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The Link between Financial Development and Sectoral Output Growth in Ethiopia: The Case of Agriculture, Industry and Service Sectors

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Abstract

This paper aimed to investigate the linkage between financial development and sectoral output growth with special emphasis on Agriculture, industry and service sectors in Ethiopia during the period from 1975 to 2016. The study has used Autoregressive Distributive lag (ARDL) bound testing approach via an augmented growth model to examine the linkage between the financial development, proxy by bank credit to sectors, and sectoral output growth. Furthermore, Vector Error Correction Model (VECM) was employed to investigate the direction of causality between financial development and sectoral output growth. The results of bound test confirmed that the long run relationship between explanatory variables and sector output growth with less co integration of agricultural output growth and respective independent variables. The empirical results of this study showed, that in the long run financial development had a less significant positive impact on agricultural and service sector output growth but, short run relationship was found to be insignificant. However, financial development has a positive and significant impact on industrial and aggregate output growth both in the short run and long run. Furthermore, VECM granger causality tests show that there is no causality between financial development and agricultural output growth both in long run and short run. However, uni-directional causality running from (1) financial development to industrial output growth both in the long run and short run which confirmed supply leading growth hypothesis (2) financial development to service sector output growth in the long run (supply leading) and in the short run running from service sector to financial development which supports demand leading hypothesis only in short run.

Keywords: Financial development; Sectoral output growth; ARDL bound tests; VECM; Granger causality tests

Background of the Study

Financial development is considered as one of the important inputs needed for economic growth and development. This is because the financial sector development determines the level of domestic saving distributed towards productive investments in which efficient resources mobilization and credit expansion raise the level of investment thereby capital accumulation in a given economy. The capacity of financial sector of the economy to provide capital for investment is an essential determinant of economic growth and transformation [1].

As result, 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 [2]. Furthermore, financial institutions make the linkage between the surplus and deficit sectors of the economy through intermediation.

Accordingly, countries having a well-functioned financial institution is no more dependence on external source financing, rather can create domestic credit expansion to run economic activities in a given economy. Most of underdeveloped financial institutions rely on external sources of financing in which its constraints provoke credit expansion thereby affecting the expansion of firms and industries as whole [3].

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 [4]. 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 these researchers such as Nkoro and Uko [5] stating that financial sector development creates strong environment for investment through efficient allocation of funds and also strengthen trade and business linkages and technological diffusion and innovation. This outcome is captured through mobilizing savings for productive investment and thereby accelerates economic growth. Unlike to positive linkage argument, the finding of Adusei [6] that financial development plays insignificant role in promoting economic growth. The extreme contrast to positive contribution financial development [7,8], still come up with the negative impact of financial development on economic growth in their empirical analysis.

Statement of the problem

Examining the relationship between financial development and sectoral output growth in a given country is crucial because it provides useful information on economic phenomena that the government and

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concerned bodies need to control relevant variables in order to attain the desired level of the macroeconomic objectives such as economic growth [9].

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 [10,11]. 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 [12]. 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 [13].

Regardless of whether the countries are developed or developing, there is no clear cut conclusion drawn on the impact of financial development on economic growth in the empirical investigation even though a significant amount of work has been done. Most of researchers have found a positive impact of financial development on economic growth using different indicators in accordance with development stage of financial system [14-17] whereas some other studies have found a negative relationship between financial development and economic growth [6,8,18,19].

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. For instance, the authors [11,20] have found a positive relationship between overall output growth and financial development by using different indicators with their respective study. Conversely, Fozia [12] found that financial development has long run negative impact on aggregate output growth in Ethiopia. On another hand, the study conducted by Roman [13] found the presence of 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, Dejene [1] 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 [13] who found the existence of uni-directional causality from economic growth to financial development, all other studies have failed to address the causality between the variables even at aggregate output level.

Moreover, the previous studies were only concentrated on the linkage between the aggregate output growth and financial development in the case of Ethiopia. The aggregate level analysis cannot be relevant to draw a policies issue to sectoral specific case so as to transform the economy. In our knowledge, there is no sectoral disaggregation analysis of output growth linkage with financial development in Ethiopia in which the financial development response differently to each economic sectors than at aggregate level.

Therefore, the present study has performed a disaggregated analysis of output growth mainly output growth of agriculture, industrial and services sectors and financial development nexus by considering appropriate financial development indicators for the period 1974/5-2015/6 in Ethiopia.

Objectives of the study

The general objective of this study was to examine the link between financial development and sectoral output growth in Ethiopia. More specifically, the study attempted:

1. To examine the short-run and long-run impact of financial development on the output growth of agriculture, industry and service sectors in Ethiopia.
2. To examine the long run and short run direction of causality of financial development with agriculture, industry and service sectors in Ethiopia.

Hypothesis of the study

Based on the specific objectives of the study outlined above, the following testable hypotheses were formulated:

HO_1: There is no a strong short-run and long- run relationship between financial development and output growth in the agriculture, industry and service sectors.

HO_2: There are a uni-directional long run and short-run causality between financial development and agriculture, manufacturing and service sectors output growth running from sectoral output growth to financial development (demand leading hypothesis).

Review of Related Literature

According to Roman [13], financial system is defined as financial institutions and markets networking that considers a variety of financial tools which are involved in money transmission activities and facilitating the loans and credit provision among productive area of activities. Well known activities of financial institutions and markets in a given economy are that it acts as intermediaries that allocating and channeling savings and other funds from depositor to borrowers and investors.

The starting points of theoretical justification of the relationship between financial development and economic growth can be traced back to the work of Schumpeter and, more recently modified in the work of King and Levine [21]. These authors suggested that financial development may have strong correlation with economic growth through which a well- developed financial system performs the most important function which is manifested in term of reducing information, transaction, and monitoring costs thereby enhance the efficiency of financial intermediation.

According to De Gregorio and Guidotti [22], the theoretical linkage between economic growth and financial sector development has become a debatable issue among different researchers and policymakers. Accordingly, early classical economic growth theory school of thought argument implied that economic development is an implication of continuous process of innovations in which financial institution and real economic sector interacted in line with innovations that provide us with a driving force for dynamic economic growth. The argument is equivalent to fact that exogenous technological progress is a driving force to determine the long-run growth rate while financial intermediaries were not separately augmented to affect the long-run growth rate.

In contrast to the positive contribution of financial development towards economic growth, when finance become bigger, it is not always good for economy rather, there might be negative side effects economic growth after financial development came to climax which is non-linear relationship exists. They indicated that there may be a threshold above which financial development no longer has a positive effect on economic growth and may harm the economy and society as a whole. According to them, for example, when the financial sector grows too large, it might lead to an inefficient allocation of resources and diseconomies of scale which finally cause financial crises. In addition to the argument of Allen et al [23] stated similar theoretical justification of effect of the finance on growth by saying "too little finance is not desirable- but too much is not desirable either".

Accordingly, Nkoro and Uko [5] examined 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.

Mercy et al. [24] examined 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 run and short run hence confirmed supply leading hypothesis.

Some of the empirical studies have been conducted on the relationship between the impact sectoral output growth by taking a sector growth independently and financial development to spill out the relative impact of sectoral output growth in country specific case. For instance, Yazdani [25] employed cointegration and causal relationship between financial development, capital stock, real interest rate, international trade and agriculture growth in case of the Iranian economy. He found out that variables are co-integrated for the long-run association. Its causality analysis implied that financial development Granger-caused agriculture growth. In the same country with methodology including Error correction model, other empirical investigation done by Yazd and Khanalizadeh [26] who examine the causal relationship between the dynamic financial development, agricultural economic growth, and instability by using annual time series covering the period 1970-2011. They suggested that there is bidirectional causality between agricultural economic growth and financial development. But, both studies failed to incorporate other influential sectors in the analysis.

Furthermore, Ehikioya and Mohammed [27] study investigated the impact of commercial bank credit accessibility and sectoral output performance in Nigerian economy for the period which spanned between 1986 and 2010. An augmented growth model was estimated through the Ordinary Least Square (OLS) techniques to examine the relationship between various commercial bank credits and sectoral output growth. Their co integration results depicted that the different commercial bank credit supply and other control variables included in the model have a long run relationship with sectoral output performance namely, agricultural, manufacturing and services sector output. The core finding implied that the main demand for a credit facility in Nigeria was the manufacturing sector. On another hand, they found that commercial bank credit has a direct and insignificant impact on sectoral output performance but cumulative supply and demand for credit in the previous period has a direct and significant impact on the growth of agriculture, manufacturing and the services sectors output. Based on the result from regression they argued that the finding highly attributed to the vital importance of credit facility as an input in the production process and persistent inflow to the manufacturing, Agriculture, and services sectors have the capacity to induce the growth and development of the sectors.

Specifically, in Ethiopia, Haile et al. [20] investigated the link between financial development and economic growth using data of Ethiopia from 1972-2010 and finally found a positive link between the two. But, they did not say anything about the causality between financial development and GDP growth.

Other study by Roman [13] investigated the link between the financial development and economic growth by using ECM Model and found that the existence of a uni-directional causality from economic growth to financial development and the presence of 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. [11] investigated the long-run impact of bank credit on economic growth in Ethiopia via a multivariate Johansen 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 findings show that bank credit to the private sector affects economic growth through its role in the efficient allocation of resources.

In the same manner, conducted the impact of commercial banks development on economic growth by using ordinary least square(OLS) method and found that a positive and significant relationship among economic growth, deposit and loan and advances whereas negative and significant association ship between economic growth and bank size i.e., asset. Fozia [12] 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-run 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.

Furthermore, the current study was done by Dejene [1] 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 [13] 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 in one hand and in another perspective, the sectoral output response to financial development is not addressed.

Data and Methodology of the Study

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.

Model specification

In analyzing the relationship between financial development and sectoral output growth, the researcher employed augmented Solow growth model based on Ehikioya and Mohammed [27] who attempted to analyze commercial credit accessibility and sectorial output performance in a deregulated financial market in Nigeria. They adopted augmented Solow production function in which output is a function of stock of capital, labor, human capital, and technology. This model is different from that of traditional slow growth model by incorporating human capital as a factor of production in which it is endogenously determined within model.

The authors analyzed 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 [27,28]. Similar assumption had been taken in an early study by Bolbol et al. [29]. 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 growth model can be specified as

$$Y_t = A_t K_t^{\partial} L_t^{å} H_t^{ā} \quad (1)$$

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 [27,30]. Taking the above equation in to natural logarithm so as make log linear form for estimation purpose, it can be:

$$\ln Y_t = \beta_0 + \alpha \ln K_{FDt} + \beta \ln L_t + \gamma \ln H_t + \varepsilon_t \quad (3)$$

As long as the study concern the relationship between the total capital stock represented by financial sector (banking sector) indicators, adopting this model to focus on the relationship between financial development and sectoral economic growth is necessary. We could not use labor in the equation because we have human capital variable which is more important to represent more human skills than labor. This is similar to Beck and Levine [31] and Ehikioya and Mohammed [27]. Thus, we are left with the following equation.

$$\ln Y_t = \beta_0 + \alpha \ln K_{FDt} + \gamma \ln HK_t + \varepsilon_t \quad (4)$$

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 this variable on economic growth [13]. Therefore, $\varepsilon_t = X_t + U_t$, the above equation can be rewritten as below when control variables are included;

$$\ln Y_t = \beta_0 + \alpha \ln K_{FDt} + \gamma \ln HK_t + \pi X_t + U_t \quad (5)$$

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 in which we have considered the variables that are not included in the reference model. The fore, the control variables that are not included in the previous or reference model includes gross investment as ratio of GDP, government consumption expenditure as percentage of GDP as proxy for the size of the government and trade openness (import plus export as percentage of GDP) as a proxy for market liberalization whereas inflation rate is included in both modified and reference model as control variable. Furthermore, other modification has been a methodology used to estimate the model that the reference model was estimated by applying simple OLS method by ignoring non-stationary of the data series while we have employed ARDL model to estimate the model.

Since the aim of this study was to examine the relationship between the financial sector and sectoral output growth, the model for this study was re-specified as follows with some modification which is different from previous one.

$$\text{Real GDP OF EACH SECTOR} = f(\text{HK, GI, FD, INFLATION, GCE, TO}) \quad (6)$$

Whereas 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; 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 used financial development (FD) indicators in developing countries in which Ethiopia inclusive are a domestic credit to private sector as % of GDP, Broad money as a percentage of GDP, Deposit liabilities and bank credit to economic sector among the others. As result, we used Bank credit to economic sectors mainly agriculture, industry and service sectors as proxy or indicators of financial development (Table 1).

Estimation procedure

As long as testing the long run relationship and causality between the dependent variable (sectoral output growth) and independent variables (human capital, gross investment, Bank credit to each sector, inflation, government consumption and trade openness) are concerned, the study applied Autoregressive Distributed Lag (ARDL) Model. The first task in this study was investigating the time series properties of our data by using Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) tests. This mean that the unit root tests were used to check the stationarity of the variables and to check none of the variables are not greater than order one (i.e., I (1)), as well as none of the dependent variables, were stationary at level which is precondition to applying ARDL model [32].

Variable	Proxy/Measurement	Notation	Expected sign	Remark
Dependent variable				
Agricultural Real GDP	The value added of real total agricultural GDP	RAGDP		
Manufacturing Real GDP	The value added of real total manufacturing GDP	RMGDP		
Service Real GDP	The value added of total manufacturing GDP	RSGDP		
Independent variables(explanatory variables)				
Bank credit to Agriculture, manufacturing and service sector.	The amount of credit provided to each respective sector.	BCA, BCM & BCS receptively	Positive	
Human capital	Hunan capital proxy by secondary school enrollment	HK	Positive	
Inflation	Consumer price index(CPI)	INF	Negative	
openness to trade	Adding the amount of export and import of good and service divided by GDP	TO	Positive	
Government consumption expenditure	the total amount of government expenditure as a percentage of GDP	GSE	Negative	.
Gross investment	Total amount of gross investment in billion birr	GI	Positive	

Table 1: Summary of variable, expected relationship with dependent variables.

The autoregressive distributed lag model (ARDL): Most of past studies have used the Johansen 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 have introduced an alternative co-integration technique known as the 'Autoregressive Distributed Lag (ARDL)' bound test [32-34]. 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 co integration [35,36]. One of the important the advantage of using ARDL approach over other method is that ARDL model is the more statistically significant approach to determine the co-integration relation in small samples [32,34], 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 [36,37]. In other hand, the ARDL estimation is free from the endogeneity problem. Therefore, we employed ARDL approach because relatively the sample used in the study is small.

However, in sectoral output growth case the **ARDL model** can be specified as:

$$\begin{aligned}\Delta LNRGDP_{it} &= \beta_0 + \beta_1 LNRGDP_{it-1} + \beta_2 LNHK_{t-1} + \beta_3 LNGI_{t-1} + \beta_4 LNBC_{it-1} \\ &+ \beta_5 INFLATION_{t-1} + \beta_6 LNGCE_{t-1} + \beta_7 LNTO_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta LNRGDP_{it-i} \\ &+ \sum_{j=1}^{q} \alpha_j \Delta LNHK_{t-j} + \sum_{k=1}^{r} \alpha_k \Delta LNGI_{t-k} + \sum_{l=1}^{s} \alpha_l \Delta LNBC_{it-l} + \sum_{m=1}^{v} \alpha_m \Delta INFLATION_{t-m} \\ &+ \sum_{n=1}^{y} \alpha_n \Delta LNGCE_{t-n} + \sum_{o=1}^{w} \alpha_0 \Delta LNTO_{t-o} + U_t\end{aligned}$$

As represented in the three sector output growth and the aggregate output growth equation of 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.

β_1, β_2, β_3, β_4, β_5, β_6 and β_7 indicate coefficients that measure long run elasticies between the variable where as α_i, α_j, α_k, α_l, α_m, α_n and α_o indicates coefficients that measure short-run elasticities among the variable.

The first step involved in ARDL model is to test the null hypothesis of no cointegration relationship which is defined as $H_o=\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=\beta_7=0$ against the alternative hypothesis of $H_1\neq\beta_1\neq\beta_2\neq\beta_3\neq\beta_4\neq\beta_5\neq\beta_6\neq\beta_7\neq0$ 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 [34]. The authors have come up with two sets of critical values which are called upper and lower critical bound for cointegration test [32,38]. The lower critical bound takes in to consideration that all the variables are stationary at level to evaluate that there is no co integration 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 relationship 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 [32]. This is due to the fact that ARDL bound testing is inapplicable when the variables are integrated of order 2 or higher order. After the testing in which existence of co integration among the variables are confirmed, the long-run and error correction estimates of the ARDL model are obtained.

Before proceed to the estimation of 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 [33] and later Narayan [34] recommend to choose a maximum of 2 lags for annual data series. However, it is also possible to choose the maximum lag length for 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-run and long-run estimation in the ARDL model. The diagnostic test such as Heteroscedasticity test (Brush and Godfray LM test), Serial correlation test (Brush & Godfray LM test), Normality (Jaque-Bera test) and Functional form (Ramsey's RESET) test were undertaken. With the existence of co integration, the short run elasticities can also be derived through constructing the error correction of the series in the following for in each sector:

$$\Delta LNRGDP_{it} = \beta_0 + \sum_{i=1}^{p}\alpha_i \Delta LNRGDP_{it-i} + \sum_{j=1}^{q}\alpha_j \Delta LNHK_{t-j} + \sum_{k=1}^{r}\alpha_k \Delta LNGI_{t-k} + \sum_{l=1}^{s}\alpha_l \Delta LNBC_{it-l} + \sum_{m=1}^{v}\alpha_m \Delta INFLATION_{t-m} + \sum_{n=1}^{y}\alpha_n \Delta LNGCE_{t-n} + \sum_{o=1}^{w}\alpha_0 \Delta LNTO_{t-o} + \gamma ECM_{t-1} + U_t \quad (7)$$

Where in each sector, the variable ECM_{tl} is the error correction term which captures the long- run relationship whereas α'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.

Granger causality test: Once the co integration for the long-run relationship among the financial sector development and sectoral output growth mainly in Agriculture, industry and service sectors confirmed through bound test approach, the long-run and short-run causality can be examined separately. The long-run and short-run causality between financial development and output growth in Agriculture, industry and service sector were investigated by the vector error correction granger causality framework. The model of VECM was specified as a matrix form in the following models:

Sectoral output growth represented i equation as follows

$$(1-L)\begin{bmatrix} LNRGDP_t \\ LNBC_{it} \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix}\begin{bmatrix} LNRGDP_{it-j} \\ LNBC_{it-j} \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \end{bmatrix}\begin{bmatrix} LNRGDP_{it-1} \\ LNBC_{it-1} \end{bmatrix}(ECM_{t-1}) + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \quad (8)$$

Where (1-L) is the difference operators and the ECMt-1 is generated from long-run causality. The significant 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.

Results and Discussion

Unit root test (stationary test) analysis

The bounds test approach to co integration 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. Thus, this study used the commonly used Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) unit root tests. Accordingly, all variables are integrated with the same order and none of them are integrated more than I (1) (Table 2).

Long run ARDL bounds tests for cointegration

Long-run and short-run estimation for agriculture output growth equation: The results from the long run estimation indicate that exception for human capital, government consumption and trade openness which have found to be insignificant impact on agricultural output growth, other variables mainly gross investment, bank credit to agriculture and inflation are positively determined agriculture output growth in the long-run. Contrary to what is expected from economic theory, trade openness and inflation are found to be unexpected sign signed.

The coefficient of long-run results showed in Table 3 depicts that financial development has found to be a positive and marginal impact on agriculture output growth. This is consistent with prior expectation. The finding is consistent with the study of Afangideh [39], Aka [40], Muhammad et al. [41 and Joseph and Daniel [42] but, not consistent with the finding of Yazdi and Khanalizadeh [26] for Iran. However, the less significant effect of financial development towards agricultural sector is the evidence of less attention given to agricultural sector in term of credit allocation to boost overall economic growth. This justification is consistent with Ang and McKibbin [43] who argued that the importance of financial development depends on the mobilization of savings and allocation of funds to productive investment projects, however, in developing countries there is market imperfection mainly information asymmetry, high transaction costs and improper allocation of resources resulted weak the interaction between savings and investment and its link with economic growth.

The total investment as percentage of GDP which comprises both private and public investment exerts a positive and statistically significant impact on agricultural sector output growth in the long run. The result of estimation provides that a one percent increase in gross investment leads to a respective agricultural sector GDP increase of 0.163. The implication of the finding is that making conducive environment for the investment expansion is an important action to accelerate sectoral output growth in Ethiopia. The study is harmony with the study of Joseph and Daniel [42] for South Africa.

The positive and statistically less significant effect of inflation is inconsistent with theoretical expectation. Theoretically, a high inflation rate is expected to be deleterious to growth in real GDP of the sector as it raises the cost of borrowing which in turn dampens the rate of investment by the private sector and thus decreases real output growth. Accordingly, the inflation is increased by 10% the real agriculture GDP will be raised by 0. 004134% and it significantly affects the sector in the long run at 10% level of significance. This finding is also consistent with Ehikioya and Mohammed [27] and Yazdi and Khanalizadeh [26].

Short run error correction model for agricultural output growth: As the table indicates all variables in the short run model have expected result except trade openness and inflation which have come up with an unexpected sign. Regardless of significance, the result reveal that the lagged value of agricultural real GDP, gross investment

Sectoral output growth model	Selected ARDL	F- Statistics	Result
Agricultural output growth model	ARDL(2,0,0,0,0,1,0)	3.318210***	Cointegration
Industrial output growth model	ARDL(4,3,3,2,2,3,3)	4.389037**	Cointegration
Service sector output growth model	ARDL(2,1,0,2,2,0,0)	4.968829*	Cointegration
Critical value bounds	1%	2.5%	5% 10%
I(0) Bound	3.15	2.75	2.45 2.12
I(1) Bound	3.23	3.61	3.99 4.43

Source: Author's computation from EViews 9, 2017.

Notes: ARDL Models selected on Akaike info criterion (AIC) automatically, intercept and no trend for *k*-6; the sign of *, ** and *** indicate the level of significance at 1%, 5%, and 10% to reject the null hypothesis of No long-run relationships exist respectively

Table 2: Bound test for co-integration.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGI	0.166534	0.031437	5.297379	0.0000*
LNHK	0.082977	0.057938	1.432177	0.1624
LNBCA	0.042726	0.02395	1.783995	0.0845***
LNGCE	-0.062955	0.125439	-0.501874	0.6194
INFLATION	0.004134	0.002303	1.795264	0.0827***
LNTO	-0.081671	0.07505	-1.088228	0.2852
C	8.982751	0.576665	15.57706	0.0000*

Source: Author's calculation from E view 9 results, 2017

Note: The sign *, ** and *** indicate that the variables are significant at the level of 1%, 5% and 10% respectively.

Table 3: Long Run Coefficients for agricultural output growth.

to GDP, human capital and bank credit to agricultural sector are positively determined agricultural output growth in short run whereas government consumption expenditure as percentage of GDP, inflation and trade openness negatively affect the agricultural output growth in Ethiopia (Table 4).

In agricultural output growth model, ECM coefficient in the short run was negative and statistically significant at one percent levels with a value of -0.716539. This implies that 71.65 percent of the disequilibrium in the long-run relationship was corrected in the current year and it would take a short period for full restoration back to the equilibrium after a short-run distortion which means that correcting any deviations from the long-run equilibrium. The significance of the error correction mechanism (ECM) supports co-integration and suggests the existence of a long-run steady-state equilibrium relationship between agricultural output growth and explanatory variables including financial development indicator. In other words, the coefficient of the error correction term which measures the speed of adjustment back to equilibrium whenever the system is disturbed indicates that adjustment is relatively fast.

The most important short-run determinants of agricultural output growth in Ethiopia are found to be a one-year lagged value of agricultural real GDP and gross investment. According to the result, as a one percent increase in gross investment to GDP leads to increase agricultural real GDP by 0.119328% with strong evidence of 1% level of significance, being other thing constant. This indicates that the productive investment in an economy is highly accelerating agricultural output growth even in short run.

Long-Run and short-run dynamics of industrial output: Since we have specified the growth model in a log-linear form except for inflation because it is expressed in growth rate at the very beginning, the coefficients can be interpreted as elasticity with respect to real GDP of the sector. The result from long run dynamics of industrial sector estimation indicates that human capital expressed in term of secondary school gross enrollment, bank credit to industrial sector and government consumption as the ratio of GDP and inflation found to have expected sign and are significant determinants of industrial output growth in the long-run. Contrary to theoretical expectations, the coefficient gross investment and trade openness have unexpected sign and statistically insignificant at the conventional level of significance.

As regression shows in Table 5, the impact of human capital as expressed by gross enrollment on industrial real GDP is positive and statistically significant in the long run at 1% level of significance.

Short run coefficients (Co integrating Form)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNRAGDP(-1))	0.326375	0.149723	2.179857	0.0372**
D(LNGI)	0.119328	0.040063	2.978493	0.0057*
D(LNHK)	0.059456	0.037415	1.589115	0.1225
D(LNBCA)	0.030615	0.018221	1.680209	0.1033
D(LNGCE)	-0.04511	0.089583	-0.50355	0.6183
D(INFLATION)	-0.001129	0.001235	-0.913741	0.3681
D(LNTO)	-0.058521	0.057385	-1.01979	0.316
CointEq(-1)	-0.716539	0.154637	-4.633671	0.0001*
Cointeq-LNRAGDP - (0.1665*LNGI + 0.0830*LNHK + 0.0427*LNBCA				
-0.0630*LNGCE + 0.0041*INFLATION -0.0817*LNTO + 8.9828)				

Source: Author's calculation from E view 9 results, 2017

Note: The sign *,** and *** indicate that the variables are significant at the level of 1%, 5% and 10% respectively.

Table 4: Short-run coefficients for agricultural output growth equation.

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LNGI	-0.288911	0.199714	-1.446628	0.1759
LNHK	0.307999	0.105807	2.910944	0.0142*
LNBCI	0.584275	0.18768	3.113137	0.0099*
LNGCE	-0.720947	0.318953	-2.260353	0.0451**
INFLATION	-0.026921	0.007118	-3.782304	0.0030*
LNTO	-0.149233	0.096674	-1.543674	0.1509
C	7.039751	1.096299	6.421379	0.0000*

Source: Author's calculation from E view 9 results, 2017

Note: the sign '*' and '**' indicate that the variables are significant at the level of 1% and 5% respectively.

Table 5: The long run coefficient of industrial output growth

Accordingly, holding other things constant, as a 1% increase in gross enrollment will lead 0.307999% rise in the industrial real GDP. This finding reveals that human capital investment is crucial for determining industrial sector growth that absorbs more probable skilled manpower so as to enhance growth through adopting new technology and innovation in the production process. The finding is consistent with the endogenous growth theories as of Lucas [19] and Romer [44] which argue that development in human capital leads to improving productivity through adopting technology and innovation that enhances economic growth.

The long-run estimation results revealed that financial development (bank credit to the industrial sector) is found to be a positive and significant impact on industrial output growth which confirmed what we have expected from economic theory and significant at 1% level of significance. The result shows its consistency with the theoretical justification that the financial sector promotes long-run output growth of sector through two major channels namely the volume of investment and the efficiency of investment in term of efficient resource allocation to the productive sector. This finding is similar to studies done by Oluwafemi et al. [45] and Akpansung and Gidigbi [46]. However, the result contradicts the finding of Udoh and Ogbuagu [47] for Nigeria. The result confirms that financial development plays a decisive role in accelerating industrial output growth in long run. In other words, evidence shows that for providing strategic bank credit to infant domestic manufacturing industries foster industrial output growth in the Ethiopia.

According to the result presented in the table, government consumption expenditure as a percentage of GDP is found a negative effect on industrial growth and its effects is also statistically significant. This is because when the government increases its expenditure on consumption which means increasing size of government, then little resources will be left for this sector towards proving infrastructure service and facilitating sectoral growth. Specifically, the result of this study indicates that a 1 percent increase in government consumption to GDP leads to 0.720947% decrease in output growth of industrial sector. The significant finding contradicts Keynesians argument for the size of the government on economic growth.

The regression results revealed that in long run inflation has a negative and significant influence on industrial output growth in Ethiopia. The coefficient of this variable is -0.026921, showing that negative relationship between inflation and industrial output growth, and the estimates of the coefficient suggesting that when the inflation is increased by 1% the manufacturing output will be decline by 0.026921%. A negative relationship between inflation rate and industrial output growth as measured by real industrial GDP implies that increasing in

general price level raise the cost of production which adversely affects the industrial sector performance (Table 6). Hence, its significant effect on industrial output growth in the long run is consistent with the study of Ehikioya and Mohammed [27].

Short run error correction model for industrial output growth: The estimated coefficient of error correction term found to be -0.649022 and statistically significant at 5% level of significance which has the correct sign, and indicates a relatively high speed of adjustment to equilibrium after the occurrence of shock. Approximately 64.9 percent of the disequilibrium from the previous year's shock converges back to the long-run equilibrium in the current year. This significant Error correction term is another proof for the existence of a stable long-run relationship among the variables.

The estimated short-run model reveals that both human capital through education and gross investment are not the main contributor to real industrial GDP which is insignificant at the conventional level of significance. Particularly, gross investment is negatively affecting output growth of industrial sector. On another hand, except two period lags, remaining period lagged value of manufacturing real GDP has a significant positive impact on the future 20 economy of the sector.

As depicted from the result shown in the table, the coefficient of bank credit to industrial sector has confirmed its expected theoretical or hypothesized signs. In other words, the results exert that the coefficient of bank credit to industrial the sector as a measure of financial development is found to be positive and statistically significant at 1 percent level of significance in the short run. Numerically, it implies that a 1% increase in bank credit, an industrial real GDP will increase by 0.19747%. The implication for positive relationship reflects that financial development facilitates the allocation of credit for productive activities which influences output growth through increased investment in the economy. This finding supports the finding of Udoh and Ogbuagu [47] for Nigeria. However, one period lag of the bank credit has the theoretical unexpected negative sign and less significantly affects output growth of sector as evidenced by the probability value of 0.0938. The implication of this finding is that total bank credit to industry in the lagged period has no robustly effect manufacturing performance. The finding is consistent with the study done by Ehikioya and Mohammed [27] for Nigeria, and Emaile for the case of Ethiopia [48].

Short run error correction model (Cointegrating Form)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNRIGDP(-1))	0.840502	0.276647	3.03818	0.0113*
D(LNRIGDP(-2))	0.439361	0.308239	1.425391	0.1818
D(LNRIGDP(-3))	0.637516	0.274827	2.319699	0.0406**
D(LNGI)	-0.135146	0.124322	-1.08706	0.3003
D(LNGI(-1))	-0.118936	0.110761	-1.073805	0.3059
D(LNGI(-2))	-0.146567	0.08891	-1.648485	0.1275
D(LNHK)	0.139913	0.108751	1.286537	0.2247
D(LNHK(-1))	0.076314	0.120527	0.633166	0.5396
D(LNHK(-2))	0.112141	0.089127	1.258214	0.2344
D(LNBCI)	0.197474	0.046651	4.233026	0.0014*
D(LNBCI(-1))	-0.08752	0.047713	-1.834314	0.0938***
D(LNGCE)	-0.38714	0.235942	-1.640829	0.1291
D(LNGCE(-1))	-0.175592	0.115519	-1.520021	0.1567
D(INFLATION)	-0.004714	0.001963	-2.400745	0.0352**
D(INFLATION(-1))	0.006167	0.002839	2.172124	0.0526**
D(INFLATION(-2))	0.003727	0.001994	1.868757	0.0885***
D(LNTO)	-0.026248	0.158752	-0.165341	0.8717
D(LNTO(-1))	0.529675	0.172116	3.077425	0.0105*
D(LNTO(-2))	0.291291	0.109945	-2.649432	0.0226**
CointEq(-1)	-0.649022	0.255208	-2.543113	0.0273**
Cointeq-LNRIGDP - (-0.2889*LNGI + 0.3080*LNHK + 0.5843				
*LNBCI -0.7209*LNGCE -0.0269*INFLATION -0.1492*LNTO + 7.0398)				

Source: Author's calculation from E view 9 results, 2017

Note: The sign *,** and *** indicate that the variables are significant at the level of 1% and 5% respectively

Table 6: Short-run coefficient for industrial output growth Equation

The estimated coefficient of inflation rate bears a negative sign and significant at 5% level of significance which is also consistent with the a priori expectation. This represents that a one percent increase in inflation rate will lead to 0. 004714 percent decrease in industrial sector output. The robustness of this variable is an indication that macroeconomic instability reduces industrial sector output mainly through rising cost of production. However, the coefficient of inflation rate has positive and significant at 5% and 10% level of significance in the one and two periods lagged respectively. This implies that inflation induces industrial growth through making an incentive for further production at least in the short-run (Table 7).

Long-Run and short-run dynamics of service sector output growth model

The result represents that all independent variables other than trade openness have long run significantly determine service sector output growth and consistent with the theoretical justification. As it can be observed from the above-estimated result, irrespective of their statistical significance, the long-run equation suggested that human capital, gross investment, bank credit, and trade openness positively affecting the service sector output growth whereas government consumption as the ratio of GDP and inflation rate negatively affect the service sector output growth in the long run.

The estimated long-run model depicts that human capital through education is the main contributor to real GDP of service sector which has positive and statistically significant as strongly evidenced by one percent level of significance. Human capital as a proxy by enrollment increases by one percent, real GDP of service sector increases by 0. 322441%. This could be due to the reason that government attention toward education for human capital development has a big impact on the people who have a positive impact on the economy in which accumulation of knowledge and learning ability increase the productivity of resources.

As prior hypothesized sign, gross investment to GDP variable has the expected positive sign. The level of investment has found to be a positive and statistically significant impact on service sector output

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LNHK	0.322441	0.061597	5.234662	0.0000*
LNGI	0.219638	0.037685	5.828212	0.0000*
LNBCS	0.090983	0.04877	1.865546	0.0744***
INFLATION	-0.004077	0.001848	-2.205489	0.0372**
LNGCE	-0.439819	0.19145	-2.297308	0.0306**
LNTO	0.086412	0.138675	0.623125	0.5391
C	4.714454	0.587969	8.018199	0.0000*

Source: Author's calculation from E view 9 results, 2017

Note: the sign of *, **, and *** represents the level of significance at 1%, 5% and 10% respectively

Table 7: Estimated long-run coefficient of service sector output growth

growth in the long run as strongly evidenced by 1% significance level. The result of estimation provides that a 1% increase in gross investment leads to a respective real service sector GDP increase of 0.22%. This indicates that investment is an important determinant of service sector output growth in Ethiopia.

The impact of total bank credit to the service sector is positive and significant at 10 percent level of significance. All other things remain constant, 1% increase in bank credit will increase the service sector real GDP growth by 0.090983% in the long run which implies that financial sector development is conducive to long-run output growth of service sector in Ethiopia. Therefore, the regression results confirm the acceptance of the alternative hypothesis that bank credit has significant positive impact on the long-run output growth of service in Ethiopia.

The coefficient of government final consumption variable as a percentage of GDP came up with hypothesized sign and statistically significant at a 5% level of significance. The results suggest that a one percent increase in government consumption leads to the decrease in real GDP of service sector by 0.44%. The logical behind the negative relationship between government final consumption and real GDP of this sector is that governments use expansionary fiscal policy through government spending during poor economic conditions to boost the economy and this crowd out the investment which ultimately affects sectoral output growth. Another logical explanation is that increasing government consumption expenditure would lead little resources left to developmental activities including infrastructure that is vital for accelerating overall economic development.

The general inflation rate as presented in the above table has a negative impact on service sector output growth and statistically significant. However, despite the fact that the level of inflation come up with a negative and statistically significant impact on service sector real GDP in the long run, the relationship between them in term of elasticities remains very weak that is a one percent increase in inflation leads to decrease a respective real GDP of service sector of 0.001297 only. This indicates that inflation rate is not an important determinant of service sector output growth. In the Ethiopian history, until 2002/03 inflation remained at a reasonable low-level rate. However, after 2004, the inflation rate continuously increased and climbed to 36.4 percent in 2009 (NBE, 2015/16), which was particularly caused by food inflation and affect the day to day consumption of the society than affecting the macroeconomic performance. In another word, the justification behind the marginal effects of inflation on Ethiopian service sector is that output growth might be associated with the reasonable low level (single digit) inflation rate registered until 2003 and after 2010 during the study period (Table 8).

Short run error correction model for service sector output growth: As depicted from above results, all variables in the short run model have come up with their prior According to the result shown in the above that the coefficient of error correction mechanism (ECM) is negative and statistically significant as evidenced by the low probability value of 0.0000. Its coefficient is found to be -0. 584009 which indicate that about 58.4 percent disequilibrium in service sector output in the previous year are corrected for the current year. The significance of the ECM is an indication and a confirmation of the existence of a stable long-run equilibrium relationship between service sector output and all the explanatory variables.

Similar to the long-run result, the estimated short-run model reveals that human capital proxy by secondary gross enrollment is the main contributor to real GDP of service sector change. It has a positive

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNRSGDP(-1))	-0.105705	0.155054	-0.68173	0.5019
D(LNHK)	0.127323	0.050486	2.521968	0.0187**
D(LNGI)	0.12827	0.039327	3.26163	0.0033*
D(LNBCS)	0.009882	0.021081	0.468772	0.6435
D(LNBCS(-1))	-0.028683	0.020379	-1.407487	0.1721
D(INFLATION)	-0.002381	0.000973	-2.447277	0.0221**
D(LNGCE)	-0.103551	0.079902	-1.295982	0.2073
D(LNGCE(-1))	0.110654	0.072966	1.516521	0.1424
D(LNTO)	0.050465	0.075749	0.666213	0.5116
CointEq(-1)	-0.584009	0.132996	-4.391168	0.0002*
Cointeq-LNRSGDP - (0.3224*LNHK + 0.2196*LNGI + 0.0910*LNBCS				
-0.0041*INFLATION -0.4398*LNGCE + 0.0864*LNTO + 4.7145)				

Source: Author's calculation, 2017

Note: The sign of '*' and '**' represents the variables are significance at the level of 1% and 5% respectively.

Table 8: Short run coefficients (short run error correction model or Cointegrating form).

and statistically significant effect on service sector output growth in the short run. Other thing being constant, as human capital increases by one percent, real GDP of service sector increases by 0.13%. On the same manner, the coefficient of gross investment as the ratio of GDP has a strong positive effect on this sector in short run as prior expectation. Accordingly, when gross investment increased by one percent, real GDP of service sector increases by 0.13% as strongly evidenced by 1% level of significance.

In short run, empirical evidence shows that financial development proxy bank credit to the sector has a positive and statistically insignificant effect on service sector output growth in the current period. The implication of this insignificant empirical evidence is that total bank credit to service sector in the current period has no significant effect service sector performance. Moreover, positive nature of this variable represents that the possibility to induce the growth of service sector performance given the crucial importance of credit facility to service business facilitation and overall economic development. The implication shows us that financial development has not an immediate contribution towards service sector's development due under development of the financial system and inefficient allocation resources to productive activities to boost sectoral output growth.

Similar to the long-run result, the inflation rate variable coefficient bears a negative sign and significantly affecting sectoral output growth at 5% level of significance which is in line with the a priori expectation. This implies that there is an indirect relationship between inflationary rate and service sector output. As result reveal that a one per cent increases in inflation rate will lead to 0.002381% decrease service sector output. The significance of this variable is an implication that macroeconomic instability reduces service sector output growth in the short run. The finding is also similar with Imoughele [27] for Nigeria (Tables 9-11).

Diagnostic test and model stability

Granger causality test result

This study has employed the Granger causality test to determine the direction of causality between co-integrated variables applying the vector error correction model (VECM) which would enable us to track the long run and short-run causality among interested variables [49]. In other words, in the Vector Error Correction Model (VECM), the

Test	LM-version		*F*-version	
	Statistic	P-value	Statistic	P-value
A:Serial Correlation: Breusch-Godfrey serial correlation LM test	2(2)= 0.075530	0.7834	*F*(2, 29)= 0.054863	0.8165
Heteroskedasticity: Breusch-Godfrey serial correlation LM test	2 (9)= 10.27220	0.3289	*F*(9, 29)= 1.151807	0.3596
Normality: Jarque-Bera test	χ^2(2)= 0.634550	0.728129	Not applicable	-
Functional Form: Ramsey RESET test	χ^2(2)= 1.089742	0.28487	*F*(1, 29)= 1.187538	0.28487

Source: Author's computation of E view 9 result, 2017

Table 9: Long run ARDL (2, 0, 0, 0, 0, 1, 0) Diagnostic Tests for agricultural output growth equation

Tests	LM-version		*F*-version	
	Statistic	P-value	Statistic	P-value
:Serial Correlation: Breusch-Godfrey serial correlation LM test	2 (2)= 1.556643	0.0876	*F*(2, 9)= 1.556643	0.2627
Heteroskedasticity: Breusch-Godfrey serial correlation LM test	2(26)=25.54424	0.4884	*F*(26, 11)= 0.867645	0.6357
Normality: Jarque-Bera test	χ^2(2)= 0.332727	0.846738)	Not applicable	
Functional Form: Ramsey RESET test	χ^2(10)= 0.510446	0.6208	*F*(1, 10)= 0.260555	0.6208

Source: Author's computation of E view 9 result, 2017

Table 10: Long-run ARDL (4, 3, 3, 2, 2, 3, 3) Diagnostic Tests for industrial output growth equation.

Tests	LM-version		*F*-version	
	Statistic	P-value	Statistic	P-value
Serial Correlation: Breusch-Godfrey serial correlation LM test	χ^2(2)= 3.181577	0.2038	*F*(2, 22)= 0.977077	0.3922
Heteroskedasticity: Breusch-Godfrey test	χ^2(14)= 17.80720	0.2157	*F*(14, 24)= 1.440425	0.2092
Normality: Jarque-Bera test	χ^2(2)= 1.304446	0.520887	Not applicable	
Functional Form: Ramsey RESET test	χ^2(23)=0.542812	0.5925	*F*(1,23)=0.294645	0.5925

Source: Author's computation of E view 9 result, 2017

Table 11: Long-run ARDL (2, 0, 1, 2, 2, 0, 0) Diagnostic Tests for service sector output growth equation

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).

The precondition for testing granger causality in the long-run based on vector error correction depends on whether two variables are nonintegrated or not [50,51]. Accordingly, the financial development and agricultural output growth are not co-integrated based on bound test. This implies that there is no long run causality between financial development and agricultural output growth in Ethiopia.

In the industrial sector, the finding revealed that there is long run uni-directional causality running from financial development to industrial output growth. This result suggests that supply leading hypothesis in the long run which argues that financial development is an important engine for industrial output growth through creating investable funds for investment that enhance economic growth. This supply lead growth hypothesis finding is consistent with the finding of Tongo [52] that found the causality between financial development and manufacturing sector output growth in South Africa. Conversely, industrial output growth does not cause financial development in the long run implying that industrial output growth does not cause bank credit to industrial sector.

On the other hand, the result in Table 12, reveals a similar long-run uni-directional causality running from bank credit to service sector output growth or supply leading growth hypothesis like that of industrial sector. The implication for this finding is that the bank credit to service sector cause to accelerate service sector output growth in Ethiopia. However, service sector output growth does not cause financial sector development in the long-run (Table 13). The results of Wald test also confirm that there is not short-run causality between financial sector development and agricultural output growth in Ethiopia. This finding is consistent with the finding of Tongo [52] for South Africa. The implication of absence of causality both in the long-run and short-run is that neither bank credit disbursed to agricultural sector in Ethiopia cause agricultural output growth nor does increase in agricultural output growth contributes to increase in deposits of bank and hence credit to sector.

Similar to long-run, there is a unidirectional causality running from financial development to industrial output growth or supply leading growth hypothesis holds in the short-run. However, there is no short-run causality running from industrial output growth to financial development which demand leading credit hypothesis.

However, unlike industrial sector, it is the output growth of service sector that pushes financial development in Ethiopia in the short run. This finding is in line with confirming demand lead hypothesis in short run. Therefore, output growth of service sector plays an important role in facilitating financial sector development in short run. However, from Table 13, the finding exerts that there is no short-run causality running from financial development to service sector output growth.

Conclusions and Recommendations

The study relied on economic theory which indicates that financial development is an essential ingredient for accelerating economic

Null Hypothesis of direction of causality	Included obs.	coefficients of ECt-1	t-ratio of ECM (-1)	Prob.
A. Agricultural sector				
LNBCA does not Granger cause LNRAGDP	There is no co-integration between bank credit and agricultural growth by bound test to co integration			
LNRAGDP does not Granger cause LNBCA	There is no co-integration between agricultural growth and bank credit by bound test to co integration			
B. Industrial sector				
LNBCI does not Granger cause LNRIGDP	39	-0.140389	-2.895885	0.0067*
LNRIGDP does not Granger cause LNBCI	39	0.004374	0.013407	0.9894
C. Service sector				
LNBCS does not Granger cause LNRSGDP	39	-0.051508	-2.788624	0.0087*
LNRSGDP does not Granger cause LNBCS	39	-0.225594	1.588869	0.1216
D. Aggregate output growth				
LNBC does not Granger cause LNRGDP	39	-0.019617	-3.950194	0.0004*
LNRGDP does not Granger cause LNBC	39	0.011698	0.25347	0.8015

Source: Author's computation of E view 9 result, 2017

Table 12: Long run Granger Causality Test using ECM procedures.

Null Hypothesis of direction of causality	Included obs.	lags	χ^2 for lagged coeff.s	Prob
A. Agricultural sector				
LNBCA does not Granger cause LNRAGDP	39	2	0.077722	0.7804
LNRAGDP does not Granger cause LNBCA	39	2	0.089826	0.7671
B. Industrial sector				
LNBCI does not Granger cause LNRIGDP	39	2	15.02001	0.0018*
LNRIGDP does not Granger cause LNBCI	39	2	2.568475	0.463
C. Service sector				
LNBCS does not Granger cause LNRSGDP	39	2	1.129357	0.5685
LNRSGDP does not Granger cause LNBCS	39	2	5.91125	0.0520**
D. Aggregate output growth				
LNBC does not Granger cause LNRGDP	39	2	4.993702	0.0823***
LNRGDP does not Granger cause LNBC	39	2	0.483305	0.7853

Source: Author's computation of E view 9 result, 2017

Note: The signs * and ** indicate the significance of the coefficients at 1% and 5% level of significance to reject the null hypothesis of the direction of causality respectively.

Table 13: Short-run Granger Causality Test using ECM procedures.

growth in the country. The empirical results implied evidence of a long-run positive impact of financial development on agricultural output growth, industrial output growth, service sector output growth in Ethiopia. This evidence is also confirmed at the aggregate level of output growth in Ethiopia. However, except for industry sector and aggregate level, financial sector has not a significant impact on agricultural and service sector output growth in the short run. This implies inefficient financial sector and underdevelopment of financial institution to support agricultural and service sector output growth at least in short.

Furthermore, VECM granger causality tests show that there is no causality between financial development and agricultural output growth both in long run and short run. However, uni-directional causality running from (1) financial development to industrial output growth both in long run and short run (2) financial development to service sector output growth in the long run (supply leading) and in short run running from service sector to financial development which supports demand leading hypothesis. At the aggregate level, the direction of causality is running from financial development to economic growth both in short run and long run. This study found the 'supply-leading' hypothesis held in the case of Ethiopia. Except for service sector, the causality result indicates that promotion of financial sectors could contribute to sectoral output growth as well as overall output growth in the long run and short run. In the case of service sector, demand leading growth hypothesis explain that improving output growth contribute financial development only in the short run.

Based on above finding, the policy makers should focus long run policies mainly improving financial markets so as to make the efficient and effective allocation of resources among productive sector which affects long-run sectoral output growth. On another word, in order to promote economic growth, it is important to improve banking function and competition by liberalizing the banking sector and promotion of private banks in Ethiopia. Moreover, the bank credit to agriculture, industry, and service sectors are used for financial development indicators may not capture the full concept of financial development variable.

Therefore, further study can be exerted through the use of different financial development indicators in Ethiopia context and incorporating important sub sector and expanding long data series should be included for the further study area.

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