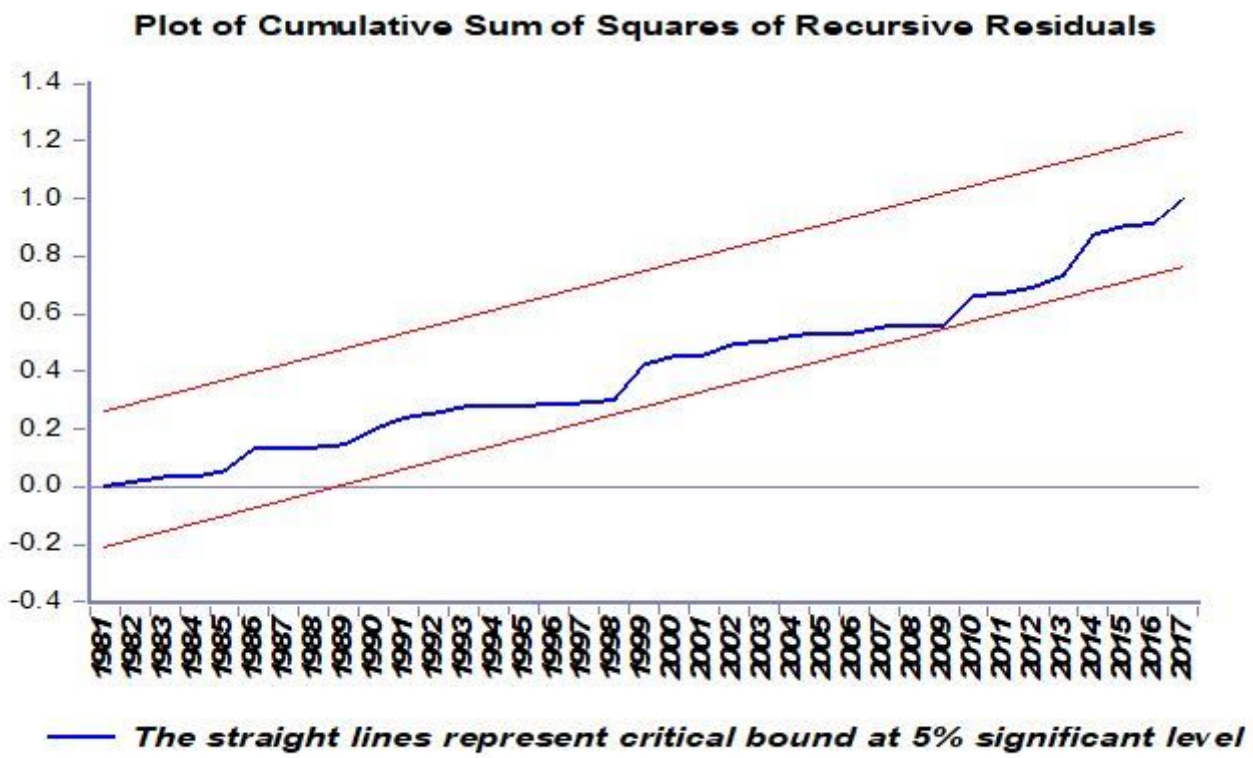
Figures



Source: own computation using Eviews9

Figure 1

Plot of Cumulative Sum of Recursive residuals



Source: own computation using Eviews9

Figure 2

Plot of Cumulative Sum of Squares of Recursive residuals

Supplementary Files

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- Appendices.docx