European Journal of Business and Management
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online)
Vol 4, No.14, 2012

The Long-Run Impact of Bank Credit on Economic Growth in Ethiopia: Evidence from the Johansen's Multivariate Cointegration Approach

K. Sreerama Murty[1], K. Sailaja[2], and Wondaferahu Mullugeta Demissie[3]

1. Professor and Principal of College of Arts and Commerce, Andhra University Visakhapatnam, India
2. Assistant Professor, Department of Economics, Andhra University Visakhapatnam, India
3. Research Scholar, Department of Economics, Andhra University Visakhapatnam, India

* E-mail of the corresponding author: wondm2001@yahoo.com; wondaferahu.mulugeta@ju.edu.et

Abstract

In this paper the long-run impact of bank credit on economic growth in Ethiopia is examined via a multivariate Johansen cointegration approach using time series data for the period 1971/72-2010/11. More importantly, the transmission mechanism through which bank credit to the private sector affects long-run growth is investigated. The results supported a positive and statistically significant equilibrium relationship between bank credit and economic growth in Ethiopia. Deposit liabilities also affect long-run economic growth positively and significantly through banks services of resource mobilization. Moreover, the effect of control variables such as human capital, domestic capital, and openness to trade on growth are found to be positive and statistically significant while inflation and government spending have statistically significant negative impact on economic growth in the long-run. A major finding is that bank credit to the private sector affects economic growth through its role in efficient allocation of resources and domestic capital accumulation. Thus, the result imply that policy makers should focus attention on long-run policies to promote economic growth - the creation of modern banking sector so as to enhance domestic investment, which is instrumental to increasing output per capita and hence promoting economic growth in the long-run .

Key words: Bank Credit, Cointegration, Economic Growth, Ethiopia, Long-run.

1. Introduction

A major chunk of the literature on growth suggests that the development of financial sector should lead towards economic growth. Usually financial services work through efficient resource mobilization and credit expansion to raise the level of investment and efficient capital accumulation. The possible positive link between credit market and economic growth is in one sense fairly obvious. That is more developed countries, without exception, have more developed credit markets. Therefore, it would seem that policies to develop the financial sector would be expected to raise economic growth. Indeed, the role of bank credit considered to be the key in economic growth and development (Khan and Senhadji, 2000). The literature on financial economics provides support for the argument that countries with efficient credit systems grow faster while inefficient credit systems bear the risk of bank failure (Kasekende, 2008). Moreover, credit institutions intermediate between the surplus and deficit sectors of the economy. Thus, a better functioning credit system alleviates the external financing constraints that impede credit expansion, and the expansion of firms and industries (Mishkin, 2007).

The Ethiopian financial system is dominated by the banking sector and has gone through several changes in last few years. The financial sector was a highly regulated one prior to the onset of structural reforms in 1992. It is with this backdrop, the objectives of this paper are first to investigates the long-run impact of bank credit on economic growth in Ethiopia using the Johansen multivariate cointegration models for the period 1971/72 to

2010/11. The second objective of this paper is to investigate whether the long-run growth is affected through a higher investment rate (capital accumulation), better resource allocation (efficiency) or both and determines domestic capital within the model. The novel feature of this study is it makes domestic capital as a function of bank credit thereby suggesting credit market development is essentially meant for promoting domestic investment. Based on the aforementioned two objectives, the following two hypotheses to be tested are:

Hypothesis 1: Bank credit has significant positive impact on the long-run economic growth in Ethiopia.

Hypothesis 2: Bank credit affects long-run growth in Ethiopia both through better resource allocation (efficiency) and through higher investment level (capital accumulation).

The rest of the paper is organized as follows. Section 2 reviews the related literature. Section 3 discusses the data, variables, and estimation technique. Estimation results and discussions are presented in section 4 and section 5 concludes the study.

2. Brief Literature review

There has been extensive empirical work on the relationship between financial development and economic growth which has been largely surveyed in King and Levine (1993) and Levine (1997). One of the most influential studies on the subject is King and Levine (1993), which shows a strong positive link between financial development and economic growth in a multivariate setting. They also show that financial development has predictive power for future growth and interpret this finding as evidence for a casual relationship that run from financial development to economic growth. The study covers a cross-section of 80 countries during the period 1960-1989 and uses four measures of the level of financial development. The first is liquid liabilities of banks and non-bank financial institutions as a share of GDP, which measures the size of financial intermediaries. The second is the ratio of bank credit to the sum of bank and central bank credit, which measures the degree to which banks versus the central bank allocate. The third is the ratio of private credit to domestic credit and the forth is private credit to GDP ratio. The last two indicators measure the extent to which the banking system channel fund to the private sector. They provide evidence that that financial sector, proxied by the ratio of bank credit granted to the private sector to GDP, affects economic growth both through the improvement of investment productivity (better allocation of capital) and through higher investment level. Their claim is that banking sector development can spur economic growth in the long-run are also supported by the findings of De Gregorio and Guidotti (1995), who consider that financial deepening affects growth through a combination of the two effects but with more importance for the efficiency effect.

The study by Levine (1997) shows that financial development can reduce the cost of acquiring information about firms and managers, and lowers the cost of conducting transactions. By providing more accurate information about production technologies and exerting corporate control, financial sector development can enhance resource allocation and accelerate economic growth in the long-run. Similarly, by facilitating risk management, improving the liquidity of financial assets, and reducing trading costs, financial development can encourage investment in high-return activities. In these regard, Khan and Senhadji, (2000) argued that the fundamental frictions that give rise to financial intermediaries are either a technological or an incentive nature. The former prevents individuals from access to economies of scale, while the latter occurs because information is costly and asymmetrically distributed across agents in world where contracts are incomplete because contingencies can be spelled out. Hence, according to them financial intermediaries relax these restrictions by: (i) facilitating the trading, hedging, diversifying, and pooling of risk; (ii) efficiently allocating resources; (iii) monitoring managers and exerting corporate control;(iv) mobilizing savings; and (v) facilitating the exchange of goods and services. In sum, financial system facilitates the allocation of resources over space and time.

Levine et al. (2000) conducted the study on 71 countries for the period 1960 to 1995. The ratio of liquid liabilities to GDP, ratio of deposit money banks domestic assets to deposit money banks domestic assets plus cen-

tral bank domestic assets, and ratio of credit issued to private enterprises to nominal GDP were used as financial indicators. The findings supported the positive correlation between bank credit and economic growth. The authors suggested that legal and accounting reforms should be undertaken to strengthen creditor rights, contract enforcement, and accounting practices in order to boost financial intermediary development and thereby accelerate economic growth.

Khan and Senhadji (2003) also examined the relationship between financial development and economic growth for 159 countries over the period 1960-1999 using cross-section data. To address the problem of potential endogeneity in the underlying relationship, the two-stage least squares (2SLS) was employed. The study found that financial development has a positive and statistically significant effect on economic growth. The study by Khan et al (2005) that investigate the link between financial development and economic growth in Pakistan over the period 1971-2004 employing the autoregressive distributed lag approach found that financial depth exerted positive impact on economic growth in the long-run but the relationship was insignificant in the short-run. The ratio of investment to GDP exerted positive influence on economic growth in the short-run but also insignificant in the long-run. The study also showed a positive impact of real deposit rate on economic growth. The authors recommended that policy makers should focus attention on long-run policies to promote economic growth, for example, the creation of modern financial institutions in the banking sector and the stock market.

Sanusi and Salleh (2007) examined the relationship between financial development and economic growth in Malaysia covering the period 1960-2002. Three measures of financial development were used, namely, ratio of broad money to GDP, credit provided by the banking system, and deposit money banks to GDP. By employing the autoregressive distributed lag approach, the study found that ratio of broad money to GDP, and credit provided by the banking system have positive and statistically significant impact on economic growth in the long-run. The results further indicated that a rise in investment will enhance economic growth in the long-run. Using panel analysis and Fully Modified OLS (FMOLS) methods Kiran et al (2009) investigated the relationship between financial development and economic growth for ten emerging countries over the period 1968–2007. Three measures of financial development (ratio of liquid liabilities to GDP, bank credit to GDP, and private sector credit to GDP) were used to quantify the impact of financial development on economic growth. The results concluded that financial development has a positive and statistically significant effect on economic growth.

Lastly, the findings of some studies do not support the finance- growth relationship. Lucas (1988) does not support the view that finance is a major determinant of economic growth. He argues that its role has been over-stressed by economists. Ahmed (2008) employed the fully modified OLS (FMOLS) to estimate long-run financial development-growth relationship. The ratio of private sector credit to GDP and domestic credit to GDP were the indicators of financial development used, while financial openness was used as a proxy for financial liberalization. The study found that financial development exerted a negative impact on economic growth when private credit was used, while the relationship was positive but insignificant when domestic credit was employed. However, the financial liberation index exerted a positive and significant impact on economic growth.

3. Data and Methodology

3.1. Data and variable description

The data used in this study are annual covering the period from 1971/72 to 2010/11 for Ethiopia regarding 1999/2000 as a base year[1]. The data were sourced from the National Bank of Ethiopia (2010/11), World Bank's World Development Indicators (2011), and IMF-International Financial Statistics CD-ROM (2012).

The relevant economic growth variable is real GDP per worker and the data on real GDP and labour force were obtained from Ministry of Finance and Economic Development-MoFED (2010/11) and WDI (2011), respectively. The capital stock series is constructed from real gross capital formation using the perpetual inventory

[1] *Fiscal year in Ethiopia begins July 1 and ends June 31*

assumption with depreciation rate set equal to 5 per cent (Wang and Yao, 2003). The per capita capital stock series is then obtained by dividing the capital stock series by labour force. The data on gross capital formation is obtained from MoFED (2010/11).

The study uses two financial indicators: bank credit to the private sector and deposit liabilities of banks to GDP ratio[2]. Both series were obtained from NBE (2010/11) and the IMF-IFS (2012). Private credit equals the value of credit by domestic financial intermediaries to GDP ratio. This ratio is a measure of financial sector activity or the ability of the banking system to provide finance-led growth. The supply of credit to the private sector is important for the quality and quantity of investment (Demetriades and Hussein, 1996). This ratio also stresses the importance of the role played by the financial sector, especially the deposit money banks, in the financing of the private economy. It isolates credit issued to the private sector from credit issued to governments, government agencies, and public enterprises. Also, it excludes credits issued by the Central Bank (Levine et al, 2000). The underlying assumption is that credit provided to the private sector generated increases in investment and productivity to a much larger extent than the credits to the public sector. It is also argued that loans to the private sector are given under more stringent conditions and that the improved quality of investment emanating from financial intermediaries' evaluation of project viability is more significant for private sector credits (Levine and Zervos, 1998).

Gelb (1989), World Bank (1989), and King and Levine (1993) use the ratio of broad money (M2) to GDP for financial depth. In principle, the increase in the ratio means the increase in financial depth. But, in developing countries, M2 contains a large proportion of currency outside banks. As a result, the rise of M2 will refer to monetization instead of financial depth (Demetriades and Hussein, 1996). Hence, the amount which is out of the banking system, that is currency, should be extracted from the broad money. So the ratio of deposit liabilities to nominal GDP is more relevant variable for Ethiopia. The data on deposit liabilities is obtained from IMF-IFS (2012) CD-ROM

3.2. Model specification

A number of recent studies have used endogenous growth theory to show the relationship between financial development and economic growth. The general idea consists of assuming that financial development improves the efficient allocation of resources, which in the context of endogenous model, implies higher long-run economic growth. These theoretical predictions are confirmed by large body of empirical evidence. Thus, the multivariate vector autoregressive (VAR) model considered below for empirical analysis capitalizes the role of bank credit on economic growth in Ethiopia through Total Factor Productivity (TFP) growth and capital accumulation equations determining domestic capital along with GDP growth. The econometric framework builds on the endogenous growth accounting model, which models TFP. Using t to denote time period (years) the basic economy wide production function can be written as

$$Y_t = A_t(K_t^d)^{\beta}(L_t)^{1-\beta} \quad \text{---------- (1)}$$

Where, Y_t, A_t, K_t^d, and L_t denote aggregate real output, TFP, stock of domestic capital and labour force, while β is a parameter of the production function. Dividing both sides of the production function by L_t, taking log transformation and denoting logs of output per worker, TFP, and domestic capital per worker by y_t, a_t,

[2] *The measures of bank credit and liquid liabilities used in this study address the stock-flow problem of financial intermediary balance sheets items being measured at the end of the year, while nominal GDP is measured over the year. To circumvent any inconsistency when employing a ratio of a stock and a flow variable, a number of authors have attempted to deal with this problem by calculating the average of the financial development measures in year* t *and* $t-1$ *and dividing by nominal GDP in year* t *(King and Levine 1993).*

and k_t^d respectively, yields

$$y_t = a_t + \beta k_t^d \text{ ---------- (2)}$$

Now bank credit can influence growth rate of GDP per worker through two channels, namely TFP growth and capital accumulation. The banking system play a role in the growth process because it integral to the provision of funding for capital accumulation and for the diffusion of new technologies. The micro-economics rationale for financial system is based largely on the existence of frictions in the trading system. In a world in which written, issuing, and enforcing contracts consume resources and in which information is asymmetric and its acquisition is costly, properly functioning financial sector can provide such services that reduce these information and transaction costs (Pagano, 1993 and Levine, 1997). This process brings together severs and investors more effectively in the credit market and ultimately contributes to economic growth through capital accumulation and TFP growth via efficient resources allocation and diffusion of technology.

According to Ahmed and MaliK (2009), there are two different approaches for constructing the model that capture the three channels mentioned above through which finance can influence economic growth. The first approach is to estimate the effects of financial indicators along with other control variables on each of the two variables; namely TFP and domestic capital then substituting the estimated equations in the growth accounting equation specified above. The other approach is to substitute the algebraic expressions indicating the relationship of TFP with financial and other variables into the growth accounting equation before estimating the latter. Following the second approach, we specify the following linear relationship to determine TFP.

$$TFP = \alpha_0 + \alpha_1 \ln pc_t + \alpha_2 \ln dp_t + \alpha_3 \ln se + \alpha_4 \ln p_t + \alpha_5 \ln gc_t + \alpha_6 \ln op_t + e_t \text{ ----- (3)}$$

Where $\ln pc_t, \ln dp_t, \ln se_t, \ln p_t, \ln gc_t,$ and $\ln op_t$ are the natural logarithm of bank credit to the private sector to GDP ratio, deposit liabilities to GDP ratio, gross secondary school enrollment, consumers price index, government final consumption to GDP ratio, and trade openness (the ratio of exports and imports to GDP), while e_t indicates random error term. Thus, besides bank credit to the private sector and deposit liabilities to GDP ratios domestic capital, which includes expenditure on human capital, research and development and infrastructure, is also assumed to affects TFP.

The vector of control variables that are assumed to affect TFP are gross secondary school enrollment, CPI, government final consumption to GDP ratio, and trade openness. Romer, (1989) as cited by Ahmed and MaliK (2009) noted than gross secondary school enrollment is a human capital indicator and it obviously affects TFP through accumulation of knowledge, learning ability, and general increase productivity of resources. Price inflation can adversely affect TFP by causing uncertainty and short term distortions in resource allocation. According to Barro and Sala-i-Martin (1995) this variable indicates macroeconomic stability. Government final consumption indicates the size of the public sector and its effect is generally regarded negative unless it is specifically meant to improve productivity. Finally, trade openness is expected to raise productivity through increased competition and transmission of technology from the rest of the world (Edwards, 1993, Levine and Zervos, 1998).

Substituting equation (3) into (2) and collecting common terms and rearranging yields the following estimable equation for the determinants of economic growth

$$y_t = \beta_0 + \beta_1 \ln k_t^d + \beta_2 \ln se + \beta_3 \ln pc_t + \beta_4 \ln dp_t + \beta_5 \ln p_t + \beta_6 \ln gc_t + \beta_7 \ln op_t + \varepsilon_t \text{ --- (4)}$$

Now to specify the determinants of domestic capital, we propose the following econometric equation

$$k_t^d = \rho_0 + \rho_1 \ln pc_t + \rho_2 \ln dp_t + \rho_3 \ln y_t + \rho_4 \ln p_t + \rho_4 \ln gc_t + \rho_6 \ln op_t + \upsilon_t \text{ ------- (5)}$$

The financial variables included in equation the domestic capital equation are the same as in the growth equation (4). Both financial variables are expected to exert favorable influence in the capital accumulation by facilitating the channeling of resource allocation from savers to higher-return activities and increasing the quantity of fund available for domestic investment as explained earlier. According to Mohammed (2000), the significant relationship between the investment ratio and the financial indicator may be a good reason to consider that the nature of the finance-growth link hinges on the investment behavior of the private sector in each economy. In other words, the insignificant correlation between financial development and economic growth may be explained by the lack of innovative entrepreneurial activity in developing countries.

Real output per worker expected to affect capital accumulation through accelerator channel. Empirical evidence is consistent with the accelerator effect and shows that high output growth are associated with higher investment rate (Fielding, 1997). The ratio of government final consumption to GDP is included in the equation to determine whether government spending is conducive to or crowds out capital accumulation. Inflation rate may have positive or negative effect on domestic investment. High and unstable inflation is likely to affect domestic investment adversely by increasing the degree of uncertainty about macroeconomic environment (Fisher, 1993). However, moderate inflation may promote capital accumulation by shifting portfolio of assets from financial to real components and by providing signals of rising aggregate demand (Tobin 1965). Finally, trade openness can affect domestic capital both through exports and imports. An increase in exports leads to an increase in the supply of foreign exchange necessary for the purchase of imported capital goods and also expands the market for domestic products. An increase in imports can accumulate domestic capital if it implies greater access to investment goods. But imports can also negatively affect domestic capital if it predominantly consists of consumer goods, which may discourage domestic production.

The above cointegration VAR models (equation 4 and 5) provide integrated approach for understanding how financial systems and domestic capital affect long-run rates of economic growth through TFP and capital accumulation. This framework captures financial economics view of finance and growth that highlighted the impact of financial systems on productivity growth and technological change. All computations in this paper were done using PcGive 12.

3.3. Estimation technique

Stationarity Test: The pre-requisite of cointegration test is the stationarity of each individual time series over the sample period. Ever since the seminal paper by Engle and Granger (1987), cointegration analysis has increasingly become the favored methodological approach for analyzing time series data containing stochastic trends. Hence, before turning to the analysis of the long-run relationships between the variables we check for the unit root properties of the single series, as non-stationary behavior is a prerequisite for including them in the cointegration analysis. The modelling procedure of unit root test of the series at their level is described as follows:

$$\Delta Y_t = \alpha_0 + \alpha_2 Y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \varepsilon_t \text{ ---------- (6a)}$$

Where Y is the variable of choice; Δ is the first- difference operator; α_i (for i = 1 and 2) and δ_i (for $i = 1,2,...,p$) are constant parameters; and ε_t is a stationary stochastic process. p is the number of lagged terms chosen by Akaike Information Criterion (AIC) to ensure that ε_t is white noise. The hypotheses of the

above equation form are:

$H_0 : \alpha_2 = 0$, i.e., there is a unit root – the time series is non-stationary.

$H_1 : \alpha_2 \neq 0$, i.e., there is no unit root – the time series is stationary.

If the calculated ADF test statistic is higher than McKinnon's critical values, then the null hypothesis (H_0) is accepted this means that a unit root exists in Y_{t-1} and ΔY_{t-1}, implying that the series are non-stationary or not integrated of order zero, i.e., I(0). Alternatively, the rejection of the null hypothesis implies stationarity of the underlying time series. Failure to reject the null hypothesis leads to conducting the test on the difference of the time series, so further differencing is conducted until stationarity is achieved and the null hypothesis is rejected (Harris, 1995). Hence, in order to determine the order of integration of a particular series, equation (6a) has to be modified to include second differences on lagged first and k lags of second differences. This is as follows:

$$\Delta^2 Y_t = \psi_1 \Delta Y_{t-1} + \sum_{i=1}^{p} \theta_i \Delta^2 Y_{t-i} + \xi_t \text{ ----------(6b)}$$

In this case, the hypotheses to be tested are:

$H_0 = \psi_1 = 0$, i.e., there is a unit root – the time series is non-stationary.

$H_1 = \psi_1 \neq 0$, i.e., there is no unit root – the time series is stationary.

If the time series are stationary in their first differences(that is $\psi_1 \neq 0$), then they can be said integrated of order one, i.e., I (1); if stationary in their second differences, then they are integrated of order two, i.e., I(2). The order of integration of the variables in equations (6a) and (6b) is investigated using the standard Augmented-Dickey-Fuller (ADF) [Dickey and Fuller, 1981] and Phillips-Perron (PP) [Phillips and Perron, 1988] unit-root tests for the presence of unit roots.

An important aspect of empirical research based on VAR is the choice of the lag order, since all inference in the VAR model depends on the correct model specification. Hence, the optimal lags required in the cointegration test were chosen using the most common traditional information criteria being the Akaike Information Criteria (AIC), Schwarz Criterion (SC), Hannan and Quinn's (HQ) and the likelihood ratio (LR).

Cointegration Test: The necessary criterion for stationarity among non-stationary variables is called cointegration. Testing for cointegration is necessary step to check if our modelling empirically meaningful relationships (Gutierrez et.al, 2007). In financial economics, two variables are said cointegrated when they have long-term, or equilibrium relationship between them (Engle and Granger, 1987). Thus, in this study Johansen (1988) cointegration analysis has been performed to investigate long term relationship between bank credit and real economic growth in Ethiopia. The purpose of the cointegration test is to determine whether a group of non-stationary series is cointegrated or not. The vector autoregressive (VAR) model as considered in this study is:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + BX_t + \varepsilon_t \text{ ----------} (7)$$

Where Y_t is a k -vector of non-stationary I(1) endogenous variables; X_t is a d -vector of exogenous de-

terministic variables; $A_1 \ldots A_p$ and B are matrices of coefficients to be estimated and ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right hand side variables. Since most economic time series are non-stationary, the above stated VAR model is generally estimated in its first-difference form as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + BX_t + \varepsilon_t \quad \text{---------- (8)}$$

Where, $\Pi = \sum_{i=1}^{p} A_i$ and $\Gamma_i = -\sum_{j=i+1}^{k} A_j$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r < k$, then there exist kxr matrices α and β each with rank r such that The method states that if Π matrix has reduced rank $r < k$, then there exists kxr matrices of α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' Y_t$ is $I(0)$. r is the number of co-integrating relations (the co-integrating rank) and each column of β' is the co-integrating vector and α is the matrix of error correction parameters that measures the speed of adjustments in ΔY_t . The Johansen approach to cointegration test is based on two test statistics, viz., the trace test statistic, and the maximum eigenvalue test statistic, as suggested by Johansen (1988) and Oseterwald Lenum (1992).

Trace Test Statistic: The likelihood ratio statistic (LR) for the trace test (λ_{trace}) as suggested by Johansen (1988) can be specified as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{k} \log(1 - \hat{\lambda}_i) \quad \text{---------- (9a)}$$

Where, $\hat{\lambda}_i$ is the i^{th} largest eigenvalue of matrix Π and T is the number of observations. In the trace test, the null hypothesis is that the number of distinct cointegrating vector(s) is less than or equal to the number of cointegration relations (r). In this statistic λ_{trace} will be small when the values of the characteristic roots are closer to zero.

Maximum Eigenvalue Test: The maximum eigenvalue test as suggested by Johansen (1988) examines the null hypothesis of exactly r cointegrating relations against the alternative of $r+1$ cointegrating relations with the test statistic:

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad \text{---------- (9b)}$$

Where $\hat{\lambda}_{r+1}$ is the $(r+1)^{th}$ largest squared eigenvalue. In the trace test, the null hypothesis of $r = 0$ is tested against the alternative of $r+1$ cointegrating vectors. If the estimated value of the characteristic root is

close to zero, then the λ_{trace} will be small.

After detecting the number of cointegration, the normalized co-integration coefficients of growth and domestic capital models along with the test of significance of the variables is examined by imposing a general restriction on each variable($\beta_i = 0$) in the regression models. Finally, we apply the Wald test on the various null hypotheses involving sets of regression coefficients.

4. Result and discussion

To check for the non-stationary behavior of the individual time series, as a first step we apply unit root tests. Specifically, we apply the ADF and PP tests. The results are summarized in Table 1. The result indicates that, for none of the series in levels the null hypothesis of a unit root can be rejected at the 5% level. For the first differences the null hypothesis is rejected on the 5% significance level. Thus, we conclude that all examined series are integrated of order one, *I*(1). Based on the results in the table, we include only a constant in the test cointegration for the growth and domestic capital models in levels.

Table 1: Unit Root Tests

Variables	ADF Test		PP Test		Inference
	Level	Difference	Level	Difference	
$\ln y$	0.1666	-3.901**	0.8733	-3.794**	I(1)
$\ln k^d$	-0.7145	-3.907**	0.7216	-3.867**	I(1)
$\ln se$	1.1810	-3.356**	2.249	-4.114**	I(1)
$\ln pc$	-2.609	-3.708**	0.2098	-3.688**	I(1)
$\ln dp$	-2.522	-3.513*	1.208	-3.223**	I(1)
$\ln p$	1.1583	-4.123**	2.630	-3.568**	I(1)
$\ln gc$	-2.757	-4.333**	0.209	-4.334**	I(1)
$\ln op$	-1.290	-5.161**	1.048	-4.941**	I(1)

*Note: ** and * indicate level of significance at 1 and 5%*

It is well known that Johansen's cointegration tests are very sensitive to the choice of lag length. Firstly, a VAR model is fitted to the time series data in order to find an appropriate lag structure. As shown in Table 2, the conventional information criteria suggested that the value $p = 1$ is the appropriate specification for the order of VAR the growth and domestic capital models for Ethiopia. Since annual data is used in this study, lagging independent variables one period seems to be an appropriate approach to see the impact of these variables on the dependent variable after one period rather than measuring their contemporaneous effects. The results of the lag length selection criteria and the selected lag lengths are reported in Table 2. In both cases up to 3 lags are considered until significant results are obtained.

Table 2: Lag length Selection

Lag	LogL	LR	AIC	SC	HQ	FPE
Growth model						
0	39.66049	NA	-1.674897	-1.376309	-1.567766	4.42e-10
1	312.5431	433.8134*	-13.15606*	-10.76735*	-12.29901*	4.75e-15*
2	358.8970	57.05098	-13.02036	-8.541542	-11.41340	6.99e-15
3						
Domestic Capital model						
Lag	**LogL**	**LR**	**AIC**	**SC**	**HQ**	**FPE**
0	-68.98992	NA	4.053509	4.314739	4.145605	2.32e-06
1	166.1592	381.3229*	-7.104135*	-4.882698*	-6.066637*	5.04e-11*
2	205.4033	50.91134	-6.886667	-3.490678	-5.689422	4.96e-11
3	245.4265	38.94146	-6.711307	-2.140767	-5.354315	6.33e-11

*Note: * denotes rejection of the hypothesis at the 5% level. Lag length is selected as 1 based on LR, AIC SC, HQ, and FPE .*

Having detected the non-stationary behavior of all the series and chosen the optimal lag length, we apply the trace and maximum eigenvalue tests for the growth and domestic capital models. Table 3a and 3b provide the results from the Johansen (1988) and Johansen and Juselius (1990) cointegration test for growth model and domestic capital, respectivelly. The trace statistics provide evidence that the null hypothesis of no cointegrating vector can be rejected at the 5% level, while the null hypothesis of at least one cointegrating vector cannot be rejected at the 1% level for the two models. Moreover, the maximum eigenvalue test makes the confirmation of this result and hence we conclude that the rank is one, i.e. a unique cointegration relationship for both models implying the variables included in the models have long-run or equilibrium relationship among them.

Table 3a: Johansen Cointegration Tests for Growth Model (VAR=1)

		Johansen's test statistics			
Ho:rank=r	**Eigenvalue**	**Maximum Eigen-values (λ_{max})**	**Critical Value (5%)**	**Trace Statistics (λ_{trace})**	**Critical Value (5%)**
r == 0	0.864709	78.01**	52.0	194.69**	165.6
r <= 1	0.554054	31.49	46.5	116.67	131.7
r <= 2	0.468631	24.66	40.3	85.179	102.1
r <= 3	0.433844	22.19	34.4	60.519	76.1
r <= 4	0.340374	16.23	28.1	38.333	53.1
r <= 5	0.233894	10.39	22.0	22.105	34.9
r <= 6	0.200797	8.741	15.7	11.714	20.0
r <= 7	0.0733968	2.973	9.2	2.9730	9.2

***Note: r** indicates the number of cointegrating relationships; Number of lags used in the analysis: 1; *& **: Indicate Statistical significance at 5% and 1%, respectively.*

Table 3b: Johansen Cointegration Tests for Domestic Capital Model (VAR=1)

		Johansen's test statistics			
Ho:rank=r	**Eigenvalue**	**Maximum Eigen-values (λ_{max})**	**Critical Value (5%)**	**Trace Statistics (λ_{trace})**	**Critical Value (5%)**
r == 0	0.733434	51.56*	46.5	142.8**	131.7
r <= 1	0.499022	26.96	40.3	91.25	102.1
r <= 2	0.430353	21.95	34.4	64.29	76.1
r <= 3	0.352543	16.95	28.1	42.35	53.1
r <= 4	0.222096	9.795	22.0	25.29	34.9
r <= 5	0.206819	9.036	15.7	15.6	20.0
r <= 6	0.154876	6.563	9.2	6.563	9.2

***Note: r** indicates the number of cointegrating relationships; Number of lags used in the analysis: 1; *& **: Indicate Statistical significance at 5% and 1%, respectively.*

The parameter estimates of the real GDP per worker and domestic capital equations are presented in Table 4 and Table 5, respectively. Subsequently, we investigate the statistical significance of each variable in the

cointegrating vector by imposing general restriction ($\beta_i = 0$). On the basis of our results, the long-run relationship among real GDP per worker, financial variables (domestic bank credit to the private sector and deposit liabilities), and other control variables included in the model receives statistical support in the case of Ethiopia over the period under examination.

The results in Table 4 support the idea that the accumulation of domestic capital is important for economic growth. The size of the estimated coefficients in the growth model is quite reasonable indicating that variables in the model modestly determine the magnitude of real economic activity in Ethiopia. As expected, the investment variable has the expected positive sign. But despite the fact that, the level of investment exerts a positive and statistically significant impact on real GDP per worker in the long run, the relationship between them in term of elasticizes remains very weak i.e. a one percent increase in investment leads to a respective real GDP increase of 0.14 only. This indicates that investment is not an important determinant of economic growth in Ethiopia. This weak relationship between domestic investment and growth is attributed usually to the prevailing situations of political instability, prolonged civil wars, and other factors such as uncertainty over agricultural leases which resulted in declining investment, particularly in major agricultural projects. The coefficient of gross secondary enrollment is positive and significantly greater than zero; implying that human capital accumulation affects long-run economic growth of Ethiopia accumulation of knowledge, learning ability, and general increase productivity of resources.

The coefficients of bank credit and deposit liabilities are positive and significant, implying financial sector development is conducive to long-run economic growth in Ethiopia. Moreover, the contribution of the private bank credit to the growth process is substantially smaller than (is almost about half of that of) banks liquid liabilities, a finding that is in line with the Ethiopian institutional setting where the Ethiopian banks are highly over liquid. Since the growth equation contains domestic capital as a separate explanatory variable the role of bank credit in GDP growth captured in the estimated equation is independent of investment channel. Therefore, the regression results confirm the acceptance of the hypothesis that bank credit has significant positive impact on the long-run economic growth in Ethiopia and the presence of other channels (technical innovation and resource allocation) that affects growth through its effect on TFP. The significance of deposit liabilities implies that banks through their effort of resource mobilization affect economic growth in the long-run, a finding consistent with Jalil and Ma (2008) for China and Pakistan in which deposit liabilities affects long-run economic growth through resource mobilization channel.

Table 4: Normalized co-integration coefficients of Growth Model (Equation 4)

$\ln y$	Constant	$\ln k^d$	$\ln gse$	$\ln pbc$	$\ln dep$	$\ln p$	$\ln gc$	$\ln op$
	7.1554 [0.0000]**	0.13989 [0.0020]**	0.23372 [0.0005]**	0.21512 [0.0003]**	0.46107 [0.0000]**	-0.11717 [0.0065]**	-0.25175 [0.0013]**	0.13022 [0.0069]**

*Note: Values in the parenthesis are P-values. *&** indicate statistical significance at 5 and 1% levels, respectively.*

With regards to the control variables, the regression results suggest that inflation has negative and significant effect on economic growth. This is because increase in inflation is generally accompanied by greater changes in relative prices as not all sectors of an economy experience equal degree of price flexibility in the short run. This sends unwanted signals to the producers and result in temporary resource allocation. The associated adjustment costs and temporary nature of reallocation result in efficiency losses and hence curtail real output per worker growth.

The coefficient of government final consumption variable also appears with the correct sign and is statistically significant at 1 percent level. The results suggest that a one percent increase in government spending leads to the decrease in real GDP per worker by 0.25. The negative relationship between government spending and real GDP is logical because governments usually tend to increase spending during poor economic conditions to boost the economy. Another argument is that the taxes necessary to support government spending could distort incentives, result in inefficient allocation of resources, and hence reduce the growth of output in Ethiopia. As expected, openness to trade, measured as the sum of exports and imports as a share of nominal GDP, has positive and significant effect on economic growth. The estimated coefficient suggests that a one per cent increase in trade openness leads to the increase in real GDP per worker by 0.13 per cent. So trade openness is an important stimulus to rapid long-run economic growth in Ethiopia. Thus, it can be inferred that the estimated cointegrating vector among the eight variables suggests that real economic activity is affected by changes in the financial indicators and control variables in the model in the long-run.

The estimated outputs of the domestic capital equation (equation 5) at level are shown in Table 5 below. The

coefficient estimate for economic growth is positive and highly significant. It implies that real GDP is the main driving force to business investment and hence capital accumulation. This result is typical representation of acceleration principle whereby changes in aggregate demand, hence output growth encourage accumulation of domestic capital. The results indicate that the coefficients of the financial indicators are significant with private credit being positive and deposit liabilities negative. The results in Table 4, on the other hand, provide evidence that both the increase in bank credit to the private sector and liquid liabilities of domestic banks directly enhance economic growth, for a given level of domestic capital. Therefore, it follows that on average the effect of bank credit on long-run economic growth is captured both through efficient resource financial allocation and capital accumulation; implying the acceptance of the second hypothesis at 1 per cent significance level..

Table 5: Normalized co-integration coefficients of Domestic Capital Model (Equation 5)

$\ln k^d$	Constant	$\ln y$	$\ln pc$	$\ln dp$	$\ln p$	$\ln gc$	$\ln op$
	34.819 [0.0004]**	4.9242 [0.0005]**	1.3189 [0.0096]**	-2.5782 [0.0061]**	1.0091 [0.0153]*	-0.6487 [0.2337]	1.0411 [0.0424]*

*Note: Values in the parenthesis are P-values. * &** indicate statistical significance at 5 and 1% levels, respectively.*

The coefficient of inflation is positive and significant. This is so because inflation results in a higher cost of holding money and a portfolio shift from money and other financial assets to physical capital; thereby leading to increase investment (Tobin, 1965). Contrary to general perceptions, government consumption has negative and insignificant impact on domestic capital. A plausible interpretation is that government consumption consists of recurring expenditure in the public sector, which is essential to support and complement the services associated to with public infrastructure. It is often observed in developing countries like Ethiopia that valuable assets in public sector are rendered useless due to lack of recurring facilities. Thus, government expenditure that improves the quality of services provided in the public sector, especially those associated with infrastructure to attract more investment from the private sector are limited. The result in Table 4 column 3 also shows that trade openness has significant positive impact on long-run capital accumulation in Ethiopia. A possible explanation for this is that international trade in Ethiopia provides excess to a greater variety and quality of goods for domestic production, transportation and communication, which leaves less room for consumer goods due to high excise taxes and hence increase domestic capital accumulation in the long-run.

We apply Wald tests on the various null hypotheses involving sets of regression coefficients. The results are shown in Table 6. The P-value indicates that we reject the null hypothesis that regression coefficients of all the variables in the GDP equation are equal to zero. The null hypothesis that regression coefficients in each equation are equal to zero is also rejected as shown by the p-values. We do the same exercise for financial variables in the real GDP and domestic capital equations. The test results confirm joint significance of the financial variables in the GDP and domestic equations.

Table 6: The Results of Wald Tests on Parameter Restrictions

Null Hypothesis	Chi-square statistics	Computed rejection probability
Regression coefficients of all the variables in the GDP equation are equal to zero	24.484	0.0002
Regression coefficients of all the variables in the domestic capital equation are equal to zero	17.966	0.0063
Regression coefficients of financial variables in the GDP equation are equal to zero	18.547	0.0001
Regression coefficients of financial variables in the domestic capital equation are equal to zero	9.8989	0.0071

5. Conclusions

In this study we have undertaken what, to the best of our knowledge, is the first attempt to examine the effect of bank credit on economic growth and identify the mechanism through which bank credit affects economic growth in Ethiopia. The role of bank credit is analysed through its effect on domestic capital accumulation and total factor productivity. The study uses a time series data for Ethiopia over the period 1971/72 to 2010/11, which represents 20 years prior and post financial reform. The analysis is based on using a multivariate cointegration VAR econometric model for time series data in which real GDP and domestic capital are expressed in per worker form. The results indicate that the long-run elasticity estimates are economically reasonable in terms of sign and magnitude. The first major conclusion of the study is that bank credit affects real GDP per worker through its role of domestic capital accumulation and efficient resource allocation (efficiency) and hence, in total factor productivi-

ty in the long-run. The efficient resource allocation and domestic capital accumulation impacts are captured by the positive and significant impact of bank credit on real GDP per worker and domestic capital equations, respectively. The study also finds that domestic capital is instrumental in increasing per worker output and hence promoting economic growth in the long-run.

The regression results also suggest that inflation has negative and significant effect on real output per worker growth due to its adverse effect of sending unwanted signals to the producers and result in temporary resource allocation in the short-run and hence curtail long-run economic growth. However, higher inflation will increase the cost of holding money and induce a portfolio shift from money and other financial assets to physical capital thereby leading to increase investment in the long-run. Increase in government expenditure slow down accumulation of domestic capital due to failure to provide recurring expenditures that are essential to support the quality of public services. On the contrary, the role of government consumption expenditure on economic growth remains positive due to its determinate effects on allocation of resources efficiency through improving property right of investors. The study finds that trade openness enhances domestic capital accumulation significantly. Trade openness is found to promote economic growth through its favorable effect on efficient resource allocation.

This study, however, is delimited by ignoring the short run impact of bank credit and domestic capital on real economic growth and the direction of causality. Hence, further study should include the Granger casualty test between financial indicators and economic growth. Moreover, more light should be shed on the comparative analysis of empirical results for the pre-reform and post-reform periods using quarterly data in order to draw lesson how financial liberalization measures promote rapid and sustainable economic growth in Ethiopia.

References

Acaravci, S. K., Ozturk I., and Acaravci A. (2009), "Financial development and economic growth: Literature survey and empirical evidence from sub-Saharan African countries", SAJEMS NS 12, No 1

Ahmed, A. D., (2008), "Financial liberalization, financial development and growth in sub-Saharan Africa's economic reform: An empirical investigation", *Centre for Strategic Economic Studies,* Victoria University, Australia.

Ahmed, E. and MaliK, A. (2009), "Financial Sector Development and Economic Growth: An Empirical Analysis of Developing Countries", *Journal of Economic Cooperation and Development*, 30(1), 17-40.

Baro R. and Sala-i-Martin (1995), *Economic Growth.* New York: McGraw, Hill.

De Gregorio, J. and Guidotti P. E. (1995), "Financial Development and Economic Growth", *World Development,* 23(3): pp.433-448.

Demetriades P.O. and Hussein K. (1996), "Does Financial Development Cause Economic Growth? Time Series evidence from 16 countries", *Journal of Development Economics* 51, 387-411.

Dickey, D.A. and Fuller W.A. (1981), "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica* 49, 1057-72.

Edward S. (1993), "Trade Policy, Exchange Rate, and Economic Growth", *NBER, Working paper* No 4511.

Engle, R. and C. Granger, (1987), "Cointegration and error correction: Representation, estimation and testing", *Econometrica*, 55: 251-276. http://ideas.repec.org/a/ecm/emetrp/v55y1987i2p251-76.html.

Fielding, D.(1997), "Adjustment, Trade Policy, and Investment Slumps: Evidence from Africa", *Journal of Development Economics*, 52:121-137.

Fisher, S. (1993), "The Role of Macroeconomic Factor in Growth", *Journal of Monetary Economics*, 32:485-512.

Gelb A. H. (1989), "Financial Policy, Growth, and Efficiency", *Policy Planning and Research Working Papers* No. 201 (World Bank)

Granger, C.W.J. (1988), "Developments in a Concept of Causality", *Journal of Econometrics 39,* 199-211.

Gutierrez E.C., Souza C. R, and Guillen de Carvalho T.O. (2007), "Selecting optimal lag length in Cointegrated VAR with Weak form of Common Cyclical Features", *Central Bank of Brazil Working Paper,* series 138.

Harris, Richard (1995), *Cointegration Analysis in Econometric Modeling. London*, University of Portsmouth, Prentice Hall.

International Monetary Fund, (IMF) (2012), International Financial Statistics CD-ROM, Washington DC., USA.

Johansen, S. and K. Juselius, (1990), "Maximum Likelihood Estimation and Inference on Cointegration - with Applications to the Demand for Money", *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

Johansen, S., (1988), "Statistical and hypothesis Testing of Cointegration Vectors", *Journal of Economic Dynamics and Control* 12, 231-54. http://ideas.repec.org/a/eee/dyncon/v12y1988i2-3 p231-254.html.

Kasekende L. (2008). Developing a Sound Banking System. Paper presented at IMF Seminar, Tunisia.

Khan, M. A., Qayyum, A. and Saeed, A. S. (2005), "Financial development and economic growth: the case of Pakistan", *The Pakistan Development Review* ,44, 4(2), 819-837.

Khan, Mohsin.S. and Senhadji, Abdelhak.S.(2000), "Financial Development and Economic Growth: An over-

view", *IMF working Paper,* WP, 00/209, December.
Khan, S.M. and Senhadji, A.S. (2003), "Financial Development and Economic Growth: A review and new evidence", *Journal of African Economies*, 12, AERC Supplement 2: ii89- ii110.
King, R. and R. Levine, (1993), "Finance and growth: Schumpeter might be right", *Quarterly Journal of Economics,* 108: 717-737. http://ideas.repec.org/a/tpr/qjecon/v108y1993i3p71 7-37.html
Kiran, B, Yavus, N. C and Guris, B. (2009), "Financial development and economic growth: A panel data analysis of emerging countries", *International Research Journal of Finance and Economics*, 30, 1450-2887.
Levine, R. and S. Zervos, (1998), "Stock Markets, Banks and Economic Growth", *American Economic Review*, 88, 537-558.
Levine, R., (1997), "Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature*, 35, 688-726.
Levine, R., N. Loyaza and T. Beck, (2000), "Financial intermediation and growth: Causality and Causes", *Journal of Monetary Economics*., 46: 31-77.
Lucas, R. E., (1988), "On the mechanics of economic development", *Journal of Monetary Economics*, 22(1), 3-42.
Ministry of Finance and Economic Development-MoFED (2010/11), Ethiopia National Account database.
Mishkin, F. S. (2007), *The Economics of Money and Financial Markets*, Pearson/Addison Wesley.
Mohamed, T. (2000), "Finance and Growth: Empirical Evidence from Developing Countries 1960-1990", *Economic Research Forum Working Paper* 0228.
National Bank of Ethiopia (2010/11), Annual Performance Report, 4th quarter.
Osterwald-Lenum, M. (1992), "A Note With Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics", *Oxford Bulletin of Economics and Statistics*, 54, pp. 461-472, Retrieved from http://ideas.repec.org/a/bla/obuest/54y1992i3p461-72.html on June 19, 2008.
Pagano, M., (1993), "Financial Markets and Growth: An Overview", *European Economic Review,* 37, 613-622.
Phillips, P.C.B., and P. Perron, (1988), "Testing for a Unit Root in Time Series Regression", *Biometrica* ,75, 335-46.
Sanusi, N. A and Sallah, N. H. M. (2007), "Financial development and economic growth in Malaysia: An application of ARDL approach", [Online], available: http://www. ibacnet.org/bai2007/proceedings/Papers/2007bai7443.doc.
Tobin, J. (1965), "Money and Economic Growth", *Econometrica*, 33: 671-684.
Wang Y. and Y. Yao, (2003), "Sources of China's Economic Growth 1952-1999: Incorporating Human capital Accumulation", *China Economic Review,* 14, PP 32 - 52
World Bank (2011), World Development Indicators