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Analysis Of Domestic Saving On Fastening Economic Growth In Ethiopia: Vector Error Correction Approach

Hassen Beshir

Department of Agricultural Economics, Wollo University

ABSTRACT
Saving has always figured prominently in both theoretical analysis and policy design in both developed and developing economies. Banking services is performed in the form of mobilizing saving (deposit), extending credit, international banking (trade, foreign exchange and money transfer) and other legal transfer payments. There are scant current literatures on the determinants of saving on fastening economic growth. 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. In the process of analysis, the time series properties of macroeconomic variables were ascertained by using the ADF unit root test procedure. Finally, the long-run relationship between variables was explored by utilizing the Johansen procedure. The estimated results indicated that one order of integration or I(1) for the series was considered. From the result, the coefficient of the co-integrating equation tells that about 36 percent of equilibrium corrected each year by change in aggregate domestic saving. Gross domestic saving in Ethiopia is 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. Saving is positively related to income level or GDP growth and terms of trade. Elasticity of exchange rate with respect to domestic saving is low and insignificant in the short run and high and significant in the long run. This implied that continuous depreciation of real exchange rate have a positive impact on domestic saving. 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 saving mobilization.
Key Words: Cointegration, Growth, Model, Saving, Vector Error Correction

1. INTRODUCTION

Saving has always figured prominently in both theoretical analysis and policy design in both developed and developing economies. This prominence emanates from its 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 saving 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 saving. Due to their preoccupation with short-term macroeconomic adjustment and stabilization policies, the emphasis on saving was relatively neglected in the 1980s in many African countries. But the focus on economic growth and hence on saving seems to have resurfaced in the 1990s and after. 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 saving 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 saving and investment in Ethiopia (See Figure 2).

Saving could be examined in terms of its 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 that of developed countries. As will be discussed later, these differences include both macroeconomic aspects of saving (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 group of countries). Banking services is performed in the form of mobilizing saving (deposit), extending credit, international banking (trade, exchange and money transfer) and other legal transfer payments. There are scant current literatures on the effect of these services on fastening economic growth. The research questions of this study are: Does saving granger cause economic growth? Does

Credit granger cause economic growth? Does Investment granger cause economic growth? What are the factors affecting saving and credit in fastening economic development in Ethiopia?

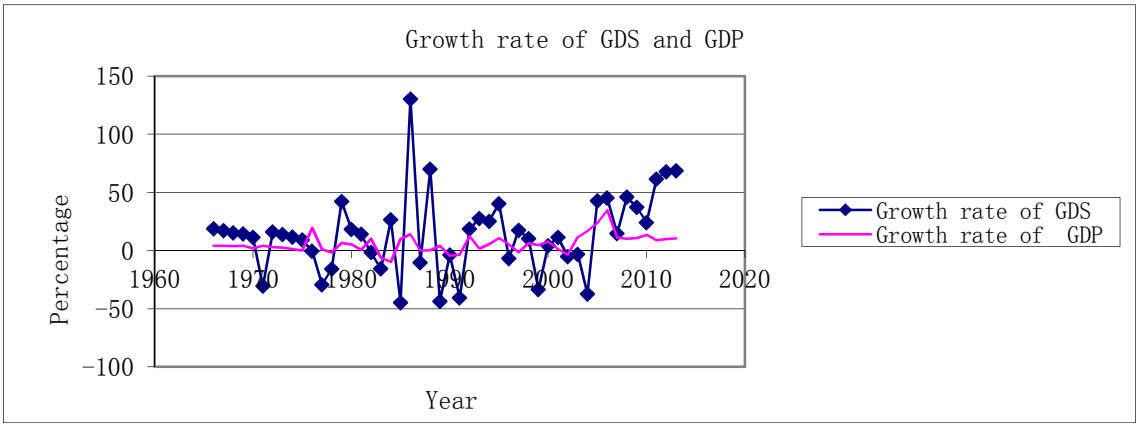
The objective of this article is to examine the factors affecting domestic saving in Ethiopia to draw policy lessons that are particularly relevant for Ethiopia economy. However, obtaining reliable data and its transformation to plausible information was the main limitation of the study. The remainder of the paper is organized as follows: section two focuses on GDP, saving, credit, exchange rate and investment trend and their measurement issues in Ethiopia. Section three presents the theoretical determinants of saving. 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 saving, 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 note 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 results 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 therefore will make it inaccurate and in their presence complex.

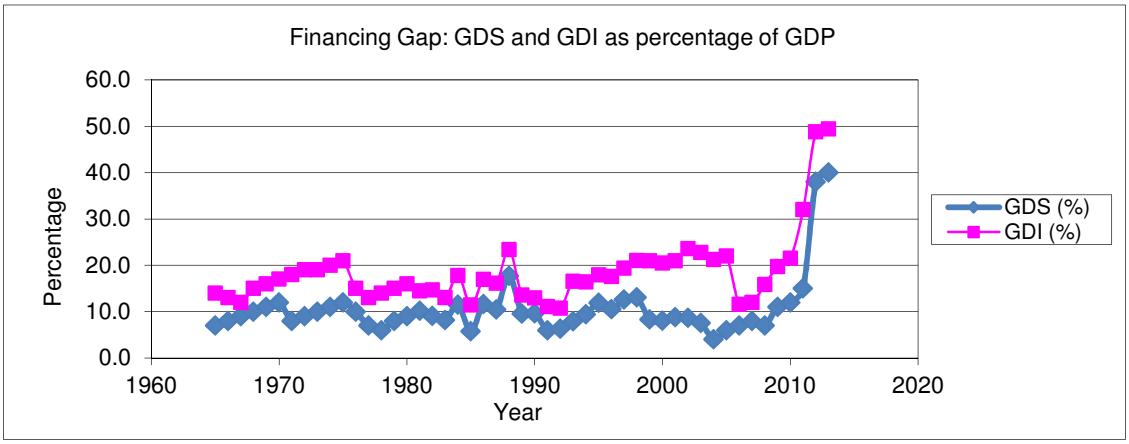
With these information in mind, using data from World Bank's 'African Development Indicators' the growth of GDP, Investment and saving for Ethiopia is presented in the following figures. From figure 1, we observe a high relationship between GDP and GDS. A small percentage change in GDP would result to a higher and more percentage change in domestic saving. However, there is a high financing gap which is the difference between gross domestic saving and gross domestic investment. This gap is financed mainly through loan and aid.

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



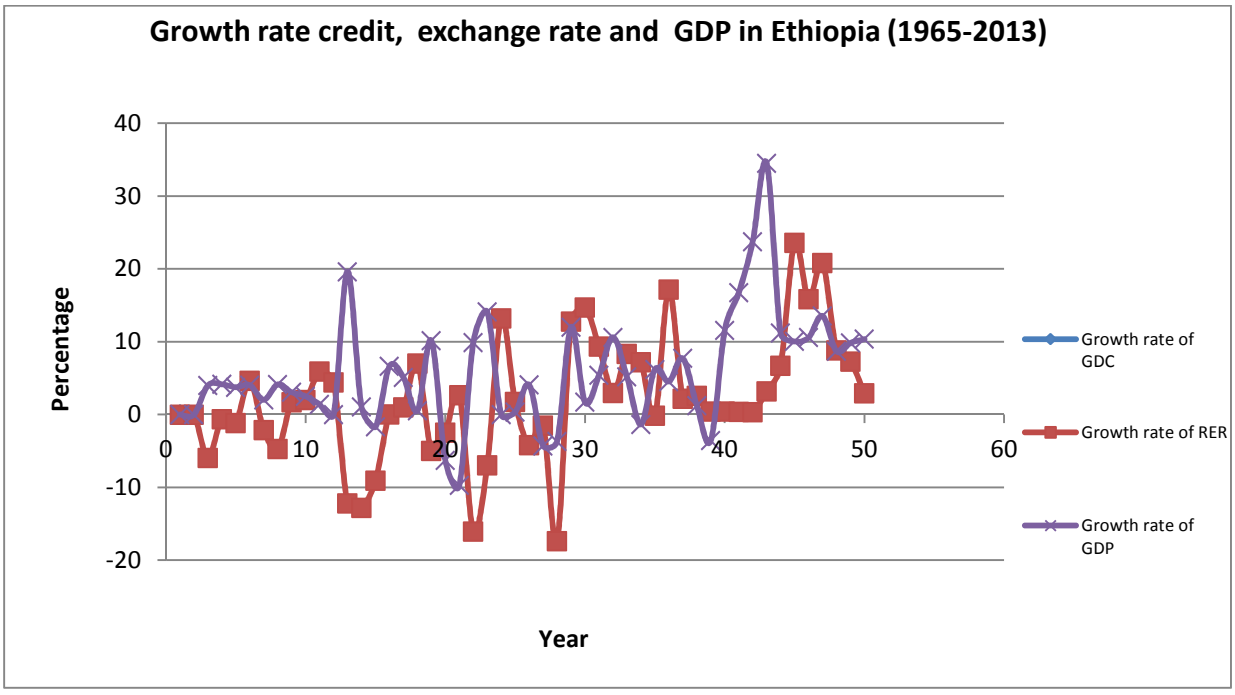
Source: Own Computation, 2015

Figure 2 Percentage of Gross Domestic Investment and Saving: Financing gap



Source: Own Computation, 2015

Figure 3 Percentage of 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 sustained long-term rise in income of a country. Lewis (1954) among others noted, "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.

And 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. And the more recent endogenous growth theories go 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 thereby 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 in that whether saving should be targeted to enhance growth or growth is the cause of saving. In SSA 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 saving 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 high level of saving. Second, due to SSA countries' limited external resources (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 have cast doubt on the conventional wisdom that savings engender economic growth shown by Harrod (1939), Domer (1946) and Solow (1956) indicate 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). For achieving this, it is required for the facilitation of 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 for raising the level of domestic savings and for their efficient channelling 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 saving, investment and economic growth discussed suggest that, first as noted earlier, the theories provide less clear direction for policy makers in that they do not provide a clear direction as to which should be targeted first (saving or growth). It is true that this does not diminish the importance of saving for African countries for reasons appropriately stated by Elbadawi and Mwega (1998), above. But for designing an appropriate policy, it is likely to be 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, at a theoretical level the determinants of saving and investment differ. Therefore, at a policy level the presumption that saving is directly translated to investment may not hold. Arguably, this is more likely to be the case in more recent years than before for at least two reasons: (i) due to the increase in availability of financial instruments not all saving is used for productive investment (but instead at least some of it may be diverted to what is called portfolio investment or speculative capital) purposes; and second, due to liberalization, the relationship between domestic saving 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 saving. The average investment to GDP ratio of 18.5% vis-à-vis the average domestic saving to GDP ratio of about 12.1% for the period 1965-2013 in Ethiopia, which is largely true in most SSA countries, is a case in point.

3.2 Saving and Consumption Smoothing

Given that saving is a postponed consumption, saving 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 saving. 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 (the case of the permanent income hypothesis) or a finite time horizon with overlapping generations (in the case of life-cycle model). In general both theories predict that consumption is determined by life time resources rather than each

period's income. This suggests that, in the absence of borrowing constraint, saving and dissaving is used as a mechanism to adjust the optimal consumption over the life time horizon.

In particular, the life cycle hypothesis postulates that saving (both to repay previous obligations and to finance expenditures during retirement) is made during productive years. This implies that the age structure of the population has a direct influence on aggregate saving such that a high dependency ratio will have a negative impact on saving (Elbadawi and Mwega, 1998, Masson et al, 1995, Birdsall et al, 1999). This is because; a decrease in the relative size of the working population decreases the number of savers relative to dissavers (the young and the old). An increase in per capita income has the opposite effect. As Deaton (1989) noted, "Per capita income growth has a similar effect (as a decrease in dependency ratio) because workers are saving on a larger scale than the retirees are dissaving". It is to be noted that this is the basis for the earlier discussed positive correlation usually observed between growths and saving.

The view that demographic factors affect saving is not however 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: households in poor countries tend to be large and poor; the economy is dominated by agriculture; households face an uncertain income flow and have different demographic structure; 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 since 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 for precautionary (against random decreases in income as short-run buffering) or to finance private investment since availability of credit for such purposes tend 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 for credit facilities to increase investment, designing tax and other policies to ensure profitability of investment will therefore be required to encourage saving.

Further, a common consideration in the context of consumption smoothing and saving is the impact of interest rates on saving. Theoretically, the impact of the real interest rate on saving 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 saving. On the other hand, given an increase in expected income (resulting from high interest rate income), it will lead to an increase in current consumption and therefore decrease current saving. The usual assumption is that the substitution effect dominates and therefore an increase in real interest rate (above the rate of time preference) will have a negative impact on consumption and a positive impact on saving. Even though as will be discussed in the empirical evidence section, its impact in the case of developing countries is very little if at all, many theories pay a significant attention to it as a determinant of saving.

In the context of developing countries, the most widely cited theory in this regard is the McKinnon (1973) and Shaw (1973) "financial repression" hypothesis. The main arguments of this hypothesis could simply put as follows: economic growth in developing countries is low because saving rates are low, and saving rates are low because official real interest rates are low. Implicit in this argument is that, saving is automatically translated to investment and economic growth is mainly determined by the rate of investment. It further assumes that private

saving responds positively to real interest rate. The repression of the financial sector as reflected in low or negative real interest rates, therefore, hinders saving mobilization. Aryeetey and Udry (1999) observed that, "real interest rates are often generally low in most of SSA for a number reasons, including relatively high inflation and other indicators of macroeconomic instability, as well as institutional factors that have often repressed interest rates".

If indeed the main obstacle to private saving mobilization is financial repression, the policy implication is clear. As has been incorporated in any typical structural reform package (usually sponsored by the Bretton woods institutions), it takes the form of liberalization of the financial sector in order to offer positive deposit rate such that it encourages private saving. As Masson et al. (1995) noted, "the effect of liberalization on saving behavior can operate through at least two channels. First, financial development may provide outlets for financial saving, thereby raising saving rates..., a channel that has been emphasized in the development literature. The second aspect involves liberalization of consumer access to bank credit, as occurred in a number of industrial countries in the 1980s." As is well known, many financial reforms have been undertaken in many SSA countries in the 1980s and early 1990s. Despite such reforms however, real deposit rates have not significantly increased in many African countries as Aryeetey and Udry (1999) noted. According to the above authors, "the real deposit rates have risen far slower than lending rates in many countries, including Ghana, Malawi, Tanzania, Uganda and Kenya. There are indications, however, that when there is some stability in macro-economic conditions and deposit rates rise, depositors react positively to such rises as happened in Ghana at the end of the 1980s and in Nigeria earlier." It has to be noted however, the evidence regarding the effect of real interest rate on saving is mixed at best. For instance, Giovannini (1985), Schmidt-Hebbel, Webb and Corsetti (1992) found no significant impact of real interest rate on saving, 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 saving are more complex. For instance, even ex-post saving 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 saving. As noted earlier, the usual rationale for granting aid or concessional loans has been to augment domestic saving. 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, for instance noted), foreign aid is used to smooth out consumption instead of investment, it will have a crowding out effect on domestic saving. That is, foreign aid is a substitute and not complementary to national saving. Recent empirical evidence seems to support the crowding out effect of foreign aid on national saving 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 saving by increasing temporary income or wealth. But the effect of permanent changes in terms of trade on saving 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 saving either by directly increasing public saving or implementing policies that increase private saving. 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 Source of Data

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. In addition, Ethiopian Economics Association (EEA), World Bank Africa database and National Bank of Ethiopia data are used when it is required for example age dependency ratio, domestic saving, etc. If data were available for long period of time, it is fairly long enough to analyze and use a co-integration of nine to ten variables with the reasonable lags. Hence scarcity of data for such period limits the study to analyze only for four to six variables with reasonable lag length.

4.2 Methods of data analysis

This study uses annual data to examine the determinants of domestic saving in Ethiopia. The co- integration procedure requires time series in the system to be non-stationary in their levels. Moreover, 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 saving and other explanatory 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:

$$\Delta X_t = \phi_0 + \beta_1 X_{t-1} + \delta t + \sum_{i=1}^{n} \theta_i \Delta X_{t-1} + \varepsilon_t \qquad (1)$$

Where, for example X_t=LDS is the domestic saving in natural logarithmic, Δ is the first difference operator, t is the time trend, β, δ and θ are parameters, ε is the stationary random error and n is the maximum lag length. The null hypothesis is that the series contains a unit root which implies that $\beta_1 = 0.$ The null hypothesis is rejected if β_1 is negative and statistically significant. To determine the long run relationship between domestic saving and explanatory variables, the Johansen co-integration procedure is used (Johansen and Juselius, 1990 and Johansen, 1991). The procedure involves the estimation of a VECM. Suppose that the two I(1) variables y_t and z_t are cointegrated and that the cointegrating vector is (1,-θ). Then all three variables $\Delta y_t = y_t - y_{t-1}$, Δzt and (yt-θzt) are I(0). The VECM used in the study is specified based on Green (2004) as follows:

$$\mathbf{\Delta y_t = x'_t \beta + \gamma(\Delta z_t) + (y_{t-1} - \theta z_{t-1}) + \varepsilon_t} \qquad (2)$$

Where, y_t is the dependent variable, z_t is the explanatory variables, x'tβ is the trend component, and Δ is represents the difference operator. The model describes the variation in y_t around its long run trend and the vector error correction (y_t- θz_t), which is the equilibrium error in the model of cointegration. 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).

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 saving (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 (LRGDP)	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 AND RESULTS

Obviously the econometric specification may differ from this general theoretical specification. Based on recent innovations in time series econometrics, the estimation is, in fact, carried out by formulating an Vector Error Correction Model. The estimation is undertaken for the period 1965-2013 using Eview 8 and Oxmetrics. The first step in dynamic modeling is to test for stationarity for the variables of interest. All variables considered are nonstationary at 1% significance level at their level. ADF test statistics suggest that the levels are nonstationary (Table 1). Whereas the first differences of each variable are stationary at 5% significance level. For example, the hypothesis that domestic saving (LDS) at its level has a unit root cannot be rejected but its difference has unit root can be rejected. So domestic saving is I (1). Therefore as we observed from the following table, the levels of the variables are nonstationary and their first differences are stationary at 5% significance level. Then, the variables are Autoregressive of order (1). 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 help to estimate elasticities of the variable.

Table 5.1 Unit Root Test using Augmented Dickey Fuller Test Statistic

	ADF Test Statistic	
Variable	Level	Difference
Domestic saving (LDS)	-2.17	-4.15
Age dependency ratio (ADR)	-2.51	-3.01
Domestic credit (LDC)	-1.52	-3.31
Net domestic investment (LDI)	-0.04	-3.55
Consumer price index (LCPI)	-0.56	-3.96
Real gross domestic product (LRGDP)	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 stationarity of the variables, 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 and Johansen, 1991). Based on Swartz (SC), Hanan Quin (HQ) and Akaike information (AIC) criteria, the appropriate lag length is determined as one. After determining the lag length, the next step is to determine cointegrating equations. The result suggests that zero cointegration is rejected at 1% significant level. Hence the variables are at least cointegrated at one cointegrating equation and at most 4 cointegrating equations (Table 2).

Table 5.2 Johansen cointegration test

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.862051	302.8967	192.89	204.95	None **
0.816704	225.6426	156	168.36	At most 1 **
0.716524	159.4731	124.24	133.57	At most 2 **
0.687931	110.3086	94.15	103.18	At most 3 **
0.565454	64.89188	68.52	76.07	At most 4
0.329562	32.38719	47.21	54.46	At most 5
0.265696	16.79406	29.68	35.65	At most 6
0.114195	4.749592	15.41	20.04	At most 7
0.000526	0.020516	3.76	6.65	At most 8

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

Comparing the trace and Eigen 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 Eigen test indicate that there are 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 long run 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 determinant of domestic saving in Ethiopia (Appendix Table 1-4). 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 Granger causality test which uses F test statistics. Based on 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 the domestic saving (see Table 3). Hence in the long-run structural equations 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 most important variables spanning the relationships.

Table 5.3 Pairwise Granger causality test

Null Hypothesis:	Obs	F-Statistic	Probability	Decision
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
LDI does not Granger Cause LDS	47	9.15	0.00	Rejected
LDS does not Granger Cause LDI		7.28	0.00	Rejected
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
LP does not Granger Cause LDS	47	2.38	0.10	Accepted
LDS does not Granger Cause LP		2.59	0.09	Rejected
LRY does not Granger Cause LDS	47	9.07	0.00	Rejected
LDS does not Granger Cause LRY		6.61	0.00	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 our co-integrating vector is unique and in terms of the structural long run relationship, the variables are significant variables 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 the domestic saving. Our model is valid for one cointegrating equation by specifying the domestic saving as dependent variable and the rest as explanatory variables. Therefore, the long run determinants of domestic saving in Ethiopia includes age dependent ratio, domestic investment, consumer price index, real GDP, terms of trade, foreign capital inflow and money supply.

Table 5.4 Long run determinants of domestic saving in Ethiopia: Dependent variable (LDS)

Explanatory Variable	Coefficient (elasticity)	t-value
LDS_1	0.44	2.74**
LADR_1	9.52	2*
LDC	-0.22	-0.56
LDI	1.13	6.33***
LCPI	-0.63	-2.13**
LRY	0.87	2.12**
LTOT_1	-0.17	-1.12
LFCF_1	0.15	1.69*
LM_1	-0.52	-1.71*
Diagnostic test		
AR 1-2 test: F(2,28) = 0.72[0.49]		
ARCH 1-1 test: F(1,46) =0.001 [0.97]		
Normality test: Chi^2(2) = 6.7 [0.03]		
hetero test: F(34,13) = 0.70 [0.80]		
RESET test: F(2,28) = 2.86 [0.074]		

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

On the other hand, the short run determinant includes age dependent ratio, domestic investment, real GDP, terms of trade, foreign capital inflow, and money supply.

Table 5.5 Short run determinants of domestic saving in Ethiopia: Dependent variable (DLDS)

Variable	Coefficient	t-value
DADR	20.36	2.49**
DLDC	-0.28	-1.07
DLDI	0.97	5.33***
DLCPI	-0.75	-1.99*
DLRY_1	1.15	2.6**
DLTOT_1	-0.32	-2.16**
DLFCF	0.047	0.55
DLM_1	-0.57	-1.86*
R^2 0.926768 F(17,29) = 21.59 [0.000]**		
Adj.R^2 0.883839 log-likelihood 24.7429		
no. of observations 47 no. of parameters 18		
Diagnostic test		
AR 1-2 test: F(2,27) = 0.94 [0.40]		
ARCH 1-1 test: F(1,45) = 0.199 [0.66		
Normality test: Chi^2(2) = 30.20 [0.0000]**		
Hetero test: F(34,12) = 0.53 [0.93]		
RESET23 test: F(2,27) = 1.18 [0.32]		

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

However, when we use the levels for regression analysis (long run determinants), our regression is spurious. On the other hand, if we use the differenced, we will loss the long run determinants of the model. Once there exists a cointegrating vector that ties the variables in the regression equation. That is the variables are cointegrated, vector error correction model is estimated for the significant variables which combined the short run (differenced) and the long run variables spanning the relationship which explain the major determinant of aggregate domestic saving 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 significant of the cointegrating equation coefficient.

Table 5.6 Cointegrating Equation: CE1

Variable	Coefficient	t-value
LADR(-1)	-11.47	-1.83*
LRY(-1)	-1.24	11.69***
LTOT(-1)	0.48	1.6*
LFCF(-1)	0.70	-3.8***
LM(-1)	-0.08	-0.25
LRER(-1)	1.07	-2.48**
LRD(-1)	-0.76	2.16**

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

Table 5.7. Vector Error Correction Model: Dependent variable (D(LDS))

Variable		coefficient	t-value
CE1		0.36	-2.56***
D(LDS(-2))		-0.78	2.79***
D(LADR(-1))		99.65	-4.17***
D(LRY(-1))		3.60	-3.66***
D(LTOT(-1))		-1.27	3.21***
D(LFCF(-1))		-0.48	-1.85*
D(LM(-1))		0.31	-0.34
D(LRER(-2))		-0.43	0.49
D(LRD(-2))		0.25	-0.29
Diagnostic test			
R-squared		0.85	
R-squared	0.61		
Adj. R-squared	0.37		
Sum sq. resids	5.14		
S.E. equation	0.43		
F-statistic	2.56		
Log likelihood	-14.85		
Akaike AIC	1.43		
Schwarz SC	2.14		

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

From the error correction model result, the coefficient of the co-integrating equation tells that about 36 percent of equilibrium corrected each year by change in aggregate domestic saving. The overall performance of the model is well fitted, because the 61% of total variation of the dependent variable is explained by the independent variables included in the model. 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, in the short run domestic saving in Ethiopia is determined by age dependency ratio, real income, foreign capital net flow and terms of trade. In the short run, elasticity of interest rate is the smallest although it has insignificant effect. In the short run the income elasticity with respect to domestic saving is 3.6 implying a direct and statically significant relationship at 1% probability level. Elasticity of age dependency is the highest with a direct relationship with domestic saving. In the short run the income elasticity with respect to domestic saving is 3.6 implying a direct and statically significant effect at 1% probability level.

In the long run, age dependency, real income, 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 positive and statistically significant elasticities with domestic saving at less than 10% probability level. This implied that improvement of term of trade had a positive impact on the improvement of saving. Money supply has inverse and insignificant elasticities. Hence in this empirical study, the result show high age dependency elasticity in the long run and short runs. But low and inverse income elasticity in the long run and high and direct income elasticity in the short run. Elasticity of exchange rate with respect to domestic saving is low and insignificant in the short run and high and significant in the long run. This implied that continuous depreciation of real exchange rate have a positive impact on domestic saving.

6. SUMMARY AND POLICY IMPLICATION

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 saving 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 saving. The policy implication of this is, as is already done in few countries in Africa, encouraging household surveys based on clearly defined concepts of income, consumption and saving. 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.

The results of the model suggested that there is a high correlation between growth and saving. 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 saving as indicated by the statistically significant growth coefficient in saving equations. For Ethiopia, GDP growth is found to be the most important variable that has a significant positive effect on saving. Foreign capital inflow 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 saving. Terms of Trade (ToT) are found to have a statistically significant negative effect on saving particularly in the short-run, but its long-term effect is reverse.

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 saving mobilization.

To Sum-up, the following variables are empirically found to be the most important determinants of saving in Ethiopia. Saving is positively related to income level or GDP growth, terms of trade, real exchange rate, and foreign capital inflow. On the other hand, more often than not it is negatively related to dependency ratio and interest rate. It is hoped that the points raised thus far help to chart an appropriate policy to raise the level of saving.

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APPENDICES

Appendix Table 1. Eigen values of long-run matrix:

real	imag	modulus
-1.231	0.0000	1.231
-1.125	0.0000	1.125
-0.5852	0.0000	0.5852
-0.4627	-0.2443	0.5232
-0.4627	0.2443	0.5232
-0.2159	-0.2622	0.3396
-0.2159	0.2622	0.3396
0.04809	0.0000	0.04809
-0.02716	0.0000	0.02716

Appendix Table 2. Eigenvalues of companion matrix:

real	imag	modulus
1.048	0.0000	1.048
0.9728	0.0000	0.9728
0.7841	0.2622	0.8268
0.7841	-0.2622	0.8268
0.5373	-0.2443	0.5903
0.5373	0.2443	0.5903
0.4148	0.0000	0.4148
-0.2313	0.0000	0.2313
-0.1253	0.0000	0.1253

Appendix Table 3. I(1) cointegration analysis, 1966 - 2013

eigenvalue	loglik	for rank
	280.1555	0
0.90569	336.8245	1

0.62840	360.5831	2
0.55015	379.7552	3
0.43602	393.5007	4
0.42626	406.8348	5
0.39657	418.9576	6
0.22947	425.2139	7
0.17512	429.8345	8
0.026171	430.4709	9

Appendix Table 4. Trace test

H0:rank<=	Trace test [Prob]
0	300.63 [0.000] **
1	187.29 [0.000] **
2	139.78 [0.005] **
3	101.43 [0.018] *
4	73.940 [0.021] *
5	47.272 [0.055]
6	23.027 [0.253]
7	10.514 [0.248]
8	1.2729 [0.259]