ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

THE LONGRUN IMPACT OF GOVERNMENT DOMESTIC BORROWING ON BANK CREDIT TO THE PRIVATE SECTOR IN ETHIOPIA

BY: MEGERSA ENDASHAW

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This is to certify that the paper prepared by Megersa Endashaw entitled: The Longrun Impact of Government Domestic Borrowing on Bank Credit to the Private Sector in Ethiopia, and submitted in partial fulfillment of the requirement of the Degree of Masters of Art in Applied Economic Modeling and Forecasting complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

BY: MEGERSA ENDASHAW

Approved by **Signature**

Assefa Admassie (PhD) _____

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Abstract

Motivated by the heavy government reliance on domestic banks credit over the last couple of years in Ethiopia, the current paper attempted to empirically test its longrun impact on private sector credit employing the tools of cointegrated VAR model. The paper used quarterly data ranging from QI 1999 to QIV 2013 E.F.Y. to chiefly explore the longrun impact of both bank credit financed government deficit and bank credit directed to the public sector on private sector credit. Arguing against the classical "interest rate transmission channel" for the Ethiopian case, and hence introducing the channel of credit i.e. availability of credit, the paper generated some important findings. Bank credit directed to the public sector reports a significant and positive longrun effect on private sector credit over the period of study. As such a 1 birr permanent increase in bank credit to the public sector is associated with a 0.40 cents growth in bank credit to the private sector supporting the crowding in effect hypothesis. The effect is stronger when we account for endogeneity of gross domestic product and bank credit financed government deficit (about 0.47 cents growth in bank credit to the private sector). Gross domestic product and bank credit financed government fiscal deficit coefficients, on the other hand, reports a positive but insignificant longrun effect on private sector credit.

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List of acronyms

$ARMA - Autoregressive\ Moving\ Average$

$CBE - Commercial\ Bank\ of\ Ethiopia$

$CEE - Central\ and\ Eastern\ Europe$

$CE - Cointegrating\ Equation$

$CPI - Consumer\ Price\ Index$

$CSA - Central\ Statistical\ Agency$

$DBE - Development\ Bank\ of\ Ethiopia$

$ECM - Error\ Correction\ Model$

$E.F.Y. - Ethiopian\ Fiscal\ Year$

$GDP - Gross\ Domestic\ Product$

$IMF - International\ Monetary\ Fund$

$LR - Likelihood\ Ratio$

$MoFED - Ministry\ of\ Finance\ and\ Economic\ Development$

$NBE - National\ Bank\ of\ Ethiopia$

$OLS - Ordinary\ Least\ Square$

$SAPs - Structural\ Adjustment\ Programs$

$SSA - Sub - Saharan\ Africa$

$VAR - Vector\ Autoregressive$

$VECM - Vector\ Error\ Correction\ Model$

$WB - World\ Bank$

1. Introduction

1.1. Background of the Study

Government borrowing from domestic banks in developing countries increased significantly starting from the late 1990s. This necessitated not only understanding the possible effects on private credit and thus on private investment in these countries but also opened the way to view the issue from different perspectives. The effects of government borrowing from domestic banks on private credit in the context of developed countries focuses on the interest rate channel (see, for instance, Ardagna et. al. (2007), Blanchard (2007), Galeand Orszag (2004), Faini (2006), Friedman (2005), Evans (1987, 1985), Bradley (1986)). The idea behind this is that bank-financed government deficits compete with private sector for scarce funds available for investment. This in turn raises interest rates and thus the cost of capital for private borrowers which may make at least some of them leave the loan market i.e. crowd out. 'Financial crowding out effect' via the interest rate channel is for that matter an area grabbed much of attention and studied well in the literature. The assumption underlying the crowding out effect via this channel is that the banking sector is fully liberalized and the interest rates are determined as the outcome of market equilibrium. When we come to the developing countries however this does not seem work. Because unlike in the developed countries the link between government borrowing and equilibrium interest rate is very weak. Historically governments in these countries often combine high borrowing with repressed financial markets. In other words they control the interest rate at which they borrow. Therefore, the credit channel, i.e. availability of credit might be a relevant channel of crowding out in the context of these countries. " If the interest rates are not determined by the market clearing, then the availability of credit will be more important in understanding the effects of government borrowing on private investment" (Farazi et al. (2009)). The benefits of financial sector liberalization for

developing countries have been widely investigated, with conclusions suggesting that there may be significant positive effects involved (see, for example, Min et al. (1998), Mattoo et al. (2006)). Nevertheless, implementation of financial liberalization policies in these countries is gradual with significant government intervention in many of them until recent times. Even if the banking sector is fully liberalized, the effects of government borrowing on the private investment in the developing countries might still be mediated primarily through the credit availability, given that the credit markets are less developed and credit rationing might be more important (Ghosh et al. (2000), Ray (1998)). Besides, the importance of credit constraint for private investment in developing countries is well-recognized in the literature (Haramillo et al. (1996), Banerjee (2004), Banerjee and Duflo (2004), Emran et al. (2007), Shafik (1992), Rama (1993)).

Ethiopia has been engaged in gradually liberalizing its financial sector since 1992. During the Derg regime, the NBE was actively involved in direct controlling of all financial institutions by fixing both deposit and lending interest rates, directly controlling the foreign exchange and credit allocation which was done in a discriminatory manner, by favoring the public sector, and by directly financing government deficit (NBE, 1998). The socialized sectors were accorded priority in credit as well as foreign exchange allocation. This favoring of the socialized sector is shown by the fact that a good part of the banks resources were directed to the socialized sector without the need for collateral (Antonio, (1988)).

With the overthrow of the Derg Regime in 1991, Ethiopia began its transition to a market economy. This transition has had profound implications for the financial system. New financial institutions have emerged, the role of the private sector in the financial system has been expanded, and the role of the central bank is being reformulated. The interest rate is fairly liberalized and the NBE has set only a floor for deposit rate, leaving all other rates to be determined by market forces. However, international institutions such as the WB and IMF, which sponsor and financially

support the liberalization scheme, are not satisfied with the pace at which the liberalization is being carried (Alemayehu Geda, (1999b)).

Despite positive results in introducing robust growth over the last decade, Ethiopian governments' huge public investment centered growth strategy has always been subjected to sharp differences between Ethiopian government and certain international financial institutions[1]. For instance, only over the last seven years, Ethiopia has made substantial economic progress, with sustained growth at an average rate of more than 11 percent. The strategy which called for substantial external financing and state mobilization of domestic resources have forced the government to intervene in domestic banking system than ever. The need to government borrowing from domestic banks arises both from government fiscal deficits that are not fully foreign financed and investment derive in the public sector.

The increased concern for private sector investment exclusion in the midst of this successful growth strategy was stemmed from the view that increased net credit to the government from the banking system will left inadequate credit for the private sector and consequently crowd out some private sector demand for credit. This in turn hampers private sector investment which is a key driver of growth and development in the country over the long run no matter the strong economic growth we observed so far. Motivated by this the current paper attempted to empirically explore the crowding out effect of public borrowing on private sector credit and hence private investment through the 'quantity channel' in Ethiopia.

[1] *The IMF and WB among others*

1.2. Statement of the problem

Countless research works undertaken so far concentrated on the transmission channel of interest rate to empirically test the impact of government domestic borrowing on private sector credit. Apart from this there are also few research works tried to address the issue with the channel of credit i.e. availability of credit as a center of analysis in the context of developing countries. For example, by focusing on the volume of private credit a paper by Farazi et al. (2009) tried to provide robust estimates of the casual effect of government borrowing from domestic banks on private credit using panel data on 60 developing countries. They found that a $1:00 more borrowing by government reduces private credit by about $1:40. Fayed (2012) applied a co-integration approach to investigate the relationship between public borrowing and private credit focusing on the volume of private credit. He concluded that government borrowing from the domestic banks leads to a more than one to one crowding out of private credit.

But in countries like Ethiopia the need to government borrowing from domestic banks can arise not only from government fiscal deficits that are not fully foreign financed but also investment derive in the public sector. Increased investment derive in the public sector in Ethiopia over the last couple of years absorbed giant bank credit that would otherwise be used to finance private sector investment requirement. This implies that, not only bank credit financed government deficit but also credit directed to public sector will be very important. There is an argument behind addressing these two issues separately as long as the quantity of domestic banks credit is concerned in Ethiopia.

Government deficit is the concept we usually use to describe government expenditures exceeding its revenues which must be financed. In fact government deficit in this paper includes deficits of regional governments and certain government institutions in addition to central or federal government deficit. The decisive factor to classify them together is that they all issue securities to raise funds needed to finance their

expenditure that is not fully covered by their revenue. Therefore, if the three runs a deficit, they may obtain funds to finance the deficit by borrowing from different sources usually from banks especially in Ethiopia. Financing their deficit via bank credit can have an impact on the money supply and commercial banks' reserves and thus, have an impact on the availability of credit for private sector. Other studies on similar works may have treated government deficit as central government deficit exclusively.

Bank credit directed to public sectors as referred in this paper on the other hand is term loan granted to public sectors by commercial banks through the formal banking principles to undertake various investment activities. As such it is completely different from government deficit financing which needs issuing securities to raise funds. If we assume that the interest rate channel is ineffective in Ethiopia, then markets fail to clear the credit market which in turn implies inefficient allocation of bank credit between private and public sectors. The problem becomes more severe if there is some form of government intervention in the credit market that favors bank credit to the public sector. Therefore, treating both bank credits financed government deficit and bank credit directed to the public sectors as one and the same to analyze their impact on private sector credit does not make sense economically. Credit obtained from banks to finance government deficit is normally a short term credit whereas bank credit granted to public sector is a credit arranged to undertake various investment activities in the public sector and as such it is a long term loan. Thus, the degree of their impact on private sector credit could not be the same by any criteria. Addressing these two issues separately is also very important if we see it from policy formulation perspective.

To the best of my understanding, there is no empirical work addressing the impact of these two issues separately on private sector credit shading light on the quantity of credit at least in Ethiopia though there is increasing concern to this issue in the country. Therefore, this paper is a step forward to filling this gap. It is expected to add to the existing literature on the issue the crowding out effect of bank credit directed to the public sector accounting for quantity of credit channel. First accepting the crowding out

effect in both cases the paper tried to answer the question - which is the main causes that results crowding out effect in Ethiopia: credit directed to public sector or bank credit financed government deficit?

1.3. Objectives of the study

1.3.1. General objective

The main objective of the study is to examine the long run relationship between private sector credit, bank credit directed to public sector and bank credit financed government deficit in Ethiopia.

1.3.2. Specific objectives

- To examine the impact of government borrowing from domestic banking system to finance deficit on private sector credit.
- To determine the impact of bank credit directed to public sector on private sector credit.
- To draw some policy implications

1.4. Significance of the study

The implication of undertaking a study on this topic at this point in time is twofold. First, it can be used as a background paper for those who want to understand discussions on this area at policy level in the Ethiopian context. Second, it is also expected to be used as an insight for those who want to undertake further and detailed study on this area.

1.5. Scope and limitation of the study

This study deals with the issue of "crowding out" caused bank[2] credit financed government deficit and credit directed to public sector at the expense of the amount of

[2] *Consists of two public owned commercial banks; sixty private owned commercial banks and one specialized public owned bank-DBE. Including and treating DBE as the remaining commercial banks operating in the country is compulsory for this particular study. The rationale behind is that DBE involved in the disbursement of credit to both public and private sector investors and in government deficit financing via its participation on T-bills and government bonds.*

credit available to private sector. Other aspects[3] of crowding out are outside the scope of this paper and are not discussed here because they are the most widely studied and well documented form of crowding out aspects in the literature. Furthermore, government borrowing from domestic banks to finance its budget deficit in this paper refers to central government borrowing in the form of T-bills and government bond as well as regional government and public institutions borrowing in the form of corporate bonds.

There are two potential limitations to this paper. The first and most important is the quarterly data for GDP series used for empirical test in this paper. The official national account data of Ethiopia are available in annual basis since 1974. However, quarterly GDP data is not yet compiled by the responsible agency, though it is needed to measure a high-frequency of real economic activity which would help policy makers in monitoring economic activities on quarterly basis. As an alternative we used quarterly GDP series disaggregated employing data driven disaggregation method by studying the availability of the data in each sector and collecting relevant information from different sectoral offices other than NBE data such as quarterly private household consumption data from CSA, private investment data from federal investment agency, government consumption and investment indicator from MoFED.

Second, the paper assumes that there is some form of government intervention in case of public owned banks' credit policy and hence credit to the public sector from these banks is taken as 'government directed credit'. This actually includes government intervention in the private owned banks' credit policy in recent time via NBE-bills and captured by DBE's total credit sourced from NBE-bills and granted to the public sector.

[3] *There is for example, what is known as „real crowding out" - a situation where deficit financed government spending "crowds out" private spending by providing a service or good that would otherwise be a business opportunity for private industry. Financial crowding out – is a situation where deficit financed government spending "crowds out" private sector credit by raising interest rates. In contrast to this are real and financial "crowding in", i.e. situations where deficit-financed government expenditures increase private expenditures and private borrowing respectively.*

1.6. Organization of the study

The study comprised of four chapters. Chapter two outlines the theoretical as well as empirical review of literature pertaining to the issue at hand. Chapter three elaborates methodological approach employed to answer research question and data used. Chapter four concludes the paper providing some policy recommendations.

2. **Literature review**

In this section of the paper an attempt is made to critically review both theoretical and empirical literature pertaining to the crowding out effect of bank credit financed government fiscal deficit on private sector credit. Taking the quantity of credit channel as the center of analysis the literature review also incorporates the crowding out effect of bank credit directed to the public sector on private sector credit and ultimately private investment. As explained in the introduction part of this paper the impact of government reliance on domestic banks' credit on private sector credit via the interest rate channel does not work in many of developing countries. Assuming that government domestic borrowing to finance its deficit and bank credit directed to the public sector crowds out private investment through availability of credit is the way we proceed to grasp the message in the literature.

2.1. **Theoretical literature**

There are three competing views regarding the impact of government borrowing from domestic sources on the economy: the Neoclassical view, the Keynesian view and the Ricardian equivalence theorem.

In the neoclassical loanable funds theory, bond-financed government deficits compete with private investment for savings - thereby raising interest rates and thus the cost of capital for private borrowers which may make at least some of them leave the loan market. However, in the Keynesian view, such an argument could not be made as there is no fixed "stock" of savings in any sense of the term. By the Keynesian multiplier, deficit-financed government spending will lead to a rise in output which will generate the very savings necessary to back it up. Thus, in the Keynesian model, private sector borrowing is not "crowded out" by government borrowing. The third view is the Ricardian equivalence theorem developed by David Ricardo in the nineteenth century but elaborated more by Robert Barro (1974). According to this theorem, any attempt by government to stimulate demand by increasing debt-financed government spending

leaves demand unchanged. This is because the rise in the demand for loanable funds (Government deficit) will be met by an exactly equivalent rise in the supply of loanable funds (savings in anticipation of future taxes) - thus interest rates remain unchanged.

It is worth noting that all the three views have taken developed countries as their reference and hence concentrated on the interest rate channel. Surprisingly, empirical studies on the effects of government domestic borrowing on private sector in these countries have came with findings that are inconclusive in general. Yet they are very important to analyze the issue in developing countries as well by providing theoretical basis. In order to consider the theoretical relationship between government domestic borrowing and private sector credit and hence private investment in developing countries, we embark on national income identity.

The relationship between private and government savings and investment must be examined within the following familiar national income identity:

$PuI + PrI = PuS + PrS + Foreign\ Savings$---------- (2.1)

Where $PuI -$ is Public Investment, $PrI -$ is Private Investment and PuS and PrS are respectively Public Savings and private savings.

$PuI - PuS = PrS - PrI + Foreign\ savings$---------- (2.2)

$Fiscal(surplus) = Private\ Surplus + Current\ account\ deficit$---------- (2.3)

One can simply observe from equation (2.2) that an increase in the fiscal deficit without recourse to increased foreign borrowing must imply an increase in net private savings, i.e. an increase in private savings or a decline in private investment or both. How much of the adjustment (increase in savings or decline in investment) is borne by the private investment depends on how fiscal deficits affect the cost and availability of credit.

If interest rates are controlled and there is non-monetary domestic borrowing there is a one to one negative correspondence between higher credit to the government to finance

the fiscal deficit and reduced credit for the private sector. Non-monetary domestic borrowing could however be consistent with the macroeconomic objectives of promoting private investment by avoiding an increase in the share of public borrowing in domestic credit provided by the banking system. If instead the government increases expenditures and resorts to financing it through money creation, the story is a little more complicated as financing through additional money creation leads to a rise in the rate of inflation. If nominal interest rates are fixed, real interest rates fall. If private savings fall, as a result of lower real interest rates, the availability of loanable funds to the: private sector declines even further. Irrespective of the financing options chosen, a higher fiscal deficit with repressed financial markets will lead to a reduction in credit to the private sector.

Several empirical studies have been conducted, regarding the above mentioned relationship between real interest rates, credit allocation and private investment. The outcome of the empirical survey is that cost of credit and quantity affect private investment in developing countries. However, their relative importance varies, depending on the degree of financial liberalization. In economies with repressed financial systems it is the quantity of credit that affect private investment, whereas in economies where financial markets have been deregulated the real lending rate is the relevant variable.

2.2. **Empirical literature**

Unlike the theoretical literature, there are a number of empirical studies that have attempted to examine the effect of government domestic borrowing from the banking sector on private sector credit in the context of developing countries. Nevertheless, the empirical literature examining the quantity of credit channel is rather thin in general and even almost nonexistent when we come to the Ethiopian case.

By focusing on the quantity of credit channel, Farazi et al. (2008) provided robust evidence that there is a significant crowding out effect of government borrowing from

the domestic banking sector on private credit using panel data on 25 developing countries. According to their findings private credit may be crowded out by up to 80 cents in the long run when the government borrows $1 from the banking sector.

In their another studies, Farazi et al. (2009) tried to estimate the causal effect of government domestic borrowing from banking sector on private credit using panel data on 60 developing countries and instruments based on the structure of the political system for 32 years. They came up with the finding that a $1 more borrowing by government reduces private credit by about $1.40, which supports a "lazy bank" model of bank behavior in developing countries.

There are also a number of research works that utilized the Farazi et al. (2009) model to investigate the same issue but at a single country level. For instance, Fayed (2012) investigated the relationship between government borrowing and private credit in Egypt using quarterly data spanning from 1998 to 2010 and applying a cointegration approach. He concluded that government borrowing from domestic banks leads to more than a one to one crowding out of private credit. Kamaly et.al. (2014) tried to estimate a VAR model using quarterly data spanning from the first quarter of 1970 until the second quarter of 2009 to test the lazy banks hypothesis (government borrowing crowds out private investment through its dampening effect on private credit). They have found a number of interesting results. As the government issues more debt instruments to finance its deficit, banks shift their portfolio away from risky private loans and opt for lazy behavior characterized by a shrinking overall credit tilted more and more toward government debt-instruments. This behavior not only limits their exposure to the private sector, hence reducing private investment, but also adversely affects investment and hence overall growth potential. In addition, evidence shows that output growth positively impacts the willingness of the banking sector to extend more credit to both the government and the private sector. Finally, and consistent with the lazy bank model, impulse response functions show that the effect of a government

borrowing shock is contractionary (as opposed to the effect of private credit shock which is slightly expansionary) with regard to the overall banking sector credit.

Heim (2010) applied demand-driven econometric model, patterned after the work of Klein and Fair and containing eight behavioral equations to estimate the crowding out effects using U.S. data for 1960-2000. The main interest in this paper was to econometrically test whether deficits financed by government borrowing "crowd out" business and consumer spending reductions by reducing credit availability. To test this hypothesis, access to credit, which varies with government deficit variables are added to investment models to see if they increase explained variance, negatively impact investment spending, and are statistically significant. The finding indicate that government deficit financed by domestic borrowing systematically crowd out private investment spending.

Gill et al. (2009) in their part studied the effect of public borrowing from the scheduled banks and general public on private investment in Pakistan. They tried to estimate an investment equation containing three independent variables: government borrowing, GDP and lending rate via unit root test, cointegration test and vector error correction model utilizing time series data of 34 years, i.e. fiscal year of 1971/72-2005/06. Their results do not corroborate the crowding-out hypothesis in Pakistan explaining the market imperfections and substantial amount of excess liquidity. A study by Chisongo (2011) investigated the impact of government domestic borrowing on private sector credit and economic growth in Kenya over the period from 199-2010. Besides the researcher was also interested in determining the threshold for government domestic borrowing at which it begins to impact private sector credit negatively. Using quarterly time series data, the study applied 2 Stage Least Squares, 3 Stage Least Squares and Generalized Method of Moments of Instrumental Variable estimation. The study found a significant negative relationship at the 1 percent significance level between government domestic borrowing and private sector credit in Kenya implying that

government domestic borrowing crowds out private sector credit. It was also found that as government domestic borrowing increases beyond a threshold ratio of about 9 percent of GDP and beyond a growth rate of about 25 percent per annum, it begins to negatively impact private sector credit and economic growth.

Kalluci et al. (2013) tried to identify and evaluate the longrun determinants of bank credit to the private sector in the case of Albania by employing a vector error correction mechanism approach based on demand and supply indicators. The study which considered quarterly data from Q1 2001 to Q4 2011 has found that among others diminishing government domestic borrowing and a more qualitative bank credit would create further lending incentives for the private sector. Similarly, Égert et al. (2006) investigated the determinants of the domestic bank credit to the private sector as a percentage of GDP in 11 CEE countries. They use three alternative techniques for estimation: fixed-effect ordinary least squares; panel dynamic OLS and the mean group estimator, for 43 countries, which are then grouped into other small panels. The authors first estimated a baseline model and find negative relations of private credit to GDP ratio (dependent variable) with bank credit to the public sector, lending rate, inflation and spread between lending and deposit rates (a proxy for financial liberalization).

When we come to the Ethiopian case, several papers might have considered various aspects of credit, but have somewhat different focus from the one we have in this study. For instance, Christensen (2004) attempted to analyze the impact of domestic government securitized debt on private sector lending applying regression analysis and covering 27 SSA countries over the period 1980-2000. The author showed that among heavily indebted poor countries in the sample, Ethiopia stands apart with a domestic debt to GDP ratio of 42% in 2000. Of the countries with a relatively large share of domestic government debt to GDP, only Ethiopia, Mauritius and Cape Verde have also a high ratio of bank credit to government to GDP, in excess of 12%. Finally the author found evidence of some crowding out of private sector lending to broad money of 0.15% as a result of an expansion of domestic debt of 1% relative to broad money.

Furthermore, the paper found that the relatively low ratio of bank credit to the private sector to GDP in some countries in the sample(including Ethiopia), is not attributable to the governments need for domestic financing, but reflects the low ratio of M_2 to GDP.

We believe that this paper will contribute to the existing literature, in several aspects. First, to our best of knowledge, this is the first paper analyzing the crowding out effect on private sector credit through the quantity of credit channel in Ethiopia. Other studies might have dealt with that issue, but in a context of a panel of countries, including Ethiopia and with a different model, time coverage as well as scope of the study. Second, we introduced new variable to the existing range: bank credit directed to the public sector as far as the quantity of credit channel is concerned.

3. Methodological Approach and Data

3.1 Theoretical model

The IS-LM model is one of the most pragmatic and widely used macroeconomic models to provide a theoretical context within which the impact of government intervention in the credit market on the availability of credit for private sector is examined. Yet it is highly criticized from a theoretical point of view. For our current purpose we entirely rely on real side of the IS-LM model.

In a Keynesian-style demand driven model of the economy the impact of fiscal policy on the economy can be derived using the aggregate demand identity.

$$Y = C + I + G + X - M \text{---------- (3.1)}$$

Where

Y = Income (aggregate expenditure), C = Consumption (consumer spending) and T = Tax, I = Investment expenditure, G = Government Spending, X = Exports and M = imports

But consumption function can be further written as a function of disposable income(Y–T), with a_c and b_c respectively autonomous consumption and marginal propensity to consume as follows:

$$C = a_c + b_c(Y\text{-}T) \text{ ---------- (3.2)}$$

Similarly a simple investment functions, with I_0 and λ is respectively autonomous investment and interest rate elasticity of investment, can be written as a function of interest rate:

$$I = I_0 + \lambda r \text{---------- (3.3)}$$

Substituting for C and I from equation (3.2) and (3.3) into equation (3.1) and rearranging the new equation,

$$Y = \frac{1}{1-b_c}[a_c - b_c T + I_0 + \lambda r + G + (X - M)] \text{---------- (3.4)}$$

According to the Keynesian multiplier effect a change in exogenous variable will cause a multiple change in National Income (Y) and real GDP. For instance the Keynesian demand theory expects that a change in G is positively related to GDP with a multiplier effect $1/ (1- b_c)$. Nevertheless, the assumptions underlying this simple multiplier effect makes Keynesian demand driven theory somewhat simplistic and far from reality. In particular, it assumes that the independently generated investment stimulus is not halted by a scarcity of credit. Business investors first anticipate and then by that fact, create an increase in income for their investment plan implementation. But investment spending is determined year after year not only by current income but also by the availability of sufficient financial resources. We can therefore relax the simplifying assumptions in the basic model by incorporating bank credit which demonstrates the potential existence of a monetary brake. The idea behind this is that monetary brake affects the power of the multiplier effect to stimulate the economy not through the interest rate but through availability of credit in countries like Ethiopia where interest rate has no role. For instance, a situation where government deficits financed by bank credit and bank credit directed to the public sector at the expense of credit availability for private sector reduce stock of credit available in the economy thereby "crowd out" domestic private investment spending. Assume a simple private sector investment model in which investment is determined by access to bank credit which varies with bank credit financed government deficit (G-T) and bank credit directed to public sector (PSC).

$$I = I_0 + \alpha(G - T) + \gamma PSC \text{----------} \quad (3.5)$$

Where

α = indicates the marginal effect of bank credit financed government deficit on private sector spending i.e. crowding out or crowding in effect depending on the sign of α.

γ = indicates the marginal effect of credit directed to public sector on private sector spending i.e. crowding out or crowding in effect depending on the sign of γ.

Rewriting the aggregate demand identity under equation (3.4) above replacing investment with its hypothesized determinants under equation (3.5) and rearranging the new equation,

$$Y = \frac{1}{1-b_c}[a_c + I_0 + (-b_c + \alpha)T + (1-\alpha)G + \gamma PSC + NX] \text{---------- (3.6)}$$

Equation (6) is a typical Keynesian IS equation incorporating the impact of government borrowing from domestic banks and credit directed to public sector on private sector investment through access to credit. We can see the normal stimulating impact of tax on GDP $(-b_c)$ is offset in part by the effects of deficit i.e. induced changes in credit availability (α) times the overall spending multiplier $(\frac{1}{1-b_c})$. But its overall effect can be positive, negative or zero depending on the size of crowding out effect (α) and the disposable income effect $(-b_c)$. Similarly the effect of a change in government spending is reduced per birr of spending from (1) to (1-α) times the overall spending multiplier. The effect of credit directed to public sector on private sector credit and hence on overall GDP depends on the sign of (γ). But the model we shall use for testing later in this paper is completely different from the model above. The above model is all about the dynamics of economies in the short run and brought here simply to show the impact of bank credit financed government deficit and bank credit directed to public sector on private sector investment and hence GDP. Furthermore, it is not necessary to go further and undertake empirical test of the above model to meet the objectives set in this paper. Even it is not necessary to test the specific model containing investment function under equation (3.5) above. Instead, we employ a VAR model containing private sector credit, bank credit financed government deficit, bank credit directed to public sector and GDP. The idea behind this is that bank credit financed government fiscal deficit and bank credit directed to public sector impact private sector investment and hence GDP indirectly. They directly affect access to credit by the private sector i.e. private sector credit. Therefore, using a VAR model containing the aforementioned variables makes our task easy and to the point given objectives set in this paper.

3.2. Empirical Methodology

VAR model is a direct and natural extension of the univariate autoregressive model to dynamic multivariate macroeconomic time series data. It was first introduced by Sims (1980) as an alternative to the large scale macro-econometric models. The validity of some of the assumptions used in traditional macro-econometric models – excluding variables or their lags from equations and/or classifying variable as either endogenous or exogenous – without any theoretical or statistical justification dissatisfied economic profession in the early 1980s. It was out of this concern that the model grew out and has gained widespread use in applied macroeconomic research.

However, even VAR models were not complete by the time. They are designed for stationary variables without time trends. Later on the importance of stochastic trends in economic variables was discovered. Moreover, the concept of co-integration was developed in a series of papers by Granger (1981), Granger and Weiss (1983), Engle and Granger (1987), Johansen (1995) and others which have shown that stochastic trends can also be captured by VAR models.

The idea behind cointegration is that in linear combinations of variables that are best described as being I(1) there is a long run equilibrium that acts as "attractor" towards which the system converges though there is a divergence from it due to non stationary caused by stochastic trends in the variables. An alternative approach to the analysis of long run economic relationships between these variables is analyzing the relationships between the differences of the series. However, this approach is only concerned with short run movements while it throws useful long-run information. Therefore, the statistical concept of co-integration is required to make sense of VAR models with I(1) data. This is mainly because an evidence of co-integration between two or more variables necessarily implies an existence of an ECM which captures both the short run dynamics and the long run information (Granger, 1983, Engle and Granger, 1987). In this paper we therefore rely on VAR model which explicitly take into account the

cointegration structure of the variables, so called vector error correction models[4]. Employing the cointegrated VAR model allows nonstationary data to be used accounting for spurious regression results and problems associated with ignoring dynamic (either differences or lags) components of variables and endo-exogenous division of variables. All variables are assumed to be endogenous, which avoids unnecessary a priori distinctions between endogenous and exogenous variables. Any assumptions regarding endogeneity and causal effects can be tested (and therefore substantiated) within the VAR framework. Moreover, for each endogenous variable there is a set of explanatory variables that comprise its own lags and lags of all the other variables in the model, allowing for rich dynamic effects to be captured. In the unrestricted form, all the variables in the system are treated symmetrically in the sense that they have precisely the same set of regressors. Furthermore, VECM embodied in cointegrated VAR model links the long-run equilibrium relationship implied by cointegration with the short-run dynamic adjustment mechanism.

3.2.1. Data and preliminary analysis

The paper uses quarterly data comprised of 60 observations covering a study period ranging from QI 1999 to QIV 2013 Ethiopian fiscal year. All data used in this paper are stock and hence are measured at the end of the quarter. There are numerous advantages of using quarterly data over that of annual data. The purpose of employing quarterly data in this paper is to allow for rich dynamic effects to be captured among variables of interest and hence improve the robustness of empirical results. To this end, this approach is chosen to significantly increase the sample size which enables us mitigate the problem of vanishing degrees of freedom in the VAR model.

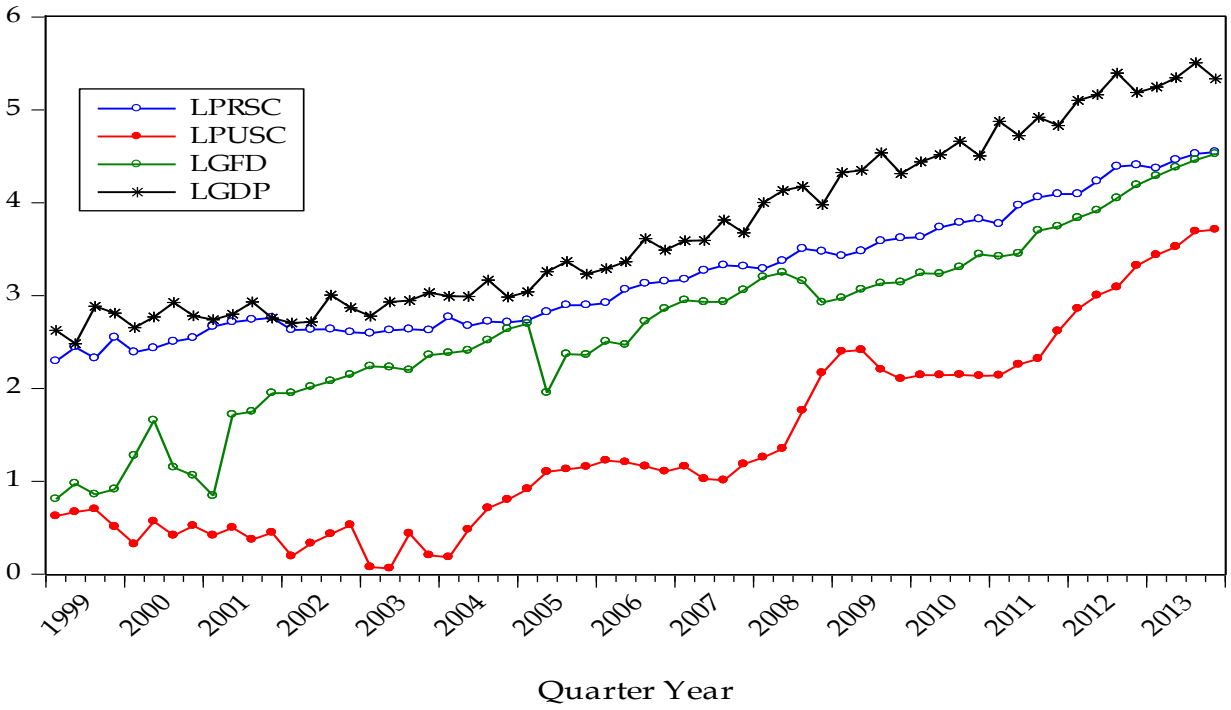
The chief source of data for bank credit to the private sector, to the public sector, bank credit financed government deficit as well as quarterly GDP series is NBE though GDP series annual counterpart is from MoFED. Data on bank credit to the private sector

[4] *Co-integration and error correction models were firmly rooted in a vector auto regression framework by the work of Johansen and Juselius (1990, 1992, and 1994).*

comprises of outstanding credit granted to the private sector (including cooperatives) by all banks operating in the country. Similarly, data on bank credit financed government fiscal deficit includes central government borrowing from all banks in the form of T-bills and government bonds as well regional government and public institutions' (excluding DBE) borrowing from CBE in the form of corporate bonds. Furthermore, bank credit directed to the public sector includes outstanding credit granted to the public sector by all banks operating in the country. This includes part of outstanding credit directed to the public sector in the form of NBE-bills via DBE. All variables are expressed in natural logarithm of their nominal values.

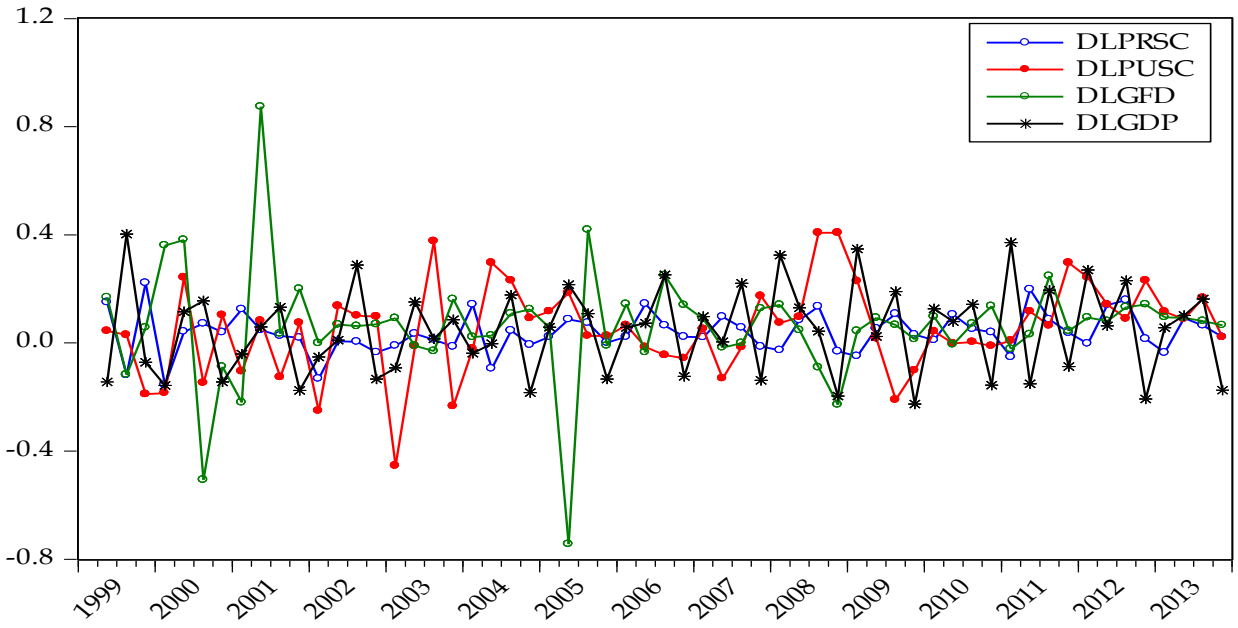
Before concluding this section we considered quarterly data on of GDP, private sector credit, public sector credit and bank credit financed fiscal deficit are all in their natural log over the period $QI1999 - QIV2013(T = 60)$. Before a formal empirical test in the next section each series are described over time. The usual way to do this is via a sequential graphical depiction. Accordingly, the following sequence of plots shows the level and first differences of the four series in this study.

Figure 1: Variable plots against time at their level



Graphical inspection of figure 1 suggests that LGDP, LPrSC, LGFD and LPuSC series fluctuates around their longrun average with a clear positive trend. On the other hand bank financed government fiscal deficit also shows some form of persistence with trend although it in some cases takes many years for the series to revert to its mean. Nevertheless, all series are best approximated by I(1) processes (fig: 2).

Figure 2: Variable plots against time at their first differences



While the levels of the all series exhibits trends or apparent level shifts over time, their first difference appear to be mean-reverting. This information will be helpful in conducting the stationarity tests in the next section. For instance, it is most appropriate to include trend during unit root test for LGDP and LGFD series as their graphical inspection clearly indicates the presence of a positive trend.

3.2.2. Model specification and estimation

3.2.2.1. Unit root test

It is a standard practice that before testing for cointegration and the VECM can be formed we conduct unit root tests on all variables to consider the order of integration and common unit root properties of the data. This is mainly because stationarity or otherwise of a series can strongly influence its behavior and properties over time. Time series stationarity is a statistical property of a series such as its mean, variance and autocovariance over time. A series is said to be weakly stationary if its first and second moments are time invariant and its autocovariance do not depend on time but just on time period that separates the two series. If a series is not stationary sometimes the series must be transformed to stationary form prior to analysis (for instance, in ARMA modeling). Moreover, economic and finance theory often suggests the existence of longrun equilibrium relationships among nonstationary time series variables. A special case of this is when these variables are all I(1) and cointegration techniques can be applied to model these longrun relations. Hence, pre-testing for unit roots is often a first step in the cointegration modeling. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used to test stationarity in this paper.

We begin the analysis by examining the stationarity properties of the variables using Augmented Dickey-Fuller (ADF) test. Based on our graphical inspection in the previous section the following equations are estimated.

$$\Delta Z_t = \propto_0 + \theta Z_{t-1} + \alpha_1 \Delta Z_{t-1} + \alpha_2 \Delta Z_{t-2} + \cdots + \alpha_p \Delta Z_{t-p} + u_t \quad ---------(3.7)$$

Where Δ is the first difference operator; t is the time trend; p denotes the number of lags used and u is the error term; α_s and θ_s are parameters. Notice that this equation has an intercept term in it but no time trend. Furthermore, the maximum number of augmenting lags (p) is determined by minimizing the Schwartz Bayesian information

criterion. The null hypothesis that series Z_t is non-stationary can be rejected if θ is statistically significant with negative sign.

The null hypothesis of the Augmented Dickey-Fuller t-test is

$H_0: \theta = 0$ (i.e. the data needs to be differenced to make it stationary) versus the alternative hypothesis of

$H_1: \theta < 0$ (i.e. the data is stationary and doesn't need to be differenced)

The fact that graphical inspections of series indicates a trend in them and are potentially slow-turning around a trend line necessitates using the following test equation:

$$\Delta Z_t = \propto_0 + \theta Z_{t-1} + \beta_t + \alpha_1 \Delta Z_{t-1} + \alpha_2 \Delta Z_{t-2} + \cdots + \alpha_p \Delta Z_{t-p} + u_t ------(3.8)$$

Notice that equation (3.7) is the same to equation (3.8) in all aspects except that this one has an intercept term and a time trend.

The null hypothesis of the Augmented Dickey-Fuller t-test in this case is

$H_0: \theta = 0$ (i.e. the data needs to be differenced to make it stationary) versus the alternative hypothesis of

$H_1: \theta < 0$ (i.e. the data is trend stationary and needs to be de-trended instead of differencing)

The Phillips-Perron (PP) unit root tests differ from the ADF tests mainly in how they deal with serial correlation and heteroskedasticity in the errors. Like in ADF test, the null hypothesis in the PP test is that the variable contains a unit root, and the alternative is that the variable was generated by a stationary process. But PP test uses Newey-West (1987) standard errors to account for serial correlation while the ADF test uses additional lags of the first-differenced variables. More specifically the pp statistics are just modifications of the ADF t statistics that take into account the less restrictive nature of the error process.

The test regression estimated for the Phillips-Perron (pp) test with intercept but no trend process is:

$$\Delta Z_t = \propto_0 + \theta Z_{t-1} + u_t \quad ---------- (3.9)$$

Similarly, for a process with both intercept and time trend is:

$$\Delta Z_t = \propto_0 + \theta Z_{t-1} + \beta_t + u_t \quad ---------- (3.10)$$

Note that in both equations (3.9) and (3.10) u_t~ serially correlated. While the ADF test corrects for higher serial correlation by adding lagged differenced terms on the right-hand side (just like in equation (3.7) and (3.8) above), the PP test makes a correction to the t statistic of the coefficient θ to account for serial correlation in u_t.

3.2.2.2. VAR specification and estimation

Apart from unit root test, setting the appropriate lag length of the model and choosing the appropriate model regarding the deterministic components in the multivariate system are also important aspects in the formulation of the dynamic model.

We follow a general to specific procedure to determine the optimal lag length. This is nothing but estimating the VAR model for a maximum number of lags (4 in this case since it is quarterly data), then reducing down by re-estimating the model for one lag less until we reach zero lag. In each of these models, we inspect the values of various lag length selection criteria in the unrestricted VAR model. We apply the Jenkinson et al (1990) procedure for choosing the appropriate deterministic components of the model. This is nothing but determining whether an intercept and/or trend should enter either the short-run or the long-run model, or both models. In the interest of illustration we provided the following VECM consisting five distinct models that can possibly happen:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \cdots + \Gamma_p \Delta Z_{t-p+1} + \pi \begin{bmatrix} \beta \\ \mu_1 \\ \delta_1 \end{bmatrix} (Z_{t-1} \quad 1 \quad t) Z_{t-1} + \mu_2 + \delta_2 t + v_t \quad ---- (3.11)$$

Model 1: No intercept or trend in CE (co-integrating equation) or VAR ($\mu_1 = \mu_2 = \delta_1 = \delta_2 = 0$).

Model 2: Intercept (no trend) in CE, no intercept or trend in VAR ($\mu_2 = \delta_1 = \delta_2 = 0$)

Model 3: Intercept in CE and VAR, no trend in CE and VAR ($\delta_1 = \delta_2 = 0$)

Model 4: Intercept in CE and VAR, linear trend in CE, no trend in VAR ($\delta_2 = 0$) and finally,

Model 5: Intercept and quadratic trend in CE, intercept and linear trend in VAR

But model 1 and 5 are not that realistic (P.T. Binh, 2013). Hence we consider only models 2, 3 and 4 in this paper.

Finally we encounter an important aspect in the formulation of the dynamic model - determining the rank of or the number of co-integrating vectors.

3.2.2.3. Cointegration Test and VECM specification and estimation

There are two popular approaches that are widely used to test cointegration: the Engle-Granger test and Johansen approach. While the former is only used to a single series the latter is appropriate for the multivariate case. In order to determine the number of cointegrating relationship among the four $I(1)$ variables in the system we conduct multivariate test based on a VAR using the Johansen Maximum Likelihood (ML) procedure. Let us define the vector Z with four variables which can all be endogenous: Log of gross domestic product (LGDP), log of bank credit financed government fiscal deficit (LGFD), log of bank credit to the private sector (LPrSC) and to the public sector (LPuSC). We have that in matrix notation $Z_t = [LPrSC_t, LGFD_t, LPuSC_t, LGDP_t]$

$$Z_t = A_0 D_t + A_1 Z_{t-1} + A_2 Z_{t-2} + A_3 Z_{t-3} + \cdots + A_P Z_{t-p} + u_t \text{---------- (3.12)}$$

Where Z is a 4x1 column vector of dependent I(1) variables with lag length equal to P; D is a vector holding deterministic terms (a constant, a linear trend, a quadratic trend etc.), and u_t is a 4x1 column vector of multivariate random errors with mean zero and covariance matrix Ω i.e. $u_t \sim IID(0, \Omega)$.

It is a common practice that before applying the Johansen procedure to cointegration test, the VAR models should be transformed into a VECM. This is mainly because the cointegrating relations are not explicitly apparent with VAR representation provided that Z_t is cointegrated. To this end, the following p^{th} order error correction VAR representation of a 4x1 vector of random variables is specified and estimated.

$$\Delta Z_t = A_0 D_t + \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \cdots + \Gamma_p \Delta Z_{t-p+1} + \Pi Z_{t-1} + v_t \text{---------- (3.13)}$$

Where Π is a matrix containing information regarding longrun relationship; assuming that Π has a reduced rank $0 < r < 4$ so that it can be expressed as $\Pi = \alpha\beta'$ with α including the speed of adjustment to equilibrium coefficients and β' the longrun matrix of coefficients. In this case both α & β' are rx4 matrices of rank r. If the matrix Π has a full rank(r= 4 in our case), all components of Z_t are I(0). That is all variables are already stationary and hence no need to estimate the model as VECM. On the other hand, Z_t are stationary in differences if rank (Π) = 0. In this case there is no stable longrun relation between variables and VECM is not possible. When the rank of the matrix Π is $r < 4$, there are $4 - r$ linear combinations that are nonstationary and r stationary cointegrating vectors that describe the longrun relationships between variables and necessitate VECM.

Generally, there are two versions of the likelihood ratio test statistics suggested by Johansen: Trace test and maximal Eigenvalue test.

$$\lambda_{trace} = -2\log(Q) = -T\sum_{i=r+1}^{n}\log\left(1-\hat{\lambda}_i\right), r = 0,1,\ldots,n-2,n-1 --- (3.14a)$$

$$\text{and } \lambda_{max} = -T\log\left(1-\hat{\lambda}_{r+1}\right), r = 0,1,\ldots,n-2,n-1. ---------- (3.14b)$$

Where r is the number of linearly independent cointegrating vectors, n is the number of variables in the system (n=4 in our case), T is the sample size and λ is the Eigenvalue. The Trace test is a joint test, the null hypothesis is that the number of cointegrating

vectors is less than or equal to r, against a general alternative hypothesis that there are more than r. The Maximal Eigenvalue test conducts separate tests on each Eigenvalue. The null hypothesis is that there are r cointegrating vectors present against the alternative that there are (r + 1) present. Critical values for both statistics are provided by Johansen and Juselius (1990). However, there is also a possibility that the two LR test statistics give us different conclusions and the researcher faces the difficulty of which one to trust. Applying the Monte Carlo experiment to compare trace test statistics with maximum-Eigenvalue statistics Helmut and Pentti (2001) found that there is a difference between the two especially when the sample size is small. According to their result the power of test is superior in case of trace tests. We therefore rely on trace test if we face any apparent contradiction in the two tests for cointegration rank in this paper.

3.2.3. Results and Discussions

3.2.3.1. Unit root test

Table 1 below summarizes ADF and PP unit root test results for the natural logarithm of variables in the system. The test results conform to graphical inspection of the integration of the variables. Both ADF and PP tests fail to reject the null hypothesis that variables have unit roots at their levels except LGFD series. Test results for LGFD series revealed that the variable is trend stationary even at levels. This implies that its nonstationary is caused by the presence of a deterministic time trend in its process, rather than by the presence of a unit root. In this circumstance the series does not need differencing to make it stationary, just including t as additional variable in the test is enough. For both of the tests the null hypothesis of unit roots at first differences are soundly rejected at all critical values for all series. Hence the series are integrated of order one i.e. I(1).

Table 1: ADF and PP unit root test results

Variable	Augmented Dickey-Fuller test				Phillips-Perron test			
	Level		First difference		Level		First difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept
LPrSC	0.872	-0.711	-9.943**	-6.713**	1.708	-1.131	-9.943**	-11.487**
LPuSC	1.303	-1.749	-6.363**	-6.809**	1.174	-1.811	-6.366**	-8.809**
LGFD	-0.814	-3.574*	-9.352**	-9.270**	-0.453	-3.595*	-16.341**	-16.084**
Critical values								
1%	*-3.555*	*-4.130*	*-3.555*	*-4.130*	*-3.546*	*-4.121*	*-3.548*	*-4.124*
5%	*-2.915*	*-3.492*	*-2.915*	*-3.492*	*-2.911*	*-3.487*	*-2.912*	*-3.489*
10%	*-2.595*	*-3.174*	*-2.595*	*-3.174*	*-2.593*	*-3.172*	*-2.594*	*-3.173*

Note: *In both types of tests lag length selection is based on SIC defualt selection*
** denotes significant at 5% and 10% .*
*** denotes significant at all significance level*

3.2.3.2. Setting appropriate lag length of the VAR model

Table 2 below summarizes results of standard lag length selection criteria in unrestricted VAR model adopting a general to specific procedure. While SC and HQ criteria select zero lags, the remaining three criteria suggest four lags. Despite the fact that SBIC will deliver the correct model with few lags as compared to AIC we must make sure that lags with significant information content are not excluded from the VAR. To this end, VAR lag exclusion Wald tests are performed (Table 3).

Table 2: VAR lag order selection criteria

Endogenous variables: DLGFD DLPrSC DLPuSC DLGDP Exogenous variable: constant				Sample: 1999Q1 − 2013Q4 Included observations: 55		
lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	130.600	NA	1 .18e-07	-4.603	-4.457*	-4.547*
1	151.500	37.999	9.87e-08	-4.781	-4.051	-4.499
2	165.115	22.775	1.09e-07	-4.695	-3.381	-4.187
3	183.183	27.593	1.03e-07	-4.770	-2.872	-4.036
4	208.875	35.501*	7.61e-08*	-5.122*	-2.640	-4.163

Notes: ∗ *Indicates lag order selected by the criterion* *AIC* − *Akaike information criterion* *LR* − *sequential modified LR test statistic*(*each test at* 5% *level* *SC* − *Schwarz information criterian* *FPE* − *Final Prediction Error* *HQ* − *Hannan-Quinn information criteria*

Wald tests results show that 1, 3 and 4 lags are jointly significant for all the equations in the VAR system at the 5% error level. As a result we finally estimated the unrestricted VAR model with lags 1-4 with the exception of lag 2.

Table 3: VAR lag exclusion Wald test

	DLPRSC	DLPUSC	DLGFD	DLGDP	Joint
Lag 1	6.280392 [0.179164]	9.778751 [0.044324]	7.353778 [0.118333]	14.85577 [0.005010]	45.48340 [0.000117]
Lag 2	3.310887 [0.507209]	5.563136 [0.234235]	11.38317 [0.022579]	4.279455 [0.369505]	25.03371 [0.069233]
Lag 3	1.604769 [0.807935]	8.819073 [0.065784]	19.95280 [0.000510]	3.144334 [0.533969]	37.37922 [0.001854]
Lag 4	3.474737 [0.481730]	12.54761 [0.013711]	13.36376 [0.009629]	11.03183 [0.026209]	45.46808 [0.000118]
df	4	4	4	4	16

Note: *Numbers in paranthes are* $p - Values$

Ho: *lag's coefficient is not significantly different from zero*(*can be excluded*)*if* $p - values >$ *chosen significance level*

3.2.3.3. Determining appropriate model for cointegration test

In this section we try to estimate only models 2, 3, and 4 out of the five distinct models illustrated above in this paper. This is mainly because models 1 and 5 occur only very rarely as noted earlier. Table 4, 5 and 6 summarizes estimates of model 2, 3 and 4 respectively.

Table 4: Cointegration test results (Model 2)

Unrestricted cointegration rank test (Trace) Trend assumption: No deterministic trend(restricted constant)

Hypothesized No. of CEs	*Eigenvalue*	*Trace statistic*	*0.05 critical value*	*Prob.***
None *	0.433354	56.93148	54.07904	0.0272
At most 1	0.240087	25.69037	35.19275	0.3595
At most 2	0.130786	10.59001	20.26184	0.5819
At most 3	0.051032	2.880884	9.164546	0.6032

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-value

Table 5: Cointegration test results (Model 3)

Unrestricted cointegration rank test(Trace) *Trend assumption: linear deterministic trend*

Hypothesized No. of CEs	*Eigenvalue*	*Trace statistic*	*0.05 critical value*	*Prob.***
None *	0.433266	48.98215	47.85613	0.0390
At most 1	0.161842	17.74956	29.79707	0.5846
At most 2	0.130300	8.039389	15.49471	0.4612
At most 3	0.006543	0.361032	3.841466	0.5479

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 6: Cointegration test results (Model 4)

Unrestricted cointegration rank test(Trace) *Trend assumption: linear deterministic trend(restricted)*

Hypothesized No. of CEs	*Eigenvalue*	*Trace statistic*	*0.05 critical value*	*Prob.***
None *	0.443949	63.97185	63.87610	0.0491
At most 1	0.269865	31.69257	42.91525	0.4052
At most 2	0.149889	14.39365	25.87211	0.6250
At most 3	0.094542	5.462278	12.51798	0.5314

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The results indicate that there is one cointegrating vector in the system. Therefore, the null hypothesis that there is no cointegrating vector in the system ($r \leq 0$) is rejected and the null that there is at most one cointegrating vector (($r \leq 1$) is accepted. The trace statistics report magnitudes of 56.93, 48.98 and 63.97 in models 2, 3 and 4 respectively which are all insignificant at the 5% critical values. Table 7 is brought to select the best model to use in the VECM.

Table 7: Johansen cointegration test summary results

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data trend	None	None	Linear	Linear	Quadratic
Test type	No intercept No trend	Intercept No trend	Intercept No trend	Intercept trend	Intercept trend
Trace	0	1	1	1	1
Max-Eig	0	1	1	1	1

**Critical values based on MacKinnon-Haug-Michelis (1999)*

Out of the three models i.e. model 2, model 3 and model 4, model 3(linear, intercept and no trend) seems to be the best model to use in the VECM according to AIC. Taking into account one cointegrating vector, 1, 3 & 4 lags and a linear model with intercept and no trend we formulated the unrestricted VECM normalized on bank credit to the private sector (LPrSC). In order to make sure that this unique cointegration vector represents private sector credit β' matrix containing the parameters of the cointegrating vector is examined (Table 8).

Table 8: Unrestricted cointegrating coefficients[5] and speed of adjustments

Cointegrating Eq.	LPRSC(-1)	LPUSC(-1)	LGFD(-1)	LGDP(-1)	Constant
CointEq1	1.000000	-0.401337 (0.09230) [-4.34812]	-0.107555 (0.05887) [-1.82701]	-0.165096 (0.12605) [-1.30978]	-1.757035

Speed of adjustment for unrestricted model (α vector)

D(LPRSC)	D(LPUSC)	D(LGFD)	D(LGDP)
-0.213021	0.66486	0.532782	-0.038007
(0.08764)	(0.1938)	(0.26010)	(0.17224)
[-2.430636]	[3.429693]	[2.048373]	[-0.220663]

Note: (-1) *indicates variables at thier first difference, standard errors in* ( ) & $t-$ *statistics in* [ ].

The results from table 8 show that only the cointegrating coefficient for bank credit to the public sector (LPuSC) is significant at the 5% significance level. Though the magnitude of cointegrating coefficient for LPuSC is reasonable, its sign is not as expected. Furthermore, this cointegrating coefficient can be interpreted as long run elasticity provided that the variables are in logarithms and only one cointegrating vector is estimated. In particular, according to results in table 8, a 10% permanent increase in bank credit to the public sector is associated with a 4% growth in bank credit to the private sector supporting the crowding in effect.

The other important point that worth explaining from table 8 above is the speed of adjustment back to the equilibrium represented by the error correction terms. From the adjustment coefficients (along with their respective t-values) we can infer some information about longrun weak erogeneity. For instance, LGFD and LGDP exhibit longrun weak exogeneity to the cointegrating vector of LPRSC (implied by relatively small t-values). Particularly, the error correction term of LGDP is not statistically different from zero indicating weak exogeneity of the variable to the cointegrating vector.

The positive and significant adjustment coefficient of the LPuSC series suggests that about 0.7 of short run disturbances correct downwards within a quarter to give rise to longrun equilibrium. We re-estimated the VAR system preserving r = 1 and restricting

[5] *The coefficient on private sector credit is normalized with a value of one*

αs on LGFD and LGDP to equal zero (i.e.$\alpha_i = 0$ for i = 3 and 4) utilizing information about weak exogeneity of LGFD and LGDP. Results of the corresponding likelihood ratio (LR) tests based on 2 degrees of freedom are presented in Table 9. As can be seen from the table, the null hypothesis of the presence of weak exogeneity is not rejected at the 5% significance level.

Table 9: Restricted longrun cointegrating coefficients and speed of adjustment estimates

Cointegrating Eq.	LPRSC(-1)	LPUSC(-1)	LGFD(-1)	LGDP(-1)	Constant
CointEq1	1.000000	-0.478394 (0.11401) [-4.19620]	-0.054125 (0.07271) [-0.74436]	-0.139349 (0.15569) [-0.89504]	-1.892384

Speed of adjustment for unrestricted model (α^* vector)

D(LPRSC)	D(LPUSC)	D(LGFD)	D(LGDP)
-0.181069 -0.07175 [-2.52346]	0.688102 (0.15404) [4.46695]	0.00 0.00 [NA]	0.00 0.00 [NA]

Note: (-1) *indicates variables at thier first difference, standard errors in* ( ) & $t-$ *statistics in* [ ].

** P-value for the joint restrictions on the α coefficients is 0.130113*

Simple comparison of results reported in table 8 and table 9 above (results of restricted and unrestricted models) reveals only a slight difference as far as cointegrating coefficients(β_s) are concerned both in magnitudes and their respective signs. The only important change to be emphasized is that LPuSC exerts stronger positive longrun impact on LPrSC under restricted model (compare β' for LPuSC in table 8 and 9). This indicates that implications of LGFD and LGDP exogeneity are of great importance for relationship between the two.

3.2.3.4. Short run dynamics: VECM

Based on this fact we can write the above longrun equilibrium conditions in equation form using standard notations as follows:

$$CIV = LPrSC - 0.478394 * LPuSC - 0.054 * LGFD - 0.139 * LGDP - 1.892384 \text{--------} \quad (3.15)$$

Where CIV is the unique cointegrating vector

This is nothing but the error correction term that to enter short term equations. Taking into account the weakly exogenous variables, short term dynamics (I(0) systems) comprises four equations of changes in LPrSC, LPuSC, LGFD and LGDP.

Therefore, the above cointegrating vector lagged one period appears on the right hand side of the four equations. However, examining how bank credit to public sector (term loan) and bank credit financed government fiscal deficit influence credit to the private sector in the longrun is paid primary concern in this paper. Therefore, only short run dynamics representation for LPrSC is presented below.

Table 10: Short run dynamics[6] for DLPrSC

	$DLPrSC_{t-1}$	$DLPrSC_{t-3}$	$DLPrSC_{t-4}$	$DLPuSC_{t-1}$	$DLPuSC_{t-3}$	$DLPuSC_{t-4}$	$DGFD_{t-1}$	$DGFD_{t-3}$	$DGFD_{t-4}$	$DGDP_{t-1}$	$DGDP_{t-3}$	$DGDP_{t-4}$	Constant
DLPrSC	0.08	0.06	0.12	-0.09	-0.02	-0.05	-0.01	0.01	0.01	0.14	0.05	0.09	0.02
	(0.14)	(0.14)	(0.11)	(0.06)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.07)	(0.01)
	[0.59]	[0.49]	[1.01]	[-1.70]	[-0.44]	[-0.93]	[-0.15]	[0.18]	[0.18]	[2.46]	[0.84]	[1.23]	[1.60]

Note: Standard errors in ( ) and $t-$ statistics in [ ]

As far as short run dynamics in the private sector credit equation is concerned only one quarter lagged change in gross domestic product and public sector credit are significant (Table 10). While the former reports positive coefficient at 5% significance level the letter reports negative coefficient at 10%. However, changes in bank credit financed government fiscal deficit (at all lags) as well as changes in gross domestic product and public sector credit at (at lags 3 and 4) report insignificant coefficient

[6] *For full and detailed list of short run dynamics of variables in the system refer to appendix 1*

Table 11: Results of VEC residual diagnostic tests

Type of test	Null hypothesis (Ho)	Chi-sq	df	Prob.
VEC residual serial correlation LM tests	No serial correlations up to lag order h	13.494*	16	0.6363
VEC residual normality tests	Residuals are multivariate normal			
Skewness	----------	6.1863	4	0.1857
Kurtosis	----------	4.1359	4	0.3879
Jarque-Bera	----------	10.3222	8	0.2431
VEC residual heteroskedasticity tests	Residuals are homoskedastic	261.054	260	0.4700

*Note: Joint tests for VEC residual heteroskedasticity is the no cross terms version of white"s heteroskedasticity test. * indicates LM statistics at the 12th lag length. df- stands for degree of freedom. We accept the null hypothesis if P-value > 0.05*

Table 11 above outlines the details of diagnostic tests for normality, serial correlation and heteroskedasticity of residuals after VEC estimation. The normality test of skewness, kurtosis and Jarque-Bera shows that residuals have normal distribution. LM test show that the residues, tested up to 12 lag orders, have no serial correlation. Besides, they do not suffer from heteroskedasticity problems.

4. Conclusions and Recommendations

4.1. Conclusions

The period covered in this study has witnessed a heavy government reliance on domestic banks credit in Ethiopia especially over the last seven years. The need to government borrowing from domestic banks arise both from government fiscal deficits that are not fully foreign financed and investment derive in the public sector. This issue has grabbed much of attention and recently gained a wide spread concern among international financial institutions such as the IMF and the WB. According to them increased government borrowing from domestic banks crowds-out private sector credit and hence private investment in the country over the longrun.

Motivated by this the current paper tried to explore empirically the impact of bank credit financed government fiscal deficit and bank credit directed to the public sector on private sector credit in the long run. Understanding the weak link between government borrowing and interest rate in developing countries in general and in Ethiopia in particular, the paper shaded light on the quantity of credit channel to examine the issue. We applied the tools of multivariate time series analysis to capture the dynamics of variables over time: unit root test, cointegration test and error correction model on quarterly data covering the period from Q1:1999 to Q4:2013 Ethiopian fiscal year. We found interesting results that might be surprising for many of us. Bank credit directed to the public sector reports a significant and positive longrun effect on bank credit to the private sector over the period of study. More specifically, a 1 birr permanent increase in bank credit to the public sector is associated with a 0.40 cents growth in bank credit to the private sector supporting the crowding in effect hypothesis. The effect becomes stronger when we account for endogeneity of gross domestic product and bank credit financed government deficit (about 0.47 cents growth in bank credit to the private sector). As we can see from the literature review section there are cases in which a

higher government borrowing from domestic banking sector may not have any significant effect on private credit or even crowd in private credit.

For example, a common argument is that when the banks have excess liquidity, a higher lending to the government may not result in any significant reduction of credit to the private sector. It has also been argued that government borrowing might actually induce the banks to undertake relatively more risky private lending, because the safe government assets in a bank's portfolio allow it to bear more risk (Kumhof and Tanner (2005)). Such endogenous response by banks will tend to crowd in private credit and at least partially offsetting the traditional crowding out effect.

On the other hand gross domestic product and bank credit financed government fiscal deficit coefficients reports a positive but insignificant longrun effect on private sector credit. The fact that the need for government borrowing from domestic banks to finance deficit is financial need to finance only short term expenditures like employee salaries etc. might have attributed to its weak effect on private sector credit. The insignificant coefficient reported by gross domestic product, on the other hand, might be associated to the high and sustainable public investment driven growth observed over the study period.

4.2. Recommendations

The fact that bank credit directed to the public sector reports a positive and significant impact on the availability of bank credit to the private sector over the study period calls for the prudent government intervention in the bank credit market. For instance, NBE-bills introduced a year ago by the Ethiopian government requires private banks to buy government bonds for a total of 27 percent of the loan disbursement capacity of each bank. The main rationale behind this was to divert private banks short term and traditional tradable sectors oriented credit to long term and primary productive sectors. Though too early to articulate, this might have contributed to the positive impact of

bank credit directed to the public sector on private sector credit. This is mainly because financial resource obtained as a result of NBE-bills has been granted not only to the public sector but also to the productive private sector who have been feeling thirst of long-term bank credit in the country. Of course, this policy measure might have exerted some negative side effects on private banks' profit as the bond bears only three percent interest as opposed to the five percent interest they give on deposits they mobilized. Therefore, government intervention in domestic banks credit market should continue to play the role of directing bank credit to productive primary sectors in the economy. But government should also take into account that it is there not only to direct bank credit to productive public sectors but also play a mediatory role between private sector borrowers and banks. Furthermore, government intervention should be in a way that encourages and enables productive and non-tradable private sectors (which need long-term credit for investment) for bank credit.

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Appendix I

where standard errors in ( ) and t-statistics in [ ]

Short run dynamics	D(LPRSC)	D(LPUSC)	D(LGFD)	D(LGDP)
D(LPRSC(-1))	0.084130	-0.207827	0.076112	-0.257486
	(0.14282)	(0.31068)	(0.43386)	(0.28122)
	[0.58908]	[-0.66895]	[0.17543]	[-0.91560]
D(LPRSC(-3))	0.069035	-0.778929	0.280717	0.039039
	(0.14135)	(0.30748)	(0.42939)	(0.27832)
	[0.48841]	[-2.53330]	[0.65376]	[0.14027]
D(LPRSC(-4))	0.118259	0.289650	1.100211	0.359436
	(0.11616)	(0.25268)	(0.35287)	(0.22872)
	[1.01810]	[1.14631]	[3.11793]	[1.57149]
D(LPUSC(-1))	-0.097895	0.416374	0.047074	0.104349
	(0.05735)	(0.12476)	(0.17422)	(0.11293)
	[-1.70695]	[3.33747]	[0.27019]	[0.92403]
D(LPUSC(-3))	-0.024675	0.237000	-0.102063	-0.061631
	(0.05548)	(0.12068)	(0.16853)	(0.10924)
	[-0.44478]	[1.96387]	[-0.60562]	[-0.56419]
D(LPUSC(-4))	-0.052409	0.143489	0.101148	0.086306
	(0.05594)	(0.12170)	(0.16995)	(0.11016)
	[-0.93681]	[1.17906]	[0.59516]	[0.78347]
D(LGFD(-1))	-0.006962	-0.052126	-0.224203	0.071499
	(0.04568)	(0.09938)	(0.13878)	(0.08995)
	[-0.15239]	[-0.52453]	[-1.61555]	[0.79484]
D(LGFD(-3))	0.007609	-0.121921	-0.429131	-0.047186
	(0.04224)	(0.09188)	(0.12831)	(0.08317)
	[0.18016]	[-1.32697]	[-3.34453]	[-0.56735]
D(LGFD(-4))	0.008384	0.153155	0.016840	0.068353
	(0.04520)	(0.09833)	(0.13732)	(0.08901)
	[0.18547]	[1.55748]	[0.12263]	[0.76792]
D(LGDP(-1))	0.145148	0.298291	-0.234354	-0.350406
	(0.05895)	(0.12824)	(0.17909)	(0.11608)
	[2.46207]	[2.32596]	[-1.30857]	[-3.01853]
D(LGDP(-3))	0.056630	0.395941	-0.149191	-0.120169
	(0.06707)	(0.14591)	(0.20376)	(0.13207)
	[0.84431]	[2.71366]	[-0.73220]	[-0.90987]
D(LGDP(-4))	0.089581	0.491085	-0.276321	0.457119
	(0.07270)	(0.15814)	(0.22084)	(0.14315)
	[1.23223]	[3.10532]	[-1.25120]	[3.19332]
C	0.024006	-0.013981	0.072891	0.031575
	(0.01500)	(0.03263)	(0.04557)	(0.02954)
	[1.60041]	[-0.42846]	[1.59961]	[1.06903]

DECLARATION

I, the undersigned, declare that this is my original work and has not been presented for a degree in any other university and that all sources of materials used for the project have been duly acknowledged.

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