JOURNAL OF ECONOMIC DEVELOPMENT 77
Volume 41, Number 2, June 2016

# DRIVERS OF PRIVATE SAVING IN SUB-SAHARAN AFRICAN COUNTRIES

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We utilize both the first-difference and the System GMM to estimate a dynamic private saving function for 39 Sub-Saharan African Countries. Parsimonious results show that the private saving rate is persistent; urbanization ratio, youth dependency ratio, elder dependency ratio, per capita income growth, terms of trade growth, public saving rate, general government consumption, real interest rate, credit to private sector, inflation and current account deficit exert a significant influence on the private saving rate. Apart from showing that the economic policy framework should take into account the persistent nature of the private saving rate, there are other policy insights from the estimation of the private saving model. There is especially the need to pursue growth-enhancing policies, to broaden the tax base, to implement trade-enhancing polices, to improve the functioning of the financial system and to design polices for prudent management of domestic resources in order to reduce current account deficits.

*Keywords*: Private Saving, Arellano Bond, System GMM, Gross National Saving, Investment
*JEL classification*: E21, C13, O16

## 1. INTRODUCTION

The role of saving in the growth process has long been recognized. Saving creates capital formation which is a catalyst in the growth process. For instance, the Solow-Growth model predicts that a rise in saving rate and productivity improvement are associated with an increase in per capita income. Indeed, one of the explanations to the dismal growth performance in Sub-Saharan Africa, particularly in 90s, was the low saving and investment rates (Shawa *et al.*, 2012). The positive link between saving and

* I am grateful to the editor and anonymous referees for valuable comments and suggestions. All remaining errors are my own. The views and opinions expressed in this paper reflect those of the author and do not reflect the official policy or position of the ILO.

growth is also empirical. Estimated growth functions have established positive significant saving coefficients. In this direction World Bank (1993) established that countries with higher saving rates grew at a faster rate than those with low saving rates. Despite the recognised role that saving rates play in explaining economic growth, empirical evidence is less clear about the drivers of saving, particular private saving in Sub-Saharan Africa.

The objective of this paper therefore is to empirically estimate a dynamic model of private saving for 39 Sub-Saharan African countries and examine the main drivers of private saving. The present work adds distinct value to earlier work on saving behaviour. First, estimating a private saving function recognises the role the private sector plays in the growth process, which is mostly ignored in economic analyses. Secondly, past work on saving has concentrated on testing the prediction of a single theory. Recognising that no single theory can fully explain private saving behaviour, we employ an encompassing model to allow a variety of potential determinants. Thirdly, instead of using a diverse group of developing countries that combine Sub-Saharan African countries with other Less Developed countries, we estimate a private saving function for only Sub-Saharan African countries to capture the region's unique characteristics. Some past empirical works have found marked differences in results of Sub-Saharan African panels and other LDC panels (Mwega, 1997). Finally, considering that static panels neglect the lagged variable effects of the left-hand side variable, the paper uses dynamic panels to take full account of the persistent nature of the private saving rate.

The rest of the paper is organized as follows: Section 2 gives some brief trends, Section 3 surveys the literature, and Section 4 presents the methodology. Results are discussed in Section 5, and Section 6 concludes the paper.

## 2. BRIEF TRENDS IN SAVING, INVESTMENT, GDP GROWTH AND CURRENT ACCOUNT BALANCE

Saving rates have generally trailed investment rates in Sub-Saharan Africa. Huge gaps existed in the 1980 and 1990s. Measured as a per cent of GDP, Gross National Savings averaged only 14.9 compared to 23 per cent of investment in the 1980 decade (Table 1). The gap widened further in the 1990 decade with Gross National Savings accounting for only 14 per cent of GDP compared to 23.5 per cent of investment. Good progress was made in the 2000s where Gross National Saving Rates increased and converged towards investment rates. The unpalatable implication of the saving-investment gap is the dependence on foreign capital for development.

Perhaps confirming the results of World Bank (1993), it can be observed that decades of low saving rates are associated with low GDP growth rates in Sub-Saharan Africa and decades of high saving rates are associated with higher income growth (Table 1). GDP grew at below 3 per cent between 1980 and 1999, decades of relatively low Gross Saving Rates. In the 2000s, on the other hand, increases in Gross National Saving

rates at 19.5 per cent (2000-2009) and 21.4 per cent (2010-2015) were associated with higher income growth rates at 5.8 per cent and 5.0 per cent, respectively.

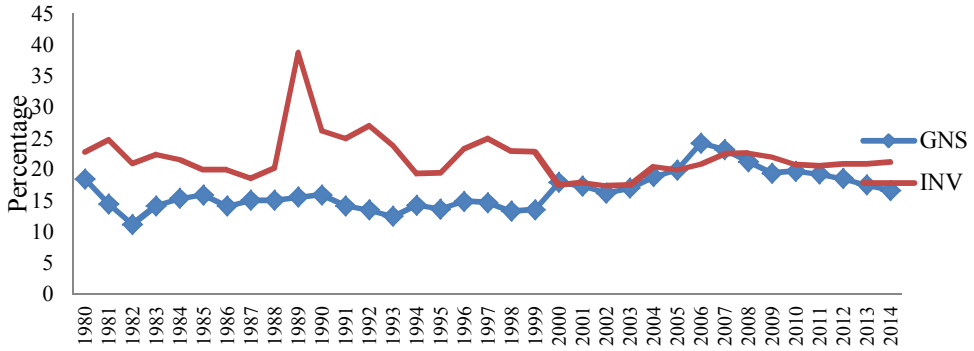
**Table 1.** Decadal Values of Gross National Saving and Investment in Sub-Saharan Africa

| Decade | Gross National Saving (Per cent of GDP) | Investment (Per cent of GDP) | Gross Domestic Product, Constant Prices, Per cent Change |
|---|---|---|---|
| 1980-1989 | 14.9 | 23.0 | 2.5 |
| 1990-1999 | 14.0 | 23.5 | 2.7 |
| 2000-2009 | 19.5 | 19.8 | 5.8 |
| 2010-2015 | 21.4 | 21.4 | 5.0 |

*Source*: IMF- *World Economic Outlook Data Base*: October 2015 Edition.

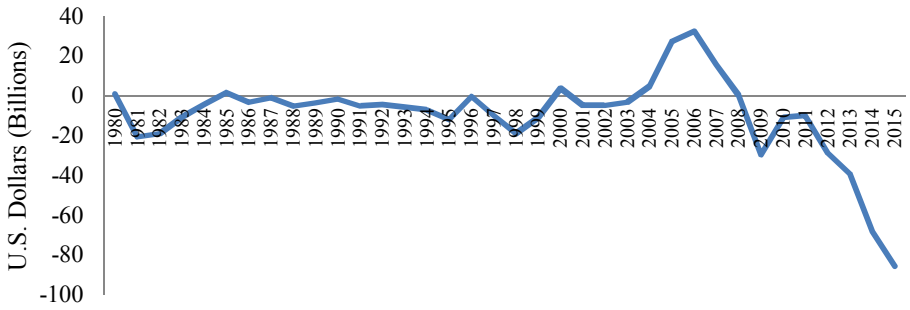
When yearly observations are taken into account (Figure 1) the saving-investment gap is further demonstrated. It is shown that for all the years between 1980 and 2000, Investment was constantly higher than Gross National Saving with 1989 registering the highest gap (23 per cent). Some sort of convergence occurred between 2000 and 2007, thereafter investment assumed higher values again.

In concomitant with the saving-investment gap, the Current Account is in constant negative between 1980 and 2003 and although there is a temporary surplus between 2004 and 2008, the deficit ensues thereafter (Figure 2).




*Source*: IMF- *World Economic Outlook Data Base*: October 2015 Edition.

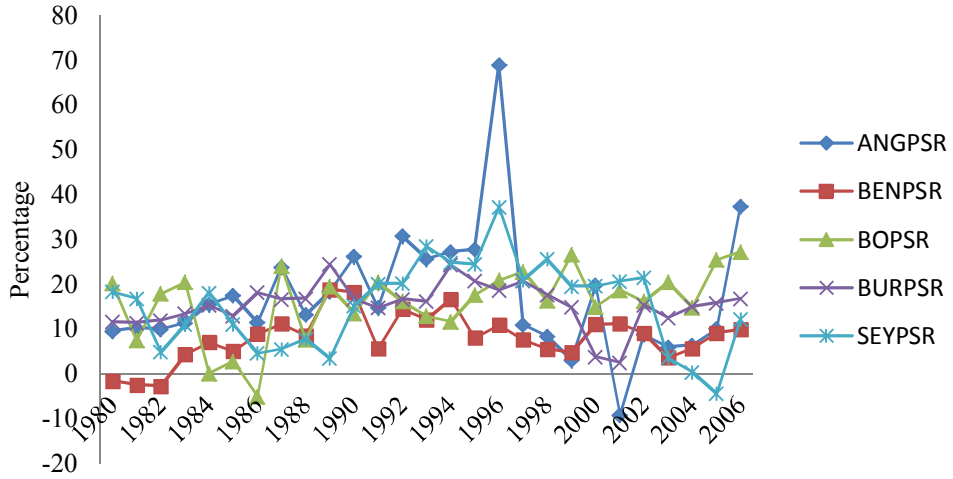
**Figure 1.** Gross National Savings and Investment (Percent of GDP): 1980-2014




*Source*: IMF- *World Economic Outlook Data Base:* October 2015 Edition.

**Figure 2.** Current Account Balance (1980-2014)

Private saving rates mimic the behaviour of saving rates in most African countries. Figure 3 shows trends of private saving rates for Angola, Benin, Botswana, Burundi, and Seychelles. Angola seems to have had higher private saving rates reaching the highest value of 68.9 in 1996 but dropping back sharply to even negative figures thereafter. As can be observed, from 1997 most countries had their private saving rates decrease.




*Source*: Calculated by Author using data from the World Bank's World Development Indicators.

**Figure 3.** Private Saving Rate for Selected Countries

# 3. LITERATURE SURVEY

## 3.1. Theoretical Review

A number of theories have attempted to explain the behaviour of consumption and saving. Coined by Keynes, *the Absolute Income Hypothesis* (AIH) posits that the consumption level of a household depends on its current level of income, with the Marginal Propensity to Consume (MPC) limited between 0 and 1. The MPC determines by what amount consumption will change in response to a change in income. In this theory, the ratio of consumption to income, the Average Propensity to Consume (APC) falls as income rises (Keynes, 1936).

Developed by Fisher the *Model of Inter-temporal Choice* also explains saving behaviour. The model illuminates the constraints consumers' face, the preferences they have, and how these constraints and preferences together determine their choices about consumption and saving (Mankiw, 2010). Fisher argues that although people would prefer to increase the quantity and quality of goods and services they consume, this is not possible because their consumption is constrained by their income, forcing consumers to face a limit on how they can spend, called a budget constraint. A decision of how much to save for the future is affected by an inter-temporal budget constraint which measures the total resources available for consumption today, and in the future.

*The Life Cycle Hypothesis* is another popular theory that explains saving. Developed by Franco Modigliani and his collaborators Albert Ando and Richard Brumberg the theory is built on the consumption/saving behaviour of a representative agent who is assumed to maximise the present value of the lifetime income subject to a budget constraint (Tobin, 1967; Modigliani, 1970; Modigliani and Ando, 1983; Modigliani, 1998; Gourinchas and Parker, 2002 and Deaton 2005). The representative agent spreads his/her lifetime consumption over the entire life by accumulating savings during earning years and maintaining consumption levels during retirement.

In the *Permanent Income Hypothesis*, Friedman (1957) argues that people base consumption on what they consider their "normal" income. In doing this, they attempt to maintain a fairly constant standard of living even though their incomes may vary considerably from month to month or from year to year. As a result, increases and decreases in income that people see as temporary have little effect on their consumption spending. The idea behind the permanent-income hypothesis is that consumption depends on what people expect to earn over a considerable period of time. In this hypothesis saving is influenced by both permanent and transitory components of income. Permanent income is defined in terms of the long-time income expectation over a planning horizon. Transitory income is the difference between actual and permanent income (Ersado *et al.*, 2003).

Duesenberry (1949), in his seminal work, *Income, Saving and the Theory of Consumer Behaviour*, introduced the *Relative Income Hypothesis* in an attempt to rationalize the well-established differences between cross-sectional and time-series

properties of consumption data (Alvarez-Cuadrado and Van Long, 2011). The hypothesis conceives consumption in relation to the income of other households and past income. The first implies that the proportion of income consumed remains constant provided that a household's position on the income distribution curve holds constant in the long-run. This is consistent with long-run evidence. Higher up the income curve, however, there is a lower average propensity to consume. The second part of the hypothesis suggests that households find it easier to adjust to rising incomes than falling incomes. There is, in other words, a "ratchet effect" that holds up consumption when income declines.

Robert Hall developed the *Rational Expectations Hypothesis* which showed that under rational expectations (the assumption that people use all available information to forecast future variables like income) consumption should be a martingale (Hall, 1978). Prior to this time, influenced by Milton Friedman's permanent income hypothesis under adaptive expectations, economists had expected past income to affect current consumption by altering individuals' expectations about their permanent income (Deaton, 1992). Instead, Hall's theory pointed to a relation between current consumption and expected future income, which implied that consumption should only change when there is surprising news about income. This, in turn, implies that changes in consumption should be unpredictable and hence a martingale.

*The Ricardian Equivalence Hypothes*is proposed by David Ricardo is yet another explanation of consumption behaviour. This theory asserts that government deficits are anticipated by individuals who increase their saving because they realize that borrowing today has to be paid later. (O'Driscoll, 1977; Barro, 1974; Barro, 1989). The implication of the Ricardian Equivalence Theorem is that interest rates and consumption will be unaffected by debt-financed government spending.

In their contribution, McKinnon (1973) and Shaw (1973) argue that in a country characterised by "financial repression" raising nominal interest rates relative to inflation would increase saving and the supply of investible resources in an economy (Fry, 1995). The productivity of investment also rises as these resources are channelled to projects that have higher rates of return than hitherto. According to the McKinnon and Shaw doctrine, financial repression arises mostly when a country imposes ceilings on nominal deposit and lending interest rates at a low level relative to inflation. The resulting low or negative real interest rates discourage savings mobilisation and the channelling of the mobilised savings through the financial system. This has a negative impact on the quantity and quality of investment and hence economic growth.

Some theories have been advanced on the premise that the traditional theories of saving are inadequate in explaining saving behaviour. For instance, it has been argued that theories of saving have neglected consumer durables (Miller, 1961; Hayashi, 1985) and that it is important to modify existing models by shifting focus from no-durable to durable consumption. To take into account *durability of consumption goods*, Hayashi (1985) suggests that consumption should be a distributed lag function of expenditure. Assuming that a commodity is perfectly perishable, only current expenditure shows up

in the distributed lag. When durable consumption is taken into account, utility is a function of total consumption in the various time periods. A durable good yields benefits over several periods of time. Consumers thus save and invest when they purchase such goods. Since consumption is not completed in a single period, demand for current production depends upon stocks already in the hands of consumers and on consumers' disposition of these stocks.

Another alternative theory is the *Buffer-Stock Theory*. The permanent-income hypothesis predicts that there should be no relation between the expected growth of an individual's income over his or her lifetime and the expected growth of his or her consumption. Consumption growth is determined by the real interest rate and the discount rate, not by the time pattern of income (Romer, 1996). There is extensive evidence that this prediction of the permanent-income hypothesis is incorrect (Carroll and Summers, 1991; Carroll, 1992; Carroll, 1997). For example, individuals in countries where income growth is very high typically have high rates of consumption growth over their lifetimes, and individuals in slowly growing countries typically have low rates of consumption growth. Similarly, typical lifetime consumption patterns on individuals in different occupations tend to match typical lifetime income patterns in those occupations. Managers and professionals, for example, generally have earnings profiles that rise steeply until middle age and then level off; their consumption profiles follow a similar pattern.

However, most households have little wealth and their consumption approximately tracks their income, but they have a small amount of saving that they use in the event of sharp falls in income or emergency spending needs. In the terminology of Deaton (1991), most household's exhibit buffer stock saving behaviour. As a result, a small fraction of households holds the vast majority of wealth.

*Habit Formation* is another theory that reflects the inadequacy of traditional theories of saving. There is growing interest in habit formation or habit persistence as a way of resolving the unsatisfactory performance of the simple permanent-income-life cycle hypothesis (Rhee, 2004). Habit formation in its most common presentation, is a preference specification according to which the period utility function depends on a quasi-difference of consumption. Under habit persistence, an increase in current consumption lowers the marginal utility of consumption in the current period and increases it in the next period. Intuitively, the more the consumer eats today, the hungrier he wakes up tomorrow. It is in this sense that this type of preferences captures the notion of habit formation.

### 3.2. Empirical Survey

A large strand of empirical work exists on saving. Schmidt-Hebbel *et al.* (1992) analysed household saving in developing countries using household data for a sample of 10 countries using both time series and cross-section observations. Results showed that: log of trend income, income growth rate, and deviation of income from trend had a

positive effect on saving rates. On the other hand, the domestic interest rate had a small and mostly negative insignificant influence on household saving rates. Further, inflation had a negative but statistically insignificant effect on saving while foreign saving boosted private consumption owing to its negative effect on saving. The dependency ratio had widely varying effects depending on the estimation technique used. Fry (1978, 1980), Giovannini (1983, 1985), Masson (1987, 1988), separately examined the role of real growth of GDP in the determination of saving and found positive, significant results.

Flavin (1981), and Campbell and Mankiw (1989) found evidence that households in industrial countries face liquidity constraints. Similar results were found by Haque and Montiel (1989) for a sample of developing countries who established that borrowing constraints are the main cause of the deviations from the Ricardian equivalence. By contrast, Seater (1993) argued that much of the empirical work is inadequate and concluded that the evidence supported the hypothesis of Ricardian equivalence. Nevertheless, Corbo and Schmidt-Hebbel (1991a) explicitly tested the Ricardian equivalence hypothesis in 13 developing countries and concluded that the Ricardian hypothesis does not explain consumption behaviour.

Early work on the effect of demographic variables on saving especially that of Leff (1969) found that the age dependency ratio had a strong negative effect on saving. However, subsequent work challenged the robustness of this result and examined both the theory and measurement of demographic variables, arguing that the results seem to depend on the data used and on the other explanatory variables included (Masson, 1987; Masson, 1988). Collins (1991) using a cross-section of Asian countries, established an ambiguous effect of the dependency ratio with a negative (positive) influence on saving in countries with high (low) growth rates.

Examining the determinants of private saving in OECD, Serres and Pelgrin (2003) established that the private saving rate is negatively related to the public saving rate, the old age dependency ratio and the real interest rate. Further the study established that the private saving rate was positively linked to a change in the terms of trade and productivity growth. No discernible effects of the inflation rate were found.

In the context of developing countries, Raut and Virmani (1989) established a significant relationship between current or predicted income and consumption. They also tested the life-cycle-permanent income hypothesis under rational expectations when both interest rate and labour earnings are stochastic. They found the coefficients of current and predicted future income very low and insignificantly different from zero. Thus the null hypothesis of Hall's life-cycle-permanent income hypothesis was not rejected for these countries. Failure to reject Hall's hypothesis under variable interest rates also suggested the possibility of Ricardian equivalence.

To investigate factors behind considerable variation in saving rates across countries and over time, Loayza *et al.* (1999) used a lagged cross-country time series data set constructed for the World Bank saving project. In the estimated private saving model, lagged private saving rate had a positive and significant coefficient revealing a large

degree of persistence. Both the level and the growth rate of real per capita private disposable income had a positive and significant impact on the private saving rate. The indicator of financial depth (ratio of M2 to GNP), however, had a small and statistically insignificant impact on private saving rate. This work also established a negative impact of public saving on private saving. As for demographic variables, the urbanization ratio, the young and old age dependency ratios have a negative and significant impact on the private saving rate. Further, the study established positive impact of inflation on the private saving rate.

In a country-specific context, Mwega *et al.* (1990) estimated a private saving function for Kenya. The study found a significant coefficient of per capita income (but not in all the models). The growth of real income was however consistently significant, and the coefficient of lagged private saving was highly significant suggesting the existence of adjustment lags in private saving behaviour in Kenya. In this study, the real deposit rate had an insignificant coefficient implying that the hypothesis that the real deposit rate is an important tool in mobilizing private saving in Kenya does not hold.

In seeking to explain the Sub-Saharan Africa's dismal performance and identifying policies that could help to reverse the region's decline in saving, Elbadawi and Mwega (2000) analysed the determinants of private saving in Sub-Saharan Africa. The study established that in Sub-Saharan Africa causality runs from growth to investment (and perhaps to private saving), whereas a rise in the saving rate Granger-causes an increase in investment. The empirical analysis of private saving in Sub-Saharan Africa and other regions over 1970-1995 suggested that the private saving in Africa could be explained by standard behavioural models. In a related study Mwega (1997) compared private saving models for LDCs and Sub-Saharan Africa and concluded that the coefficients of the two models had marked differences.

Using a reduced form equation to relate private saving to a set of economic fundamentals controlling for structural factors and institutional differences among countries, Ferruchi and Miralles (2007) found that population aging lowered private saving over time, an increase in government borrowing increased private saving, and that government consumption was negatively correlated with private saving in the long run. Additionally, higher GDP growth increased private saving in the long run, inflation was positively correlated with private saving, positive terms of trade increased saving and financial development as measured by the share of private sector credit in GDP exerted the anticipated negative effect on saving.

## 4. METHODOLOGY

### 4.1. Dynamic GMM Estimators

In the selection of an appropriate estimation procedure many issues need special consideration (Shawa *et al.*, 2012). First, we want to allow inertia in the private saving

rate that may arise from lagged effects of the explanatory variables in private saving. Further, it is common knowledge that some explanatory variables included in the equation may be jointly endogenous (Schrooten and Stephen, 2005). Furthermore, unobserved time-and-country-specific factors may be correlated with the explanatory variables leading to biased and inconsistent estimates. These issues have to be addressed. We describe the GMM estimators used by first considering a reduced-form private saving equation of the following form:

$$PS_{i,t} = \delta_1 PS_{i,t-1} + \delta_2 X_{i,t} + \eta_i + \tau_{i,t}, \quad (1)$$

where *PS* is the private saving rate, *X* represents a set of variables that potentially affect the private saving rate for which time and cross-sectional data are available, $\eta$ represents a set of unobserved time-invariant country-specific effects and $\tau$ is the error term. Anderson and Hsiao (1982) note that it is helpful to specify Equation (1) in difference form as it eliminates the country-specific effect and allows lagged levels of endogenous variables to become valid instruments. The difference form equation is given as follows:

$$PS_{i,t} - PS_{i,t-1} = \delta_1(PS_{i,t-1} - PS_{i,t-2}) + \delta_2(X_{i,t} - X_{i,t-1}) + (\tau_{i,t} - \tau_{i,t-1}). \quad (2)$$

We use instruments based on lagged values of the explanatory variables to control for joint endogeneity. In this way we do not assume strict exogeneity that the explanatory variables are uncorrelated with the error term at all leads and lags. Only weak exogeneity is assumed implying that the current explanatory variables may be affected by past and current realizations of the dependent variable but not by its future innovations. Under these assumptions the Arellano and Bond (1991) estimator uses the following set of moment conditions:

$$E[PS_{i,t-k}(\tau_{i,t} - \tau_{i,t-1})] = 0 \text{ for } k \geq 2, \ t = 3,\ldots,T, \quad (3)$$

$$E[X_{i,t-k}(\tau_{i,t} - \tau_{i,t-1})] = 0 \text{ for } k \geq 2, \ t = 3,\ldots,T. \quad (4)$$

According to Blundell and Bond (1998), although the GMM estimator based on Equations (3) and (4) is asymptotically consistent, it has low asymptotic precision and large biases in small samples. In order to mitigate these problems, Arellano and Bover (1995) suggested a different estimator commonly known as the System GMM. This estimator combines in a system, regression equations in levels with the regression in differences estimator (Blundell, 2002). It exploits moment conditions on the model in levels in addition to moment conditions on the first-differenced model. The additional moment conditions for the regression in levels are given by:

$$E[PS_{i,t-k} - PS_{t-k-1}(\eta_i + \tau_{i,t})] = 0 \text{ for } k = 1, \quad (5)$$

$$E[X_{i,t-k} - X_{i,t-k-1}(\eta_i + \tau_{i,t})] = 0 \text{ for } k = 1. \quad (6)$$

We use both the Arellano-Bond (1991) estimator: the first-difference estimator and the Arellano-Bover (1995)/Blundell-Bond (1998) estimator: the System GMM estimator. We use four specifications: Arellano-Bond (AB) one way fixed effects specification; Arellano-Bond (AB) two-way fixed effects specification; System GMM (Sys-GMM) one-way fixed effects specification; and System GMM (Sys-GMM) two-way fixed effects specification.

### 4.2. The Basic Model

The empirical review has provided vital insights on possible factors that can explain the behaviour of private saving. These can be categorised into *income* variables, *demographic* variables, *fiscal policy* variables, variables that capture the characteristics of the *financial system*, variables that capture *uncertainty or macroeconomic instability* and variables that capture the *open economy dynamics*.

Income variables include *per capita income* and *growth in per capita income*; demographic variables include *old-age dependency*, *young age dependency*, and *urbanisation*; fiscal policy variables include *public saving* and *government consumption expenditure*; characteristics of the financial system are captured by the *real deposit rate*, the *degree of financial depth* measured by M2/GDP and the degree to which financial constraints are binding measured by *the ratio of private credit to GDP*. *Inflation* captures uncertainty, and open economy dimensions are captured by the *current account deficit* and the *terms of trade growth*.

In the present work we therefore employ an encompassing dynamic panel model which is capable of explaining the variation in private saving across countries and over time. Guided by theory, our empirical model is given as:

$$\begin{aligned}(PS/GDP)_{it} = {} & \beta_0 + \beta_1(PS/GDP)_{it-1} + \beta_2 UR_{it} + \beta_3 YDPR_{it} + \beta_4 EDPR_{it} \\ & + \beta_5 PCI_{it} + \beta_6 PCG_{it} + \beta_7 GTOT_{it} + \beta_8(PUS/GDP)_{it} \\ & + \beta_9(GC/GDP)_{it} + \beta_{10} RIR_{it} + \beta_{11}(M2/GDP)_{it} \\ & + \beta_{12}(PCR/GDP)_{it} + \beta_{13} INF_{it} + \beta_{14}(CAD/GDP)_{it} + \mu_{it}, \end{aligned} \quad (7)$$

where $(PS/GDP)_{it}$ is the current private saving rate; $(PS/GDP)_{it-1}$ is the one-period lagged private saving rate; $UR_{it}$ is the urbanisation rate; $YDPR_{it}$ is the youth dependency ratio; $EDPR_{it}$ is the elder dependency ratio; $PCI_{it}$ is per capita income; $PCG_{it}$ is growth in per capita income; $GTOT_{it}$ is growth in terms of trade; $(PUS/GDP)_{it}$ is the public saving rate; $(GC/GDP)_{it}$ is the ratio of general government consumption to gross domestic product; $RIR_{it}$ is the real interest rate (real deposit rate); $(M2/GDP)_{it}$ is the ratio of broad money to gross domestic product; $(PCR/GDP)_{it}$ is the ratio of private credit to gross domestic product; $INF_{it}$is the inflation rate; $(CAD/GDP)_{it}$ is the ratio of current account deficit to gross domestic ratio; $\mu_{it}$ is an error

term that contains country and time specific fixed effects: $\mu_{it} = \mu_i + \upsilon_{it}$ in the one-way error component regression model; $\mu_{it} = \mu_i + \lambda_{it} + \upsilon_{it}$ in the two-way error component regression model; $\mu_i$ is the time-invariant unobserved country-specific effect, $\lambda_{it}$ is the unobservable time effect, $\upsilon_{it}$ is the remainder disturbance term which is independent and identically distributed $IID(0,\sigma_\upsilon^2)$, $i$ and $t$ denote country and time period, respectively.

### 4.3. Rationale for Explanatory Variables

#### *4.3.1. Income Variables*

In the life cycle world, income is expected to exert a positive influence on private saving. Thus a positive relationship is expected between per capita income and private saving. The expected sign for growth in per capita income is however ambiguous. Economic growth increases the income of workers relative to that of non-workers (the youth and retirees) and therefore leads to more saving to cater for increased consumption during their retirement. But the contention of Tobin (1967) and Bosworth (1993) is worth noting. The youth may borrow against future income while workers may anticipate the increased growth and increase consumption instead. Growth may also reduce liquidity and borrowing constraints inducing households to increase consumption. In fact, the simple permanent income theory predicts that higher growth (future growth) reduces current saving (Loayza *et al*., 2000). Nonetheless, in the life cycle model, growth has an ambiguous effect on saving, depending on which cohort benefits the most from income growth, how steep their earnings profile are, and the extent to which borrowing constraints apply (Deaton, 1992).

#### *4.3.2. Demographics*

In the life cycle domain, the age composition of the population is postulated to have a significant influence on household saving behaviour. The youth and the elderly have low income and low savings. Those in the middle age have higher productivity, incomes and save more to repay past obligations and to finance their retirement. Consumption on the other hand is fairly stable or slightly increasing over time. Aggregate saving will therefore be affected by the age distribution of the population. Rapid population growth also increases the proportion of the youth and may adversely affect saving unless this is offset by an increase in income or a decrease in consumption by the working population. The life cycle model predicts a negative relationship between the private saving rate and the dependency ratio. This will only hold provided that the life cycle motive for saving to finance retirement is important (Mwega, 1997; Elbadawi and Mwega, 2000). If the bequest motive dominates among the elderly, an increase in the dependency ratio may actually increase the private saving rate rather than reduce it (Deaton, 1995). Empirical evidence is conflicting and therefore has not resolved the issue (Harrigan, 1995).

As regards urbanization, Elbadawi and Mwega (2000) note that urbanization may either reduce or increase the saving rate. It can reduce the private saving rate if precautionary saving associated with the volatility of income in the agricultural sector is reduced and if this effect dominates the increase in saving arising because urban dwellers may have better access to financial instruments.

### *4.3.3. Fiscal Policy Variables*

The government budget balance (public saving) may or may not influence private saving. Depending on the assumption made, this may have no impact (neoclassical), some impact (Keynesian), or is fully crowded out (Ricardian equivalence). The Ricardian equivalence asserts that it does not matter whether the government finances its expenditure through taxes or borrowing. Thus, only the time path of government expenditure affects the economy and not the time path of taxes that finance such expenditure.

As regards government consumption, Edwards (1994) observes that for given government savings, an increase in government consumption expenditures entails an equal increase in tax revenue. Hence if members of the public do not value government consumption, private saving will decline. If they value government consumption, the effect of an increase in government expenditure will depend on the degree of substitutability of private saving and consumption in the individual's utility function.

### *4.3.4. Financial Variables*

As regards interest rate, the life cycle hypothesis predicts positive correlations between interest rates and saving if the substitution effect surpasses the income effect. If a household is a net lender on the other hand, an increase in interest rate will increase life time income, and so increase consumption and reduce saving. Thus in line with the inter-temporal model, the impact of interest rate on saving is ambiguous. The McKinnon and Shaw doctrine, however postulates that under conditions of financial repression the substitution effect dominates the income effect. The doctrine also postulates that there is a portfolio effect in which an increase in real interest rates induces a shift in the composition of the wealth portfolio from non-financial to financial assets, thereby enhancing financial intermediation. Under this doctrine therefore real interest rates (real deposit rate) will increase saving.

Liquidity and borrowing constraints can also affect private saving. According to Mwega (1997), the extent to which individuals can actually dissave in the inter-temporal model will depend on their ability to borrow for consumption against future income. If the borrowing constraints are binding, for example due to banks' unwillingness to lend due to uncertainty of future incomes or risk of moral hazard from default behaviour on the side of borrowers, individuals who would like to borrow to increase present consumption cannot do so. They are constrained in consumption to their current

liquidity- current incomes and assets. However, if borrowing constraints are less stringent, present consumption will increase and saving will decrease.

#### *4.3.5. Uncertainty*

In terms of inflation and uncertainty, the life-cycle model posits that inflation affects saving through its role in determining the interest rate. This is based on the assumption of the absence of real balance effect of inflation and the non-existence of money illusion in people's saving behaviour. Inflation brings about uncertainty in the future income streams and this may induce higher saving on precautionary grounds. Skinner (1988) and Zeldes (1989) note that an increase in uncertainty should raise saving since risk-averse consumers set resources aside as a precaution against possible adverse changes in income.

#### *4.3.6. Open Economy Dimension*

The current account balance is used as a proxy for international borrowing: a deficit implies that a country receives credit from abroad whereas a surplus implies that a country grants credit to other countries. Assuming that national saving and foreign capital might be substitutes, it is expected that a higher current account deficit goes along with reductions in national savings.

In general, a change in terms of trade has an ambiguous effect on private saving. The Harberger (1950) and Lausern and Meltzer (1950) effect holds that an improvement in the terms of trade increases incomes and hence saving, especially when the improvement is considered transitory and therefore not expected to last (Mwega, 1997). With this line of argument, a positive relationship is expected between private saving and growth in terms of trade. However, the relationship between saving and terms of trade crucially depends on the expected duration of terms of trade shock. If expected to be permanent, it would have a limited impact on savings as postulated by the permanent income hypothesis. Changes in terms of trade could in fact be negatively correlated with private saving if their improvement reduces liquidity constraints when these are affected by the availability of foreign exchange.

### 4.4. Data Sources

The panel data set used in the study has a time series dimension spanning from 1985 to 2008 and a cross-section dimension consisting of 39 units. Several data sources were used to collect data for estimation purposes. The data sources included the various issues of African Development Indicators, various issues of World Development Indicators, various issues of World Bank Africa Data Base, various issues of the IMF's International Financial Statistics (IFS), various editions of the IMF World Outlook Data Base, the Updated World Bank Global Development Network Growth Database, various

issues of African Statistical Yearbooks, various issues of the World Economic and Financial Survey (Regional Economic Outlook:Sub-Saharan Africa); various issues of the Global Development Finance, and Penn World Tables.

### 4.5. Panel Data Properties

Since standard inference procedures do not apply to regressions which contain an integrated dependent variable or integrated regressors, it is important to ascertain whether the variable is stationary or not before using it in a regression. Four panel unit root tests are employed and they include the Levin, Lin & Chu t* test (LLC), the Im, Peseran and Shin W-stat test (IPS), the ADF-Fisher Chi-Square test (ADF-FCS) and the PP-Fisher Chi-Square test (PP-FCS). While the LLC test assumes common unit root processes, the other three tests assume individual unit root processes. Further, while probabilities for Fisher tests are computed using an asymptotic Chi-square distribution, all other tests assume asymptotic normality. Furthermore, the panel unit root tests employed in this study are conducted under the null hypothesis of *unit root* implying that a rejection confirms stationarity.

Panel unit root tests are classified on the basis of whether there are restrictions on the autoregressive process across cross-sections or series. We consider the following AR(1) process for panel data:

$$y_{it} = \rho_i y_{it-1} + X_{it}\delta_i + \varepsilon_{it}, \tag{8}$$

where $i$=1,2,…,$N$ cross-section units or series that are observed over periods $t$=1,2,…,$T_i$. The $X_{it}$ represent the exogenous variables in the model including any fixed effects or individual trends, $\rho_i$ are the autoregressive coefficients, and the errors $\varepsilon_{it}$ are assumed to be mutually independent idiosyncratic disturbance. If $|\rho_i| < 1$, $y_i$ is said to be weakly ( trend ) stationary. On the other hand if $|\rho_i| = 1$ then $y_i$ contains a unit root.

For purposes of testing there are two natural assumptions that we can make about $\rho_i$. First, one can assume that the persistent parameters are common across cross-sections so that $\rho_i = \rho$ for all $i$. Alternatively, one can allow $\rho_i$ to vary freely across cross-sections.

#### *4.5.1. Levin, Lin and Chu Test*

The Levin, Lin, Chu (LLC) test (See Levin *et al*., 2002) assumes that there is a common unit root process so that $\rho_i$ is identical across cross-sections. The test employs a null hypothesis of a unit root and considers the following basic ADF specification:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij}\, \Delta y_{it-j} + X'_{it}\delta + \varepsilon_{it}, \tag{9}$$

where we assume a common $\alpha = \rho - 1$ but allow the lag order for the difference terms,

$p_i$ to vary across cross-sections. The null and alternative hypothesis may be written as:

$$H_0: \alpha = 0, \tag{10}$$

$$H_1: \alpha < 0. \tag{11}$$

The test derives its estimates of $\alpha$ from proxies for $\Delta y_{it}$ and $y_{it}$ that are standardized and free of autocorrelation and deterministic components. For a given set of lag orders, we begin by estimating two additional sets of equations, regressing both $\Delta y_{it}$ and $y_{it-1}$ on the lag terms $\Delta y_{it-j}$ (for $j$=1,…, $p_i$) and the exogenous variables $X_{it}$. The estimated coefficients from these two regressions will be denoted ($\beta$,$\delta$) and ($\dot{\beta}$,$\dot{\delta}$) respectively. We define $\Delta\overline{y}_{it}$ by taking $\Delta y_{it}$ and removing the autocorrelations and deterministic components using the first set auxiliary estimates:

$$\Delta\overline{y}_{it} = \Delta y_{it} - \sum_{j=1}^{p_i} \beta_{ij}\, \Delta y_{it-j} - X'_{it}\delta. \tag{12}$$

Likewise we may define the analogous $\overline{y}_{it-1}$ using the second set of coefficients:

$$\overline{y}_{it-1} = y_{it-1} - \sum_{j=1}^{p_i} \dot{\beta}_{ij}\, \Delta y_{it-j} - X'_{it}\dot{\delta}. \tag{13}$$

Next we obtain our proxies by standardizing both $\Delta\overline{y}_{it}$ and $\overline{y}_{it-1}$ dividing by the regression standard error:

$$\Delta\overline{y}_{it} = (\Delta\overline{y}_{it}/s_i), \tag{14}$$

$$\overline{y}_{it-1} = (\overline{y}_{it-1}/s_i), \tag{15}$$

where $s_i$ are the estimated standard errors from estimating each ADF in Equation (9).

Lastly an estimate of the coefficient $\alpha$ may be obtained from the pooled proxy equation:

$$\Delta\overline{y}_{it} = \alpha\overline{y}_{it-1} + \eta_{it}. \tag{16}$$

LLC show that under the null, a modified t-statistic for the resulting $\hat{\alpha}$ is asymptotically normally distributed:

$$t^*_{\alpha} = \frac{t_{\alpha} - (N\overline{T})S_N\hat{\sigma}^{-2}se(\hat{\alpha})\mu_{m\overline{T}^*}}{\sigma_{m\overline{T}^*}} \xrightarrow{d} N(0,1), \tag{17}$$

where $t_{\alpha}$ is the standard t-statistic for $\hat{\alpha} = 0$, $\hat{\sigma}^2$ is the estimated variance of the error term $\eta$, $se(\hat{\alpha})$ is the standard error of $\hat{\alpha}$ and $\overline{T} = T - (\sum_i p_i/N) - 1$. The average

standard deviation ratio, $S_N$ is defined as the mean of the ratios of the long run standard deviation to the innovation standard deviation for each individual. $\mu_{m\overline{T}^*}$ and $\sigma_{m\overline{T}^*}$ are adjustment terms for the mean and standard deviation.

*4.5.2. Im, Pesaran and Shin Test*

Im, Pesaran and Shin (Im *et al.*, 2003) begin by specifying a separate ADF regression for each cross-section;

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \dot{\beta}_{ij} \Delta y_{it-j} + X'_{it}\delta + \varepsilon_{it}. \quad (18)$$

The null hypothesis and alternative hypotheses are given as:

$$H_0: \alpha_i = 0 \text{ for all } i, \quad (19)$$

$$H_1 = \begin{cases} \alpha_i = 0 & \text{for} \quad i = 1,2,\dots,N \\ \alpha_i < 0 \text{ for } i = N+1, N+2, \dots N. \end{cases} \quad (20)$$

After estimating the separate ADF regressions, the average of the t-statistics for $\alpha_i$ from the individual ADF regressions $t_{iTi}(pi)$:

$$\overline{t}_{NT} = (\sum_{i=1}^{N} t_{iTi}\,(pi))/N, \quad (21)$$

is then adjusted to arrive at the desired test statistics. In the general case where the lag order may be non-zero for some cross-sections, IPS shows that a properly standardised $t_{NT}$ has an asymptotic standard normal distribution:

$$W_{\overline{t}_{NT}} = \frac{\sqrt{N}(\overline{t}_{NT} - N^{-1}\sum_{i=1}^{N} E\left(\overline{t}_{iT}(p_i)\right))}{\sqrt{N^{-1}\sum_{i=1}^{N} Var(\overline{t}_{iT}(p_i))}} \xrightarrow{d} N(0,1). \quad (22)$$

*4.5.3. Fisher ADF and Fisher PP*

An alternative approach to panel unit root tests uses Fisher's (1932) results to derive tests that combine the p-values from individual unit root tests. This idea has been proposed by Maddala and Wu and Choi (Maddala and Wu, 1999; Choi, 2001). If we define $\pi_i$ as the p-value from any individual unit root test for cross-section *i*, then under the null of unit root for all *N* cross sections we have the asymptotic result that:

$$-2\sum_{i=1}^{N} \log(\pi_i) \xrightarrow{d} \chi_2^2 N. \quad (23)$$

In addition Choi demonstrates that:

$$Z = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \phi^{-1}(\pi_i) \xrightarrow{d} N(0,1), \quad (24)$$

where $\phi^{-1}$ is the inverse of the standard normal cumulative distribution function. The null and alternative hypotheses are the same as in IPS.

**Table 2.** Panel Unit Root Tests

| Variable | Levin, Lin & Chu t* (LLC) | Im, Peseran and Shin W-stat (IPS) | ADF-Fisher Chi-Square (ADF-FCS) | PP-Fisher Chi-Square (PP-FCS) |
|---|---|---|---|---|
| Private Saving Rate | -4.9507*** | -6.3492*** | 165.7370*** | 165.9800*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| Urbanisation Ratio | -6.4567*** | -2.0753** | 296.8180*** | 51.1848*** |
| | (0.0000) | (0.0190) | (0.0000) | (0.0001) |
| Youth Dependency Ratio | -12.5008*** | -5.1592*** | 314.2960*** | 135.9087*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| Elder Dependency Ratio | -15.8012*** | -4.5496*** | 153.8880*** | 126.4938*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| Per Capita Income | -5.7733*** | -3.0376*** | 189.8120*** | 177.4532*** |
| | (0.0000) | (0.0012) | (0.0000) | (0.0000) |
| Per Capita Growth | -16.0288*** | -17.5012*** | 407.2170*** | 423.6740*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| TOT Growth | -23.0876*** | -25.0021*** | 583.1700*** | 597.7800*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| Public saving/GDP | -3.7471*** | -4.0386*** | 126.7240*** | 128.6020*** |
| | (0.0001) | (0.0000) | (0.0000) | (0.0000) |
| General Govt Cons/GDP | -33.4484*** | -3.1930*** | 301.0840*** | 92.5123* |
| | (0.0000) | (0.007) | (0.0000) | (0.0513) |
| Real Interest Rate | -10.2138*** | -11.3031*** | 263.3660*** | 265.1750*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| M2/GDP | -1.6729** | -1.8652** | 101.5230** | 82.8376* |
| | (0.0472) | (0.0204) | (0.0380) | (0.0792) |
| Private Credit/GDP | -1.7299** | -1.4038* | 103.9720*** | 83.8278* |
| | (0.0403) | (0.0802) | (0.0020) | (0.0684) |
| Inflation | -7.6589*** | -9.4850*** | 230.4360*** | 232.8940*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| Current Account Deficit/GDP | -5.4904*** | -6.8002*** | 168.3900*** | 166.4710*** |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) |

*Notes*: *** Significant at 1% level; ** Significant at 5% level;*Significant at 10% level; Figures in parentheses are p-values.

# 5. RESULTS AND DISCUSSION

## 5.1. Panel Unit Root Tests

Panel unit root tests are employed using the Levin, Lin & Chu t* test (LLC), the Im, Peseran and Shin W-stat test (IPS), the ADF-Fisher Chi-Square test (ADF-FCS) and the PP-Fisher Chi-Square test (PP-FCS). From the results (Table 1) all the four tests confirm that the panel is stationary.

## 5.2. Regression Results

The models are first estimated including all the variables. After obtaining the initial results, insignificant variables are removed one by one until a parsimonious model is identified for each formulation. Results of the non- parsimonious dynamic GMM panel estimation are reported in Table 3. The corresponding parsimonious models are reported in Table 4.

To avoid spurious results, for each model specification, the validity of the instrument variables is checked first, using the Sargan test of over-identifying restrictions. In this test the model specification is confirmed if the null hypothesis, stating that the instruments are valid, cannot be rejected. To construct the Sargan test of over-identifying restrictions, the J- Statistic is used, which is simply the Sargan Statistic. The Sargan statistic is distributed as $\chi(p-k)$ where $k$ is the number of estimated coefficients and $p$ is the instrument rank. Results of the Sargan test show that the null hypotheses cannot be rejected implying that there is no correlation between the error term and the instruments. Thus all model specifications are valid for both the non-parsimonious and parsimonious models as there is evidence of support for the instruments used in the estimation process (see Sargan p-values in Tables 4 and 5 which report regression results). Further, the hypothesis of lack of second order residual serial correlation cannot be rejected indicating support for the dynamic specification (see p-values for 2nd order serial correlation test). Furthermore, results from the Wald test of joint significance show that the coefficients are jointly significant.

Regression results show that the one-period lagged saving rate has the expected positive and highly significant effect on current private saving as shown by the System GMM estimators.[1] The estimated coefficients are 0.0792 in model 3, 0.2100 in model 4, 0.0892 in model 7 and 0.2276 in model 8. This indicates that saving rates inherit a certain degree of persistence, underscoring the importance of using dynamic models. Additionally, the finding of persistent private saving rates is in line with other studies including studies by Loayza *et al*. (1999) and Schrooten and Stephan (2005). In a single

[1] It is common knowledge that in persistent data the Arellano and Bond (1991) estimator produces biased results and is less efficient than the System GMM. Thus, in any case of conflict between the results of the two models, the results of the System GMM will be preferred.

country case, Mwega *et al.* (1990) also found evidence of a persistent private saving rate.

**Table 3.** Regression Results of the Dynamic GMM Estimation Techniques

| Variable | AB One-Way Model(1) | ABTwo-Way Model(2) | Sys- GMM One-Way Model(3) | Sys-GMM Two-Way Model(4) |
|---|---|---|---|---|
| Lagged Private | -0.1205*** | -0.0779*** | 0.0792*** | 0.2100*** |
| Saving Rate | (-8.0510) | (-3.9057) | (4.5473) | (4.9648) |
| Urbanisation | 0.4342** | 1.2449* | 0.7248*** | 1.7612*** |
| Ratio | (2.0220) | (1.7739) | (5.6586) | (3.5756) |
| Youth | 0.4225** | 0.5689** | 0.4728*** | 0.6094*** |
| Dependency Ratio | (2.0545) | (2.4218) | (5.5744) | (2.8514) |
| Elder Dependency | -0.1755 | -2.6329** | -0.8856 | -2.9029** |
| Ratio | (-0.3257) | (-2.2002) | (-1.4972) | (-2.3978) |
| Per Capita Income | 0.1765 | 0.1261 | -0.2120* | -0.3366 |
| | (0.7855) | (0.5592) | (-1.7470) | (-1.4682) |
| Per Capita | 0.1653*** | 0.1894*** | 0.1154** | 0.1847** |
| Growth | (4.6016) | (4.0530) | (2.3886) | (2.3805) |
| Terms of Trade | 0.0285*** | 0.0372*** | 0.0400** | 0.0335* |
| Growth | (2.6694) | (3.2340) | (2.0088) | (1.9603) |
| Public | -0.7880*** | -0.8400*** | -0.9379*** | -0.7359*** |
| saving/GDP | (-14.5327) | (-17.1779) | (-20.8225) | (-8.2653) |
| General Govt | -0.0111 | -0.0669 | 0.0341** | -0.0361 |
| Cons/GDP | (0.7622) | (-1.2195) | (2.3444) | (-0.6122) |
| Real Deposit Rate | 0.1119*** | 0.1064** | 0.0591*** | 0.1123** |
| | (3.1508) | (2.2545) | (2.8774) | (2.5584) |
| M2/GDP | -0.0443 | -0.0574 | 0.0758* | 0.1770 |
| | (-0.9185) | (-0.7328) | (1.8446) | (1.4933) |
| Private | -0.0019 | 0.0389 | -0.0136 | -0.0864** |
| Credit/GDP | (-0.0568) | (1.3977) | (-0.5972) | (-2.1279) |
| Inflation | 0.1122*** | 0.1066** | 0.0592*** | 0.1124** |
| | (3.1479) | (2.2489) | (2.8764) | (2.5552) |
| Current Account | 0.1748** | 0.2157** | 0.2571*** | 0.2375*** |
| Deficit/GDP | (2.0032) | (2.1887) | (8.3082) | (3.5165) |
| Sargan Test | 0.7527 | 0.9929 | 0.6612 | 0.9994 |
| Wald Test | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Serial Correlation Test | | | | |
| 1st Order | 0.0412 | 0.0223 | 0.0121 | 0.0354 |
| 2nd Order | 0.6102 | 0.5178 | 0.4743 | 0.5549 |

*Notes*: *** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level; Figures in parentheses are values of the t-statistic; p-values reported for Sargan, Wald and Serial Correlation tests.

**Table 4.** Regression Results of Parsimonious Dynamic GMM Estimation Techniques

| Variable | AB One-Way Model(5) | AB Two-Way Model(6) | Sys-GMM One-Way Model(7) | Sys- GMM Two-Way Models(8) |
|---|---|---|---|---|
| Lagged Private Saving Rate | -0.1683*** (-9.5699) | -0.0831*** (-4.7924) | 0.0892*** (4.8554) | 0.2276*** (5.2674) |
| Urbanisation Ratio | 0.3173* (1.7149) | - | 0.6001*** (5.4901) | 1.7478*** (4.0955) |
| Youth Dependency Ratio | 0.4971*** (2.8502) | 0.4087* (1.9018) | 0.4354*** (5.7307) | 0.6566*** (2.9363) |
| Elder Dependency Ratio | - | -2.8755** (-2.4462) | - | -1.7964* (-1.8849) |
| Per Capita Growth | 0.1020*** (3.4185) | 0.1900*** (5.7171) | 0.1074*** (3.1669) | 0.1777*** (3.3242) |
| Terms of Trade Growth | 0.0260*** (2.6778) | 0.0389*** (3.3818) | 0.0445** (2.0564) | 0.0348** (2.2349) |
| Public saving/GDP | -0.7371*** (-11.3216) | -0.8304*** (-15.3010) | -0.8838*** (-19.6041) | -0.7610*** (-8.8993) |
| General Govt Cons/GDP | - | - | 0.0290** (2.0564) | - |
| Real Deposit Rate | 0.1136** (2.5766) | 0.1299*** (2.9542) | 0.0743*** (4.1596) | 0.1099*** (2.7710) |
| Private Credit/GDP | - | - | - | -0.0702*** (-2.8088) |
| Inflation | 0.1139** (2.5750) | 0.1301*** (2.3242) | 0.0744*** (4.1583) | 0.1200*** (2.7653) |
| Current Account Deficit/GDP | 0.1705** (2.4244) | 0.2024** (2.1547) | 0.2381*** (8.9159) | 0.2214*** (4.2507) |
| Sargan Test | 0.5110 | 0.9883 | 0.6033 | 0.9999 |
| Wald Test | 0.0012 | 0.0032 | 0.0000 | 0.0000 |
| Serial Correlation Test | | | | |
| 1st Order | 0.0428 | 0.0315 | 0.0192 | 0.0382 |
| 2nd Order | 0.6310 | 0.5528 | 0.4913 | 0.5818 |

*Notes*: *** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level; Figures in parentheses are values of the t-statistic; p-values reported for Sargan, Wald and Serial Correlation tests.

The coefficient of the urbanization ratio is consistently positive and significant in all the models (except in model 6). Elbadawi and Mwega (2000), note that urbanization may either reduce or increase the saving rate. It can reduce the private saving rate if precautionary saving associated with the volatility of income in the agricultural sector is reduced and if this effect dominates the increase in saving arising because urban

dwellers may have better access to financial instruments. The coefficient is positive and significant signalling that the effect of better access to financial instruments by urban dwellers dominates the effect of the reduction in precautionary saving associated with the volatility of income in the agricultural sector.

The coefficient of the youth dependency ratio is positive and significant in all models. On the other hand, the coefficient of the elder dependency ratio is negative and significant in models 2, 4, 6 and 8. In the life cycle domain, provided that the life cycle motive for saving to finance retirement is important, a negative relationship between the private saving rate and the dependency ratios is expected (Elbadawi and Mwega, 2000). While the elder dependency ratio in line with life cycle arguments results of the youth dependency ratio are in contradiction with the life cycle proposition. The positive sign of the coefficient of youth dependency can be attributed to education expenditures, which have to be saved for. The negative sign of the elder dependency ratio is in line with the findings of Ferruchi and Miralles (2007). However, given that in most cases demographic changes are measured by total dependency ratio which usually comes out with a much smaller coefficient, the effects of dependency ratios cannot be directly compared with most previous studies (Serres and Pelgrin, 2003). In this regard, studies by Elbadawi and Mwega (2000) and Serres and Pelgrin (2003) refrained from using total dependency ratios. Elbadawi and Mwega (2000), contrary to the present findings, found a negative and significant youth dependency coefficient and a positive and insignificant coefficient of elder dependency ratio. In line with the present study, Serres and Pelgrin (2003) established a negative coefficient for the elder dependency ratio in OECD countries.

As was established by Mwega (1997) in a sample of 15 Sub-Saharan African countries, and Loayza and Shankir (2000) for India, the coefficient of per capita income is negative and statistically significant (at the 10% level and only in model 3 and does not enter into the parsimonious model) contrary to the predictions of the life cycle theory. Certainly this is not a common finding. In support of this rare finding, Loayza and Shankir (2000) argued that in poor countries, most consumers had not yet satisfied their vital consumption needs. It is therefore only natural that an increase in income translates into an increase in basic consumption and not in financial saving, durable consumption or expenditures on human capital.

The growth of the rate of per capita GDP captures the improvements in the standard of living and should have a positive impact on saving. However, the simple permanent income theory predicts that higher growth (that is higher future growth) reduces current saving (Loayza *et al*., 2000). Further in the life cycle model growth has an ambiguous effect on saving, depending on which cohorts benefit the most from income growth, how steep their earning profiles are, and the extent to which borrowing constraints apply (Deaton, 1992). Current results show a positive and highly significant coefficient for per capita income growth as was found by Japelli and Pagano (1994), Edwards (1994), Mwega (1997), Loayza *et al.* (1999), Elbadawi and Mwega (2000), Schimdt- Hebbel *et al*. (1992), and Schrooten and Stephan (2005). A 1 % increase in economic growth raises

the private saving rates by about 0.19% points in models 2 and 6. The results confirm the existence of virtuous cycle between private saving and growth.

Terms of trade growth have positive and highly significant coefficients in all the models. These results are in line with the Harberger-Laursen-Meltzler effect which argues that an improvement in the terms of trade leads to an increase in saving and in the trade balance. The modern literature integrates this effect into inter-temporal models and stresses the distinction between transitory and permanent changes in the terms of trade (Masson *et al.*, 1998). A transitory improvement in terms of trade, leads only to a transitory change in income. A permanent increase on the other hand, leads to a reduction in saving as consumers increase their consumption. The positive and significant coefficient of growth in terms of trade therefore points to the direction that the improvement in terms of trade in the period under study has been transitory. Similar findings have been reported by a variety of other studies including Masson *et al.* (1998), Haque *et al.* (1999), Loayza *et al.* (2000), Serres and Pelgrin (2003), and Ferruchi and Miralles (2007). Further, results of these studies confirm the contention by Ostry and Reinhart (1992) who observed that empirical literature tends to confirm a positive correlation between transitory terms of trade shocks and saving.

The public saving coefficient is negative and highly significant in all models. An increase in the public saving rate by 1% reduces the private saving rate by at least 0.7% points. The degree of offset is much higher in model 3 (the one-way system GMM) of about 0.9% points and is similar to the estimates in literature. For instance, Mwega (1997) found the degree of offset coefficient of about 0.9% points in a model of 33 LDCs and Harrigan (1995) found a short-run coefficient of -0.8 and Serres and Pelgrin (2003) found coefficients ranging from -0.5 to -0.9 in OECD countries. The negative sign is in line with results of studies by Mwega (1997), Corbo and Schmidt-Hebbel (1991a), Edwards (1996), Loayza *et al.* (2000) and Schrooten and Stephan (2005). The negative sign shows that public saving crowds out private saving in Sub-Saharan Africa. Further, since the degree of offset is less than unity, the results suggest a departure from pure Ricardian Equivalence and only emphasizing partial offsetting private saving behaviour.

The coefficient of the general government consumption is only statistically significant in Models 3 and 7 with a positive sign as was found by Masson *et al.* (1995), Mwega (1997), Elbadawi and Mwega (2000). For a given public saving rate, policies that reduce government consumption expenditures (and reduce tax revenue) would have an adverse impact on private saving rate, consistent with the postulates of the Ricardian Equivalence. Further, this result suggests that the private sector places value on government consumption (Edwards, 1995).

Some studies have established a negative relationship between real interest rate (real deposit rate) and private saving. These studies include Deaton (1982), Giovannini (1983, 1985), Mwega *et al*. (1990), Oshikoya (1992), Edwards (1995), Mwega (1997), Loayza, Schmidt-Hebbel and Serven (2000) and Schrooten and Stephan (2005). The present results show a positive and highly significant coefficient in all models. According to the

inter-temporal model, the impact of interest rates on household saving is ambiguous. Higher interest rates increase the opportunity cost of consumption forcing households to increase saving (the substitution effect) while they increase the wealth of positive savers, hence their consumption increases (the income effect). Thus, saving will have a positive relationship with interest rate only when the substitution effect surpasses the income effect.

In favour of a positive interest rate effect, McKinnon (1973), Shaw (1973) and Athukorola and Sen (2004), argue that when a country is characterized by financial repression, liberalization of interest rates would increase saving and the supply of investible resources in the economy. Adding to this, Nwachukwu and Egwaikhide (2007) argue that in an environment where self-financing and bank loans make up the bulk of investment funds, accumulation of financial saving is determined more by the desire to invest than the desire to live on interest income. As a result, the greater part of household saving will be in the form of cash and near-money assets. Thus the substitution effect will usually be much greater than the income effect of an interest change. The present results therefore are in concomitant with the McKinnon-Shaw hypothesis and signal a larger substitution effect relative to the income effect. Masson *et al.* (1998) also find a positive relationship using first-difference instrumental variables method for a large sample of industrial and developing countries, and Serres and Pelgrin for OECD countries.

The study uses a measure of broad money (M2/GDP) as a proxy for financial deepening. Regarding this measure, Schmidt-Hebbel *et al*. (1996), argued that broad money may be negatively correlated with consumer borrowing constraints (and thus positively with consumption) and positively correlated with consumer wealth (and, again with consumption), as such its relationship with saving is ambiguous, and so are the results of cross country samples. The present study establishes a positive and marginally significant coefficient (although the variable does not enter into the parsimonious model), which contradicts results of studies by Corbo and Schmidt-Hebbel (1991b), and Schmidt-Hebbel *et al.* (1992) who report negative effects of broad money on saving in developing countries. However, in line with the present findings, Edwards (1995) reports positive effects for both industrial and developing countries and Mwega (1997) finds positive effects for a sample of 33 LDCs. Results show that an increase in the M2/GDP ratio by 1% increases the private saving rate by 0.08%. Schmidt-Hebbel *et al.* (1996) argued that financial deepening may raise the efficiency of intermediation, thereby increasing growth and thus private saving. Borrowing from this argument, the positive and significant coefficient (in model 3) may signal some level of efficiency of intermediation in the financial sector of Sub-Saharan Africa. Besides, the positive and significant coefficient suggests that there is a large potential from economic reforms if they deepen the financial system (Mwega, 1997).

According to Schmidt-Hebbel *et al*. (1996) variables that more closely reflect borrowing constraints are reported to have less ambiguous effects on saving. The degree to which financial constraints are binding is measured by the share of domestic credit to

the private sector as a percentage of GDP. The coefficient of this variable is negative and highly significant in only models 4 and 8 as was found by Jappelli and Pagano (1994), Mwega (1997), Elbadawi and Mwega (2000) and Ferruchi and Miralles (2007). Although in his study, the coefficient is insignificant, Edwards (1995) also establishes a negative coefficient. The results suggest that liquidity and borrowing constraints are less stringent and as such consumption thrives reducing private saving since the ability to borrow for consumption against future income induces dissaving motives in the inter-temporal model.

Inflation has consistently positive and significant coefficients in all Models. As it represents macroeconomic uncertainty, the results show that increased uncertainty about the aggregate economy and expectation of further price increases induces agents to lower their current consumption and increase current saving. Thus the result is consistent with the precautionary motive. This is particularly true for households in Sub-Saharan Africa whose income prospects are more uncertain than their counter parts in developed countries. Similar results were reported by Lehmussaari (1990), Masson *et al.* (1998), Haque *et al.* (1999), Loayza *et al.* (2000) and Nwachukwu and Egwaikhide (2007).

The current account deficit has a significant positive coefficient in all models as was found by Gupta (1987), Masson *et al*. (1998) and Schrooten and Stephan (2005). The present results however are contrary to findings by Chenery and Stout (1966), Fry (1978, 1980), Giovannini (1985) and Schmidt-Hebbel *et al.* (1992). Mwega (1997) found positive but insignificant coefficients for a sample of 33 LDCs and negative but insignificant coefficients for a sample of 15 African countries, after controlling for country-specific (fixed) effects.

## 6. CONCLUSIONS AND POLICY IMPLICATIONS

From the dynamic GMM regressions, several conclusions come to light. First and foremost, there seems to be considerable persistence in the private saving rate. This conclusion works in favour of the use of dynamic panel modelling which the study has utilized. Consequently, a consideration of the determinants of private saving in Sub-Saharan Africa should take into account the effect of the previous period saving rate. This means that there are adjustment lags in saving behaviour as the full reaction of savers to changes in their environment is not instantaneous but occurs over time. For instance, only a fraction of the desired change in saving may be adjusted for in any period because of inertia, habit persistence or customs that make savers react only slowly to changes in exogenous stimuli (Mwega *et al*., 1990). Thus the effect of economic policy on private saving is not likely to be instantaneous.

Second, the urbanization coefficient is positive and highly significant. As Elbadawi and Mwega (2000) note, urbanization may positively affect private saving if the effect of the increase in saving arising because urban dwellers may have better access to financial instruments exceeds the effect of reduction in private saving caused by the associated

precautionary saving due to the volatility of income in the agricultural sector. Thus the positive and significant coefficient signals the impact off better access to financial markets by urban dwellers. This underscores the need for policies that enhance access to financial instruments.

Third, the age-structure of the population is important in shaping the private saving function. While the coefficient of the youth dependency ratio is positive and significant in all models, the coefficient of the elder dependency ratio is negative and significant in models 2, 4, 6 and 8. The positive effect of the youth dependency ratio on private saving signals the effect of saving for education expenditures which is a crucial undertaking for households with school going children. The negative impact of the elder dependency ratio is however in line with the expectation of the life-cycle hypothesis. The present results imply that it is important to disaggregate dependency ratios into youth dependency and elder dependency to sift out the individual effects of the two variables since the combined effect of total dependency ratio may be misleading. In order to enhance saving by households with school-going children, banks should provide special financial packages targeting households that save for education. These packages should have favourable interest rates targeting both the urban and rural population. Further, appropriate insurance schemes should be instituted by governments and the private sector. This is the case because results show that the elder dependency ratio has negative impacts on private saving. Yet an appropriate saving mechanism instituted by both the government and the private sector, may do well to encourage the elderly to save for bequests or unpredictable expenses.

Fourth, income variables exert significant influence on private saving. However, per capita income has a negative coefficient and is only marginally significant in model 3. The variable does not enter the parsimonious model. The negative effect of per capita income on private saving may signal that Sub-Saharan Africa is still poor and as such any increases in income prioritise the fulfilment of consumption requirements. On the other hand, the per capita income growth has a positive and highly significant effect on private saving as has been commonly found in many studies. This result implies an improvement in the standards of living in Sub-Saharan Africa producing a virtuous cycle of private saving and growth. Growth-enhancing polices should therefore be favoured.

Further, as regards macroeconomic uncertainty and external variables which include growth in terms of trade, inflation and current account deficit, positive effects have been established. The results are robust in both the non-parsimonious and parsimonious models. Generally, terms of trade improved for most of the countries included in the sample and particularly oil-exporting countries, over the period of the study. However, the effect is only temporary implying that in the long-run negative effects may emerge. Inflation represents macroeconomic uncertainty which induces agents to lower their current consumption and increase current saving, consistent with the precautionary-saving motive. The positive effect exerted by current account balance rekindles the contention that international borrowing can be an important source of private domestic saving in SSA. However policies aimed at taming inflation and increasing domestic

resource mobilisation would reduce macroeconomic uncertainty and improve the current account balance.

Furthermore, among the fiscal variables, the coefficient of the public saving rate is negative and highly significant while the coefficient of government consumption rate is positive and significant only in models 3 and 7. The public saving has a degree of offset less than unity suggesting a rejection of the pure Ricardian equivalence emphasizing partial offsetting private saving behaviour. The coefficient of government consumption is marginally positive and significant emphasizing that for a given public saving rate, policies that reduce government consumption expenditures (and reduce tax revenue) would have an adverse impact on private saving rate, consistent with the postulates of the Ricardian Equivalence. Further, this result suggests that the private sector places value on government consumption (Edwards, 1995).

Finally, as regards financial variables (the real deposit rate, M2/GDP, and the share of private sector credit) only the deposit rate consistently exerts a significant positive influence on the private saving rate. The positive impact of the real deposit rate implies that the substitution effect is greater than the income effect of an interest change, consistent with the McKinnon-Shaw hypothesis. The coefficient of M2/GDP is negative and only marginally significant in model 3 and the variable does not enter into the parsimonious model. Although the private credit enters into the parsimonious model it is only significant in models 4 and 8. The negative impact of private credit on private saving suggests that liquidity and borrowing constraints are less stringent and as such consumption thrives reducing private saving since the ability to borrow for consumption against future income induces dissaving motives in the inter-temporal model.

In conclusion, the parsimonious models indicate that the main variables that drive private saving in SSA are lagged private saving, urbanization ratio, youth dependency ratio, elder dependency ratio, per capita income growth, terms of trade growth, public saving rate, general government consumption, real interest rate, credit to the private sector, inflation and current account balance. Thus private saving rates can be explained by traditional determinants of saving in SSA.

# APPENDIX

**Table A1.** Countries Used in the Sample

| | | | |
|---|---|---|---|
| 1 | Angola | 21 | Malawi |
| 2 | Benin | 22 | Mali |
| 3 | Burkina Faso | 23 | Mauritania |
| 4 | Botswana | 24 | Mauritius |
| 5 | Burundi | 25 | Mozambique |
| 6 | Cameroon | 26 | Namibia |
| 7 | Central African Republic | 27 | Niger |
| 8 | Chad | 28 | Nigeria |
| 9 | Comoros | 29 | Rwanda |
| 10 | Congo, Democratic Republic | 30 | Senegal |
| 11 | Congo, Republic of | 31 | Seychelles |
| 12 | Côte d'Ivoire | 32 | Sierra Leone |
| 13 | Ethiopia | 33 | South Africa |
| 14 | Gabon | 34 | Sudan |
| 15 | Gambia, the | 35 | Swaziland |
| 16 | Ghana | 36 | Togo |
| 17 | Guinea-Bissau | 37 | Uganda |
| 18 | Kenya | 38 | Zambia |
| 19 | Lesotho | 39 | Zimbabwe |
| 20 | Madagascar | | |

**Table A2.** Measurement of Variables

| | |
|---|---|
| Private Saving Rate | Private Saving is calculated as a residual by subtracting foreign saving and public saving from gross national saving. The Private Saving Rate is the ratio of private saving to GDP. |
| Urbanization Rate | Ratio of the urban population to the total population |
| Youth Dependency Ratio | Population below the working age (0-14) divided by the population of working age (between age 15 and 64). |
| Elder Dependency Ratio | Population above 64 divided by the population of working age (between age 15 and 64). |
| Per Capita Income | Gross Domestic Product divided by Mid-Year Population. |
| Per Capita Income Growth | Annual percentage growth rate of GDP per capita based on constant local currency. |
| Gross Domestic Product | The sum of gross value added by all resident producers in the economy plus any product taxes minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. |

| | |
|---|---|
| Terms of Trade | Ratio of implicit price deflator for exports of goods and services and the implicit price deflator for imports of goods and services. Growth in terms of trade is the per cent growth rate of this index. |
| Public Saving Rate | Total revenue minus current expenditure of the consolidated public sector divided by the Gross Domestic Product. |
| General Government Consumption | Includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defence and security but excludes government military expenditures that are part of government capital formation. It has been calculated as a rate by dividing by gross domestic product. |
| Real Deposit Rate | Interest rate paid by commercial or similar banks for demand, time or saving deposits adjusted for inflation as measured by the GDP deflator. |
| M2/GDP | Calculated as the ratio of broad money to gross domestic product. It measures the degree of financial depth. |
| Private Sector Credit/GDP | Refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities and trade credits and other accounts receivable, that establish a claim payment divided by GDP. |
| Inflation | Yearly changes in the Consumer Price Index. The Laspeyres formula is used. |
| Current Account Balance | Is the sum of net exports of goods, services, net income, and net current transfers. |

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*Received June 4, 2012, Revised January 14, 2016, Accepted June 10, 2016.*