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The causality between Financial Development and Economic Growth in Ethiopia: Supply Leading vs Demand Following Hypothesis

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Abstract

This paper investigates linkage between financial development and economic growth in Ethiopia during the period from 1975 to 2016 using Autoregressive Distributed Lag (ARDL) approach. The paper also schedules Vector Error Correction Model (VECM) in order to observe how fast the cointegrated variables convergence in long-run. Accordingly, the results of bound test confirm existence of the long-run relationship between explanatory variables and economic growth. The empirical results show evidence of long- and short-run positive impacts of financial development on economic growth in Ethiopia which implies that progesses in financial sector contribute to economic growth in both short- and long-run. In consideration of few control variables, the study finds all indicators, except inflation and government expenditure, significantly influence economic growth in the long-run. However, it also reveals that government expenditure, trade openness, human capital, and gross investment are pioneering determinants of the economic growth in Ethiopia in short-run. Moreover, the study employs Granger causality tests in order to show direction of impact is running from financial development to economic growth both in short- and long-run. As a result, it finds that the 'supply-leading' hypothesis holds in Ethiopia.

Keywords: *Financial Development; Economic Growth; ARDL Bound Test; VECM; Granger Causality Test.*

JEL Classification: *G12, D40, C51, C59.*

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1. Introduction

Financial development is linked to economic growth due to having various functions, includes financial intermediation, reduction of transaction costs, and the possibility for diversification. The overall functions of financial institution come up with an improved accumulation of capital, efficient allocation of economic resources and improvement in technological capability which are crucial ingredients for economic growth (Levine, 2004). Furthermore, financial institutions make the linkage between the surplus and deficit sectors of the economy through intermediation.

For long period of time, both theoretical and empirical analysis argued that financial sector development comprises an important mechanism for long-run economic growth through effective mobilization of domestic savings for productive investment, thereby alleviation of poverty especially for developing nations (Ellahi, 2011). In line with that there are various studies have identified the relation between financial development and economic growth.

However, there is no cross-cutting consensus arrived on such linkage. For instance, some theoretical and empirical investigation witness that financial development leads to foster economic growth. Empirical analysis supporting the positive relationship between finance and growth nexus argued by those researchers such as Giuliano and Ruiz-Arranz (2009) and Nkoro and Uko (2013) stating that financial sector development creates strong economic environment for investment through efficient allocation of funds and also strengthen trade and business linkages and technological diffusion and innovation. These outcomes can be obtained mainly through mobilizing savings for productive investment and thereby accelerate economic growth. Unlike to positive linkage argument, Adusei (2012) finds that financial development plays insiginificant role in promoting economic growth. The extreme contrast to positive contribution financial development, some scholars such as Loayza and Ranciere (2006), Adusei and Nkrumah (2013), and Beck et al. (2013) still come up with the negative impact of financial development on economic growth in their empirical analysis.

In Ethiopian context, development of the financial sector has a long history and categorized as banking and non-banking institutions which consists of commercial banks, development banks, specialized financial institutions, cooperatives, insurance companies, etc. However, the organizational structure, management, and ownership of these financial institutions as well as their performance have been varying across the three regimes (Roman, 2012).

In Ethiopia economic system including financial institution has become market-oriented in 1992 after the collapse of socialism economic system and has undergone financial reforms called liberalization through gradualism (Alemayehu, 2006; Murty et al., 2012). After the policies reform, Ethiopia has been experiencing strong economic growth compared to early years; the major financial institutions operating in Ethiopia are banks, insurance companies, and microfinance institutions and the financial sector of the country shows a slightly on the way of growth but the performance of the financial sector of Ethiopia as compared to other middle-income African countries shows the need for more improvement (Fozia, 2014). This clearly shows that there is still weak financial system which manifested in high government regulation and dominance of the government-owned commercial bank in terms of holding assets, savings mobilization, and loans disbursement. In sub-Saharan countries in which Ethiopia is inclusive, the national saving is very low and insufficient to finance the development which necessitating financial sector development and attraction of foreign direct investment (Roman, 2012).

Moreover, Ethiopia's financial sector is infant stage and is highly dominated by the banking system. Ethiopia has also experienced the non-existence of capital market and underground informal investment in shares of private companies. In addition to missing market of capital including stock and equity market, money markets are at infant stage and there is only a thin primary market for treasury bills and weak inter-bank money market. There are only government's issued bonds available in Ethiopia. Despite of supply of the banking service which is growing from year to year, it has not yet increased the outreach of the banking system at large in which large populations are not served well. This is an implication that Ethiopia still characterized by under-banked country in the world (Roman, 2012).

With regards to direction of causality, the empirical results across different countries implies that there is no clear cut conclusion on the direction of causality between financial development and economic growth rather, causality result widely differs across countries based on the individual characteristics of financial development, the pattern of economic growth, and government macroeconomic policy designed towards enhancing financial sector development (Kyophilavong et al., 2016). Moreover, some of the empirical work reveals that the direction of causality between finance and growth largely depends on the choice of the proxy used to measure financial development in countries specific studies.

In the context of Ethiopia, there are a few studies that have been conducted on the relationship between financial development and output growth at

aggregate level and have all come up with mixed result and contradicting with each other. Murty et al. (2012) have found a positive relationship between overall output growth and financial development by using different indicators with their respective study. Conversely, Fozia (2014) found that financial development has long-run negative impact on aggregate output growth in Ethiopia. On another hand, the study conducted by Roman (2012) found presence of a positive and significant long-run relationship between financial development and economic growth and an insignificant effect in the short-run. In contrast to this finding, Bekana (2016) found the negative and insignificant effect of financial development on economic growth in the long-run, but significant relation in the short-run which implies controversies result toward the financial development and economic growth relationship. Except for the study of Roman (2012) who found the existence of long-run uni-directional causality from economic growth to financial development, all other studies have failed to address the causality between the variables and aggregate output level in both short- and long-run. Moreover, in contrast to previous study, this study has used domestic credit provided by financial sector (as percentage of GDP) to measure financial development. This is because of the fact that Domestic credit provided by the financial sector includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. This indicator is crucial to measure the level of development in the financial system, providing also information about the sectors' performance and size as compared to credit to private sector as a percentage of GDP to measure financial development.

This paper fills another research gap of methodology perspectives in which Autoregressive Distributive Lag (ARDL) model which has a superior advantage over Engle-Granger and conventional Johansson cointegration. Furthermore, the direction of causality between the financial development and economic growth in the long- and short-run separately with appropriate model were also an uncovered area of research previously. Therefore, the present study has performed the short- and Long-run causality between economic growth and financial development nexus by considering appropriate financial development indicators and including updated data for the period 1974/5-2015/6 in Ethiopia.

2. Review of Related Literature

The modern growth models developed by McKinnon (1973) and Shaw (1973) showed that economic development as a function of financial sector development and liberalization. They relate financial development with liberalization to accelerate country's economic development. They argue that when there is financial repression in the economy, there might be the existence of low levels of

savings and poor and inefficient allocation of credit facilities. Financial repression means that it impedes the smooth flow of resources to the financial sector and allocates funds towards unproductive economic activities. This consequently declines economic growth and restrains the expansion of the financial sector at large. McKinnon-Shaw model focused solely on the role of capital accumulation in economic growth. They further indicated in their model that economic growth can be increased by removing institutional interest rate discrimination and reserve requirement tax and ensuring that the financial system competitively operates under conditions of free entry under the liberalization environment.

There are various studies conducted in different countries regarding causality between financial development and economic growth. There is no wide consensus among these studies; however, they provide evidences for one of these four observations: demand following causality, supply leading hypothesis, bidirectional, or no causality between financial development and economic growth. For example, in chronological order the studies done by Quartey and Prah (2008), Bittencourt (2012), and Shahbaz (2013) are strongly confirmed the 'supply leading' hypothesis in their empirical investigation. They found a uni-directional causality running from financial developments to economic growth. In other words, they observe that countries with more developed financial markets tend to enjoy sustainable growth comparing to others. Contrarily, few scholars such as Demirguc-Kunt and Levine (2008), Odhiambo (2010), and Rafindadi and Yusof (2013) found the 'demand following finance hypothesis' which argues that economic growth are leading indicator (the result) of the financial development.

The third category of direction of causality between the variable is bi-directional school of thought as empirically evidenced by different scholars such as Pehlivan Jenkins and Katircioglu (2010) and Kyophilavong et al. (2016).

On the other hand, contrarily to aforementioned studies, few other empirical works (De Gregorio and Guidotti, 1995; Gries et al., 2009) confirm that there is no causality between financial development and growth. They assert that neither financial development nor economic growth is endogenously determined.

Accordingly, Nkoro and Uko (2013) examine the finance-growth nexus in Nigeria. They employed Error Correction Mechanism (ECM) with an annual series covering the period 1980-2009. They also used five different indicators namely; ratios of broad money stock to GDP, private sector credit to GDP, market capitalization-GDP, banks deposit liability to GDP and Prime interest rate were used to measure financial development. The empirical results show that there is a positive effect of financial sector development on economic growth in Nigeria. However, credits to the private sector and financial sector depth were found to be

ineffective and fail to accelerate growth. However, this study did not address the problem of endogeneity which is a problem in time series studies since the relationship between financial development and economic growth cannot be determined on a priori grounds.

Karbo and Adamu (2011) analyze the nexus between financial development and economic growth in Sierra Leone over the period 1970-2008 and employed methodology for analysis was autoregressive distributed Lag (ARDL) model. They found that financial development as represented by private credit exerts a positive and statistically significant effect on economic growth and concluded that investment is an important allocative channel through which financial development affects economic growth. A similar conclusion has been drawn early by Sanusi and Sallah (2007) that they investigated the relationship between financial development and economic growth in Malaysia data covering period of 1960 to 2002 using autoregressive distributed lag (ARDL) and took different financial development indicator to compare their significance on growth. Finally, they come up with a positive and statistically significant impact on economic growth in the long-run when only ratio of broad money to GDP and bank credit used as indictor. Moreover, similar to other conclusion, a rise in investment will encourage economic growth in the long-run.

Murcy et al. (2015) examine the relationship between financial development and economic growth in Kenya using annual time series data. They employed autoregressive distributed lag (ARDL) so as to accommodate small sample data series and to address the problem of endogeneity and found that financial development has a positive and statistically significant effect on economic growth in Kenya in long- and short-run hence confirmed supply leading hypothesis.

In case of Ethiopia, few studies such as Roman (2012) investigates the link between the financial development and economic growth by using ECM Model and found that the existence of an uni-directional causality from economic growth to financial development and the presence of the positive and significant long-run relationship between financial development and economic growth and an insignificant effect in the short-run which implies controversies result toward the financial development and economic growth relationship in line with other studies in the same area. On another hand, Murty et al. (2012) investigates the long-run impact of bank credit on economic growth in Ethiopia via a multivariate Johansen (1988) co-integration approach using time series data for the period 1971/72-2010/11. Their focus of the investigation was transmission mechanism through which bank credit to the private sector affects economic growth and

found that a positive and statistically significant equilibrium relationship between bank credit and economic growth in Ethiopia. Moreover, they also come up with results that deposit liabilities affect long-run economic growth positively and significantly through banks services of resource mobilization. Basically, their finding shows that bank credit to the private sector affects economic growth through its role in the efficient allocation of resources.

Fozia (2014) tried to investigate the effect of the financial sector on the economic growth of Ethiopia over the period of 1980-2013 by employing ordinary least square method to determine both long- and short-run effects of financial development on economic growth. An indicator of financial development used by the researcher was commercial-central bank asset ratio whereas variables such as openness lagged real GDP, total investment, aid, and labor force were used as conditioning variables. She found a negative and significant effect of financial development indicator (i.e. commercial-central bank asset ratio) on the economic growth of Ethiopia. In addition, regarding control variables she used indicated that trade openness and labor force had an expansionary effect on the economic growth whereas aid showed a significantly negative effect on the economic growth.

Furthermore, the current study was done by Bekana (2016) who undertaken empirical investigation of the relationship between financial development and economic growth by using VAR approach and Johnson cointegration, and found that financial development has negative coefficient and insignificant effect in the long-run, but significant relation in the short-run which is conflicting results with the Roman (2012) finding. The studies implied in Ethiopia context are come up with the different result which is difficult to draw a relevant conclusion on the relation between financial development and economic growth.

3. Data and Methodology

3.1. Data Type and Source

The annual time series data set serially ranging from 1974/75 to 2015/16 has been employed in the current study. The study used sectoral dis-aggregate macro-data based on the availability of relevant data for the study. The relevant data was collected from various sources: National Bank of Ethiopia, Ethiopia Development Bank, Ministry of Finance and Economic Development (MoFED), Ethiopian Economic Association, World Bank, World Development Indicator database.

3.2. Model Specification

In analyzing the relationship between financial development and growth, the researcher employed augmented Solow (1956) growth model in which output is a function of stock of capital, labor, human capital, and technology (Solow, 1956). This model is different from that of traditional Solow growth model by incorporating human capital as a factor of production in which it is endogenously determined within model.

Imoughele et al. (2013) and Adebola and Dahalan (2012) analyze the effect of financial sector development on economic growth within standard growth accounting framework and assumed that capital stock is delivered by two sector – banking sector and the stock market. Similar assumption had been taken in an early study by Caporale et al. (2004), and Bolbol et al (2005). However, in Ethiopia context, the stock market is missing. So, it is ignored from the model specification.

In cobb-Douglas production function framework, the augmented Solow (1956) growth model can be specified as:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} H_t^{\gamma} \quad (1)$$

where *Y* is the output flow, *L* is labor force, *K* is capital stock and *H* is human capital. As described above the total capital stock is represented by banking sector (financial sector development) indicators. Therefore

$$Y_t = A_t K_{FDt}^{\alpha} L_t^{\beta} H_t^{\gamma} \quad (2)$$

Furthermore, the effect of technology (A_t) is divided into constant term β_0 and country specific deviation ε (Imoughele et al., 2013). Besides, we could not use labor in the equation, because we have human capital variable which is more important to represent human skills than labor. Thus, the final equation specified as:

$$Ln(Y_t) = \beta_0 + \alpha Ln(K_{FDt}) + \gamma Ln(HK_t) + \varepsilon_t \quad (3)$$

Rather than taking the entire unexplained variable in the technology which is exogenously determined, including additional combination variables in the model that should be a proxy for technology is important because it makes the model more predictable and appropriate to know the accurate effects these variables on economic growth (Imoughele et al., 2013). Therefore, $\varepsilon_t = X_t + u_t$, the above equation can be rewritten as below when control variables are included.

$$Ln(Y_t) = \beta_0 + \alpha Ln(K_{FDt}) + \gamma Ln(HK_t) + \psi X_t + u_t \quad (4)$$

where K_{FDt} is total capital stock provided by banking (financial) sector and HK_t is human capital proxy by secondary school enrollment whereas X_t is a vector of control variables. Since the aim of this study was to examine the relationship between the financial sector and economic growth, the model for this study was re-specified as follows with some modification which is different from previous one.

$$Real\ GDP = f(HK, GI, FD, INF, GCE, TO) \tag{5}$$

where *GI* is a gross investment to GDP; *FD* is financial development; *GCE* is government consumption expenditure as percentage of GDP as a proxy for the size of the government; *INF* is inflation level; *TO* is trade openness (import plus export as a percentage of GDP) as a proxy for market liberalization and other variables are stated earlier.

As stated in the empirical literature review, many scholars such as Anwar and Cooray (2012) and Valickova et al. (2015) used financial development (*FD*) indicators in developing countries in which Ethiopia inclusive are a domestic credit to private sector as percentage of GDP, Broad money as percentage of GDP, Deposit liabilities and bank credit to economic sector among the others. As result, we used domestic credit as percentage of GDP to represent financial development.

Since all the variables under study were transformed into natural logaritmic form, to avoid heteroscedasticity (Gujarati., 2004) and to show elasticity of the variables we re-write the growth function as below.

$$\begin{aligned} Ln(GDP_t) = {} & \beta_0 + \beta_1 Ln(HK_t) + \beta_2 Ln(GI_t) + \beta_3 Ln(BC_t) + \beta_4 Ln(INF_t) \\ & + \beta_5 Ln(GCE_t) + \beta_6 Ln(TO_t) + u_t \end{aligned} \tag{6}$$

In order to proxy financial development (*FD*) we have used domestic bank credits (*BC*) as percentage of GDP. We believe it reflecs financial development and economic growth at aggregate level.

3.3. Equation Procedure

3.3.1. Unit Root Test

The necessary condition to be addressed for testing unit root test is to check whether the variables enter in the regression are not order two (I.e. *I(2)*) which considered as a precondition in employing ARDL model. Therefore, running any sort of regression analysis is impossible without testing for time series variables.

So, the first step in this study is testing unit root before running regression analysis.

The testing procedure for the ADF unit root test is specified as follows:

$$X_t = \alpha + \delta t + \mu X_{t-1} + \sum_{i=1}^{\rho} \lambda \Delta X_{t-i} + \varepsilon_t \quad (7)$$

where is $\boldsymbol{X_t}$ a time series variables which are mentioned above in this model at time t, δ is a time trend variable; Δ denotes the first difference operator; is the error term; ρ is the optimal lag length of each variable chosen such that first-differenced terms make ε_t a white noise. Thus, the ADF test the null hypothesis of no unit root (stationary) which is expressed as follows.

$$H_0: \mu = 0;\ H_1: \mu \neq 0 \quad (8)$$

Regarding decision of unit root test, if the t value or t-statistic is more negative than the critical values, the null hypothesis (I.e. H_0) 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. Failure to reject the null hypothesis of unit root test leads to take the test on the difference of the time series to come up out with stationary variable for analysis.

3.3.2. The Autoregressive Distributed Lag Model (ARDL)

Most of the past studies have used the Johansen (1988) co-integration and Engle-Granger causality technique to determine the long-term relationships between variables of interest. This is because many researchers confirm that most of the accurate method to employ this method when the variables of interest are integrated in the same order. Recently, however, a series of studies by Pesaran et al. (2001), Pesaran and Shin (1999), and Nayaran (2004), who introduced an alternative co-integration technique known as the 'Autoregressive Distributed Lag (ARDL)' bound test. There are numbers of advantages of using ARDL model also called 'Bound Testing Approach' over conventional Engle-Granger two-step procedure, Maximum likelihood methods of cointegration (Johansen and Jtiselius, 1990). The advantage of using ARDL approach over other methods is three-fold.

First, the ARDL model is the more statistically significant approach to determine the the co-integration relation in small samples (Pesaran et al., 2001; Nayaran, 2004), while Johansen co-integration techniques require large data samples for valid estimation of the parameters. This means that the model avoids

the problem of biases that arise from small sample size. Therefore, we employed ARDL approach because relatively the sample used in the study is small.

Secondly, the estimation is free from the endogeneity problem. In this approach of Pesaran and Shin (1999) maintain that modeling ARDL with the appropriate number of lags will address autocorrelation and endogeneity problems, because it is possible that different variables have different optimal numbers of lags, whereas in Johansen-type models this is not possible rather take the same lag length for all variables. According to Jalil et al. (2008), no doubt on the problem of endogeneity if the estimated ARDL model is free of autocorrelation.

The third advantage of the ARDL approach is that the it can be applied whether the regressors are purely ordered zero [I(0)], purely order one [I(1)], or a mixture of both. While other cointegration techniques require all of the regressors to be integrated of the same order. This means that the ARDL approach avoids the pre-testing problems associated with standard cointegration, which requires that the variables be already classified into I(1) or I(0) or mixture of both (Pesaran et al., 2001).

Moreover, the other advantages of bound testing approach in the long- and short-run are that parameters of the model in interested variables are determined simultaneously. Finally, applying the ARDL technique we can obtain unbiased and efficient estimators of the model (Narayan, 2004; Pesaran and Shin, 1999). Therefore, this approach becomes popular and suitable for analyzing the long-run relationship and extensively applied in empirical research in the recent years.

Hence, ARDL model can be specified as:

$$\begin{aligned}\Delta Ln(GDP_t) = {} & \beta_0 + \beta_1 Ln(GDP_{t-1}) + \beta_2 Ln(HK_{t-1}) + \beta_3 Ln(GI_{t-1}) \\ & + \beta_4 Ln(BC_{t-1}) + \beta_5 Ln(INF_{t-1}) + \beta_6 Ln(GCE_{t-1}) \\ & + \beta_7 Ln(TO_{t-1}) + \sum_{i=1}^{p} \alpha_i \Delta Ln(GDP_{t-i}) + \sum_{j=1}^{q} \alpha_j \Delta Ln(HK_{t-j}) \\ & + \sum_{k=1}^{r} \alpha_k \Delta Ln(GI_{t-k}) + \sum_{l=1}^{s} \alpha_l \Delta Ln(BC_{t-l}) \\ & + \sum_{m=1}^{v} \alpha_m \Delta Ln(INF_{t-m}) + \sum_{n=1}^{y} \alpha_n \Delta Ln(GCE_{t-n}) \\ & + \sum_{o=1}^{w} \alpha_0 \Delta Ln(TO_{t-o}) + u_t \end{aligned} \quad (9)$$

As represented in the ARDL model, the symbol Δ is the first difference operator; *p, q, r, s, v, y* and *w* are the lag length with their respective variables and u_t error term which is assumed to be serially uncorrelated.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, and\ \beta_7$ indicate coefficients that measure long-run elasticities between the variable whereas $\alpha_i, \alpha_j, \alpha_k, \alpha_l, \alpha_m, \alpha_n\ and\ \alpha_o$ indicates coefficients that measure short-run elasticities among the variables.

The first step involved in ARDL model is to test the null hypothesis of no cointegration relationship which is defined as $H_O = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_5 = \beta_6 = \beta_7 = 0$ against the alternative hypothesis of $H_1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0$ of the existence of co integrating relationship between the variables.

The co-integration test has been undertaken on the F-statistic with help of the bound test of ARDL. The F-test has a non-standard distribution which depends on (1) whether the variables include in the model are I(0), or I(1), (2) the numbers of regressors, and (3) whether the model contains an intercept and/or a trend (Narayan, 2004). Thus, Pesaran et al. (2001) came up with two sets of critical values which are called upper and lower critical bound for cointegration test. The lower critical bound takes in to consideration that all the variables are stationary at level to evaluate that there is no cointegration among the variables whereas existence of co integration depicts when the upper bound takes that all the variables are stationary only at first difference.

Accordingly, when calculated the *F*-statistic is greater than the upper critical bound, and then the null hypothesis will be rejected suggesting that there is presence of long-run relationships among the variables while the F-statistics falls below the lower critical bound value, it implies that there is no long-run relationship. However, when the F-statistic lies within the lower and upper bounds, then we can have no decision made up on co integration. In this case, unit root tests should be conducted to assure the order of integration of the variables (Pesaran et al., 2001). This is due to the fact that ARDL bound testing is inapplicable when the variables are integrated of order 2 or higher order.

The standard test for a unit root is to use Augmented-Dickey (ADF) and Phillips-Perron (PP) t-test statistics. The selection of the lag length was based on Akaike Information Criterion (AIC) which was automatically selected by E-views software. Moreover, the researcher was not going to employ the bound critical value developed by Pesaran et al. (2001) because of the computed critical values are based on large sample size (500 and more) rather, we applied the bound critical values developed by Narayan (2004) which was developed based on small

sample size ranging from 30 to 80 observations in which EViews automatically produce critical value with corresponding computed F-statistic. To conduct the study our sample size was also relatively small this is 42 years' observations.

After the testing in which existence of cointegration between the variables are confirmed, the long-run and error correction estimates of the ARDL model are obtained.

Before proceed to the estimation of a selected model by using ARDL, the orders of the lags in the ARDL Model was selected by the Akaike Information criterion (AIC) or the Schwarz Bayesian criterion (SBC). According to Pesaran and Shin (1999) and later Narayan (2004) recommend to choose a maximum of 2 lags for annual data series. However, it is also possible to choose the maximum lag length for the dependent and independent separately so as to avoid autocorrelation is chosen automatically in the latest version of EViews in which it was not included in the previous version. From this, the lag length that minimizes Akaike Information criterion (AIC) was selected.

The diagnostic test was the mandatory tasks for selected ARDL model so as to examine validity of the short- and long-run estimation in the ARDL model. The diagnostic test such as Heteroscedasticity test (Brush & Godfray LM test), Serial correlation test (Brush & Godfray LM test), Normality (Jaque-Bera test) and Functional form (Ramsey's RESET) test were undertaken. Similar to residual diagnostic test, the parameter stability test of the model was also conducted.

With the existence of cointegration, the short-run elasticities can also be derived through constructing the error correction of the series in the following for in each sector respectively.

$$\begin{aligned}\Delta Ln(GDP_t) = \beta_0 &+ \sum_{i=1}^{p} \alpha_i \Delta Ln(GDP_{t-j}) + \sum_{j=1}^{q} \alpha_j \Delta Ln(HK_{t-j}) \\ &+ \sum_{k=1}^{r} \alpha_k \Delta Ln(GI_{t-k}) + \sum_{l=1}^{s} \alpha_l \Delta Ln(BC_{t-l}) \\ &+ \sum_{m=1}^{v} \alpha_m \Delta Ln(INF_{t-m}) + \sum_{n=1}^{y} \alpha_n \Delta Ln(GCE_{t-n}) \\ &+ \sum_{o=1}^{w} \alpha_0 \Delta Ln(TO_{t-o}) + \gamma ECM_{t-1} + z_t \end{aligned} \quad (10)$$

where, the variable ECM_{t-1} is the error correction term which captures the long-run relationship whereas $\alpha's$ are the coefficients associated with short-run

dynamics of the model coverage to equilibrium. For the model to converge to the long-run equilibrium relationships, the coefficient of ECM should be negative and significant.

3.3.3. Granger Causality Test

Once the cointegration for the long-run relationship among the financial sector development and output growth is confirmed through bound test approach, the long- and short-run causality can be examined separately. The long- and short-run causality between financial development and economic growth was investigated by the vector error correction granger causality framework. Granger causality framework was specified as a matrix form in the following model.

$$(1-L)\begin{bmatrix} Ln(GDP_t) \\ Ln(BC_t) \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix}\begin{bmatrix} Ln(GDP_{t-i}) \\ Ln(BC_{t-i}) \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \end{bmatrix}\begin{bmatrix} Ln(GDP_{t-1}) \\ Ln(BC_{t-1}) \end{bmatrix}(ECM_{t-1}) + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \quad (11)$$

where, *(1-L)* is the difference operator. Significance of the coefficient for lagged error term refers to long-run causality and statistical significant of F-statistic using Wald test referring short-run causality.

When the economic growth expressed by real GDP are taken as dependent variable, significant and negative coefficient of lagged error term in above equation indicates that financial development is granger cause of economic growth in the long-run. In order to determine short-run causality relation, the Wald test was applied. As result, the coefficients related the lagged values of financial development indicator are found to significant as a whole, it can be stated that financial development granger cause of economic growth in short-run.

Similarly, when financial development expressed as the dependent variable, the significant and negative coefficient of lagged error correction term indicates that direction of causality running from output growth to financial development. On another hand, the coefficient of lagged value of real GDP indicates that output growth granger cause of financial sector development.

4. Results and Discussion

4.1. Unit Root Test Analysis

The bounds test approach to cointegration does not need pre-testing for stationary of the variables included in the model, but still, it is important to carry out stationary tests on all the series. The justification behind the unit root test is to take a care on the order of integration not above *I(1)* in which we cannot apply ARDL bounds test to co-integration. Therefore, it was necessary to test for stationary of the series before any econometric analysis was done. It is notable that stationary properties of time series are investigated by testing for unit roots. There are several methods for testing for stationary. Thus, this study used the commonly used Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) unit root tests. The unit root tests results are presented in Table 1.

Table 1 above deals with unit root results of the series at the level and first differences including constant only and intercept with trend specification so as to capture the variables stationary. According to ADF test, all the variable are non-stationary at level and become stationary at the first difference with intercept, and intercept with trend at one percent level of significance except government expenditure as percentage of GDP become stationary at 5% level of significance under Phillip-Perron (PP) unit root tests. However, real GDP and inflation rate become stationary at level form under Phillip-Perron (PP) unit root tests only.

Similarly, the PP test implies that gross investment and government consumption expenditure as percentage of GDP are level stationary at 5% and 10% significance levels respectively, whereas real GDP and inflation rate are also level stationary at 1% significance level. The remaining variables are fist difference stationary at 1% of significance means that the null of nonstationarity is rejected under the Phillip-Perron (PP) unit root tests with intercept specification only. In this case, PP suggests that three variables are I(1) while remaining four variables are I(0). On the other hand, in case of PP test with intercept and trends specification, all variables, except inflation that is I(0), appear I(1) at 1% significance level. These results indicate that, with both types of specifications, inflation series is stationary at level with rejection rule of 1% which would not allow us to apply the Johansen approach of co-integration. This is the critical justification for the reason why we are using the ARDL approach (bounds test approach of cointegration) developed by Pesaran et al. (2001).

Table 1. Augmented Dickey-Fuller and Phillip-Perron unit root tests

Augmented Dickey-Fuller test statistics(ADF Test)							
S no.	***Variable***	*With intercept*			*With intercept and trend*		
		At level	*1st difference*	*Order of integration*	*At level*	*1st difference*	*Order of integration*
4	*Ln(GDP)*	2.1126	-3.9105***	I(1) at 1%	0.0606	-6.3814***	I(1) at 1%
5	*Ln(HK)*	-0.4719	-8.3341***	I(1) at 1%	-2.2032	-8.2226***	I(1) at 1%
6	*Ln(GI)*	2.1425	3.3974**	I(1) at 5%	-1.0064	-6.9945***	I(1) at 1%
10	*Ln(BC)*	0.2267	-7.0325***	I(1) at 1%	-1.7967	-7.6794***	I(1) at 1%
11	*Ln(GCE)*	-1.6611	-3.7991***	I(1) at 1%	0.2226	-4.4983***	I(1) at 1%
12	*Ln(INF)*	2.1859	-8.7494***	I(1) at 1%	-2.3255	-8.6444***	I(1) at 1%
13	*Ln(TO)*	-1.0380	-5.9054***	I(1) at 1%	-1.9220	-5.8217***	I(1) at 1%
Phillip-Perron (PP) unit root tests							
4	*Ln(GDP)*	4.7027***		I(0) at 1%	0.1939	-5.9141***	I(1) at 1%
5	*Ln(HK)*	-0.7557	-8.3341***	I(1) at 1%	-2.2033	-8.2226***	I(1) at 1%
6	*Ln(GI)*	3.4072**		I(0) at 5%	-0.9557	-7.1682***	I(1) at 1%
10	*Ln(BC)*	0.4310	-6.9849***	I(1) at 1%	-1.4530	-7.8627***	I(1) at 1%
11	*Ln(GCE)*	-2.8696*		I(0) at 10%	-2.5591	-8.1021***	I(1) at 1%
12	*Ln(INF)*	-4.2954***		I(0) at 1%	-4.2601***		I(0) at 1%
13	*Ln(TO)*	-1.0679	-5.9033***	I(1) at 1%	-2.0182	-5.8186***	I(1) at 1%

Notes: The sign of *, ** and *** represents the rejection of the null hypothesis of non-stationary at 10%, 5% and 1% significant level respectively. The null hypothesis is that the series is non-stationary or the series has a unit root against alternative hypothesis that the series are stationary. Akaike info criterion (AIC) is used to determine the lag length while testing the stationarity of all variables.

Moreover, the precondition of using ARDL model is that the dependent variable must be non-stationary at a level which confirmed on the above table under the ADF test.

4.2. Long-run ARDL Bounds Tests for Cointegration

As far as we determined the stationary nature of the variables, the next task in the bounds test approach of co-integration is estimating the ARDL model using the appropriate lag length selection criterion. In other word, ARDL bounds analysis is used to investigate the presence of long-run relation among the variables included in the model. In order to undertake cointegration test with help of ARDL bound test, the maximum lag length must be determined. This is because an important issue addressed in employing ARDL is selecting optimum lag length. The model was estimated by ARDL and the optimal lag was selected by Akaike Information criterion (AIC) method.

According to Pesaran and Shin (1999) and Nayaran (2004) recommend choosing a maximum of 2 lags for annual data series Therefore, we set recommended the maximum lag length at 2 years for which are sufficiently long enough for annual data series to investigate the variable relationship and then AIC is employed to choose at the best ARDL mode (Lutkephl, 2005).

Table 2. Bound Test for Cointegration

Levels	***Bounds***	***Critical Values***
10% Level	*Lower Bound I(0)*	2.12
	Upper Bound I(1)	3.23
5% Level	*Lower Bound I(0)*	2.45
	Upper Bound I(1)	3.61
2.5% Level	*Lower Bound I(0)*	2.75
	Upper Bound I(1)	3.99
1% Level	*Lower Bound I(0)*	3.15
	Upper Bound I(1)	4.43
F-Statistics ARDL (2,0,0,2,0,1,0)		**7.22*** **

Notes: ARDL Model is automatically selected on the basis of minimum value of Akaike info criterion (AIC). We obtain critical values for upper and lower bounds from Peseran et al. (2001) table CI(iii) at page 300 where ARDL model uses unrestricted intecept but no trend with k=6. The sign of *, **, and *** indicate the level of significance at 10%, 5%, and 1% to reject the null hypothesis of no long-run relationships exist respectively.

According to the result shown in the table 2, we have the upper and lower Narayan (2004) critical values to compare with corresponding F statistics in order to reject or accept the null hypothesis of no long-run relationship among the variables. As we have discussed earlier, for small sample ranging from 30 to 80 years' data, we have been used Narayan (2004) critical values in which EViews software provided it automatically.

As the result observed from the table 2 depicts that F-statistic is 7.22 which is greater than the upper bounds critical value at 1% significance level. This clearly evidenced that there is a strong evidenced long-run relationship between economic growth and explanatory variables. Therefore, the null hypothesis of no long-run relationship is rejected at 1% significance level and alternative hypothesis of the existence of long-run relationship between the variables is accepted. In other words, the variables included in the model have long-run relationship which is a base for estimating the long-run impact of the explanatory variable on economic growth at large.

4.3. Long-run and Short-run ARDL Model Estimation

Once cointegration among economic growth and all explanatory variables through bound test are confirmed, then long-run estimation of the model comes next. Accordingly, The ARDL (1,0,0,2,0,1,0) can be estimated for long-run.

Table 3. Estimated Long-run Coefficient of Aggregate Output Growth

Variable	*Long-run Coefficient*
Ln(HK)	0.2013*** (0.0384)
Ln(GI)	0.1861*** (0.0257)
Ln(BC)	0.1221*** (0.0283)
Ln(GCE)	-0.0722 (0.0909)
Ln(INF)	-0.0008 (0.0015)
Ln(TO)	-0.1504** (0.0640)
C	7.2958*** (0.4007)

Notes: The sign of *, **, and *** indicate the levels of significance at 10%, 5%, and 1% respectively.

In long-run, most of the coefficients of explanatory variables have their expected theoretical or hypothesized signs except for trade openness. Consistent with theory, gross investment to GDP in Ethiopia has a positive sign on real GDP. Similarly, human capital has a positive and significantly determines economic growth in Ethiopia which confirms endogenous growth model that incorporate human capital development as an engine for economic growth.

As the results depict that the coefficient of bank credit (a measure of financial development) has a positive sign as predicted by the theory and statistically significant at 1% level. This result is also similar to long-run effect of domestic bank credit to on economic growth in Ethiopia. It indicates that 1% increase in bank credit lead to increase 0.12% in aggregate output growth as

measured the real GDP. This is implying that financial development as proxy by domestic credit facilitate supply of investible funds to productive sector which influences overall output growth through increased investment in the economy. This finding is consistent with those of Levin et al. (2000), Afangideh (2009), Murty et al. (2012), Helmi et al. (2013) and Mercy et al. (2015). From the theoretical perspective, this finding is also consistent with the theory of Schumpeter which argued the importance of financial development on the economic growth of a country. Conversely, this result is not consistent with the finding of Fozia (2014) and Bekana (2016) for the case of Ethiopia. To this end, bank credit is highly significant impact on aggregate output growth implying that financial development is an engine for long-run economic growth.

The long-run estimated coefficient of trade openness has found to be a negative sign and significant effect on economic growth as confirmed by 1 percent level of significance. In our opinion, justification for the inverse relationship is that the liberalizing trade might have exposed the country's infant industry to foreign competition thereby adverse effect on long-run real GDP. In this case, domestic investors who are engaged in the non-exportable economic activities were forced to exit from domestic markets. Hence, a percentage increase in the ratio of import plus export to GDP which is trade openness will reduce overall output growth by 0.1504 percent. The finding is similar to the finding conducted by Adebiyi (2006) for Nigeria, Adu et al. (2013) for Ghana, Mercy et al. (2015) for Kenya, Agyei (2015) for Ghana, and Okafor and Shaibu (2016) for Benin. According to Bibi and Rashid (2014), trade openness could be manifested either positive or negative depending on the values of determinants of trade openness.

4.4. Short-run error correction model

An ECM coefficient in the short-run was negative and statistically significant at 1% level with a value of -0.6055. This implies that 60.5 percent of the disequilibrium in the short-run was corrected in the current year which means the short-run distortion is to be corrected towards the long-run equilibrium path. In other words, we found that the deviations in the short-run towards the long-run equilibrium are corrected by 60.5% each year. Relatively better speed of adjustment in aggregate output growth might be due to the developing competitiveness of the financial sector through wide spread involvement of private sector and fast economic growth recorded since 2003/4 in Ethiopia. The short-run coefficient of the model explains the short-run relationships between overall output growth and explanatory variables are depicted as follows.

Table 4. Short-run Coefficients (Short Run Error Correction Model)

Variable	*Short-run Coefficient*
$\Delta Ln(HK_t)$	0.1219*** (0.0275)
$\Delta Ln(GI_t)$	0.1127*** (0.0308)
$\Delta Ln(BC_t)$	0.0484*** (0.0178)
$\Delta Ln(BC_{t-1})$	-0.0337** (0.0149)
$\Delta Ln(GCE_t)$	-0.0437 (0.0522)
$\Delta Ln(INF_t)$	-0.0018*** (0.0006)
$\Delta Ln(TO_t)$	-0.0911* (0.0500)
$CointEq_{t-1}$	-0.6055*** (0.1312)

Notes: The CointEq = Ln(GDP) - (0.2013*Ln(HK) + 0.1861*Ln(GI) + 0.1221*Ln(BC) - 0.0722*Ln(GCE) - 0.0008*Ln(INF) - 0.1504*Ln(TO)+7.2958). The sign of *, **, and *** indicate the levels of significance at 10%, 5%, and 1% respectively.

In short-run, economic growth represented by real GDP is determined by human capital, gross investment and bank credits as a proxy for financial development which are positive and statistically significant at 1% level of significance. The significant impact of domestic bank credit on aggregate output growth is consistent with the finding of Bekana (2016). However, one period lagged bank credit has an inverse relation with output growth at aggregate level which is confirmed by 5% significance level. This time lag contribution of the bank credit to economic growth might be justified that the financial development takes time to benefit aggregate output growth near the future and other reason may be underdevelopment of the financial sector in the short-run.

The result revealed that trade openness has negative and statistically significant impact aggregate output growth which is a contrast to theoretical expectation. The justification behind for this result may be traded openness leads

to competition between foreign investors and domestic investors which have a negative effect on domestic investors that need the protection during an infant stage and another explanation might be a continuous decline of export performance. This result is consistent with the finding of Mercy et al. (2015) for Kenya, Iheanacho (2016) for Nigeria, and Ofori-Abebrese et al. (2017) for Ghana**.** On another hand, as expected prior Government consumption expenditure as a ratio of GDP has a negative and insignificant effect on economic growth, whereas inflation rate affects economic growth negatively and significant at 1% significance level.

4.5. Diagnostic Test and Model stability

In order to check the verification of the estimated model, diagnostic testing is important prior to undertaking any econometric data analysis. In addition, to test the stability of model, some of the diagnostic tests such as Heteroscedasticity test, Serial correlation test (Brush & Godfray LM test), Normality (Jaque-Bera test) and Functional form (Ramsey's RESET) test were undertaken so as to proceed the analysis of the model result. Therefore, diagnostic tests are representing that long- and short-run estimates are free from serial correlation, misspecification of the short-run model, non-normality of the error term, and heteroscedasticity as indicated blow table 5.

Table 5. Long-run ARDL (1,0,0,2,0,1,0) Diagnostic Tests

Diagnostic Tests	*Chi-statistic*	*F-statistic*
Breusch-Godfrey Serial Correlation LM Test	$\chi^2(2) = 3.0477$ *Prob.*= 0.0695	*F*(2, 27)= 2.8873 *Prob.*= 0.0731
Breusch-Godfrey Heteroskedasticity Test	$\chi^2(10) = 6.3604$ *Prob.*= 0.7841	*F*(10, 29)=0.5483 *Prob.*= 0.8411
Jarque-Bera Normality Test	$\chi^2(2) = 0.1164$ *Prob.= 0.9434*	NA
Ramsey RESET Test	$\chi^2(1) = 0.2819$ *Prob.*= 0.7799	*F*(1, 31)= 0.0794 *Prob.*=0.7799

4.6. Test of Parameter Stability

The stability of the model for long- and short-run relationship is detected by using the cumulative sum of recursive residuals (CUSUM) which helps as to show if coefficient of the parameters is changing systematically and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests which is useful to indicate if the

coefficient of regression is changing suddenly. Accordingly, if the blue line crosses redline which is critical line and never returns back between two critical line, we accept the null hypothesis of the parameter instability whereas the cumulative sum goes inside the area (can returns back) between the two critical lines, then there is parameter stability in the short- and long-run.

Figure 1. Plot of Cumulative Sum of Recursive Residuals (i)

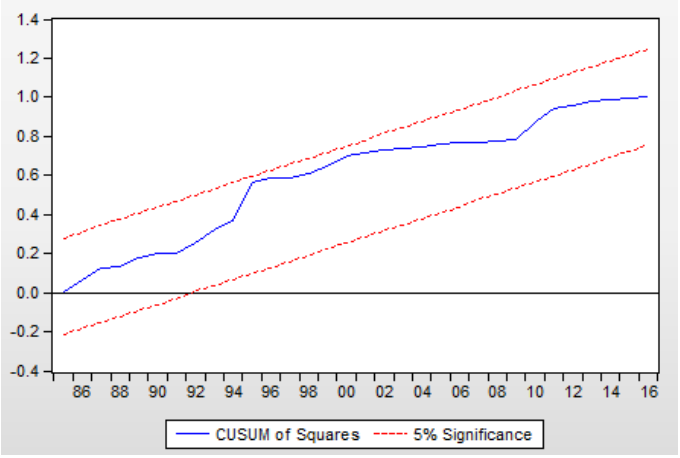

Figure 2. Plot of Cumulative Sum of Squares of Recursive Residuals (ii)

As the result seen from the figure, the plot of CUSUM test did not cross the critical limits. In the same manner, the CUSUMSQ test shows that the graphs do not cross the lower and upper critical limits. So, we can conclude that long-run estimates are stable and there is no any structural break.

4.7. Granger Causality Test

This study has employed the Granger causality test to determine the direction of causality between cointegrated variables applying the vector error correction version of granger causality tests which would enable us to track the long- and short-run causality among interested variables (Kyophilavong et al., 2016). In other words, the long-run association can be deduced from the significance of the lagged error correction terms, while the short-run association is deduced from the coefficient of the lagged differenced variables. Therefore, the requirement for long-run causality is that *ECT* coefficients must be negative and statistically significant. The short-run causality has been tested using the Wald test (x2).

Table 6. Long- and Short-run Granger Causality Test

	Null Hypothesis	Obs.	Lags	Coefficient	Prob.
Long-run	*Ln(BC) does not Granger cause Ln(GDP)*	39	NA	-0.0196	0.0004***
	Ln(GDP) does not Granger cause Ln(BC)	39	NA	0.0117	0.8015
Short-run	*Ln(BC) does not Granger cause Ln(GDP)*	39	2	4.9937	0.0823***
	Ln(GDP) does not Granger cause Ln(BC)	39	2	0.4833	0.7853

Notes: The sign of *, **, and *** indicate the levels of significance at 10%, 5%, and 1% to reject the null hypothesis of the direction of causality respectively.

The prerequisite for testing granger causality in the long-run based on vector error correction depends on whether two variables are cointegrated or not (Tamba et al., 2014; Balago, 2014). Accordingly, Granger causality test indicated from above result reveals that financial development is essential for the economic growth in Ethiopia that confirms the augment of supply lead growth hypothesis in long-run. This result is in line with early causality study done by Mckinnon (1973) and Shaw (1973), works of King and Levine (1993), and the later study by Helmi et al. (2013) and Agyei (2015). Whereas, the finding is contradicts with Patrick's (1966), Roman (2012), and Ofori-Abebrese et al. (2017) who found the demand-following hypothesis which postulates a causal relationship from economic growth to financial development, that is an increasing demand for financial services might lead to an expansion in the financial sector as the economy continuous to grows.

Similar to long-run causality, the result at table 6 also reveals that there is uni-directional causality running from total bank credit (domestic credit) to economic growth in the short-run. This finding is also confirmed supply lead growth hypothesis that means in order to accelerate economic growth, there is a need of financial sector development in the short-run.

4. Conclusion and Recommendations

This study examined the linkage between financial development and economic growth in Ethiopia during the period from 1975 to 2016. The study employed ARDL bound test approach to examine the long- and short-run

relationship between economic growth and explanatory variables and VECM used to investigate the direction of causality between financial development and output growth. Before employing ARDL model, we have tested stationarity properties of the variables by using ADF and PP tests. The results of unit root test reveal all variables are stationary after the first difference. Regarding to diagnostic and stability test, the result shows that the model is stable and desirable in long-run without any evidence of serial autocorrelation and heteroscedasticity as well as no any evidence for structural break. A bound test approach to cointegration indicated that bound test (F-statistic) value is greater than the upper critical value which implies there is a long-run relationship between economic growth their respective determinant.

The empirical results implied evidence of a long- and short-run positive impact of financial development on economic growth in Ethiopia. This implies a financial sector and financial institution act as an input to support and accelerate economic growth short- and long-run. With regard to control variables, except inflation and government expenditure as a percentage of GDP, all variables significantly influence economic growth in the long-run and resulted as we have expected from economic theory. Other than inflation, government expenditure, trade openness, human capital, gross investment and financial indicator were the pioneer determinant of economic growth in the short run. Furthermore, VECM granger causality tests show that the direction of causality is running from financial development to economic growth both in short- and long-run. This study found the 'supply-leading' hypotheses held in the case of Ethiopia.

Therefore, based on the finding, government should strengthen its current effort on development of financial sector to accelerate economic growth in the country. Moreover, due the evidence of supply leading hypothesis, the policy makers should focus long-run policies mainly improving financial markets, so as to make the efficient and effective allocation of resources among the productive sector which affects long-run economic growth in Ethiopia.

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