Factors Affecting Savings as Means of Economic Growth in Ethiopia

Hassen Beshir[1]

Abstract

This study used co-integration and vector error correction model (VECM) to examine the causal relationship between the growth rate of real Gross Domestic Savings (GDS) and growth rate of real Gross Domestic Product (GDP) for Ethiopia. The estimation was undertaken for the period 1965-2013, using Eview9 software. In the analysis, the time series properties of macroeconomic variables were ascertained by using the Augmented Dickey Fuller (ADF) unit root test procedure. Finally, the long-run relationship between variables was explored by utilizing the Johansen procedure. The ADF test showed that there was unit root after the first difference. The estimated results indicated at most four order of integration or I(4) for the series was considered. From the result, the coefficient of the co-integrating equation indicates that about 73.3 percent of disequilibrium corrected each year by change in aggregate domestic saving with respect to income, money supply and price. Gross domestic savings in Ethiopia are affected by age dependency ratio, real exchange rate, real interest rate, real gross domestic product, foreign capital inflow and money supply both in the short and long run. Elasticity of exchange rate with respect to domestic savings is high and significant in the long run. This implied that continuous depreciation of real exchange rate has a direct impact on encouraging domestic savings. This would improve terms of trade and foreign capital inflow. Addressing institutional (through sensible policies such as formalization of the informal sector) and structural problems (such as infrastructural provision and efficient and relevant education policy) is also noted in the empirical literature as influencing savings mobilization.

Key Words: Co-integration, Growth, Model, Saving, Vector Error Correction
JEL Classification: E21

[1] Hassen Beshir is Associate Professor in Agricultural and Applied Economics at Wollo University in Ethiopia.
Email: hasen.beshir@wu.edu.et and/or hassenhussien@gmail.com

1. Introduction

Savings have always figured prominently in both theoretical analysis and policy design in both developed and developing economies. This prominence emanates from their assumed direct theoretical link to future economic growth and current expenditure levels via its link to consumption. Early theories of economic growth emphasized the role of savings as a source of capital accumulation and, hence, growth. Similarly the aggregate demand-based theory of Keynesian economics also focused on aggregate expenditure, which has a direct implication to savings. Due to their pre-occupation with short-term macroeconomic adjustment and stabilization policies, the emphasis on savings was relatively neglected in the 1980s in many African countries. But the focus on economic growth and, hence, on savings seems to have resurfaced in the 1990s and afterwards. This interest is partly due to the belief that one of the reasons for slow growth in sub-Saharan Africa is the low rate of savings relative to other developing regions (Schmidt-Hbbel *et al.*, 1996; Aryeetey and Udry, 1999). This is in particular true when one compares the level of domestic savings and investment in Ethiopia (see Figure 2).

Savings could be examined in terms of their aggregate behavior or at a personal or household level. In addition to distinguishing the unit of analysis, it is also imperative that a distinction be made between saving behavior in developed and developing economies. As Deaton (1989) noted, there are many good reasons which indicate that factors that determine saving behavior in developing countries are likely to differ from those of developed countries. These differences include both macroeconomic aspects of savings (mainly related to institutional and policy issues) and microeconomic factors (such as family structure and type of asset-portfolios available for households in the two groups of countries). Banking services are given in the form of mobilizing savings (deposit), extending credit, international banking (trade, exchange and money transfer) and other legal transfer payments. There is limited current literature on the effect of these services on enhancing economic growth. The research questions of this study are: Do savings, credit, and investment granger cause economic growth individually or collectively? What are the factors affecting savings and credit as means of enhancing economic development in Ethiopia?

The objective of this study was to examine the factors affecting domestic savings in Ethiopia to draw policy lessons that are particularly relevant to the Ethiopian economy. The remainder of the paper is organized as follows: Section Two focuses on GDP, savings, credit, exchange rate, and investment trend and their measurement issues in Ethiopia. Section Three presents the theoretical determinants of savings. Section Four presents data and methodology. Section Five presents estimation and results. Finally, Section Six presents summary and the policy implications of the results examined in the paper.

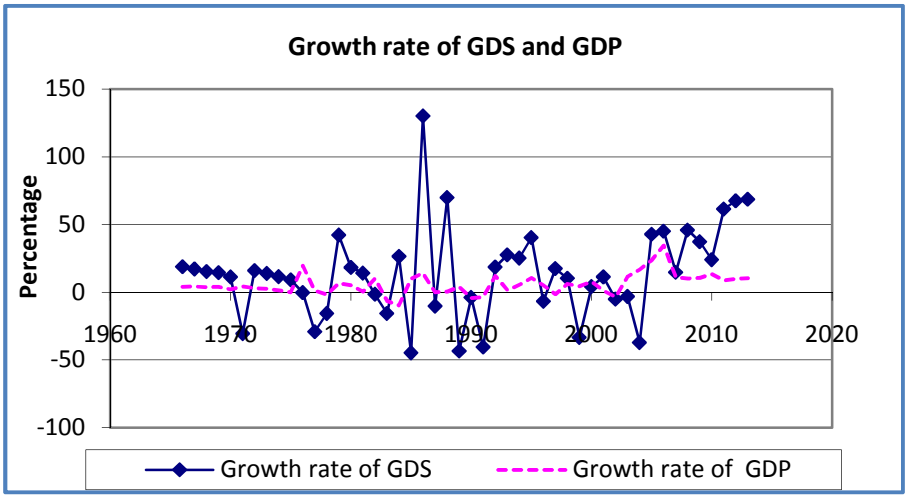
2. Measurement Issues, Credit, Foreign Exchange, Growth, Investment and Saving Trends in Ethiopia

It has to be noted from the outset that data problems in examining savings, investment and growth behavior, both at the macroeconomic and microeconomic levels, particularly in developing countries, are pervasive. For instance, at the macroeconomic level, "saving is not measured directly but is the residual between two large magnitudes [GDP and consumption], each itself measured with errors (Deaton, 1989)". Similarly, at the microeconomic level, "The standard household survey may well understate saving. The concept of income is itself extraordinarily complex, and most people in developing countries have little reason to distinguish between business and personal cash transactions" (Deaton, 1989). Aryeetey and Udry (1999) also noted that in the case of sub-Saharan Africa, non-financial assets (livestock, stocks of goods for trading, grain and farm inputs) dominate their asset portfolios, which in essence are used to smooth out consumption over time. What is more, due to distortions in the trade sector that result in illegal capital outflow (via over-invoicing of imports and under-invoicing of exports, for instance), saving will be underestimated when calculated as the sum of trade and government surpluses and domestic investment (Deaton, 1989). Analysis of saving behavior in the absence of the above considerations will, therefore, make it inaccurate and in their presence complex.

With this background information and using data from World Bank's 'African Development Indicators', the growth of GDP, investment and saving for Ethiopia is presented in the following figures. From Figure 1, we observe a high relationship between GDP and Gross Domestic Savings (GDS). A small

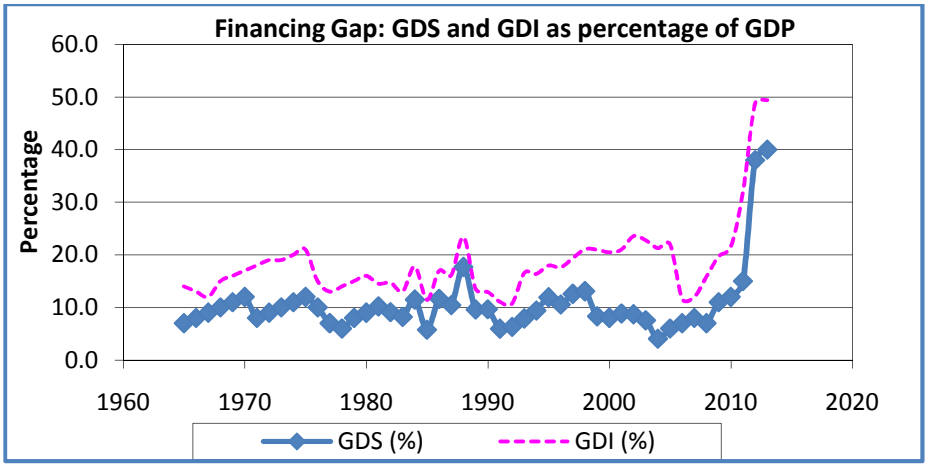
percentage change in GDP would result in a higher amount as well as percentage change in domestic savings. However, there is a high financing gap, which is the difference between gross domestic savings and gross domestic investment. This gap is financed mainly through loans and aid.

Figure 1: Growth Rate of Gross Domestic Product (GDP) and Gross Domestic Savings (GDS)



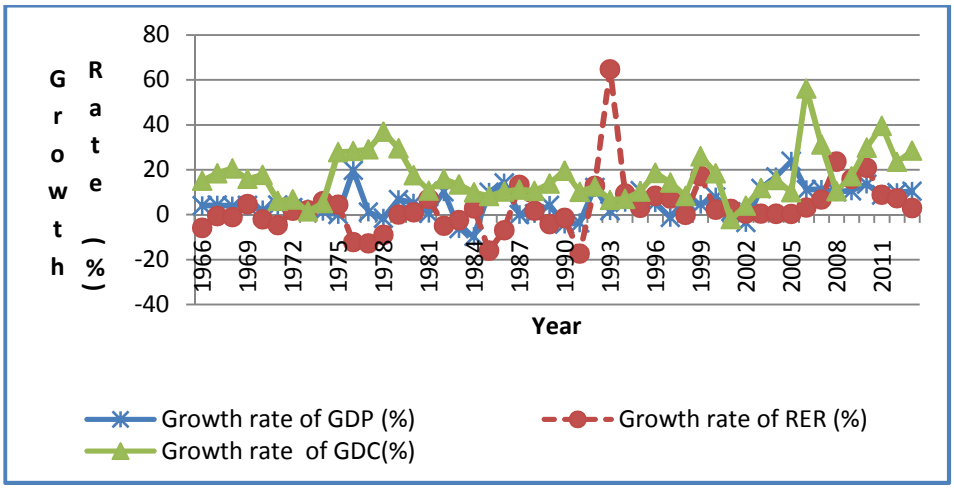
Source: Own Computation, 2015

Figure 2: Percentage of Gross Domestic Investment and Savings: Financing Gap



Source: Own Computation, 2015

Figure 3: Percentage Growth Rate of Credit, Exchange Rate and GDP in Ethiopia (1965-2013)



Source: Own Computation, 2015

From Figure 3, we observe a high association between growth rate of GDP, credit and exchange rate.

3. Theoretical Aspects of Saving Behavior

3.1 Saving and Growth

Economic theory has maintained for long that saving or capital accumulation is the main determinant of economic growth, which can be understood as a sustained, long-term rise in the income of a country. Lewis (1954), among others, noted, "The central problem in the theory of economic development is to understand the process by which a community which was previously saving 4 or 5 percent of its national income or less, converts itself into an economy where voluntary saving is running at about 12 to 15 per cent of national income or more". This belief implied that, first, saving is directly translated to investment and, second, saving is a prerequisite for economic growth. Similarly, all the neoclassical growth theories developed in the 1950s and 1960s also emphasized the importance of saving in the economic growth process. This emphasis could be summarized in the following stylized facts: higher saving leads to higher investment, and higher investment leads to economic growth. The presumption of this reasoning is that, at least in a

closed economy, *ex-post* domestic saving must equal *ex-post* domestic investment.

According to the above theories, investment is directly related to output growth via the incremental capital output ratio (ICOR), at least during the transition to its steady state level or in the short run. The more recent endogenous growth theories go even further by asserting that saving and investment (combined with technological progress and human capital) induce both short-term and long-term economic growth (Romer, 1986; Lucas, 1988).

The implication of the above theories is that, as Schmidt-Hbbel et al. (1996) noted, "Saving is automatically translated into capital accumulation and, hence, growth, and that this translation is simply the mechanism underlying the positive correlation between saving and growth that is observed in practice." Caroll and Weil (1994) argue that the positive correlation observed between saving and growth is partly due to the fact that growth precedes saving even under the assumption that saving is automatically translated into investment. Not incorporating this two-way causality between saving and growth would, therefore, overestimate the contributions of saving to growth. Such a finding makes the policy implication complex as it is difficult to determine which one to target - saving or growth. In sub-Saharan Africa, Elbadawi and Mwega (1998) argue that regardless of the direction of causation (i.e. even if saving follows economic growth), focusing on policies that enhance private savings is important for at least two reasons. First, even if saving is the result and not the cause of economic growth, empirical evidence suggests that sustaining a high rate of growth requires a high level of accumulation of capital, which requires a high level of saving. Second, due to the limited external resources of sub-Saharan African countries (limited ability to borrow from international capital markets and the conditionality imposed when borrowing from multilateral financial institutions), mobilizing national saving to maintain a high rate of investment and, hence, growth is essential.

Various studies that have cast doubts on the conventional wisdom that savings engender economic growth (Harrod, 1939; Domer, 1946; and Solow, 1956) indicate that an increase in savings translate into high investment, which in turn stimulates economic growth. The apparent effect of higher savings is to

increase the availability of funds for investment. The more capital goods a nation has at its disposal, the more goods and services it can produce (Degu, 2007). To achieve this, it is a requirement to facilitate the development of sound domestic financial systems, especially in the countries that are less advanced in their economic transformation. Improving financial intermediation can be a key factor to raise the level of domestic savings and to efficiently channel them into growth-enhancing investment. However, financial deepening has to reach a certain level before the financial system can intermediate efficiently in channeling savings into productive investment.

The theoretical linkages of savings, investment, and economic growth discussed suggest that, first, as noted earlier, the theories do not provide a clear direction for policy makers as to which should be targeted first (savings or growth). It is true that this does not diminish the importance of savings for African countries for reasons appropriately stated by Elbadawi and Mwega (1998) above. But to design an appropriate policy, it is useful to clearly identify the exact causative linkage in order to distinguish between what is an instrument and what is a target, both in the short run and the long run. Second, the determinants of savings and investment differ at a theoretical level. Therefore, at a policy level the presumption that savings are directly translated into investment may not hold. Arguably, this is more likely to be the case in more recent years than before for at least two reasons: first, due to the increase in availability of financial instruments, not all savings are used for productive investment (but instead, at least some of them, may be diverted to what is called 'portfolio investment' or 'speculative capital') purposes; and second, due to liberalization, the relationship between domestic savings and domestic investment incorporate an international dimension. That is, the net change in capital flow is what determines investment and not necessarily the level or rate of domestic savings. A case in point is the average investment-to-GDP ratio of 18.5% vis-à-vis the average domestic savings to GDP ratio of about 12.1% for the period 1965-2013 in Ethiopia, which is largely true in most SSA countries.

3.2 Saving and Consumption Smoothing

Given that saving is a postponed consumption, it has always been examined in relation to consumption smoothing behavior. This is because a decision by

households or individuals to consume or save is a joint decision. This decision is the main determinant of national savings. The relationship between saving and consumption could be summed up in the predictions of the two popular models of consumption behavior - namely, the permanent income hypothesis and life-cycle models of consumption. These two models are based on the premise that the motive for saving is to average out consumption over an infinite time horizon (in the case of the permanent income hypothesis) or a finite time horizon with overlapping generations (in the case of the life-cycle model). In general, both theories predict that consumption is determined by life-time resources rather than incomes in particular periods. This suggests that, in the absence of borrowing constraints, saving or dissaving is used as a mechanism to adjust the optimal consumption over the life-time horizon.

However, the view that demographic factors affect savings is not shared by all researchers. For instance, Koskela and Viren (1989), Kennickell (1990), and Caroll and Summers (1991) question the significance of age structure in determining saving behavior. Kennickell, and Caroll and Summers, in particular, argue that differences in age-consumption profiles are too small for demographic factors to significantly affect saving rates. Regardless of the merits of the above theories in explaining the saving behavior in developed countries, the determinants of saving in developing countries are likely to differ in many significant ways. Deaton (1989) documents some of the features that may influence household saving behavior in developing countries. These features include the following: there are a large number of households who are poor; the economy is dominated by agriculture; households face an uncertain income flow and have different demographic structures; and liquidity constraints are binding. Given these features, therefore, how households smooth consumption over time and decide on how much to save is likely to differ from the basic predictions of the above-discussed inter-temporal models of consumption and saving behavior. In explaining the motives for saving in developing countries, which exhibit the above features, Birdsall et al. (1999) argue that since households operate in a multigenerational context, the need to save for retirement is not important as adults expect that their children will support them during old age. Further, due to the uncertainty of income (say, owing to the volatility of agricultural output), such households may not be able to predict future income and, hence,

plan consumption and saving over a long-time horizon. Life-cycle models, which are based on an inter-temporal decision scheme, are, therefore, likely to have little explanatory power in predicting the saving behavior in poor countries.

As more recent theories emphasize, the main motives for saving in poor-income countries are likely to be precautionary (against random decreases in income as short-run buffering) or to finance private investment since availability of credit for such purposes tends to be scarce. At a policy level, this implies that high rates of return on investment will encourage saving (Birdsall et al., 1999). This, of course, is only true if the rate of return on investment is higher than the rate of time preference. But as Birdsall et al. (1999) noted, given the subsistence nature of such economies, the rate of time preference is relatively high since there are not many goods (luxuries, for instance) that could be removed from the consumption bundle. The above arguments suggest that, in addition to a concerted effort to provide access to credit facilities to increase investment, designing tax and other policies to ensure the profitability of investment will be required to encourage saving.

Further, a common consideration in the context of consumption smoothing and saving is the impact of interest rates on savings. Theoretically, the impact of the real interest rate on savings is ambiguous. This is because a change in interest rate implies both substitution and income effects. For instance, an increase in income implies that tomorrow's consumption becomes relatively cheaper (or the opportunity cost of current consumption increases), which in turn implies a positive impact on savings. On the other hand, an increase in expected income (resulting from high interest rate income) will lead to an increase in current consumption and, therefore, a decrease in current savings. The usual assumption is that the substitution effect dominates and, therefore, an increase in real interest rates (above the rate of time preference) will have a negative impact on consumption and a positive impact on savings. Even though, as will be discussed in the empirical evidence section, the impact of real interest rates in the case of developing countries is very little, if at all, many theories pay a significant attention to it as a determinant of savings. It has to be noted, however, that the evidence regarding the effect of real interest rates on savings is mixed at best. For instance, Giovannini (1985) and

Schmidt-Hebbel, Webb and Corsetti (1992) found no significant impact of real interest rates on savings, while Ogaki, Ostry, and Reinhart (1995) found positive effects that are small and very sensitive to income levels.

3.3 Saving and External Sector

In the case of open economies, the determinants of savings are more complex. For instance, even *ex-post* savings may not equal investment as long as there is no constraint to capital flow across national boundaries. For instance, capital inflows in the form of concessional loans and foreign aid have an impact on national savings. As noted earlier, the usual rationale for granting aid or concessional loans has been augmenting domestic savings. But if, instead, as many researchers (Elbadawi and Mwega, 1998; Dayal-Gulati and Thimann, 1997; Schmidt-Hebbel *et al.,* 1996; and Masson *et al.*, 1995) noted that foreign aid is used to smooth out consumption instead of investment, it will have a crowding-out effect on domestic savings. That is, foreign aid is a substitute and not complementary to national savings. Recent empirical evidence seems to support the crowding-out effect of foreign aid on national savings more than the complementarity hypothesis (For more details, see Dayal-Gulati and Thimann, 1997; Schmidt-Hebbel *et al.*, 1996; Global Coalition, 1993).

A related issue usually considered in the literature as influencing saving behavior is changes in terms of trade, otherwise known as the Harberger-Laursen-Metzler effect. At a theoretical level, this effect is examined in an inter-temporal optimization model. Accordingly, this theory predicts that a temporary improvement in terms of trade would lead to an increase in savings by increasing temporary income or wealth. But the effect of permanent changes in terms of trade on savings is ambiguous (Dayal-Gulati and Thimann, 1997; Schmidt-Hebbel *et al.,* 1996). Mwega (1997) argues that the effect of terms of trade is important in SSA countries due to their narrow export base and the price volatility of primary exports. He cites some evidence that this, indeed, was the case in Kenya in which coffee producing rural households were able to save about 60 per cent of their windfall during the 1976-1977 coffee booms.

3.4 Saving and Macroeconomic Policies

In principle, government policy could have a potentially significant influence on national savings either by directly increasing public savings or implementing policies that increase private savings. Such policies include "revenue policy (tax structure, tax incentives), expenditure policy (transfers, income redistribution), and the degree of government saving".

4. Data Source and Methodology

4.1 Data Source

The main source of data for this study is the national income accounts of Ethiopia as prepared and compiled by the Ministry of Finance and Economic Development (MOFED), Department of National Accounts, from 1965 to 2013. In addition, data from the Ethiopian Economics Association (EEA), the World Bank Africa database and the National Bank of Ethiopia are used when such pieces of information as age dependency ratio, domestic savings, etc. are required. If data were available for long periods of time, it is fairly long enough to analyze and use a co-integration of nine to ten variables with reasonable lags. Hence, scarcity of data for such periods limits the study to analyzing only for four to six variables with reasonable lag lengths.

4.2 Analytical Procedure

This study uses annual data to model saving behavior in Ethiopia. The Johansen co-integration procedure was used to determine the existence of co-integration (long-run equilibrium) relationship between domestic savings and other macroeconomic variables. The co-integration procedure requires time series in the system to be non-stationary in their levels. Johansen developed a multivariate co-integration method in 1988, which is still the most suitable approach to test variables that are usually endogenous and simultaneously determined (Enders, 2010). The four important points to be considered before performing co-integration tests, according to Enders (2010), cited in Widarjono (2007), are: first, co-integration refers to one or more linear combinations of non-stationary variables. Second, all variables must be integrated of the same order. However, this condition is not necessarily

required in all cases. It is possible that variables are integrated of different orders. Third, there may be as many as n-1 linearly independent co-integrating vectors if a linear combination of non-stationary variables has 'n' variables. The number of co-integrating vectors is called the co-integrating rank (r). If more than two time series are considered, it is possible to have more than one co-integrating rank. Finally, consider the case in which each variable contains a single unit root. Before conducting the co-integration tests, the lag lengths are determined by using the minimum value of the Akaike information criterion.

Testing for stationarity

It is imperative that all time series in the co-integrating equation have the same order of integration. Thus, the study first ascertains the time series properties of domestic savings and other macroeconomic and demographic variables by using the augmented Dickey-Fuller (ADF) test for stationarity (Dickey and Fuller, 1979 and 1981). The equation estimated for the ADF test is stated as follows: Stationary time series data happen if the average, variance and covariance at any lag are still constant at any time (Dickey and Fuller, 1979). The individual macroeconomic series are tested for the order of integration to determine whether or not they are stationary. A number of tests for stationarity are available in the literature; these include the Dickey-Fuller (DF) test (Dickey and Fuller, 1981), the Augmented Dickey-Fuller (ADF) test (Said and Dickey, 1984), and the Philips-Peron (PP) test. A standard test for non-stationarity is the Augmented Dickey-Fuller (ADF) test (Said and Dickey, 1984).

For each series X_t the test statistic was measured by the following regression:

$$\Delta Xt = \alpha + \delta X_{t-1} + \sum_{k=1}^{p} \beta\delta X_{t-k} + \varepsilon_t \qquad (1)$$

where,

Xt	= savings at time t
Δ	= first difference operator
t	= time indicator
ε_t	=the error term
δ, α and β	= parameters to be estimated
K	= number of lag of the macroeconomic series to be included.

The first stage is to test whether each series is stationary, i.e., i (0). If the null hypothesis of non stationarity cannot be rejected, that is, the absolute value of the ADF statistic is smaller than the critical Augmented Dickey Fuller (ADF) value, then the next stage is to test whether the first differences are stationary. If the null hypothesis of non-stationarity cannot be rejected, then the series is still not stationary. Therefore, differencing continues until the series becomes stationary and order-noted. The process is considered stationary if / δ /<1; thus, testing for stationarity is equivalent with testing for unit roots (δ <1) under the following hypotheses:

$H_o: \delta = 0$ the series is non-stationary or there is existence of unit root.

$H_1: \delta \neq 0$ the series is stationary or there is white noise in the series.

The hypothesis of non-stationarity will be accepted at 0.01 or 0.05 levels if ADF is greater than the critical value.

Selection of lag length

For the determination of the lag length to be included in the VAR (Vector Auto Regression) model, Akaike's (1974) cited in Said and Dickey (1984), Greene (1993) and Engle and Granger (1987), information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and Hannan-Quinn criterion (HQIC) are used for VAR models. When using AIC, SBC or HQIC based on the estimated standard errors in respective equations, the model with the lowest value from the AIC, SBC or HQIC will be chosen.

$$\text{SBIC} = \ln(\sigma^2) + K/T \ln T$$
$$\text{HQIC} = \ln(\sigma^2) + 2K/T \ln T$$
$$\text{AIC} = \ln(\sigma^2) + 2K/T$$

In this paper, the AIC was used because it has the lowest estimated standard error when compared with others. AIC can be described by the following equation:

$$\mathbf{AIC = \ln(\sigma^2) + 2K/T} \qquad \mathbf{(2)}$$

where:

σ^2	=	the variance of the estimated residuals;
T	=	the number of parameters;
K	=	the sample size.

The maximum lag length begins with 3 lags and proceeds down to the appropriate lag by examining the AIC, HQIC and SIC information criteria. The number of lagged difference terms to be included can be chosen based on t-test, F-test or the Akaike's information criterion (AIC), cited in Engle and Granger (1987).

Testing the number of co-integrating relationships

Johansen also proposed two likelihood ratio tests, namely, Eigen value and trace statistics for the determination of r. It is a maximum likelihood ratio test involving a reduced rank regression between two variables, say I(1) and I(0). λ trace has a null hypothesis of a number of co-integrating vectors being less than or equal to r, while in the alternative hypothesis there are more than r co-integrating vectors. Additionally, λ max has a null of r co-integrating vectors against r+1 co-integrating vectors. For both tests, if the test statistics is more than the critical value, we reject the null hypothesis. Testing is conducted as a sequence and under the null, r = 0, 1,..n-1. When r = 0, failing to reject h_0 will complete the test. But if this is not the case, meaning when h_0: r = 0 is not rejected, the test continues until the null is no longer rejected.

(a) The trace statistics is computed (Johansen and Juselius (1990) and Rapsomanikis *et al.* (2005)) as:

$$\lambda trace = T \sum_{i=r+1}^{n} \ln (1 - \hat{\lambda}_i) \qquad (3)$$

where:

Λi = estimated Eigen value (characteristic roots) obtained from π matrix
T = the sample size
R = number of co-integrating vectors
N = number of variables under considerations.

(b) The maximum Eigen value statistics is computed as:

$$\mathbf{max(r/r+1) = -\,t\ ln\ (1-\lambda_{r+1})} \qquad \mathbf{(4)}$$

T = the sample size

(λ_{r+1}) = estimated Eigen values (characteristic roots) obtained from the $\prod$ matrix

H_0 : there is no co-integrating vector between the estimated series.

H_a : there is co-integrating vector between the estimated series.

If the value of λ trace and λ max exceed the critical value, reject the null hypothesis and accept the alternative hypothesis of more co–integration vectors at 0.05 or 0.01 level. Absence of a co-integrating relationship spots nonexistence of long-run relationship.

Vector Error Correction Model (VECM)

If macroeconomic series are integrated of the same order and a series of each model is co-integrated, a vector error correction model (VECM) is appropriate to determine the multivariate relationships among variables. Johansen defined two matrices α and β, such that $\pi = \alpha\beta'$, where both α and β are (n x r) matrices. The procedure is based on a maximum likelihood estimation of the error correction model and each two-variable system is modeled as a vector auto regression (VAR) as in the following equation (Oladapo and Momoh, 2007; Ojiako, 2012; and Hopcraft, 1987):

$$X_t = \mu + \sum_{i-1}^{p} \gamma_i \Delta X_{t-1} + \pi X_{t-k} + \varepsilon_t + \beta_t \qquad \mathbf{(5)}$$

where:

X = the vector of endogenous variables

γ_i = the matrix of short run coefficients

π = the matrix of long–run coefficients

ε_t = the vector of independent and normally distributed errors

K = number of lags, and should be adequately large enough both to capture the short-run dynamics of the underlying VAR and to produce normally distributed white noise residuals.

If the coefficient matrix π has a reduced rank $r < n$, then there exist n x r matrices α and β, each with rank r such that $\pi = \alpha\beta'$ and $\beta' X_t$ is stationary; r is the number of co-integrating relationships; the elements of α are known as the adjustment parameters in the vector error correction model and each column of β is a co-integrating vector. It can be shown that for a given r, the maximum likelihood estimator of β defines the combination of X_{t-1} that yields the r largest canonical correlations of ΔX_t with X_{t-1} after correcting for lagged differences and deterministic variables when present. Johansen proposed two different likelihood ratio tests of the significance of these canonical correlations and the reduced rank of the π matrix.

The procedure for testing co-integration is based on the Error Correction Model (ECM) representation of *Xt* given by Ahmed and Rustagi (1987), Oladapo and Momoh (2007), Ojiako (2012), and Hopcraft (1987):

$$\Delta X_t = \mu + \sum_{i-1}^{p-1} \gamma_i \Delta X_{t-1} + \pi X_{t-k} + \varepsilon_t + \beta_t \qquad \textbf{(6)}$$

where:

Δ	=	the difference operator
Xt	=	(nX1) vector of i (1) (*i.e* integrated of order one) series
γ_i	=	- (i – π_1 - ……,k -1)
i	=	1, 2,……, k - 1
π	=	- (i - π - π_k) each of π_1 is an (n X) matrix of parameters
k	=	number of lags
ε_t	=	an identical and independently distributed *n*-dimensional vector of residuals with zero mean and variance matrix
β_t	=	co-integrating vector (containing the long-run)
μ	=	constant term
t	=	time trend.

Since X_{t-k} is i(1), but δX_t and δX_{t-i} variables are i(0) (i.e., integrated of order zero), equation (9) will be balanced if $\delta X_t - _k$ is i(0). Therefore, it is the ∏ matrix that conveys information about the long-run relationship among the variables in X_t. The rank of ∏, r, determines the number of co-integrating vectors, as it determines how many linear combinations of Xt are stationary. If

r = n, the variables are stationary in levels. If r = 0, no linear combination of Xt is stationary.

If 0 < rank (∏) = r < n, and there are n X r matrices α and β such that π = αβ', then it can be said that there are r co-integrating relations among the elements of Xt. The co-integrating vector β has the property that β'Xt is stationary even though *Xt* itself is non-stationary. The matrix α measures the strength of the co-integrating vectors in the ECM, as it represents the speed of adjustment parameter.

Empirical model

To determine the long-run relationship between domestic savings and variables, the Johansen co-integration procedure is used (Johansen and Juselius, 1990; Johansen, 1991). The procedure involves the estimation of a VECM. Suppose that the two I(1) variables y_t and z_t are co-integrated and that the co-integrating vector is (1,-θ). Then all three variables $\Delta y_t = y_t - y_{t-1}$, Δz_t and $(y_t - \theta z_t)$ are I(0). The VECM used in the study is specified, based on Green (2004), as follows:

$$\mathrm{a}\boldsymbol{y_t} = \boldsymbol{x'_t\beta} + \boldsymbol{\gamma}(\mathrm{a}\boldsymbol{z_t}) + (\boldsymbol{y_{t-1}} - \boldsymbol{\theta z_{t-1}}) + \boldsymbol{\varepsilon_t} \qquad \textbf{(7)}$$

where, y_t is the endogenous macroeconomic variable, z_t is the exogenous variables, $\boldsymbol{x}'_t\beta$ is the trend component, and Δ represents the difference operator. The model describes the variation in y_t around its long-run trend and the vector error correction $(y_t - \theta z_t)$, which is the equilibrium error in the model of co-integration. The VECM allows causality to emerge even if the coefficients of the lagged differences of the explanatory variable are not jointly significant (Granger, 1983; Engle and Granger, 1987; Miller and Russek, 1990; Miller, 1991; Dawit, 2003). If y_t is scalar, then the error correction term will also be scalar.

4.3 Definition, Measurement and Hypothesis of Variables

Variables considered in the model are defined, measured and hypothesized in the following table.

Table 4.1: Definition, Measurement and Hypothesis of Variables

Type and definition of variables	Measurement*	Hypothesis
Dependent variables		
Domestic savings (LDS)	Dollar	
Independent variable(s)		
Age dependency ratio (LADR)	Ratio	-
Domestic credit (LDC)	Dollar	+
Net domestic investment (LDI)	Dollar	+
Consumer price index (LP)	%	-
Real gross domestic product (LRY)	Dollar	+
Term of trade (LTOT)	%	+
Foreign capital flow (LFCF)	Dollar	+
Real foreign exchange rate (LRER)	Dollar	+
Real interest rate (LRD)	%	-
Money supply (LM)	Dollar	-

*Real value of natural logarithms

5. Estimation Approach, Results, and Interpretation

Obviously the econometric specification may differ from the general theoretical specification. Based on recent innovations in time series econometrics, the estimation was, in fact, carried out by formulating a Vector Error Correction Model. The estimation was undertaken for the period 1965-2013 using Eview 9. The first step in dynamic modeling is to test for stationarity for the variables of interest. All variables considered are non-stationary at 1% significance level at their level. ADF test statistics suggest that the levels are non-stationary (Table 5.1), whereas the first differences of each variable are stationary at less than 5% probability level. For example, the hypothesis that domestic saving (LDS) at its level has a unit root cannot be rejected but that its difference has a unit root can be rejected. Domestic saving is I (1). Therefore, as we observe from the following table, the levels of the

variables are non-stationary and their first differences are stationary at less than 5% significance level. This means that the associated lag polynomial contains a unit root. If we use the levels for regression analysis, our regression is spurious. On the other hand, if we use the differenced, we will loss the long run determinants of the model. Moreover, natural logarithm of each macroeconomics variable is required to avoid normality and heteroscedastic problems and to help to estimate elasticities of the variable.

Table 5.1: Unit Root Test Using Augmented Dickey Fuller Test Statistic

Variable	ADF Test Statistic	
	Level	1st Difference
Domestic saving (LDS)	-2.17	-4.15
Age dependency ratio (LADR)	-2.51	-3.01
Domestic credit (LDC)	-1.52	-3.31
Net domestic investment (LDI)	-0.04	-3.55
Consumer price index (LP)	-0.56	-3.96
Real gross domestic product (LRY)	1.10	-4.86
Term of trade (LTOT)	-1.74	-6.28
Foreign capital flow (LFCF)	-0.47	-5.88
Real exchange rate (LRER)	0.33	-4.52
Real interest rate (LRD)	-0.89	-3.50
Money supply (LM)	2.70	-5.71

1% Critical Value *-3.6117, 5% Critical Value *-2.9399, 10% Critical Value*-2.608
*MacKinnon critical values for rejection of hypothesis of a unit root
Source: Own Computation, 2015

After determining the order of integration of the variables, an attempt is made to undertake unrestricted VAR. Based on the unrestricted VAR result, the appropriate lag length using Johansen approach is determined (Johansen and Juselius, 1990; Johansen, 1991). Based on Swartz (SC), Hanan-Quin (HQ) and Akaike information criteria (AIC), the appropriate lag length is determined as one. After determining the lag length, the next step is to determine co-integrating equations. The result suggests that zero co-integration is rejected at 1% significance level. Hence, the variables have at most 4 co-integrating relationships (Table 5.2).

Table 5.2: Johansen Co-integration Test

Hypothesized No. of CE(s)	Eigen value	Trace		Max-Eigen	
		Statistic	5% Critical Value	Statistic	5% Critical Value
None	0.92	477.65*	285.14	117.14*	70.54
At most 1	0.80	360.51*	239.24	74.89*	64.50
At most 2	0.76	285.62*	197.37	67.26*	58.43
At most 3	0.67	218.36*	159.53	51.99*	52.36
At most 4	0.64	166.37*	125.62	48.13*	46.23
At most 5	0.54	118.24*	95.75	36.51	40.08
At most 6	0.48	81.74*	69.82	30.92	33.88
At most 7	0.39	50.82*	47.86	23.49	27.58
At most 8	0.28	27.32	29.80	15.34	21.13
At most 9	0.16	11.98	15.49	8.18	14.26
At most 10	0.08	3.80	3.84	3.80	3.84

*(**) denotes rejection of the hypothesis at 5% and (1%) significance level
L.R. test indicates 4 co-integrating equation(s) at 5% significance level
Source: Own Computation, 2015

Comparing the trace and maximum Eigen value statistics with the corresponding critical values, it can be seen that the null hypothesis of no co-integrating relationship can be rejected at the 5 percent significance level for the variables. The results from the trace and maximum Eigen value test indicate that there are at most four co-integrating vectors. This implies that there existed a long-run relationship between the variables. The next step is to undertake hypothesis testing on the significance of coefficients of the variables in the long-run structural equation. This helps to identify the major determinant variables in the model. This is made by imposing restriction on the beta parameters. From the likelihood ratio statistics, domestic investment, real gross domestic product and foreign capital flow are the long-run determinants of domestic savings in Ethiopia (Table 5.2). However, likelihood ratio (LR) statistics is wedded to the normal distribution and limits its generality (Greene, 2003). Therefore, an alternative to LR statistics is to use robust estimator using Engle-Granger causality test, which uses F test statistics. Based on the Granger causality test (Engle and Granger, 1987), domestic credit, consumer price index, real gross domestic product, terms of trade, real exchange rate, real interest rate, foreign capital flow, and money

supply are the significant variables that Granger causes the dependent variable - in our case domestic savings (see Table 5.3). Moreover, Granger causality for blocks was also made (Appendix Table 1). The results indicated that age dependency ratio, domestic investment, real interest rate, real exchange rate and terms of trade granger cause the rest of the macroeconomic series.

Table 5.3: Engle-Granger causality test by Block

Null Hypothesis:	Obs	F-Statistic	Probability	Decision
Production block				
LRY does not Granger Cause LDS	47	9.07	0.00	Rejected
LDS does not Granger Cause LRY		6.61	0.00	Rejected
Demand block				
LDI does not Granger Cause LDS	47	9.15	0.00	Rejected
LDS does not Granger Cause LDI		7.28	0.00	Rejected
LDC does not Granger Cause LDS	47	1.49	0.24	Accepted
LDS does not Granger Cause LDC		1.59	0.22	Accepted
LADR does not Granger Cause LDS	47	0.78	0.47	Accepted
LDS does not Granger Cause LADR		0.79	0.46	Accepted
LFCF does not Granger Cause LDS	47	1.08	0.35	Accepted
LDS does not Granger Cause LFCF		0.93	0.40	Accepted
LM does not Granger Cause LDS	47	2.46	0.10	Accepted
LDS does not Granger Cause LM		6.27	0.00	Rejected
Price block				
LP does not Granger Cause LDS	47	2.38	0.10	Accepted
LDS does not Granger Cause LP		2.59	0.09	Rejected
LTOT does not Granger Cause LDS	47	0.75	0.48	Accepted
LDS does not Granger Cause LTOT		2.44	0.09	Rejected
LRER does not Granger Cause LDS	47	1.19	0.31	Accepted
LDS does not Granger Cause LRER		1.58	0.22	Accepted
LRD does not Granger Cause LDS	47	0.27	0.77	Accepted
LDS does not Granger Cause LRD		4.92	0.01	Rejected
LRER does not Granger Cause LTOT	47	2.55	0.09	Rejected
LTOT does not Granger Cause LRER		2.74	0.08	Rejected
LRD does not Granger Cause LTOT	47	0.38	0.69	Accepted

Source: Own Computation, 2015

The diagnostic test result suggests that the co-integrating vector is unique and in terms of the structural relationship, the variables are significant in explaining the dependent variables. Granger causality test indicates that domestic credit, consumer price index, real gross domestic product, terms of trade, foreign capital flow, and money supply are the significant variables that Granger causes the dependent variable - in our case domestic savings. However, when we use the levels for regression analysis, our regression is spurious. On the other hand, if we use the differenced, we will lose the long-run determinants of the model. Once there exists a co-integrating vector that ties the variables in the regression equation. That is, the variables are co-integrated; the vector error correction model is estimated for the significant variables for four co-integrating equation which explain the major determinants of aggregate domestic savings in Ethiopia. In doing so, several attempts are made to get the congruent error correction model. The final model is selected using information criteria, coefficient of determination and significance of the co-integrating equation coefficient.

Table 5.4: Vector Error Correction Model: Dependent variable (D(LDS))

Co-integrating Equation (CointEq)	**Estimate**	**CointEq1**	**CointEq2**	**CointEq3**	**CointEq4**
LDS(-1)		1	0	0	0
LM(-1)		0	1	0	0
LP(-1)		0	0	1	0
LRY(-1)		0	0	0	1
LRD(-1)	Coef	-0.334*	0.014	-1.387	-0.979
	Std.err	-0.176	-0.563	-1.447	-1.029
LRER(-1)	Coef	1.302***	-1.685***	3.741***	2.977***
	Std.err	-0.179	-0.573	-1.473	-1.048
LDC(-1)	Coef	0.020	1.439**	-3.103*	-1.979
	Std.err	-0.206	-0.656	-1.688	-1.201
LDI(-1)	Coef	-1.091***	-2.174***	5.407***	3.392***
	Std.err	-0.092	-0.294	-0.757	-0.538
LFCF(-1)	Coef	0.420***	-2.937***	7.351***	5.363***
	Std.err	-0.086	-0.275	-0.706	-0.502
LTOT(-1)	Coef	1.836***	0.139	-2.432*	-1.382
	Std.err	-0.162	-0.517	-1.329	-0.945
@Trend (1965)		-0.011	0.259	-0.993	-0.716
C		-12.173	-7.421	5.456	-7.208

Error Correction:		**D(LDS)**	**D(LM)**	**D(LP)**	**D(LRY)**	**D(LRD)**	**D(LRER)**	**D(LDC)**
CointEq1	Coef	-0.732**	-0.020	-0.383***	-0.247***	0.013	0.089	0.185***
	Std.err	-0.334	-0.109	-0.157	-0.097	-0.107	-0.089	-0.077
CointEq2	Coef	-1.403***	0.037	-0.672***	-0.741***	0.244*	0.087	-0.088
	Std.err	-0.419	-0.137	-0.197	-0.122	-0.134	-0.111	-0.096
CointEq3	Coef	-0.354	-0.149	-0.011	0.616***	0.358*	0.115	0.499***
	Std.err	-0.629	-0.205	-0.295	-0.183	-0.201	-0.167	-0.144
CointEq4	Coef	-0.286	0.265	-0.382	-1.287	-0.384	-0.129	-0.746***
	Std.err	-0.856	-0.280	-0.402	-0.249	-0.274	-0.227	-0.196
D(LDS(-1))	Coef	0.217	-0.133	0.493***	0.211***	-0.095	-0.056	-0.017
	Std.err	-0.304	-0.099	-0.143	-0.088	-0.097	-0.081	-0.070
D(LM(-1))	Coef	0.526	-0.529***	0.032	0.347***	-0.237	0.015	-0.114
	Std.err	-0.593	-0.193	-0.278	-0.172	-0.190	-0.157	-0.136
D(LP(-1))	Coef	-0.864	0.226	-0.073	-0.300	-0.049	-0.365**	-0.174
	Std.err	-0.583	-0.190	-0.274	-0.170	-0.187	-0.155	-0.134
D(LRY(-1))	Coef	0.831	-0.297	-0.020	0.497***	-0.107	0.241	0.215
	Std.err	-0.694	-0.227	-0.326	-0.202	-0.222	-0.184	-0.159
D(LRD(-1))	Coef	0.263	0.093	-0.460*	-0.323**	0.179	0.512***	0.206
	Std.err	-0.550	-0.180	-0.258	-0.160	-0.176	-0.146	-0.126
D(LRER(-1))	Coef	0.399	-0.158	0.169	0.114	-0.206	0.037	-0.175
	Std.err	-0.647	-0.211	-0.304	-0.188	-0.207	-0.171	-0.148
D(LDC(-1))	Coef	1.377	-0.234	0.623*	0.892***	0.267	-0.375*	0.455***
	Std.err	-0.765	-0.250	-0.359	-0.222	-0.245	-0.203	-0.175

D(LDI(-1))	Coef	-0.548	0.080	-0.633***	-0.420***	0.174	0.152	-0.172*
	Std.err	-0.446	-0.146	-0.209	-0.130	-0.143	-0.118	-0.102
D(LFCF(-1))	Coef	-0.102	-0.092	0.124	0.159***	0.080	-0.020	0.011
	Std.err	-0.186	-0.061	-0.087	-0.054	-0.060	-0.049	-0.043
D(LTOT(-1))	Coef	-0.566	0.079	0.062	0.057	0.097	-0.092	-0.100
	Std.err	-0.352	-0.115	-0.165	-0.102	-0.113	-0.093	-0.081
C	Coef	-2.532***	0.606***	-1.767***	-2.126***	-0.460***	0.093	-0.282***
	Std.err	-0.374	-0.122	-0.176	-0.109	-0.120	-0.099	-0.086
@Trend (1965)	Coef	0.010**	0.002	0.007***	0.008***	0.003**	0.001	0.002**
	Std.err	-0.005	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001
LADR	Coef	-30.24***	7.01***	-22.27***	-25.66***	-5.256***	0.624	-4.518***
	Std.err	-4.117	-1.344	-1.932	-1.196	-1.317	-1.091	-0.943
R-squared		0.787	0.718	0.888	0.959	0.661	0.641	0.633
Adj. R-squared		0.674	0.568	0.828	0.937	0.480	0.450	0.437
Sum sq. residuals		2.787	0.297	0.614	0.235	0.285	0.196	0.146
S.E. equation		0.305	0.099	0.143	0.089	0.098	0.081	0.070
F-statistic		6.948	4.774	14.822	43.691	3.659	3.354	3.227
Log likelihood		-0.294	52.319	35.266	57.790	53.261	62.131	68.993
Akaike AIC		0.736	-1.503	-0.777	-1.736	-1.543	-1.920	-2.212
Schwarz SC		1.405	-0.834	-0.108	-1.067	-0.874	-1.251	-1.543
Mean dep.		0.140	0.062	0.105	0.101	0.022	0.029	0.149
S.D. dep.		0.534	0.151	0.345	0.353	0.135	0.109	0.093

* **Significant at 1% significance level, ** significant at 5% significance level, * significant at 10% significance level
Source: Own Computation, 2015

Of the four vector error correction models (VECM), the coefficient of the co-integrating equations shows that about 73.2%, 38.3% and 24.7% disequilibrium corrected each year by change in aggregate domestic saving, consumer price index and gross domestic product, respectively. The overall performance of the model is well fitted because 78.7% of the total variation of the dependent variable is explained by the independent variables included in the model. Normality and autocorrelation test depicts no problem (See Appendix - Tables 2 and 4). Moreover, the model selection criteria indicated the model is adequate to represent the real world and manageable to predict saving behavior in Ethiopia. As we see from the results, domestic saving in Ethiopia is determined by age dependency ratio and real money supply. Elasticity of age dependency is the highest with an inverse relationship with domestic savings. In the short run the age dependency elasticity with respect to domestic savings is 30.24, implying an inverse and statically significant effect at 1% probability level.

In the long run, age dependency, real domestic investment, and real interest rate have negative and significant elasticities at less than 10% probability level. Terms of trade, foreign capital inflow, and real exchange rate have direct and statistically significant elasticities with domestic savings at less than 10% probability level. This implies that a 1% improvement of terms of trade had a positive 1.836% impact on the improvement of domestic savings. Moreover, a 1% increase in foreign capital flow had a 0.42% improvement of domestic savings. It also shows that a 1% increase in real exchange rate had a 1.302% improvement of domestic savings. Elasticity of exchange rate with respect to domestic savings is low and insignificant in the short run and high and significant in the long run. This implies that continuous depreciation of real exchange rate has a positive impact on domestic savings. This further equilibrates the terms of trade and foreign capital flow.

6. Summary and Policy Implication

6.1 Summary and conclusion

Having reviewed the determinants of saving and its linkages to various economic aggregates, the purpose of this section is to highlight the main conclusions of the empirical evidence, including our estimated results, and to

summarize their policy implications. The savings data, both at macro-economic and microeconomic levels, suffers from measurement problems. This measurement problem arises because at the macroeconomic level saving is measured as a residual of a residual, and at a micro-economic level the concept of saving, particularly in a rural-based economy, is complex. This may partly explain the inconclusive, mixed, and at times contrasting evidence found about the determinants of savings. The policy implication of this is, as is already seen in a few countries in Africa, household surveys based on clearly defined concepts of income, consumption and savings should be encouraged. Doing this in the context of a diversified portfolio of assets as observed both at the rural and urban households will help clear some of the confusions. *This study used co-integration and vector error correction model (VECM) to examine the effect and causal relationship between the growth rate of real Gross Domestic Saving (GDS) and growth rate of real Gross Domestic Product (GDP) for Ethiopia. The estimation was undertaken for the period 1965-2013 using Eview9 software. In the process of the analysis, the time series properties of macroeconomic variables were ascertained by using the Augmented Dickey Fuller (ADF) unit root test procedure. Finally, the long-run relationship between variables was explored by utilizing the Johansen procedure. The ADF test showed that there was unit root after first difference.* To sum-up, the following variables are empirically found to be the most important determinants of savings in Ethiopia. The results of the model suggested that there is a high correlation between growth and savings. However, the causality issue (whether saving causes growth or the other way round) is not yet settled. But, in general, most studies seem to suggest that income growth influences savings as indicated by the statistically significant growth coefficient in saving equations. For Ethiopia, GDP growth is positively and significantly determined by savings, money supply, and foreign capital flow. Foreign capital in-flow in the form of foreign aid and credit is found to have a statistically significant negative effect in the short run and direct effect in the long run on domestic savings. Terms of trade (ToT) are found to have a statistically significant direct effect on savings, particularly in the long-term effect.

6.2 Policy Implication

Demographic and institutional factors are found to be important. The dependency ratio, both in developing countries in general and in SSA countries in particular, is found to have a statistically significant negative effect. This underscores the importance of placing an appropriate population policy to enhance saving rates. Addressing institutional (through sensible policies such as formalization of the informal sector) and structural problems (such as infrastructural provision and efficient and relevant education policy) is also noted in the empirical literature as influencing savings mobilization. The model results suggest that to raise the level of savings in Ethiopia, raising the level of income or GDP growth, terms of trade, real exchange rate, and foreign capital in-flow is crucial. On the other hand, reducing dependency ratio and interest rate is important in raising domestic savings. *Elasticity of exchange rate with respect to domestic savings is high and significant in the long run. This implies that continuous depreciation of real exchange rate has a direct impact on encouraging domestic savings. This would improve terms of trade and foreign capital in-flow. Addressing institutional (through sensible policies such as formalization of the informal sector) and structural problems (such as infrastructural provision and efficient and relevant education policy) is also noted in the empirical literature as influencing savings mobilization.* It is hoped that the points raised thus far will help to chart an appropriate policy to raise the level of savings.

References

Ahmed R., and Rustagi N. (1987). Marketing and price incentives in African and Asian countries. In: Elz D., editor. *Agricultural marketing strategy and pricing policy. International Bank for Reconstruction and Development*, Washington, USA.

Alemayehu Geda and Haile Kibret. (2007). Aggregate Saving Behavior in Africa: A Review of the Theory and the Existing Evidence with New Empirical Results. *Ethiopian Journal of Economics, Vol XII No 1*

Aryeetey, E., and C. Udry. (1999). "Saving in Sub-Saharan Africa" (mimeo).

Birdsall, N., T. C. Pinckney, and R. H. Sabot. (1999). 'Equity Saving and Growth', Center on Social and Economic Dynamics, Working paper N0. 8.

Caroll, C., and D. Weil. (1994). 'Saving and growth: A Reinterpretation', Carnegie-Rochester Conference Series on Public Policy, 40 (June), pp. 133-192.

Caroll, C., and L. Summers. (1991). 'Consumption Growth Parallels Income Growth: Some New Evidence', *National Saving and Economic Performance*, edited by B. Douglas.

Dawit, Sheggu. (2007). Causal Relationship between Economic Growth and Gross Domestic Savings: The Case of Ethiopia. Unpublished Article, Department of Economics, Addis Ababa University

_____. (2003). 'Real Effective Exchange Rate Misalignment, Volatility and Their Impact on Macroeconomic Performances of Ethiopia: An Empirical Investigation,' Unpublished M.Sc. Thesis, Department of Economics, Addis Ababa University.

Dayal-Gulati, A., and C. Thimann. (1997). Saving in Southeast Asia and Latin America Compared: Searching for Policy Lessons", IMF Working Paper WP/97/110.

Deaton, A. (1989). Saving in Developing Countries: Theory and Review. Proceedings of the World Bank Annual Conference on Development Economics.

Dickey D. A., and Fuller W. A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica*: 49(4):1057-1072.

_____. (1979). Distribution of the Estimators for Autoregressive Time Series with Unit Roots. *Journal of the American Statistical Association*, 74(366): 427-431.

Elbadawi, I. A., and F. M. Mwega. 1998. Can Africa's Saving Collapse Revert? A paper Prepared for the World Bank's Project on "Saving Across the World: Puzzles and Policies".

Enders, W. (2010). *Applied Econometric Time Series*, 3rd edition, New York: Wiley.

Engle, R. F., and Granger C. W. J. (1987). 'Co-integration and Error Correction: Representation, Estimation and Testing', *Econometrica*, 55(2): 251-276.

Giovannini, A. (1985). Saving and the Real Interest Rate in LDCs. *Journal of Development Economics,* 18(2-3), pp. 197-217.

Global Coalition for Africa. (1993). Annual Report, Washington, D. C.

Granger, C. W. J. (1983). Co-investigated Variables and Error-Correction Models. Working Paper, 83-13. University of California, San Diego.

Greene, W. H. (2003). *Econometric Analysis.* Fifth edition. Macmillan, New York, pp 10-83.

_____. (1993). *Econometric Analysis*. Second Edition. New York: Macmillan.

Griffiths, William E., R. C. Hill, and G. G. Judge. (1993). *Learning and Practicing Econometrics.* New York: John Wiley.

Hopcraft, P. (1987). 'Grain marketing policies and institutions in Africa.' *Finance and development*, 24(1): 37-43.

Johansen, S. (1991). 'Estimation and Hypothesis Testing of Co-integration Vectors in Gaussian Vector Autoregressive Models', *Econometrica*, vol. PP. 1551-80.

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

Kennickell, A. (1990). 'Demographics and Household Savings.' Finance and Economics Discussion Series N0. 123 (Washington: Board of Governors of the Federal Reserve System).

Koskela, E., and M. Viren. (1989). 'International Differences in Saving Rates and the Life Cycle Hypothesis: A Comment.' *European Economic Review*, Vol. 33, pp. 1489-98.

Lewis, A. (1954). 'Economic Development with Unlimited Supplies of Labour.' *The Manchester School*, 22: 139-191.

Lucas, R. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22: 3-42.

Masson, P., T. Bayoumi, and H. Samiei. (1995). 'Saving Behaviour in Industrial and Developing Countries', IMF Working Paper, WP/95/51.

Mckinnon, R. (1973). *Money and Capital in Economic Development.* Washington: Brookings Institution.

Miller, M. (1991). 'Money Dynamics: An Application of Co-integration and Error-Correction Modeling', *Journal of Money, Credit, and Banking*, 23: 139-54.

Miller, S., and F. S. Russek. (1990). 'Co-integration and Error-Correction Models: The Temporal Causality between Government Taxes and Spending,' *Southern Economic Journal*, 12: 221-29.

Mwega, F. M. (1997). 'Saving in Sub-Saharan Africa: A Comparative Analysis', *Journal of African Economies*, 6(3): 199 - 228.

Ojiako, I. A., Ezedinma C., Asumugha G. N., and Nkang N. M. (2012). Spatial Integration and Price Transmission in Selected Cassava Products' Markets in Nigeria: A Case of Lafun', *World Applied Sciences Journal*, 18(9): 1209-1219.

Oladapo, M. O., and Momoh S. (2007). 'Food price differences and market integration in Oyo State, Nigeria', *International Journal of Agricultural Research*, 2(1): 69-74.

Rapsomanikis, G., Hallam D., and Conforti P. (2005). Market integration and price transmission in selected food and cash crop markets of developing countries: Review and Applications, 225-229.

Romer, P. (1986). 'Increasing Returns and Long-Run Growth' *Journal of Political Economy*, 94: 1002-1037.

Said, S. E., and Dickey D. A. (1984). Testing for unit roots in autoregressive-moving average models of unknown order. *Biometrika*, 71:599-607.

Schmidt-Hebbel, K., L. Serven, and A. Solimano. (1996). 'Saving and Investment: Paradigms, Puzzles, Policies', *The World Bank Research Observer*, 11(1): 87-117.

Shaw, E. (1973). *Financial Deepening in Economic Development*. New York: Oxford University Press.

Widarjono, A. (2007). 'Econometrics: Theory and applications to economics and business', Ekinosia Faculty of Economics, UII, Yogyakarta.