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Impact of Foreign Aid on Economic Growth in Ethiopia

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Abstract

This paper aims to analyze the impact of foreign aid on economic growth in Ethiopia using time series data over the period 1974–2017. Autoregressive distributed lag approach to co-integration and error correction model was applied to investigate the long-run and short-run impact of foreign aid on economic growth. The model results revealed that foreign aid has a negative impact on economic growth in both the long run and short run. The negative and significant error correction term shows that the short-run disequilibrium adjusts to its long-run equilibrium by 84.6% each year. The paper suggested that more effort has to be made to improve the negative impact of foreign aid, mainly because of the existence of poor institutional arrangements that contribute the funds to unproductive sectors. The government has to ensure a close monitoring and consistent management strategies, which are 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

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

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IMF	International Monetary Fund
AIC	Akaike information criterion
CS	cumulative sum
CSS	cumulative sum of squares
CV	cross-validation

Introduction

In recent times, the global financial crisis of 2007/2008, climate change, the global COVID-19 pandemic, and the current Russo-Ukrainian war have featured prominently in policy circles because these global crises can harm countries that depend on foreign aid from developed countries. Consequently, there have been growing calls for governments in developed countries, international organizations, and non-governmental organizations to not cut back on foreign aid to developing countries (Heinrich et al., 2016; OECD, 2019). This is because a cut in foreign aid could adversely impact the poor and the most vulnerable in developing countries (Boateng et al., 2021). Some recent studies have provided empirical evidence to suggest that aid cuts by donors tend to linger (see Arellano et al., 2009; Frot, 2009; Frot & Perrotta, 2012; Heinrich et al., 2016). However, Heinrich et al. (2016) noted that, although the economic crisis experienced by developed countries tends to cause a reduction in aid flows to developing countries, empirical evidence suggests that foreign donors do increase rather than decrease aid flows to developing countries (see also Perotti, 2005; Auerbach, 2009; Egert, 2015). Despite this, in response to global shocks, some developed country governments have reduced their aid commitments and aid disbursement (OECD, 2019).

Given that many developing countries remain financially constrained (Haile, 2015) and depend on foreign aid (see Sachs, 2005; OECD, 2019), a critical feature of the policy discourse has focused on aid effectiveness (see Bjerg et al., 2011; Civelli et al., 2018; Jena & Sethi, 2020; Ilorah & Ngwakwe, 2021). Despite some existing theoretical and empirical evidence on foreign aid effectiveness in driving economic growth, the empirics are complicated and unresolved. On the one hand, proponents of foreign aid argue that aid stimulates economic growth by relieving developing countries from the problem of capital scarcity by supporting the physical and human capital development necessary to sustain economic growth (Sachs, 2005; Easterly et al., 2004; Clemens et al., 2012; Juselius et al., 2014; Heinrich et al., 2016; Galiani et al., 2017). On the other hand, critics argue that increased aid to developing countries has impeded economic growth by displacing savings, thus creating aid-dependency problems (Rajan & Subramanian, 2011; Liew et al., 2012; Herzer & Morrissey, 2013; Mitra & Hossain, 2013; Adeyemi et al., 2014; Dreher & Langlotz, 2017). Similarly, study by Mallik (2008) found the significant negative effect of foreign aid on economic growth in sub-Saharan countries. He argued that for most sub-Saharan countries the more foreign aid they have received, the more aid dependent they have become.

Several studies have been investigated the impact of foreign aid on economic growth in Ethiopia, but they came up with mixed results. For example, studies by Tadesse (2011), Duresa (2022) and Girma and Tilahun (2022) found the positive

relationship between foreign aid and the long-run economic growth, while other studies (e.g., Siraj, 2012; Haile, 2015; Kidanemariam, 2013; Gebru**,** 2015, and Abera, 2017) found the negative relationships between foreign aid and the long-run economic growth in Ethiopia. These mixed results lead to raise question of why impact of aid on economic growth in Ethiopia continues to be paradoxical in its findings. Moreover, Haile (2015) argued that despite notable donor intervention in the country's economic activities, the actual role of foreign aid has no significant impact on Ethiopian economic growth. This debate seems to be mainly driven by the results from cross-country regression analyses, while there have been few studies that adopt specific-country approach to investigate the impact of aid on economic growth. Because aid effectiveness is diverse across countries. Although cross-country empirical analyses have progressively developed and enormously contributed to understanding of aid-growth link, there is clear need for country case studies to capture country-specific heterogeneous features. Hence, this study makes a contribution to the less researched country-level literature on the impact of aid on economic growth. This paper aims to analyze the impact of foreign aid on economic growth in Ethiopia using time series data over the period 1974–2017. The significance of this study rests on informing public mandate towards foreign aid impact on economic growth in Ethiopia and gives glimpse of ideas on debates surrounding the mixed results from empirical literature on the contribution of foreign aid towards economic growth in Ethiopia. As commonly known, Ethiopia has been one of the major recipients of international aid; therefore, the expected outcome from this study could help improving policy design, institutional setup, implementation, monitoring and evaluation of foreign aid in Ethiopia.

Theories of Economic Growth

The Neo-classical Theory of Growth

The basic framework of neo-classical growth models was first developed by Solow (1956) and Swan (1956), which 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 his 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 Solow (1956), simple mathematical model, economic growth can be measured as:

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

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

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

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,

$$\frac{\partial Y}{\partial K} * \frac{\Delta Kt}{\Delta Yt} = \frac{\partial Y}{\partial K} * \frac{Kt}{Yt} * \frac{\Delta K}{Kt} = \beta K \frac{\Delta K}{Kt} = \beta K g K$$

Using the same methodology for labor and technology, reduced form of Eq. (2)in growth form is as follows.

$$gy = \beta K g K + \beta L g L + \beta A g A \tag{3}$$

Or

$$\beta A g A = gy - (\beta K g K + \beta L g L) \tag{4}$$

Since 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 the share of capital is βk, then the share of labor is 1 - $\beta k = \beta L$ and the above equation can be rewritten as

$$\beta A g A = gy - (\beta K g K + (1 - \beta k) g L) \tag{5}$$

where

gy = growth rate of real GDP
gk = growth rate of physical capital
gL = growth rate of human capital
gA = growth rate of technology and

βk, βL, and 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.

Methodology

Model Specification

As we discussed in the "Theories of Economic Growth" section, the model to examine the relationships between foreign aid and GDP growth in the paper is derived from neo-classical growth model:

$$Y = f\ (GK, LF) \tag{6}$$

where

Y denotes a proxy for economic growth
Gk denotes physical capital
Lf denotes human capital

Following the 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. The mathematical relationship between real GDP and its components given as:

$$Y = f\ (GK, AID, EXD, EXHE, EXT, INF) \tag{7}$$

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
INF denotes general inflation rate

According to Benoit (2011), the next step is expressing the variables into logarithmical form in a regression model. Thus, the growth function of Eq. (7) written as:

$$\begin{aligned} \Delta lnRGDPt = {} & \beta 0 + \beta 1 lnGK(t-1) + \beta 2 lnAID(t-1) \\ & + \beta 3 lnEXD(t-1) + \beta 4 lnEXHE(t-1) + \beta 5 lnEXT(t-1) \\ & + \beta 6 INF(t-1) + \varepsilon t \end{aligned} \tag{8}$$

lnRGD Pt	represents natural logarithm of real 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 error term

β0, β1, β2, β3, β4, β5, and β6 are coefficients that measure long-run and short-run relationship of independent variables with real RGDP in this specified model.

An ARDL representation of Eq. (6) will be:

$$\Delta \mathrm{Yt} = \beta 0 + \sum_{\mathrm{i}=1}^{\mathrm{p}} \beta \Delta \mathrm{Yt\text{-}i} + \sum_{\mathrm{i}=1}^{\mathrm{p}} \mathrm{a}\Delta \mathrm{Xt\text{-}1} + 82\mathrm{Xt\text{-}1} + \mathrm{Ut} \tag{9}$$

where Δ denotes for first difference operation, *Yt* is for a vector of dependent variables, *Xt* is a vector of *p* determinants of *Yt* regressors, *Ut* is the residual term which is assumed to be white noise.

Basically, the ARDL approach to co-integration (Pesaran et al. 2001) involves estimating of the error correction model (ECM) version of ARDL model for the determinants of economic growth:

$$\begin{aligned}
\Delta LNRGDP = \alpha 0 &+ \sum_{i=1}^{p} \beta 0 \Delta LNRGDPt \\
&+ \sum_{i=0}^{p} \beta 1 \Delta LNGK1 \\
&+ \sum_{i=0}^{p} \beta 2 \Delta LNAIDt - 1 \\
&+ \sum_{i=0}^{p} \beta 3 \Delta LNEXDt - 1 \\
&+ \sum_{i=0}^{p} \beta 4 \Delta LNEXHEt - 1 \\
&+ \sum_{i=0}^{p} \beta 5 \Delta LNEXTt{-}1 \\
&+ \sum_{i=0}^{p} \beta 6 \Delta INFt{-}1 \\
&+ \theta 0 LNRGDPt{-}1 \\
&+ \theta 1 LNGKt{-}1 \\
&+ \theta 2 LNAIDt{-}1 \\
&+ \theta 3 LNEXDt{-}1 \\
&+ \theta 4 LNEXHEt{-}1 \\
&+ \theta 5 LNEXTt{-}1 \\
&+ \theta 6 INFt{-}1 + Ut
\end{aligned} \tag{10}$$

where *RGDP* is the real GDP in Million Birr at a time *t*, *GK* is capital formation (proxied by gross investment), *AID* is foreign Aid, *EXD* is total external debt, *EXHE* is expenditure of health and education (both recurrent and capital), which is proxy of human capital, *EXT* is total export of goods and service, and *INF* is the general inflation rate, *u* is the residual term, which is assumed to be white noise, *p* is the optimal lag length, and *ln* is natural logarithm. Except inflation, all the variables entered in the model is measured in millions of Birr.

The bounds test is mainly based on the joint Wald test or *F*-test which its asymptotic distribution is non-standard under the null hypothesis of no co-integration. The hypotheses to determine a long-run relationship between the variables in Eq. (10) are:

Null: - H0: Θ0 = Θ1 = Θ2 = Θ3 = Θ4 = Θ5 = Θ6 =*0* (no long-run relationship)

Alternative: - H1: Θ0 ≠ Θ1 ≠ Θ2 ≠ Θ3 ≠ Θ4 ≠ Θ5 ≠ Θ6 ≠ 0 *(*there is a long-run relationship)

If there is an evidence of long-run relationship (co-integration) of the variables, the following long-run ARDL (P1, P2, P3, P4, P5, P6, P7) models will be estimated.

$$LNRGDP= \quad \alpha 0 + \sum_{i=1}^{p} \beta 0 \Delta LNRGDPt + \sum_{i=0}^{p} \beta 1 \Delta LNGK1 + \sum_{i=0}^{p} \beta 2 \Delta LNAIDt - 1 + \sum_{i=0}^{p} \beta 3 \Delta LNEXDt - 1 + \sum_{i=0}^{p} \beta 4 \Delta LNEXHEt - 1 + \sum_{i=0}^{p} \beta 5 \Delta LNEXTt - 1 + \sum_{i=0}^{p} \beta 6 \Delta INFt - 1 + \mathcal{E}t \tag{11}$$

Data Sources

The necessary data for the paper is collected from various sources such as Ethiopian Economic Association (EEA) database CD Rom, Ministry of Finance and Economic Development (MOFED), National Bank of Ethiopia (NBE), Ethiopian Central Statistical Authority (CSA), National Metrology Agency, International Monetary Fund (IMF) database, Penn World Table, and World Bank online databases. The method employed in the study is based on recent advancements in the theoretical and empirical aid–growth relationships. As the data used is time series (annual time series data over the period 1974 to 2017), various tests such as testing for stationary (unit root test) and co-integration test are performed. The rank of co-integration is determined by using ARDL. The model is estimated by using ordinary least Square (OLS).

Results and Discussion

Econometric Model Testing

The Unit Root Test Analysis

Before conducting ARDL co-integration test, first it is recommended to conduct test for the stationarity status of the given time series data to determine their order of

integration. A unit root test is carried out using Augmented Dickey-Fuller (ADF) test for each variable in the model. The unit root test could convenience us whether or not the ARDL model should be used and to avoid spurious results, all the variables used in the regression model should not be stationary at an integrated of order two (I(2), because the computed *F*-statistics provided by Pesaran et al. (2001) are valid only when the variables are I(0) or I(1). Therefore, Augmented Dickey-Fuller (ADF) test was conduct and its result shown in Table 1.

The unit root test results clearly show all explanatory variables which are non-stationary [i.e., I(0)] at levels and stationary [i.e., I(1)] at their first difference and but not on I(2). This gives a clue to meet the basic requirements in applying ARDL model due to fact that the order of integration of the time series is not I(2). That is, the 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.

Diagnostic Test and Model Stability

After checking the stationarity of the variables, standard property of the model is tested through diagnostic and model stability test. Model stability and diagnostic checking to detect serial correlation (Brush and God fray LM test), functional form (Ramsey's RESET), conflict to normality (Jaque-Bera test), and heteroscedasticity (Breusch-Pagan-Godfrey test) were performed. In order to reject or accept the null hypothesis, we can decide by looking the *p*-values associated with the test statistics. That is, the null hypothesis is rejected when the *p*-value are smaller than the standard significance level (i.e., 5%). The *p*-value associated with both LM version and F version of the diagnostic test statistics is above the standard critical value (its above 5%). Therefore, it is possible to conclude that the ARDL co-integration model of the study passes all the diagnostic tests (which include serial correlation, functional form, normality, and heteroscedasticity) (Table 2). 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 heteroskedasticity 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 cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests (Figs. 1 and 2), which are recommended by Pesaran and Shin (1999).

As shown in the above figures, the plot of CUSUM stays within the critical 5% bound for all equations (Fig. 1), and CUSUMSQ statistics does not exceed the critical boundaries (Fig. 2), that confirms the long-run relationships between the economic growth and the explanatory variables; thus, we can be able to conclude that the parameters of the model do not suffer from any structural instability over the study period. 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%

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*

The rejection of the null hypothesis is based on MacKinnon (1996) critical values

of the model has been explained by the regressors; hence, the results of the estimated model are reliable and efficient.

Long-Run ARDL Bounds Tests for Co-integration

The bounds test approach of co-integration is estimating the ARDL model specified in Eq. (4) 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

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] **

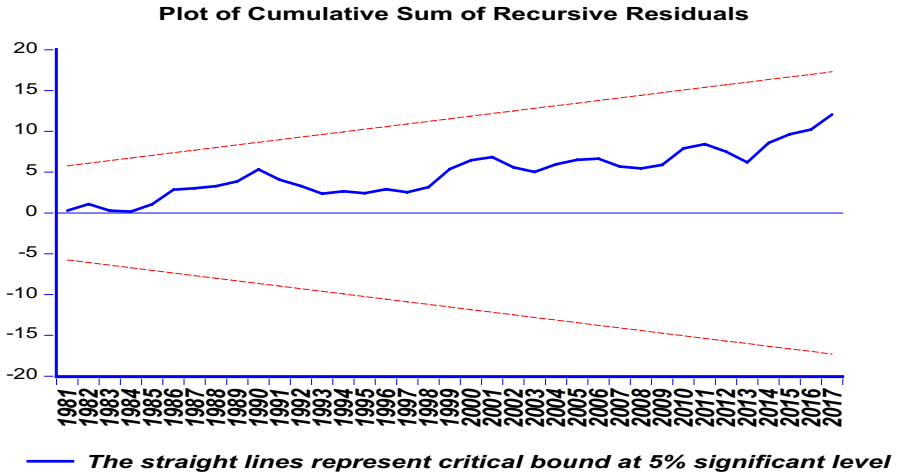

Fig. 1 Plot of cumulative sum of recursive residuals

aid, external debt, expenditure for education and health, total export, and general inflation) in Eq. (5) The computed *F*-statistic value is compared with the lower and upper bound critical values provided by Pesaran et al. (2001) and Narayan (2004). 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.

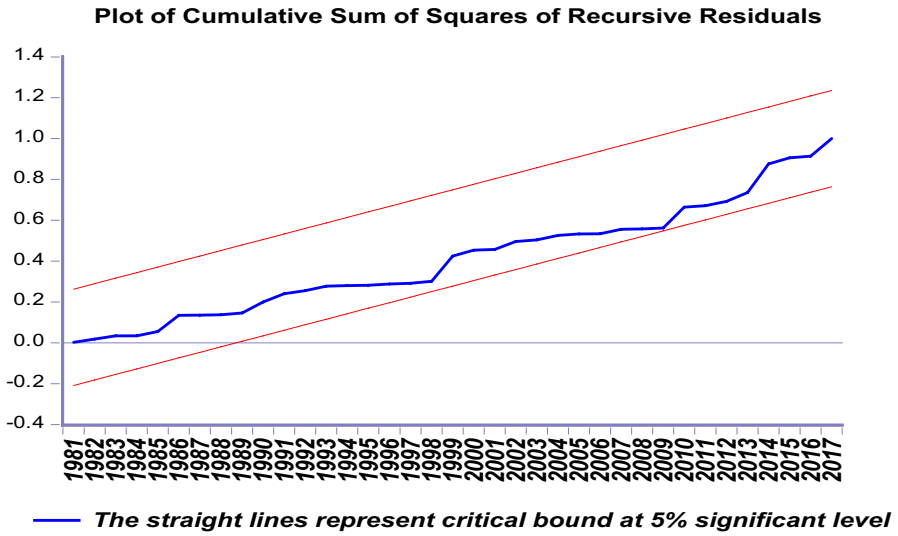

Fig. 2 Plot of cumulative sum of squares of recursive residuals

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

The computed *F*-statistic value is compared with the lower bound and upper bound critical values tabulated in Table 4 CI (III) case IV of Pesaran et al. (2001) and Narayan (2004).

As it is depicted in the above table, the value of significance level at 1%, 5%, and 10% are tabulated, based on Pesaran et al. (2001) and Narayan (2004) 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 used Narayan (2004) which is developed based on 30 to 80 observations as we discussed earlier in the third part of this study.

Accordingly, the value of the calculated *F*-statistics 9.388 is higher than Pesaran et al. (2001) and Narayan (2004) 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 et al. (2001) and Narayan (2004) 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.

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. Once we are checking long-run co-integration among the variables, and then it is good to estimate the ARDL model to find out the long-run coefficients. The estimated coefficients are reported in Table 5. In doing so, the Akaike information criterion (AIC) is chosen with two maximum lag order

Table 4 Pesaran et al. (2001) and Narayan (2004) 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 (2004) critical values for *K*=6	4.53	6.26	3.33	4.70	2.387	3.671

Source: Pesaran et al. (2001) and Narayan (2004) tables

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]*		

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% 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 presents the summary of estimated results of the long-run growth model in the regression with respect to their significant levels. It shows that, the estimated coefficients of the variables entered in the regression; gross capital formation, human capital formation, and inflation have positive signs and statistically significant at 1% significant level. Meanwhile, external debt and exports of goods and service have negative sign and statistically significant at 1% significant level.

Foreign aid is the central variable in this study, as shown in the table above; it has negative significant impact on Ethiopian economic growth. The negative coefficient of the results of foreign aid is consistent with the studies by Siraj (2012), Haile (2015), Kidanemariam (2013), Gebru (2015), and Abera (2017) which found the negative impacts of foreign aid on long-run economic growth in Ethiopia. In contrary, Tadesse (2011), Duresa (2022), and Girma and Tilahun (2022) found the positive impacts of foreign aid on long-run economic growth in Ethiopia.

There might be two possible reasons behind the negative impact result of foreign aid on long-run economic growth in 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 added 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 to 2017).

The other variable is the debt burden, which is measured by total external debt. It has a significant negative relationship with real GDP at 1% significant level. The estimated coefficient of the long-run relationship shows that a 1% increase in the external debt holding other things constant leads to approximately 0.0895% 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 the government with heavy debt burden.

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 1% significant level. A 1% 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% change in real GDP during the study period. This result is similar with the results found by Demissie (2011) and Gebru (2015) in Ethiopia. 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% of export level in the country that comes from agricultural primary product, which suffered from international price shock.

General inflation rate in Table 5 shows the unexpected positive impact on Ethiopian economic growth. However, it is not statistically significant at 1% significant level. From the results, we can understand that inflation does not harm the economic growth significantly during the study period. Finally, the long-run estimated model presented approximately as follow with figures in the parenthesis indicates calculated *t*-value.

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

Short-Run Error Correction Estimates

The short-run dynamic coefficient estimation was obtained from estimation of the error correction model (ECM). The error correction term (ECM) indicates the speed of adjustment to restore equilibrium in the dynamic model. It is a one lagged period residual obtained from the estimated dynamic long-run model. The coefficient of the error correction term indicates how quickly variables converge to equilibrium and it should have a negative sign and statistically significant (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.

As presented in the error correction model Table 6, the error correction term is strongly significant and its coefficient (*ECM-1*) is −.0.8465, which implies that the deviation from the long term in economic growth is corrected by 85% in the next year. The coefficient of the lagged error correction coefficient, estimated at −0.8465, is highly significant, has the correct negative sign, and implies a very high speed of adjustment to equilibrium. Gebru (2015) and Girma and Tilahun (2022) stated that a highly significant error correction term was a further evidence of the existence of a stable long-run relationship. Moreover, the coefficient of the error term (*ECM-1*) implies that the deviation from long-run equilibrium level of real

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]*		

GDP in the current period is corrected by 84.65% in the next period to bring back equilibrium when there is a shock to a steady-state relationship among the variables.

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 1% significance level in the short term. This shows that holding other things remain constant a 1% increase in capital formation will result approximately in 21% increase in real GDP in the short run during the study period.

Foreign aid is similar to the long-run model that has significant negative impact on Ethiopian economic growth with unexpected coefficient sign and statistically significant at 1% significance level, in the short term. As a result, holding other things constant, a 1% increase in foreign aid will result in approximately 10% decrease 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 5% significance level. As a result holding other things constant, a 1% increase in external debt will result in approximately a 1% decline in the real GDP in the short run. However, the 1-year lag result value indicates 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, it is permanent as well as transitory and overhang occurs both in short and long run. This result is consistent with the results of long-run model and the study by Wessene (2014) and Gebru (2015) in Ethiopia. According to Wessene (2014) and Gebru (2015), the reason behind the negative impact on economic growth in the short run might be the improper management of external debt which might also be the case in this study.

Human capital formation/expenditures to health and education showed similar result with the long run, have significant positive impact on Ethiopian economic growth and statistically significant at 1% significance level, in the short term. As a result, holding other things constant, a 1% increase in human capital expenditure will result in approximately 29% increase 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% 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 1% 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.

Conclusion

Similar to other developing countries, physical domestic capital accumulation has a pivotal role to lifting up economic growth in Ethiopia. Due to domestic resources gap, the country obliged to look for external source of capital in terms foreign aid to enhance economic growth. There are several empirical studies that are undertaken to analyze the nexus between foreign aid and economic growth in Ethiopia; but they came up with mixed results. Some of the studies concluded that foreign aid has a positive and significant effect on economic growth, while the others showed that foreign aid has a negative impact on economic growth. This enables to raise question of why impact of aid on economic growth in Ethiopia continues to come up with paradoxical findings.

To investigate and examine the inconsistency in findings of foreign aid and economic growth in Ethiopia, this study aims at exploring this question by analyzing the impact of foreign aid on economic growth and the study also examined the contribution of foreign aid and the macroeconomic policy environment to economic growth in the country.

In order to examine the long-run and short-run economic growth model, the study applied an autoregressive distributed lag (ARDL) approach over the period 1974 to 2017. This is because ARDL gives reliable estimates even if in the presence of endogenous variables; it is possible to apply whether the regressors are I(0), I(1), or mixed; it is relatively more reliable and efficient for small size sample, which is the case for this study.

The empirical finding of the study revealed that foreign aid flow has a negative sign in the long run and short run. The study also found out that external debt and export of goods and services have unexpected significant impact on economic growth of Ethiopia with negative sign in the long run and short run. The result of external debt indicates the existence of debt overhang problem in the country during the study periods. On the other hand, export of goods and services in the long run and short run showed unexpected significant impact on economic growth of Ethiopia with negative sign. From this, one can understand that, holding other things constant, export of goods and services has no brought significant impact in real GDP growth and so far economic growth does not achieved by export of goods and services during the study period.

The long-run and short-run ECM model results showed that a 1% increase in foreign aid, holding other things constant, has resulted in 0.0587 and 0.101% decrease in real GDP during the study period respectively. Hence, it is concluded that there might be a possible reason behind the negative impact result of foreign aid on Ethiopian economic growth. This might be 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. .

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 and strengthening saving for housing program and for investment equipment scheme.

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

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

Declarations

Conflict of Interest The authors declare no competing interests.

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