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**Public Policies and Private Savings and Investment in  
Sub-Saharan Africa: An Empirical Investigation**

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**Abstract**

This paper assesses empirically the role of public policies in stimulating private savings and investment in sub-Saharan African countries, based on data for the period 1986-92. The main findings of the analysis are as follows: (i) policies effective in stimulating private savings and investment include those that keep the rate of inflation low, reduce macroeconomic uncertainty, promote financial deepening, and lower the external debt burden; (ii) measures that promote structural reforms and reduce the budget deficit (without lowering government investment) help to raise private investment; and (iii) declines in government savings are only partially offset by increases in private savings.

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### Summary

Economic performance in sub-Saharan Africa as a whole has lagged behind that of other developing regions during the past two decades. Nonetheless, the performance indicators have masked noticeable differences among subgroups of countries in the region; countries that have effectively implemented broadly based adjustment policies have done better than the others. The adjustment experience of sub-Saharan Africa during 1986-92 demonstrates expanding private savings and investment is essential for achieving gains in real per capita GDP. The divergence in the private sector and overall economic performance among the various country groups primarily reflected differences in their policy response to the deterioration in the terms of trade--in particular, in the progress made toward promoting macroeconomic stability, improving external competitiveness, and alleviating structural and institutional impediments to private sector activity.

Total and private savings and investment in sub-Saharan Africa are still too low to facilitate a sustainable expansion in output at a satisfactory rate. Furthermore, in view of the modest share of foreign direct investment currently channeled to sub-Saharan Africa and the increasing competition for direct investment, more of the resources needed to boost economic growth would need to be generated by the domestic private sector of the countries in the region. In this context, the domestic private sector would have to play a major role in accelerating output growth and gradually narrowing the gap in per capita incomes relative to other developing countries.

Accordingly, public policies would need to be aimed at creating an environment that is conducive to private sector development. Therefore, a critical question is, to what extent would changes in public policies be effective in stimulating the rates of private savings and investment in the region? This paper attempts to answer this question by empirically investigating the relationships between public policy indicators on the one hand and private savings and investment on the other, using pooled data for a large sample of sub-Saharan African countries during 1986-92. It finds that public policies can indeed promote private savings and investment in the region, particularly policies aimed at maintaining low inflation, reducing macroeconomic uncertainty and the external debt burden, and promoting financial intermediation. The empirical results also indicate that, although efforts to lower the budget deficit would help stimulate private investment, achieving this objective by lowering government investment would be counterproductive, given the complementarity between government and private investment. Thus, alternative ways of reducing budget deficits to sustainable levels would have to be considered, such as lowering unproductive current expenditure and strengthening revenue mobilization.



## I. Introduction

The experience of sub-Saharan African countries with public policy reforms and economic performance has been extensively investigated by several recent studies. <sup>1/</sup> The renewed interest in economic developments in these countries has been prompted by a less than satisfactory record of performance for sub-Saharan Africa as a whole during the past two decades. A recent paper by Hadjimichael and others (1995) provides a detailed assessment of economic performance in sub-Saharan Africa during 1986-93. The paper's analysis indicates that the overall poor performance of sub-Saharan African countries masks major differences in the performance of individual countries or country groups. The divergence in the private sector and overall economic performance among various country groups has reflected primarily the differences in their policy response to the deterioration in the terms of trade--in particular, in the progress made in promoting macroeconomic stability, improving external competitiveness and alleviating the structural and institutional impediments to private sector activity. Countries that have adopted and effectively implemented broad-based structural adjustment programs (the sustained adjusters) and countries with low macroeconomic imbalances have done better than the others. The sustained adjusters achieved positive per capita real GDP growth and a reduction in inflation during 1986-93, while countries with inappropriate policies (countries with protracted imbalances) experienced a decline in per capita incomes and an increase in inflation. The implementation of appropriate policies by the sustained adjusters contributed to higher government savings and higher private investment, and was complemented by increasing inflows of foreign assistance. At the same time, the countries with positive real per capita growth during 1986-93 experienced positive government savings, increases in government investment, and strong increases in private savings and investment. In contrast, countries with negative per capita growth recorded declines in savings and investment by both the government and the private sector. The average savings and investment ratios during 1986-93 for the countries with positive per capita growth were significantly higher than those for the countries with negative per capita growth and the average for all sub-Saharan African countries; in addition, countries with positive per capita growth financed a much larger proportion of their total investment through domestic savings than did the other African countries.

The experience of sub-Saharan African countries in recent years has demonstrated that a key factor for achieving gains in real per capita incomes is an expansion in private savings and investment. Nonetheless, savings and investment ratios for sub-Saharan African countries are significantly lower than for other developing countries and still too low to support a sustainable expansion in output and employment. For example, the ratios to GDP of total savings and investment in sub-Saharan Africa during 1986-92 amounted to 11.8 percent and 18.6 percent, respectively, as compared with 24.5 percent and 25.7 percent for developing countries in general (IMF

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<sup>1/</sup> See, for example, the studies by Corbo and Fischer (1991), Hadjimichael and others (1995), Hussain and Faruquee (1994), IMF (1993a and 1993b), Khan (1990), Maastricht (1990), Nsouli (1993), Patel (1992), Schadler and others (1993), and World Bank (1989, 1991, 1993, and 1994).

(1994)). World Bank estimates indicate that an investment/GDP ratio of about 25 percent would be needed by sub-Saharan African countries to maintain a sustainable economic growth rate of about 6 percent. In addition, recent developments in the theory of endogenous growth have established positive long-run effects on growth stemming from increases in the investment ratio, and much of the recent empirical evidence in the growth literature has found strong, positive, significant, and robust effects of increases in investment ratios on economic growth. 1/ Thus, in the period ahead, one of the key challenges facing sub-Saharan African countries would be to raise their investment ratios in an attempt to boost economic growth and close the gaps in regional economic performance. However, given the limited role played by foreign direct investment in sub-Saharan Africa and the growing demand for the limited international foreign assistance funds, more of the resources needed to finance investment in the region would have to come from domestic sources. 2/ Accordingly, public policies would need to be directed at establishing a conducive environment for the development of the indigenous private sector; such policies will also be needed to attract foreign direct investment.

In broad terms, private savings and investment depend on a range of institutional and economic factors, including economic endowments; the levels of human capital and of per capita income; the administrative, legal and institutional framework; and the stance of financial policies. In many African countries, the expansion of private investment has traditionally been impeded by a number of structural and institutional constraints, government intervention, overvalued exchange rates and high cost structures, unstable macroeconomic conditions, and limited confidence in the direction of government policies. While public policies would not be the only determinant of private savings and investment, they certainly would have a major role to play. In this context, with a view to gauging the relative importance of public policies, the principal objective of this paper is to empirically investigate the effectiveness of public policies in stimulating private savings and investment in the context of sub-Saharan Africa. This issue has received only limited attention in available empirical studies on the experience of sub-Saharan Africa. 3/ This paper uses data from a

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1/ Indeed, the paper by Levine and Renelt (1992) finds that the rate of investment is among a few variables that are robustly correlated with growth for a group of developed and developing economies. See also the papers by Barro (1989 and 1991), and Fischer (1991)

2/ Foreign direct investment in developing countries was estimated at around US\$134 billion during 1991-93, with the bulk (about 78 percent) flowing into Asian and Latin American countries, and only about 3 percent going to Africa.

3/ A recent article by Oshikoya (1994) is an exception as regards the behavior of private investment in Africa; however, his study included only six countries from sub-Saharan Africa. Most of the existing empirical investigations have been conducted with data from Asia and Latin America, owing mainly to the availability of data.

relatively large sample of countries in the region during 1986-92 to perform the empirical analysis. The results indicate that policy measures that keep the rate of inflation at low levels, lower macroeconomic uncertainty, promote financial deepening, and reduce the external debt burden are effective in raising private savings and investment. Also, private investment can be encouraged by measures aimed at lowering fiscal deficits without lowering government investment, and at promoting structural reforms.

The layout of the rest of the paper is as follows: Section II outlines the broad trends in the behavior of savings and investment in sub-Saharan Africa during 1986-92 and highlights the problems with the data. Section III discusses the channels identified in the theoretical literature through which public policies and other factors can affect private savings and investment. Section IV outlines the empirical methodology and summarizes the estimation results. The last section summarizes the conclusions and draws some policy implications.

## II. Trends in Savings and Investment

National accounts estimates of private savings and investment in the context of developing countries suffer from major weaknesses, as they are usually obtained as residuals. Typically, direct measures of private savings from household and corporate surveys are not available in such countries; moreover, in most sub-Saharan African countries available national accounts data are rudimentary and subject to significant deficiencies, and cover mainly the output side of the economy. The data used in this paper were obtained from the African Economic Trends data base, compiled by the African Department of the IMF since 1985. These data are derived from national sources where available, or on estimates by the IMF staff based on a number of indicators. To ensure consistency across countries, private investment is calculated as the difference between total gross investment and government investment; as a consequence, this measure of private investment includes investment by public enterprises for which no separate data are available. Similarly, gross national savings are obtained as the sum of gross domestic investment and the external current account balance, and domestic (or domestically generated) savings are calculated by subtracting official transfers (foreign grants) from national savings. <sup>1/</sup> Private savings are derived as the difference between total savings and government savings; the measurement of government savings is based on budgetary data for the central government. Thus, the estimates of private

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<sup>1/</sup> This definition of domestic savings differs somewhat from the conventional national accounts concept of domestic savings, in that the latter also excludes private transfers. The measurement of private transfers in the context of sub-Saharan Africa is subject to several limitations, however, as these transfers may very well reflect current nonfactor payments transactions, which are normally included in domestic savings.

savings and investment are bound to be affected by deficiencies in the data for aggregate investment, the balance of payments, and the government budget. The data weaknesses relate mainly to problems in classifying aggregate expenditure as consumption or investment; difficulties in measuring private capital flows; and distortions in the official exchange rates. <sup>1/</sup> Also, the measures for savings and investment would be affected by shifts in the coverage of the government sector over time, and by differences in definitions across countries. Given these deficiencies and the associated weaknesses in testing the implications of theoretical models on the behavior of savings and investment, the results of empirical investigation need to be interpreted with caution.

In addition to looking at sub-Saharan Africa as a whole, this paper considers a number of analytically interesting subgroups of countries, based on criteria related to institutional arrangements and economic performance (Table 1). The first criterion is membership in the CFA franc zone, given the limitation that this membership poses on the use of nominal exchange rate adjustments as an instrument of policy. During 1986-92, CFA franc countries had to rely entirely on internal measures to address their adjustment needs, resulting, inter alia, from a major worsening in their external environment. The differentiated economic performance of the CFA franc countries as a group in comparison with the other African countries has had a distinct influence on the performance of sub-Saharan Africa as a whole. The second criterion relates to ex post economic performance. The countries of sub-Saharan Africa are divided into two groups, depending on whether they have attained on average positive or negative (non-positive) real per capita GDP growth during 1986-92. Under the third criterion, countries are divided into three distinct groups depending on the need for, or the implementation of, appropriate adjustment policies. A small group of sub-Saharan African countries has been characterized in recent years by relatively low internal and external imbalances (countries with low macroeconomic imbalances); broadly speaking, these countries implemented appropriate policies during 1986-92 and did not need to adopt major adjustment programs, with or without support from the IMF. The remaining countries have been classified into two other groups, depending on whether or not they adopted broadly appropriate policies under IMF-supported adjustment programs for at least three years during 1986-92 (sustained adjusters and countries with protracted macroeconomic imbalances). Admittedly, this criterion may contain some judgmental considerations, particularly as some countries were not able to maintain satisfactory performance throughout 1986-92.

Table 2 summarizes the evolution of total domestic and private savings and investment for 39 countries in sub-Saharan Africa during 1986-92.

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<sup>1/</sup> See the paper by Deaton (1990) for an overview of these shortcomings.

Table 1. Sub-Saharan Africa: Analytical Country Groups <sup>1/</sup>

	SSA	CFA	NCFA	PPC	NPC	LOW	IMB	SUS
Benin	x	x			x			x
Botswana	x		x	x		x		
Burkina Faso	x	x		x			x	
Burundi	x		x	x				x
Cameroon	x	x			x		x	
Cape Verde	x		x	x			x	
Central Afr. Rep.	x	x			x		x	
Chad	x	x		x			x	
Comoros	x	x			x		x	
Congo	x	x			x		x	
Côte d'Ivoire	x	x			x		x	
Equatorial Guinea	x	x		x			x	
Ethiopia	x		x		x		x	
Gabon	x	x			x		x	
Gambia, The	x		x	x				x
Ghana	x		x	x				x
Guinea	x		x	x			x	
Guinea-Bissau	x		x	x			x	
Kenya	x		x	x				x
Lesotho	x		x	x				x
Madagascar	x		x		x		x	
Malawi	x		x		x			x
Mali	x	x		x				x
Mauritius	x		x	x		x		
Mozambique	x		x	x				x
Namibia	x		x	x		x		
Niger	x	x			x			x
Nigeria	x		x	x			x	
Rwanda	x		x		x		x	
Sao Tome & Principe	x		x		x		x	
Senegal	x	x		x				x
Seychelles	x		x	x		x		
Sierra Leone	x		x		x		x	
South Africa <sup>2/</sup>	x							
Swaziland	x		x	x		x		
Tanzania	x		x	x				x
Togo	x	x			x			x
Uganda	x		x	x				x
Zaire <sup>2/</sup>	x		x		x		x	
Zambia	x		x		x		x	
Zimbabwe	x		x		x	x		
Total	41	14	26	22	18	6	20	14

<sup>1/</sup> The abbreviations are as follows: SSA: total sub-Saharan Africa; CFA: CFA franc countries; NCFA: Non-CFA franc countries; PPC: countries with positive average per capita growth during 1986-92; NPC: countries with negative average per capita growth during 1986-92; LOW: countries with low macro imbalances; IMB: countries with protracted imbalances; and SUS: sustained adjusters. Only the sub-Saharan African countries covered by the African Department of the IMF are included in this study owing to the availability of a consistent data base for this group of countries. However, Angola and Liberia are excluded owing to data limitations. Djibouti, Mauritania, Somalia, and Sudan are covered by the IMF's Middle Eastern Department.

<sup>2/</sup> South Africa and Zaire are excluded from the empirical investigation of Section IV.

Table 2. Trends in Savings and Investment, 1986-92 1/

(In percent of GDP)

	1986	1987	1988	1989	1990	1991	1992	Average 1986-92	Ratio S/I 1986-92
<b>Total domestic savings</b>									
Sub-Saharan Africa	10.3	11.6	10.9	12.0	14.0	13.3	11.9	12.0	65.6
CFA franc countries	12.8	12.0	8.6	8.1	7.1	7.2	6.1	8.8	49.6
Non-CFA franc countries	9.3	11.3	12.1	13.9	17.6	16.4	15.0	13.7	73.4
Positive per capita growth countries	9.8	11.9	12.4	15.5	19.0	18.8	17.3	15.0	77.3
Negative per capita growth countries	11.1	11.3	9.0	7.5	7.6	6.0	5.0	8.2	48.6
Sustained adjusters	8.6	10.2	10.6	10.2	11.1	11.5	9.8	10.3	55.4
Protracted macroeconomic imbalances countries	9.0	10.4	8.8	10.7	13.9	12.2	10.9	10.8	62.5
Low macroeconomic imbalances countries	29.4	23.8	24.3	24.0	22.0	23.0	21.4	24.0	105.3
<b>Total investment</b>									
Sub-Saharan Africa	17.0	18.3	18.7	17.5	18.4	19.4	18.8	18.3	
CFA franc countries	22.8	21.3	19.1	16.1	15.1	15.5	14.8	17.8	
Non-CFA franc countries	14.6	16.5	18.5	18.1	20.2	21.3	21.0	18.6	
Positive per capita growth countries	15.3	16.8	18.8	19.0	20.7	22.6	22.3	19.4	
Negative per capita growth countries	19.5	20.0	18.6	15.4	15.5	15.1	14.2	16.9	
Sustained adjusters	14.3	18.0	18.8	19.7	20.7	20.2	18.3	18.6	
Protracted macroeconomic imbalances countries	18.0	18.2	17.8	15.4	16.2	17.9	17.9	17.3	
Low macroeconomic imbalances countries	18.8	19.4	23.8	23.1	25.1	24.8	24.5	22.8	
<b>Private savings</b>									
Sub-Saharan Africa	8.1	10.9	11.6	11.8	12.8	11.8	12.1	11.3	
CFA franc countries	9.7	12.2	12.1	12.8	10.4	10.2	10.2	11.1	
Non-CFA franc countries	7.5	10.2	11.4	11.3	14.0	12.7	13.1	11.5	
Positive per capita growth countries	6.1	9.9	11.0	11.8	13.8	13.0	13.5	11.3	
Negative per capita growth countries	11.1	12.2	12.4	11.6	11.5	10.3	10.3	11.3	
Sustained adjusters	9.9	10.2	9.0	8.7	10.3	9.9	10.4	9.8	
Protracted macroeconomic imbalances countries	4.9	9.9	11.7	12.2	13.8	12.3	12.4	11.0	
Low macroeconomic imbalances countries	30.2	20.4	18.2	17.4	13.5	14.1	14.5	18.3	
<b>Private investment</b>									
Sub-Saharan Africa	8.4	9.2	10.2	9.7	10.6	10.8	10.3	9.9	
CFA franc countries	13.9	11.2	12.8	11.1	10.1	11.1	10.8	11.6	
Non-CFA franc countries	6.2	8.0	8.9	9.0	10.9	10.6	10.0	9.1	
Positive per capita growth countries	6.3	8.1	8.9	9.9	11.4	11.5	10.8	9.6	
Negative per capita growth countries	11.5	10.5	11.9	9.3	9.6	9.8	9.6	10.3	
Sustained adjusters	7.7	10.6	10.8	10.9	12.3	12.0	11.0	10.8	
Protracted macroeconomic imbalances countries	8.0	8.1	8.9	8.0	8.6	9.1	8.9	8.5	
Low macroeconomic imbalances countries	14.5	11.8	16.1	15.8	17.4	16.5	15.7	15.4	

Source: IMF, Economic Trends in Africa data base, August 1993.

1/ See Table 1 for the countries included in each subgroup of countries. Note that South Africa and Zaire are excluded from the analytical subgroups of countries.

Several interesting patterns can be detected from these data. 1/ Both the ratios for private savings and investment followed generally upward trends during 1986-92 for sub-Saharan Africa as a whole. However, these aggregate trends masked major differences in the behavior of private savings and investment for the various country groups. Thus, for example, the positive per capita growth countries experienced generally increasing ratios of total (and private) savings and investment during 1986-92. The opposite was true for the negative per capita growth countries and the CFA franc countries. Also, broadly speaking, the movements in savings and investment were quite closely linked for the various country groups. Countries that have maintained generally high (low) ratios of private and total investment also have maintained high (low) ratios of private and total savings. The countries with low macroeconomic imbalances recorded higher average ratios of savings and investment than did the other subgroups. Also, the positive per capita growth countries registered higher average ratios of savings and investment than did the countries with negative per capita growth. The average ratio of savings to investment was quite high for the positive per capita growth countries in comparison with that of the other subgroups.

An objective of this paper is to empirically investigate the factors that can explain this diversity in the performance of private savings and investment among the various groups of countries in sub-Saharan Africa. To this end, an econometric investigation is carried out in Section IV; to help with the interpretation of the results of this analysis, the next section provides a review of the theoretical underpinnings of the determinants of savings and investment in developing countries.

### III. Theoretical Considerations

The existing theoretical models of private investment can be classified under some broad categories, including the accelerator model, the expected profits model, the neoclassical model, and the Tobin's Q model. 2/ However, the difficulties associated with testing the implications of these models in the context of developing countries are well known. It is often noted that certain special characteristics of developing countries make the empirical testing of these theoretical models in the context of developing

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1/ The data for nominal GDP and aggregate savings and investment for the various country groups have been derived as the sum of the levels of the relevant variables for individual countries, expressed in U.S. dollars at current exchange rates. This aggregation method ensures the consistency among changes in fiscal balances, sectoral savings and investment balances, and the external current account balance.

2/ For an overview of these models, see Rama (1993).

economies rather difficult. 1/ As data limitations preclude the estimation of structural models, empirical studies have tended to use with success semi-reduced form frameworks to investigate the determinants of investment in developing countries. In particular, studies have examined the effects of macroeconomic policies on private investment, while controlling for the economic environment; in this context, macroeconomic policies were perceived to be among the main factors that influence the dependent variables in structural models of private investment. 2/

In addition, a number of studies have investigated the factors that affect savings in developing countries, although not many of them have specifically investigated the relationship between macroeconomic stability and savings. 3/ Most of these studies use variants of the "life-cycle" model of the behavior of household savings, developed by Ando and Modigliani (1963). The basic premise of the life-cycle model is that individuals save mainly to smooth their consumption path over time in accordance with their anticipated lifetime income. Subsequent extensions of the basic life-cycle model of savings have incorporated the idea that individuals also save for bequest motives and for unexpected expenses. 4/ According to the general life-cycle hypothesis, households' savings depend on lifetime income, wealth, and the expected returns on savings. In such a framework, government policies that affect these variables would be expected to affect savings as well. In addition, the age structure of the population, typically measured by the ratio of the population defined as dependent (under 15 and over 64 years) to total population (age dependency ratio), is another important determinant of savings. The larger the proportion of the working age population in a country, the larger the aggregate lifetime income and aggregate savings. Also, an implication of the life-cycle hypothesis is that the rate of output growth has a positive effect on

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1/ These characteristics include limited monetization of the economies, underdeveloped capital, financial and foreign exchange markets, large informal sectors, and complex administrative and institutional structures that raise transactions costs.

2/ The bulk of these studies find that macroeconomic policies and uncertainty affect private investment in ways that are consistent with certain theoretical regularities, suggesting that policies that foster a stable macroeconomic environment, lower macroeconomic uncertainty, and make clear the rules of the game are conducive to increased private investment. See, for example, the papers by Cardoso (1993), Greene and Villanueva (1991), Larrain and Vergara (1993), and Servén and Solimano (1993).

3/ See the studies by Aghevli and others (1990), and Schmidt-Hebbel, Webb, and Corsetti (1992) and the studies cited in them.

4/ See, for example, Blanchard and Fischer (1989).

savings. <sup>1/</sup> In addition, countries that are at a higher stage of development can devote more resources to savings.

Thus, according to life-cycle theories, two important determinants of savings are the population's age structure and the rate of economic growth. Nevertheless, the ability of these variables to explain the behavior of savings in developing economies has been reexamined recently (e.g., Deaton (1989), and Gersovitz (1988)). <sup>2/</sup> It has been suggested that certain special characteristics of these economies tend to weaken the link between the life-cycle variables and savings. First, the income level of a large proportion of households in developing economies barely surpasses subsistence income. Growth in income from these low bases tend to be consumed, regardless of other incentives for financial savings. Second, imperfections in the financial markets coupled with the uncertain nature of household income (stemming mainly from the vagaries of weather and terms of trade shocks) in developing economies tend to encourage households to save in nonfinancial assets; under such circumstances an increase in income, if saved at all, would tend to be in the form of assets such as jewelry, livestock, and land. Third, it has been noted that the relatively short life expectancy of households in developing economies coupled with the concept of extended families prevalent in these economies, tend to weaken the relationship between age dependency and savings. Unlike in industrial countries where intra-generational transfers by households are done in order to smooth consumption during the life cycle, households in developing economies tend to depend more on inter-generational transfers within the extended family to smooth consumption over time.

The following subsections review briefly the main transmission channels through which macroeconomic policies and other factors can influence private savings and investment.

#### 1. Macroeconomic policies and uncertainty

A stable macroeconomic environment could be defined as one where inflation is low and predictable; the exchange rate is near its equilibrium level; the government budget is well managed; the budget deficit relative to GDP is at a reasonable level (consistent with a non-increasing ratio of public debt to GDP); and the use of central bank credit to finance the budget deficit is kept at a minimal level. Macroeconomic stability sends important signals to the private sector about the direction of economic policies and the credibility of the authorities' commitment to manage the

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<sup>1/</sup> Empirical studies that have included output growth in saving functions have invariably found it to have a significant positive coefficient. See, for example, Collins (1989), Fry (1978, 1980, 1986, and 1989), Giovannini (1983 and 1985), and Mason (1988).

<sup>2/</sup> See also Ogaki, Ostry, and Reinhart (1995) on a slightly different but related issue.

economy efficiently. Such stability, by facilitating long-term planning and investment decisions, encourages savings and capital accumulation by the private sector.

a. Macroeconomic uncertainty

Excessive volatility in key macroeconomic variables and/or uncertainty about the outlook for these variables make it difficult and costly for economic agents to extract the correct signals from relative prices--such as the real returns to investment--and thus lead to inefficient allocation of resources (Barro (1976 and 1980)). In addition, recent papers indicate that uncertainty can have large adverse effects on investment, given the irreversible nature of investment decisions (e.g., Bernanke (1983) and Pindyck (1988)). According to these papers, since capital goods are not very mobile once installed, investors would be expected to exercise their option of waiting for new information in an uncertain environment. In such an environment, even small changes in the degree of uncertainty can have large effects on private investment.

b. Inflation

The direction of the effects of inflation on savings and investment is ambiguous in the theoretical literature. According to the Tobin-Mundell effect, higher anticipated inflation leads to a lower real interest rate and causes portfolio adjustments away from real money balances toward real capital; hence, a higher anticipated inflation would be expected to lead to higher real investment. However, in the case of developing countries with underdeveloped capital and financial markets, the portfolio adjustments would most likely be from real money balances to real assets, which are not usually included in private investment, or to assets denominated in foreign currency through capital flight. Thus, higher anticipated inflation in these countries would lower private investment and savings. Also, in the context of developing countries, inflation may serve as an indicator of the authorities' commitment to a stable macroeconomic environment. The presence of high and variable inflation rates would be expected to lower the credibility of the authorities vis-à-vis the private sector and reduce the returns on private savings and investment, thereby lowering these aggregates. In addition, in the cash-in-advance models (e.g., Stockman (1981)), anticipated inflation, by raising the cost of capital, lowers capital accumulation.

c. Fiscal policy

The extent of government involvement in the economy and the government's ability to create an environment conducive to private sector development--through, inter alia, its tax policy and investment decisions--have received considerable attention in the development literature. <sup>1/</sup>

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<sup>1/</sup> For a survey, see Lindauer and Velenchik (1992).

The empirical literature has focused on the budget deficit as a measure of the government's borrowing requirement and on government investment. Other things being equal, a larger budget deficit will crowd out the private sector investment as a result of lower access to bank credit and/or higher real interest rates, and a more appreciated exchange rate. Government investment is used to account for the government's contribution to capital accumulation and the adequacy of basic economic and social infrastructure. Although larger deficits may crowd out private investment, the way in which fiscal imbalances are corrected has an influence on private capital accumulation. Reductions in unproductive government expenditure would, if viewed as permanent by the private sector, reinforce the credibility of economic policies, and thus would be expected to stimulate private investment. However, if fiscal imbalances are corrected by curtailing government investment, private investment would be reduced, given the complementarity between public and private investment. Although a large fiscal deficit may be indicative of an unstable macroeconomic policy stance, some authors (e.g., Krueger (1991) and Sala-i-Martin (1991)) have argued that large deficits could be symptomatic of more fundamental microeconomic policy distortions. In this context, inappropriate microeconomic policies, by introducing distortions in resource allocation and use, slow down economic growth for a given level of resources. If the growth rate falls below a level that is politically acceptable, governments may embark on expansionary fiscal policies in an attempt to revive economic activity, thus raising the budget deficit ratio.

A growing budget deficit is likely to be associated with declining government savings. <sup>1/</sup> In the theoretical literature, the effects of changes in government savings on private savings are ambiguous. According to the simple Keynesian view, an increase in government consumption increases income by a "multiplier effect." An increase in income, in turn, raises private savings. However, in an intertemporal environment where expectations play an important role, current government fiscal actions can affect the current and future time paths of macroeconomic variables, including private savings and investment. If the private sector expects an increase in future tax liabilities, current and future private consumption and savings would change, depending on the income and substitution effects of these liabilities. The income effect of an increase in tax liabilities would lower consumption in all periods, whereas the substitution effect would encourage consumption in the current period. If the income effect were to dominate the substitution effect, consumption would fall in the current period, thus raising private savings.

In such an intertemporal framework, the "Ricardian equivalence" theory (Barro (1974)) suggests that in anticipation of an increase in future tax liabilities following a decline in contemporaneous government savings, private savings increase by an equivalent amount so that national savings

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<sup>1/</sup> For the sample of countries in this paper, the correlation coefficient between government savings and the budget deficit is -0.81.

remain unaffected. <sup>1/</sup> Thus, according to this view, changes in government deficits would not be expected to affect national savings. In fact, the Ricardian equivalence theory maintains that for a given higher level of public expenditure, a temporary switch from tax finance to bonds finance will not alter real variables in the economy. This is because forward-looking economic agents, having full knowledge of the government's budget constraint and using the same discount rate as the government, know that at some future time taxes would have to be increased. Hence, as economic agents are assumed to be concerned about the well-being of their heirs, they raise their savings to leave bequests, so that the welfare of these heirs is not reduced when taxes actually increase at some point in the future. However, in the context of developing economies, the strict conditions required for the Ricardian equivalence theory to hold (such as the existence of perfect capital markets, the absence of liquidity constraints, the lack of uncertainty about the future course of fiscal policy, and the equality between public and private discount rates) are unlikely to be met. Thus, contrary to the Ricardian equivalence theory, private savings would most probably not offset fully an increase in fiscal deficits. <sup>2/</sup>

d. Exchange rate policy

Exchange rate policy has received significant attention in the adjustment efforts of developing countries. An objective of a devaluation is to correct an overvaluation, thereby improving external competitiveness by inducing a real depreciation. <sup>3/4/</sup> However, the direction of the effects on investment of changes in the real exchange rate is ambiguous. <sup>5/</sup> On the one hand, a real depreciation raises the cost of imported capital goods and, since a large component of investment goods is

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<sup>1/</sup> Seater (1993) provides a detailed survey of the issues related to the Ricardian equivalence theory.

<sup>2/</sup> The empirical evidence to date tends to reject the Ricardian equivalence theory in the context of developing countries (e.g., Corbo and Schmidt-Hebbel (1991), Haque and Montiel (1989), Raut and Virmani (1990), and Rossi (1988)). In the context of developed economies, many of the early studies also tended to reject the Ricardian equivalence. However, Seater (1993) notes that many of these studies have major weaknesses, such as misspecified equations, simultaneity bias, measurement problems, and spurious correlations owing to the use of nonstationary series. Recent studies in the context of developed economies, using more appropriate econometric techniques and better data, tend to support "approximate" Ricardian equivalence.

<sup>3/</sup> Many sub-Saharan African countries have by now adopted more flexible exchange rate arrangements. The term "devaluation" here is used to refer to the array of policies, including exchange rate policies, that aim at maintaining the actual real exchange rate close to its equilibrium rate.

<sup>4/</sup> For a detailed review of exchange rate policies in developing countries, see Aghevli and others (1991).

<sup>5/</sup> See, for example, the paper by Lizondo and Montiel (1989).

imported in developing countries, it depresses private investment, especially investment in the nontradable goods sector. On the other hand, however, a depreciation of the real exchange rate, by raising profitability in the tradable goods sector, would be expected to stimulate private investment in that sector.

## 2. Structural and institutional reforms

Although macroeconomic stability is a necessary condition for sustained economic growth, it must be supplemented by structural and institutional reforms. Such reforms are necessary to enhance economic incentives and improve the allocation of resources, as well as remove the impediments to private sector development. Structural policies include those aimed at improving efficiency and resource allocation, and those aimed at expanding the productive capacity of the economy (Khan (1987)). The first category of policies includes measures to reduce the wedges between prices and marginal costs, which typically arise from price controls (including those on interest rates, exchange rates, and agricultural prices), imperfect competition, subsidies and tax exemptions, distortive taxes, and exchange and trade restrictions. In recent years, many sub-Saharan African countries have implemented, in varying degrees, a broad range of structural reforms. These measures have included the restructuring and privatization of public enterprises; the lifting of controls on retail and producer prices and on marketing arrangements for agricultural products; the liberalization of the exchange and trade system; the lifting of interest rate controls, the introduction of government financial instruments, the restructuring of commercial banks, the introduction of strengthened prudential requirements, and other financial sector reforms; the implementation of tax reforms to broaden the tax base and strengthen economic incentives and promote equity; administrative reforms to strengthen the economic management capacity of the public sector; the introduction of legal reforms; and the simplification of the administrative requirements or procedures for private sector activities. <sup>1/</sup>

Although, in principle, structural reforms make it possible to raise output for a given level of economic resources without reducing consumption, in practice the rewards from such policies may be felt with a lag, as factors of production move slowly from one sector (or activity) to another. In addition, special interest groups that benefit from the rent opportunities provided by existing price distortions may stand in the way of implementing structural reforms.

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<sup>1/</sup> Given the complex nature of structural reforms, it is not possible to have a variable that accounts for them explicitly in empirical work. In the empirical section of the current study, an attempt is made to capture the effects of these reforms by the use of dummy variables for selected country groups. The sustained adjusters are considered to have made relatively more progress in the area of structural reforms than did the countries with protracted macroeconomic imbalances during 1986-92.

Other structural reforms include liberalization of administrative procedures for private sector activity and legal reforms. A common characteristic of countries with limited political rights and civil liberties is a lack of well-defined property rights and market-friendly legal institutions. The absence of these rights and institutions lowers the security for life and property, and, as a consequence, reduces the rate of accumulation and the efficiency of factors of production, including human and physical capital. The lack of political freedom, therefore, is expected to lower private investment. 1/

### 3. Financial intermediation

McKinnon (1973) and Shaw (1973) have emphasized the crucial role played by financial deepening in increasing the rate of domestic savings. 2/ In addition, if financial deepening contributes to an increase in the expected profitability of capital, it would also be expected to encourage investment. Efforts toward financial liberalization include the lifting of ceilings on deposit and lending rates and making them more responsive to market conditions. 3/ From the theoretical literature, the effect of a change in interest rates on savings and consumption is ambiguous because the income and substitution effects of such a change work in opposite directions. An increase in the returns to savings raises the stream of future income and wealth, and thus is expected to raise current consumption. At the same time, the higher returns on savings are expected to encourage economic agents to raise savings because postponing current consumption would imply the possibility of larger future consumption out of current income. If the substitution effect of a rise in the returns to savings dominates the income effect, then an increase in interest rates would be expected to raise savings.

Although financial liberalization is expected to have a positive effect on savings, it could be envisaged that such liberalization, by easing the liquidity constraints of households and business firms and lowering uncertainty as regards the future income stream, could potentially reduce

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1/ Some empirical studies have attempted to capture the effects of the political and institutional environment on growth performance. See, for example, the papers by Barro (1989 and 1991), Fosu (1992), and Kormendi and Meguire (1985).

2/ Recently, the endogenous growth literature has been extended to investigate the effects of financial deepening and intermediation on growth. This literature has emphasized the important role that financial intermediation plays in improving the efficiency of investment, and thus in stimulating economic growth. King and Levine (1993) provide a survey of studies investigating the empirical linkages between financial indicators (including the ratio of money to GDP) and economic growth.

3/ For a detailed review of interest rate policies in developing countries, see IMF (1983).

the rate of domestic savings in the short term. This would occur especially if the easing of liquidity constraints made it less costly to finance consumption for a given level of aggregate income. However, if the liberalization efforts were also successful at raising real income (say, by raising the level of efficiency in the economy), the adverse effects on the rate of savings, if any, would be mitigated.

The empirical literature for developing countries does not provide a definitive answer to the ambiguity regarding the effects of changes in interest rates on the rate of savings. <sup>1/2/</sup> The lack of a significant and robust relationship between real interest rates and savings in the context of developing countries may reflect more a measurement problem than a substantive one with the existing theory concerning the role of financial intermediation. It is well known that savings data for developing countries are not very reliable. Also, during the time period used by most existing studies, interest rates in many developing countries were controlled, and thus they adjusted very slowly relative to economic fundamentals. Although the empirical evidence suggests that interest rate policies have small effects on savings rates, maintenance of negative real interest rates for prolonged periods could lead to a flight out of financial savings.

#### 4. External debt

A number of channels have been identified in the literature for the negative impact on private investment and savings of large ratios of external public debt to exports. Three of these channels are particularly relevant for the countries of sub-Saharan Africa. First, the resources used for servicing the debt crowd out public investment, which in turn discourages private investment, given the complementarity between these two types of investments. Second, the external debt ratio could be indicative of a "debt overhang," whereby the presence of high debt ratios leads economic agents to anticipate future tax liabilities for its servicing (Borensztein (1990a and 1990b) and Eaton (1987)). An increasing external debt ratio could induce these agents to transfer funds abroad, thus raising the implicit domestic cost of capital. Finally, it has been argued that uncertainty as regards the future stance on economic policies in response to an uncertain debt service profile would also have deleterious effects on private capital formation.

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<sup>1/</sup> Fry (1978 and 1980) provides empirical evidence to support a small but positive relationship between the real interest rate and aggregate savings. However, subsequent work by Giovannini (1983 and 1985) found Fry's results to lack robustness because they depended crucially on the experience with financial liberalization of the Republic of Korea. With a modified data set, Giovannini found negligible responses of aggregate savings to changes in real interest rates.

<sup>2/</sup> See also Ogaki, Ostry, and Reinhart (1995) for a review of some relevant papers.

5. Terms of trade changes

The effects of changes in the terms of trade on savings are also ambiguous in the theoretical literature. 1/ In the models proposed by Harberger (1950) and Laursen and Metzler (1950), a deterioration in the terms of trade, by lowering real income, lowers savings. Subsequent authors, using intertemporal models, have challenged the Laursen-Metzler-Harberger effect. For example, in a model proposed by Obsfeld (1982), savings actually increase with a deterioration of the terms of trade. In this model, the economy has a target level of real wealth; with a fall in real wealth following a deterioration of the terms of trade, savings are raised to maintain the targeted level of real wealth. Svensson and Razin (1983) and Persson and Svensson (1985) have noted that a change in the terms of trade has ambiguous effects on savings, depending on whether this change was of a temporary or a permanent nature, or on whether or not this change was anticipated.

6. Foreign assistance

The effects of an increased inflow of foreign assistance on private savings and investment are ambiguous. The increased availability of foreign assistance, by lowering liquidity constraints, could potentially encourage consumption, thereby lowering savings. Also, a branch of the literature on the real exchange rate, building on the "Dutch disease" effect, has noted that foreign aid can have an undesirable impact on economic performance. 2/ When a large part of foreign aid is spent in the nontraded goods sector, the ensuing upward pressure on the domestic price of nontraded goods causes the equilibrium real exchange rate to appreciate, thus lowering external competitiveness. But the resulting improvement in the profitability of the nontraded goods sector induces labor to move out of export-oriented activities into service-oriented activities. A fall in labor supply in the export-oriented sector puts upward pressure on labor costs, thus lowering the profitability of this sector. The resulting decline in external competitiveness hurts export performance and, in turn, could depress investment in the tradable goods sector. Despite the Dutch disease effect, an inflow of foreign assistance is not always undesirable. Foreign assistance could also have beneficial effects, if it helps the development of economic and social infrastructure, thereby complementing private sector activities. The extent to which foreign aid is beneficial would depend on whether the positive effects of aid inflows were to dominate their adverse effects.

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1/ See the papers by Ostry and Reinhart (1992), Persson and Svensson (1985), and Svensson and Razin (1983) for a summary of the issues related to the effects on savings of changes in the terms of trade.

2/ See van Wijnbergen (1986) for a theoretical exposition and empirical confirmation.

#### IV. Empirical Framework and Results

##### 1. Empirical framework

A regression framework is used to gauge empirically the effects of public policies on the rates of private savings and investment, using pooled data for a sample of countries in sub-Saharan Africa during 1986-92. Each variable of interest (private savings and investment) is regressed on indicators of public policies, while controlling for the effects of other variables. However, as the data sample includes pooled time-series and cross-country data, a number of adjustments need to be made to correct for problems arising from country heterogeneity, time effects, and heteroscedasticity. <sup>1/</sup> The estimation is carried out using a feasible generalized least squares (GLS) procedure.

The empirical specification for the private investment equation takes the form:

$$PIY = f(E^i, p^i, U, S), \quad (1)$$

where

- PIY - the ratio of private investment to GDP;
- $E^i$  - a set of relevant economic and aggregate demand variables;
- $p^i$  - a set of variables indicating the stance on macroeconomic and financial policies;
- U - a set of indicators of macroeconomic uncertainty; and
- S - a set of variables indicating the extent of structural and institutional reforms.

Table 3 gives the definitions and sources of the variables used in the regressions. The economic variables ( $E^i$ ) include per capita economic growth (YGPC); external debt as a ratio to GDP (DETX); and overseas development assistance as a ratio to GDP (ODAY). The policy variables ( $p^i$ ) include the rate of inflation (INF); fiscal deficit as a ratio to GDP (DEFY); government investment as a ratio to GDP (GIY); broad money as a ratio to GDP (BMY); and the percentage change in the real effective exchange rate (RERG). The variables that capture the effects of uncertainty (U) are the standard deviation of the rate of inflation (INFSD), and the standard deviation of the percentage change in the real effective exchange rate (RERGSD). In addition, qualitative variables are used to capture the effects of structural and institutional reforms, and to account for the effects of certain special institutional arrangements among subgroups of countries and of progress toward political liberalization (S). In particular, dummy

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<sup>1/</sup> See the Appendix for a discussion of how these issues are tackled in this paper. See Hsiao (1986) and Judge and others (1985, pp. 516-51) for a concise treatment of issues related to panel data.

Table 3. Definitions of the Variables Used in the Regressions 1/

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PIY	Private investment as a ratio to GDP.
PSY	Private savings as a ratio to GDP, where private savings are defined as national savings (excluding grants) minus government savings (excluding grants). National savings are defined as the current account balance plus total investment.
GSY	Government savings as a ratio to GDP.
YGPC	Growth in per capita real GDP.
GIY	Government investment as a ratio to GDP.
RYPC\$	Per capita real GDP, expressed in US dollars.
DEFY	Overall budget deficit (including grants) as a ratio to GDP.
INF	Annual percentage change in the consumer price index (annual rate of inflation).
INFSD	Standard deviation of INF during 1986-92. Note that this variable is time invariant.
RERG	Percentage change in the real effective exchange rate (REER). The data for the REER were obtained from the IMF's World Economic Outlook data base. For each country, the REER is a weighted index of the nominal exchange rates adjusted for the differential between the domestic inflation rate and the rates of inflation in partner countries using a geometric weighing method (see Wickham (1987) for details). A positive value for RERG denotes an appreciation of the REER. Data for this variable for the full period 1986-92 are not available for Benin, Comoros, Equatorial Guinea, Guinea, Guinea Bissau, Namibia, and Sao Tome/Principe.
RERGSD	Standard deviation of RERG during 1986-92. Note that this variable is time invariant.
BMY	Broad money as a ratio to GDP.
FINANCE	Dummy variable which takes a value of 1 if BMY is greater than the sample mean of 26% and 0 otherwise.
ITG	Percentage change in the terms of trade. Data for this variable for the full period 1986-92 are not available for Namibia.
DETX	External debt as a ratio to total exports.
DETXSQ	DETX squared.
DEPEND	Dependency ratio, defined as the ratio to total population of those below 15 and over 64. The proxy used to measure DEPEND is the ratio to total population of the difference between total population and the labor force (LABOR). Data for LABOR were unavailable for Sao Tome/Principe, and Seychelles. The labor force was obtained from the World Bank, <u>World Tables</u> (various issues).
ODAY	Overseas development assistance as a ratio to GDP.
ODAYSQ	ODAY squared.
FREE	Index of political freedom and civil liberties, obtained from McColm and others (1991). The data for 1992 were provided by Dr. Joseph Ryan of the Freedom House (New York).
SUS	Dummy variable for countries judged as sustained adjusters during 1986-92. See Table 1 for a list of countries.
IMB	Dummy variable for countries with protracted imbalances during 1986-92. See Table 1 for a list of countries.
CFA	Dummy variable for CFA franc countries. See Table 1 for a list of countries.
NCFA	Dummy variable for non-CFA franc countries. See Table 1 for a list of countries.
PPC	Dummy variable for countries with an average positive per capita real GDP growth during 1986-92. See Table 1 for a list of countries.
NPC	Dummy variable for countries with an average negative per capita real GDP growth during 1986-92. See Table 1 for a list of countries.
LOW	Abbreviation used for the countries with low macroeconomic imbalances during 1986-92. See Table 1 for a list of countries.

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1/ See Table 1 for a list of countries included in this paper. All data (except for the ones indicated) are from the Economic Trends in Africa (AETA) data base.

variables are used for the CFA franc countries (CFA); countries with protracted macroeconomic imbalances during 1986-92 (IMB); sustained adjusters during 1986-92 (SUS); 1/ and an index of political freedom and civil liberties (FREE). 2/

The empirical specification for the private savings equation takes a form similar to that for private investment:

$$PSY = g(E^S, P^S, U, S), \quad (2)$$

where

PSY - the ratio of private savings to GDP;  
 $E^S$  - a set of relevant economic and demographic variables;  
 $P^S$  - a set of relevant macroeconomic policy variables; and  
U, and S are as defined before.

The economic and demographic variables ( $E^S$ ) include real per capita GDP expressed in U.S. dollars (RYPC\$); YGPC, DETX, and ODAY, which are defined above; and the dependency ratio (DEPEND). The policy variables ( $P^S$ ) include the rate of inflation (INF); government savings as a ratio to GDP (GSY); and a dummy variable to account for the effects of financial deepening (FINANCE). 3/ The set of variables that measure uncertainty (U), and structural and institutional reforms (S) are the same as those used to estimate equation (1).

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1/ See Table 1 for a list of the countries included in each subgroup.

2/ The data for this index for the period 1986-91 were obtained from McColm and others (1991) and those for 1992, from Freedom House (New York). Briefly, the methodology used by McColm and others (1991) for the calculation of this index entails the rating of countries on a seven-point scale for levels of political rights and civil liberties; these ratings are summarized in terms of overall assessments as free, partly free, and not free. For the purpose of the current study, these three categories have been assigned the (arbitrary) numeric codes 2, 1, and 0, respectively. Political rights are defined as rights to participate meaningfully in the political process, such as the right of all adults to vote and compete for public office, and for elected representatives to have a decisive vote on public policies. Civil liberties are defined as rights to free expression, to organize or demonstrate, and to a degree of autonomy such as is provided by freedom of religion, education, travel, and other personal rights.

3/ This variable takes a value of 1 if the level of broad money as a ratio to GDP (BMY) is greater than the sample mean of BMY (26 percent). The reason for using a qualitative variable instead of using BMY directly as done in estimating equation (2), is that a large proportion of private savings in sub-Saharan African countries takes the form of bank deposits, which is part of broad money. Thus, it would be inappropriate to use BMY as a continuous variable to estimate a private savings equation.

## 2. Preliminary evidence

Before proceeding with a discussion of the regression results, an examination of the correlation coefficients between pairs of variables used in the regressions is informative. Table 4 gives the sample and subsample means of the variables used in the regressions and Table 5 gives the correlation matrix. Several of these correlation coefficients are statistically significant. As expected, the ratios to GDP of private savings and investment are significant and positively correlated, with a coefficient of 0.56. Therefore, it is not surprising that a number of the variables that are significantly correlated with private savings are also significantly correlated with private investment. Thus, both the ratios of private savings and investment are positively correlated with: per capita growth, the level of real per capita GDP, and the ratios to GDP of government savings, broad money and foreign assistance; and negatively correlated with: the rate of inflation, the budget deficit as a ratio to GDP, the standard deviation of inflation, and the standard deviation of the percentage change in the real effective exchange rate. However, the correlation between private savings and investment is not spectacularly high, indicating perhaps a low average degree of financial intermediation for sub-Saharan Africa as a whole.

As regards the analytically interesting subgroups of countries, in comparison with the sample means for all countries, the countries with positive growth had a significantly higher private investment ratio, government savings ratio, foreign assistance ratio, external debt ratio, and index of political freedom. <sup>1/</sup> They also had a lower budget deficit ratio and dependency ratio, and a more depreciated real effective exchange rate. The countries with protracted imbalances had a significantly lower private investment ratio, private and government savings ratios, per capita growth rate, broad money ratio, and index of political freedom. These countries also had a higher budget deficit ratio and external debt ratio, and a larger standard deviation of the percentage change in their real effective exchange rate. In addition, the sustained adjusters had a significantly higher government investment ratio, broad money ratio, external assistance ratio, and standard deviation of inflation; and a lower budget deficit ratio, real per capita GDP, and dependency ratio. The average real effective exchange rate of the sustained adjusters as a group was also more depreciated. Finally, in comparison with sub-Saharan Africa as a whole, the countries of the CFA franc zone were characterized by lower levels of government investment and savings ratios, per capita real GDP growth, inflation, the standard deviations of inflation and the percentage change in the real effective exchange rate, external debt ratio, external assistance ratio, and index of political freedom. They also had a more appreciated real effective exchange rate.

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<sup>1/</sup> Only the statistically significant correlation coefficients are mentioned.

Table 4. Sample and Subsample Means of the Variables Used in the Regressions 1/

Variables 2/	Groups 3/						
	SSA	SUS	IMB	PPC	NPC	CFA	NCFA
PIY	11.73	12.82	10.02 ***	12.90 **	10.22 **	10.77	12.27
GIY	8.68	9.15	8.35	10.66 ***	6.12 ***	7.14 ***	9.54 ***
PSY	11.56	11.41	10.03 ***	12.06	10.91	10.89	11.93
GSY	-2.98	-0.44 ***	-8.07 ***	0.08 ***	-6.93 ***	-5.75 ***	-1.42 ***
YGPC	-0.08	0.34	-1.35 ***	1.78 ***	-2.49 ***	-5.75 ***	-1.42 ***
RYPC\$	768.51	309.53 ***	685.44	809.99	714.87	815.41	742.25
INF	19.22	21.40	20.29	20.45	17.63	0.74 ***	29.57 ***
INFSD	10.69	12.90 *	11.24	11.56	9.57	3.40 ***	14.78 ***
RERG	-4.80	-6.83 *	-3.55	-6.35 *	-2.80 *	-1.48 ***	-6.54 ***
RERGSD	9.91	10.65	11.24 ***	9.68	10.21	5.67 ***	12.13 ***
DEFY	5.65	4.58 *	8.45 ***	3.54 ***	8.39 ***	6.19	5.35
BMY	26.15	28.37 **	23.90 ***	26.88	25.20	25.18	26.69
TTG	-4.19	-4.13	-5.76 **	-3.32	-5.27	-4.43	-4.05
DETX	729.06	763.77	863.56 **	854.08 **	567.27 **	413.78 ***	905.61 ***
ODAY	18.85	22.99 ***	20.07	20.81 *	16.31 *	15.10 **	20.95 **
DEPEND	56.23	54.99 **	56.06	55.23 **	57.53 **	56.99	55.76
FREE	0.51	0.44	0.35 ***	0.60 ***	0.39 ***	0.28 ***	0.63 ***

1/ All means are unweighted averages during 1986-92; thus, they would differ from those given in Table 3. The symbols \*\*\*, \*\*, and \* beside the estimated means for the subsamples indicate that these means are statistically different from their relevant overall sample means at the 0.01, 0.05, and 0.10 levels of significance, respectively.

2/ See Table 3 for definitions of variables.

3/ The abbreviation SSA refers to sub-Saharan Africa. See Table 3 for the definitions of the other abbreviations.

Table 5. Matrix of Correlation Coefficients for Pairs of Variables Used in the Regressions 1/

	GIY	PSY	GSY	YGPC	RYPG\$	INF	INFSD	RERG	RERGSD	DEFY	BMY	TTG	DETX	ODAY	DEPEND	FREE	CFA	SUS	IMB	PPC
PIY	0.21 ***	0.56 ***	0.12 **	0.14 **	0.31 ***	-0.16 ***	-0.23 ***	0.08	-0.30 ***	-0.12 *	0.30 ***	0.06	0.04	0.11 *	0.01	0.07	-0.08	0.09	-0.19 ***	0.15 **
GIY	1	-0.02	0.17 ***	0.23 ***	-0.07	0.03	-0.02	-0.08	0.03	0.00	0.17 ***	-0.01	0.48 ***	0.44 ***	-0.31 ***	-0.10	-0.22 ***	0.06	-0.06	0.42 ***
PSY		1	0.20 ***	0.16 ***	0.28 ***	-0.23 ***	-0.28 ***	0.12 *	-0.31 ***	-0.16 ***	0.27 ***	0.12 **	-0.20 ***	0.20 ***	0.17 ***	0.18 ***	-0.05	-0.01	-0.16 ***	0.06
GSY			1	0.24 ***	0.27 ***	-0.06	-0.06	0.00	-0.18 ***	-0.81 ***	-0.02	0.08	-0.28 ***	-0.56 ***	0.12 **	0.26 ***	-0.18 ***	0.16 ***	-0.43 ***	0.30 ***
YGPC				1	0.12 **	0.04	0.03	-0.04	-0.08	-0.24 ***	0.04	0.11 *	-0.005	-0.002	-0.04	0.19 ***	-0.28 ***	0.07	-0.28 ***	0.48 ***
RYPG\$					1	-0.20 ***	-0.23 ***	0.14 **	-0.30 ***	-0.24 ***	0.02	0.01	-0.16 ***	-0.31 ***	0.17 ***	0.16 ***	0.03	-0.33 ***	-0.08	0.04
INF						1	0.77 ***	-0.07	0.60 ***	0.10	-0.18 ***	-0.10	0.23 ***	0.16 ***	-0.05	0.14 **	-0.41 ***	0.05	0.03	0.04
INFSD							1	-0.14 **	0.74 ***	0.10 *	-0.18 ***	-0.12 *	0.22 ***	0.16 ***	-0.10 *	0.11 *	-0.35 ***	0.11 *	0.03	0.06
RERG								1	-0.22 ***	-0.05	0.13 *	0.11	-0.14 **	-0.14 **	0.27 ***	0.09	0.18 ***	-0.13 *	0.08	-0.13 *
RERGSD									1	0.23 ***	-0.09	-0.11 *	0.28 ***	0.25 ***	-0.20 ***	0.02	-0.38 ***	0.06	0.17 ***	-0.02
DEFY										1	0.09	-0.12 *	0.33 ***	0.43 ***	-0.15 **	-0.24 ***	0.06	-0.11 *	0.38 ***	-0.34 ***
BMY											1	0.09	0.25 ***	0.14 **	0.29 ***	0.01	-0.06	0.13 **	-0.17 ***	0.06
TTG												1	-0.06	-0.04	0.10	0.10	-0.01	0.00	-0.12 **	0.08
DETX													1	0.64 ***	-0.21 ***	-0.13 **	-0.24 ***	0.03	0.13 **	0.15 **
ODAY														1	-0.26 ***	-0.12 **	-0.14 **	0.16 ***	0.06	0.11 *
DEPEND															1	0.34 ***	0.09	-0.15 **	-0.03	-0.18 ***
FREE																1	-0.26 ***	-0.08	-0.24 ***	0.16 **

1/ See Table 3 for the definition of the variables. The symbols \*\*\*, \*\* and \* beside the estimated coefficients denote statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

It should also be noted that certain explanatory variables (such as the rate of inflation, the standard deviation of inflation, and the standard deviation of the percentage change in the real effective exchange rate) are highly correlated, and thus, contain largely the same information; in order to avoid the problem of multicollinearity, these variables are not included together in the same regression.

### 3. Estimation results for private investment

The regression results for private investment are summarized in Table 6. 1/ The estimated regressions explain a large proportion of the variation in the rate of private investment, as indicated by the estimated "goodness of fit" statistic suggested by Buse (1973). 2/ Studies that have used panel data to examine the determinants of private investment have typically been successful in explaining a large fraction of the variations in the rate of private investment. 3/ It is clear from the results that macroeconomic policies and uncertainty play an important role in explaining the behavior of the rate of private investment in sub-Saharan Africa. It should be noted, however, that once account is taken of the effects of macroeconomic policies, per capita GDP growth has no independent effect on the rate of private investment, supporting a similar result by Özler and Rodrik (1992), despite the fact that the simple correlation between per capita growth and the rate of investment is positive and significant (Table 5). 4/

The effects of macroeconomic uncertainty, as measured by the standard deviations of the rate of inflation and the percentage change in the real

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1/ In an attempt to correct for simultaneity bias, the explanatory variables likely to contribute to this problem were entered with a lag in the regressions for the rates of private savings and investment.

2/ It should be noted that under the GLS estimation procedure used in this paper, the conventional coefficient of determination loses its usual interpretation (Judge and others (1985, pp. 31-32)). Buse (1973) has suggested an alternative measure for the goodness of fit for GLS models, calculated as the proportion of weighted variation in the dependent variable explained by the regression.

3/ For example, the studies by Servén and Solimano (1993), and Larrain and Vergara (1993) explained over 90 percent of the variation in the rate of private investment; Greene and Villanueva (1991), about 80-90 percent; and Cardoso (1993), and Oshikoya (1994), about 70 percent. The study by Özler and Rodrik (1992), however, explained only about 50 percent of the variation in the rate of private investment.

4/ The results provided by Greene and Villanueva (1991), Servén and Solimano (1993), Cardoso (1993), and Larrain and Vergara (1993) indicate that increases in per capita growth rates have a significant positive effect on the rate of private investment, even when account is taken of the effects of macroeconomic policies.

Table 6. Estimates of the Private Investment Equation 1/

(Estimation method: generalized least squares)

Explanatory Variables	Regression Number			
	(1)	(2)	(3)	(4)
Lag(YGPC)	0.079 (1.06)	0.042 (0.55)	0.102 (1.36)	0.008 (0.12)
Lag(GIY)	0.407 *** (4.40)	0.419 *** (4.64)	0.409 *** (4.41)	0.397 *** (5.38)
Lag(INF)	-0.035 *** (4.82)	-0.032 *** (4.61)	---	---
INFSD	---	---	-0.095 *** (5.56)	---
RERGSD	---	---	---	-0.462 *** (11.58)
Lag(DEFY)	-0.142 ** (2.51)	-0.086 (1.50)	-0.109 * (1.84)	-0.009 (0.17)
Lag(BMY)	0.174 *** (6.07)	0.162 *** (5.59)	0.142 *** (4.92)	0.137 *** (5.43)
Lag(RERG)	0.004 (0.22)	0.013 (0.69)	-0.026 (1.22)	-0.017 (1.09)
Lag(DETX)	-0.001 ** (2.07)	-0.001 ** (2.12)	-0.001 (1.02)	1.5xE-4 (0.26)
Lag(ODAY)	-0.274 *** (4.23)	-0.258 *** (4.36)	-0.297 *** (4.71)	-0.269 *** (4.66)
Lag(ODAYSQ)	0.004 *** (3.43)	0.004 *** (3.49)	0.004 *** (3.60)	0.004 *** (4.11)
CFA	-3.58 *** (6.08)	-3.08 *** (5.42)	-3.37 *** (5.48)	-4.62 *** (8.66)
SUS	1.63 *** (2.64)	---	1.83 *** (2.84)	1.10 * (1.78)
IMB	---	-2.39 *** (3.36)	---	---
FREE	0.57 (1.46)	0.54 (1.42)	0.96 ** (2.42)	1.04 *** (3.05)
Goodness of fit 2/	0.940	0.939	0.937	0.959
F-value 3/	170.5 ***	169.4 ***	156.5 ***	258.3 ***
N 4/	192	192	192	192

1/ See Table 3 for definitions of variables. The numbers in parentheses below the estimated coefficients are the absolute values of the t-ratios. The symbols \*\*\*, \*\*, and \* beside the estimated coefficients denote statistical significance at the 0.01, 0.05, and 0.10 levels, respectively. All the regressions include dummies for the years.

2/ Based on the coefficient of determination suggested by Buse (1973) for heteroscedastic models.

3/ F-value is the statistic for the test of the null hypothesis that the joint effect of all the variables included on the right hand side of the estimated equation is zero.

4/ Number of observations used in estimation. Owing to data limitations on the real effective exchange rate, only 32 countries are included in the regressions. Data are available for the period 1986-92; however, one observation is lost with the one-period lag.

effective exchange rate, are, as expected, negative and strong, confirming similar results by Servén and Solimano (1993) for a group of developing countries, and Larrain and Vergara (1993) for East Asia. <sup>1/</sup> Thus, highly variable real effective exchange rates and inflation rates, which are indicative of uncertainties about the returns on investment or about the direction of the future course of economic policies, have deleterious effects on private investment. This finding confirms the theoretical predictions of irreversible investment models (e.g., Bernanke (1983)). The correlation matrix indicates that the standard deviation of the percentage change in the real effective exchange rate is positively and strongly correlated with the rate of inflation, the standard deviation of inflation, the government deficit ratio, and the external debt ratio. Thus, monetary and fiscal policies geared toward macroeconomic stabilization are expected to have beneficial effects on the rate of private investment by lowering the degree of uncertainty as regards the future returns to private investment. Furthermore, the effect of inflation is negative and strong, indicating that inflationary policies are generally detrimental to efforts toward private capital accumulation. This result tends to support the predictions of the cash-in-advance models (e.g., Stockman (1981)), and the empirical findings of Greene and Villanueva (1991), and Özler and Rodrik (1992). In the context of African countries, Oshikoya (1994) found the effects of inflation to be negative for a group of three low-income economies but positive for a group of four middle-income economies.

The estimation results provide support for the complementarity between government and private investment, confirming similar results by a number of other studies. <sup>2/</sup> Thus, government investment, by providing positive externalities, fosters private capital accumulation. In addition, the budget deficit ratio--a variable not typically considered by previous empirical studies--is found to have a significant negative effect on the rate of private investment, indicating a crowding-out effect (regression (1)). However, this effect is not robust to the various specifications. For example, in regressions (2) and (4), the budget deficit ratio loses its

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<sup>1/</sup> Ghura and Grennes (1993) provide empirical evidence on the adverse effects of uncertainty on total investment as a ratio to GDP (and other indicators of macroeconomic performance) for a sample of sub-Saharan African countries during 1972-87.

<sup>2/</sup> See, for example, the studies by Blejer and Khan (1984), Greene and Villanueva (1991), Servén and Solimano (1993), and Wai and Wong (1982) for a diverse group of developing countries; Cardoso (1993) for Latin America; Larrain and Vergara (1993) for East Asia; and Sakr (1993) for Pakistan. Oshikoya's (1994) results on the effects of public investment in Africa are not robust. The study by Özler and Rodrik (1992) found a crowding-out effect of government investment on private investment. Blejer and Khan (1984) and Sakr (1993) have also distinguished between government investment on infrastructure and other government investment; they found that the former has a larger positive impact on private investment, while the latter can actually lower private investment.

statistical significance, although in regression (2) the coefficient for the budget deficit ratio is still significant at the 5 percent level for the one-tail test. As regards regression (4), it must be noted that the measure of uncertainty (RERGSD) is highly correlated with the budget deficit ratio. Thus, the regression that includes both DEFY and RERGSD suffers partly from multicollinearity and cannot detect an independent effect of DEFY. It can be concluded with some degree of confidence, however, that increases in budget deficits may be detrimental to private capital accumulation. Also, the results for estimated coefficients for the budget deficit ratio and the government investment ratio combined imply that although lowering the deficit would be beneficial to private investment, achieving this objective by cutting government investment expenditure would be counterproductive.

The regression results confirm the beneficial effects of financial deepening on private investment, as depicted by the positive, significant, and robust effect of the ratio of broad money to GDP (BMY). The real interest rate was used as an additional variable to capture the effects of financial liberalization and deepening. This variable, however, was highly correlated with the rate of inflation (with a correlation coefficient of 0.96), indicating that during 1986-92, nominal interest rates in sub-Saharan African countries adjusted rather slowly to changes in economic fundamentals and that, on average, changes in inflation dominated movements in the real interest rates. <sup>1/</sup>

In regressions (1) and (2) where no uncertainty variables are included, increases in the external debt ratio are found to have a significant adverse effect on private investment, supporting similar results by a number of other studies. <sup>2/</sup> This adverse effect could occur through a number of transmission channels, as indicated in Section III, including the debt overhang effect. It appears, however, that the "uncertainty" channel dominates the impact of an increase in the debt ratio on private investment, as suggested by the results in regression (3) and (4). Once the standard deviation of inflation or the standard deviation of the percentage change in the real effective exchange rate is included in the regression, the debt ratio loses its significance, owing in part to multicollinearity. Thus, when account is taken explicitly of the effects of uncertainty, DETX does not have an independent effect on private investment.

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<sup>1/</sup> Schmidt-Hebbel, Webb, and Corsetti (1992) also found the correlation between the rate of inflation and the real interest rate to be high for a group of developing economies. The rigidity of nominal interest rates in the context of sub-Saharan Africa has, aside from government controls, also been attributed to the oligopolistic nature of the domestic banking system; inadequate banking supervision; and thin domestic money, credit, and capital markets.

<sup>2/</sup> See, for example, the studies by Borensztein (1990a and 1990b), Greene and Villanueva (1991), Oshikoya (1994), Özler and Rodrik (1992), Servén and Solimano (1993), and Larrain and Vergara (1993).

The level of the real exchange effective seems in all regressions to have an insignificant effect on private investment, confirming similar results by Cardoso (1993), Larrain and Vergara (1993), and Servén and Solimano (1993). This result could simply reflect the theoretical ambiguity underlying the effects of real depreciations, with a positive effect on investment in the tradable goods sector canceling the adverse effect on investment in the nontradable goods sector. This result could also reflect the fact that investment reacts favorably to real depreciations with a long lag, an effect that cannot be adequately captured by the short time span covered by the data set used in the current study. Indeed, using data covering a longer time span for Chile, Solimano (1989) has found that private investment reacts adversely to a real depreciation in the short run, but positively over the medium term.

The regression results also suggest that progress in implementing structural reforms encourage private investment. The coefficient of the dummy variable for the sustained adjusters is significantly positive in all regressions, while the coefficients for the dummy variables for the CFA franc countries and the countries with protracted macroeconomic imbalances are significantly negative and large in absolute terms. As account has already been taken of differences in the policy stance, the macroeconomic environment, and the level of uncertainty, these dummy variables are most likely capturing the effects of the differentiated progress registered by these country groups in alleviating structural and institutional impediments to private sector development. Furthermore, the coefficient of the variable indicating progress toward political freedom and institutional reforms (FREE), is positive, albeit not robust; <sup>1/</sup> this effect appears to be significant only when account is taken of macroeconomic uncertainty.

Finally, the regression results indicate that the effect of foreign assistance (ODAY) on private investment, an impact that has typically been ignored in the empirical literature, is nonlinear and negative at the sample mean. This somewhat puzzling result is in contrast to the simple correlation between PIY and ODAY which is positive and significant. Thus, it would appear that once account is taken of the effects of other variables, increases in ODAY have adverse effects on PIY.

#### 4. Estimation results for private savings

The regression results for private savings (PSY) are summarized in Table 7. Again, as in the case of private investment, the estimated

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<sup>1/</sup> The effects of political systems on private investment have typically not been investigated in empirical studies. A notable exception is the study by Özler and Rodrik (1992), which reported similar nonrobust results on the effects of political rights and civil liberties. However, these authors found a robust effect on private investment of an interaction variable between political rights and the world interest rate.

Table 7. Estimates of the Private Savings Equation 1/  
(Estimation method: generalized least squares)

Explanatory Variables	Regression Number			
	(1)	(2)	(3)	(4)
Lag(YGPC)	0.033 (0.43)	-0.025 (0.32)	0.001 (0.01)	-0.028 (0.35)
Lag(RYPCS)	0.006 *** (15.48)	0.006 *** (15.40)	0.006 *** (14.33)	0.006 *** (15.52)
Lag(INF)	-0.033 *** (4.07)	-0.031 *** (4.00)	---	---
INFSD	---	---	-0.102 *** (4.57)	---
RERGS	---	---	---	-0.286 *** (5.52)
Lag(GSY)	-0.168 *** (2.78)	-0.189 *** (3.16)	-0.171 *** (2.77)	-0.162 *** (2.50)
FINANCE	6.29 *** (8.85)	6.33 *** (10.00)	5.98 *** (7.93)	6.10 *** (9.24)
Lag(TTG)	0.035 * (1.67)	0.030 (1.45)	0.017 (0.77)	0.027 (1.16)
Lag(DETX)	-0.003 *** (2.92)	-0.002 *** (2.62)	-0.002 ** (2.15)	-0.003 *** (2.86)
Lag(ODAY)	0.218 ** (2.23)	0.234 *** (2.61)	0.178 * (1.90)	0.333 *** (3.66)
Lag(ODAYSQ)	-0.003 * (1.92)	-0.003 ** (2.20)	-0.003 * (1.69)	-0.003 * (1.95)
DEPEND	0.013 (0.20)	-0.001 (0.02)	0.006 (0.09)	-0.018 (0.25)
CFA	-3.11 *** (4.24)	-3.11 *** (4.54)	-3.28 *** (4.17)	-4.91 *** (6.63)
SUS	0.93 (1.32)	---	1.46 ** (1.91)	-0.89 (1.26)
IMB	---	-1.59 ** (2.13)	---	---
FREE	0.43 (0.80)	0.34 (0.72)	0.82 (1.45)	-0.39 (0.81)
Goodness of fit 2/	0.936	0.943	0.928	0.951
F-value 3/	161.0 ***	184.6 ***	140.1 ***	183.9 ***
N 4/	216	216	216	186

1/ See Table 3 for definitions of variables. The numbers in parentheses below the estimated coefficients are the absolute values of the t-ratios. The symbols \*\*\*, \*\*, and \* beside the estimated coefficients denote statistical significance at 0.01, 0.05, and 0.10 levels, respectively. All the regressions include dummies for the years.

2/ Based on the coefficient of determination suggested by Buse (1973) for heteroscedastic models.

3/ F-value is the statistic for the test of the null hypothesis that the joint effect of all the variables included on the right hand side of the estimated equation is zero.

4/ Number of observations used in estimation. Owing to data limitations, only 36 countries are included in regressions (1)-(3), and 31 countries are included in regression (4). Data are available for the period 1986-92; however, one observation is lost with the one-period lag.

regressions explain a large proportion of the variation in private savings, as indicated by the estimated "goodness of fit" statistic suggested by Buse (1973). The results suggest that macroeconomic policies and uncertainty play an important role in explaining the behavior of private savings in sub-Saharan African countries. It should be noted, however, that once account is taken of the effects of macroeconomic policies, per capita GDP growth has no independent effect on private savings, although the simple correlation between per capita growth and private savings is positive and significant (Table 5). In addition, the age dependency ratio, another important determinant of savings in life-cycle models (besides income growth), has an insignificant effect on the rate of private savings. A number of studies have investigated the effects of demographic factors on savings, but the evidence to date is not definitive and remains somewhat controversial. <sup>1/</sup> It appears that the results are highly dependent on the sample and time period considered, the specification used, and the variables included or excluded.

Thus, the two important variables that explain the behavior of savings in life-cycle models have no statistically significant role to play in explaining the behavior of private savings for this sample of mostly very low income economies, confirming the views advanced by Deaton (1989). It must be noted, however, that the lack of significant effects may be due to two other factors. First, the time span considered is short; demographic variables change very slowly over time, thus making it difficult to pick a significant effect with a short time series even with cross section data in which the majority of countries have essentially similar demographic characteristics. Second, as regards the potential for simultaneity bias stemming from income growth, taking the lagged values of the latter may not have adequately removed this bias.

The effects of macroeconomic uncertainty on private savings, as measured by the standard deviations of the rate of inflation and the percentage change in the real effective exchange rate (INFSD and RERGS), are negative and strong. Thus, highly variable real effective exchange rates and inflation rates, by raising the uncertainty about future returns on savings or about the direction of future course of economic policies, have deleterious effects on private savings. As in the case of private investment, monetary and fiscal policies that foster macroeconomic stability are expected to have beneficial effects on private savings by lowering uncertainty. The effect of inflation is negative and strong, indicating that inflationary policies are generally detrimental to private savings efforts. The papers by Aghevli and others (1990), Gupta (1987), Lahiri (1989) and Schmidt-Hebbel, Webb, and Corsetti (1992) have also investigated

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<sup>1/</sup> See the papers by Aghevli and others (1990), Collins (1989), Fry (1986), Lahiri (1989), Leff (1969), Mason (1988), Ram (1982), and Rossi (1989), Schmidt-Hebbel, Webb, and Corsetti (1992). See also the survey article by Hammer (1986).

the effects of inflation on savings in developing countries, but their results are mixed and generally statistically insignificant.

The effect of government savings (GSY), an indicator of fiscal policy, is negative, significant, and robust. According to the Ricardian equivalence theory, a fall in government savings would be fully offset by an increase in private savings so that aggregate savings remain unchanged. For the sub-Saharan African countries considered in this paper, however, only a partial offset is found. This result could be interpreted either as evidence against full Ricardian equivalence, or indicative of partial Ricardian equivalence, or a Keynesian income effect. 1/

The estimation results provide support for the beneficial effects on private savings of financial liberalization and deepening, as depicted by the positive and significant coefficient of the dummy variable FINANCE in all regressions. This result is in sharp contrast to that presented by Schmidt-Hebbel, Webb, and Corsetti (1992), who found a significant negative relationship between household savings and the beginning-of-period ratio of broad money to income in a diverse group of developing countries; they interpret their result as evidence in favor of an increase in consumption (a decline in savings) following an easing of liquidity constraints or an increase in real wealth. In addition, the regression results confirm the adverse effects of a rise in the external debt ratio (DETX) on private savings. Several channels for such effects were indicated in Section III. Unlike for the case of private investment, it appears that the debt overhang channel has a dominating effect for the case of private savings, because DETX has a strong robust effect on private savings, even when account is taken of the effects of macroeconomic uncertainty. The residual adverse effect of DETX on private savings could be due to an anticipation of future tax liabilities in the presence of large debt ratios that encourage capital flight. 2/ Thus, to the extent that private savings are an important source of funds for private capital accumulation, private investment would also be indirectly but strongly affected by an increase in DETX. 3/

There is some indication that progress in implementing structural reforms contributes to higher private savings. As in the regressions for private investment, the coefficients for the dummy variables for CFA franc countries and the countries with protracted macroeconomic imbalances are significantly negative. However, neither the sign nor the significance

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1/ See the papers by Corbo and Schmidt-Hebbel (1991) and Easterly and Schmidt-Hebbel (1993) for a similar interpretation.

2/ Haque and Montiel (1990) have shown empirically that capital mobility is indeed quite high in Africa, even in the presence of capital controls. They argue that capital flight in developing economies occurs mainly through overinvoicing of imports, underinvoicing of exports, bribery, and smuggling.

3/ The paper by Aghevli and others (1990), using data for 86 developing countries during 1982-88, found that countries without debt-servicing problems had significantly higher rates of national savings.

level of the estimated coefficient for the dummy variable for the sustained adjusters is robust. Also, the variable indicating progress toward political freedom and institutional reforms (FREE) is not statistically significant.

Changes in the terms of trade did not have a robust effect on private savings, although this effect is positive. <sup>1/</sup> Also, the estimation results indicate that private savings rates are higher in countries at higher levels of development (measured by the real GDP per capita, expressed in U.S. dollars (RYPC\$)). <sup>2/</sup> The ability of an economy to mobilize domestic savings to finance investment activities depends in part on its level of development; thus, countries that are at low levels of development can devote fewer domestic resources to finance private investment. Finally, the effect of foreign assistance (ODAY) on private savings is nonlinear and positive at the sample mean, a result that is in contrast not only to the effect of foreign assistance on private investment, but also to the effects found for aggregate savings by numerous other studies.

#### 5. Beta coefficients

An indication of the relative importance of the independent variables in explaining the variability in private investment and savings can be obtained by the beta coefficients reported in Table 8. The variability of the real effective exchange rate exerted the largest relative impact on private investment during 1986-92, a result that lends strong support to the dominating effect of uncertainty proposed by the irreversible investment models. Uncertainty also exerted a relatively large adverse impact on private savings. Of the variables measuring the effects of policies, government investment and broad money exerted the largest relative impact on private investment. The results clearly indicate that although lowering the fiscal deficits would be beneficial to private capital accumulation, achieving this objective by cutting government investment would be largely counterproductive. Also, efforts toward financial liberalization and deepening would have a large beneficial impact on both private savings and investment, as indicated by the relatively large positive beta coefficients of BMV and FINANCE. A result that is in sharp contrast with the one found in sub-sections 3 and 4 is the impact of foreign assistance (ODAY) on both private savings and investment; the beta coefficients show a positive impact on private investment and a negative impact on private savings, in contrast

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<sup>1/</sup> In a pooled data analysis of eight African economies, Oshikoya (1994) found the effect of changes in the terms of trade on private investment to be insignificant.

<sup>2/</sup> Similar results have been found for household savings by Schmidt-Hebbel, Webb, and Corsetti (1992), and for aggregate savings by Collins (1989), Fry (1978 and 1980), Leff (1969), and Ram (1982) among others.

Table 8. Estimated Beta Coefficients

Explanatory variable 1/	Dependent variable			
	PIY		PSY	
	Estimated coefficient 2/	Estimated beta coefficient 3/	Estimated coefficient 4/	Estimated beta coefficient 3/
YGPC	0.079	0.039	0.033	0.015
RYPGS	---	---	0.006	0.662
GIY	0.407	0.245	---	---
INF	-0.035	-0.133	-0.033	-0.117
INFSD	-0.095	-0.167	-0.102	-0.167
RERGSD	-0.462	-0.438	-0.286	-0.252
DEFY	-0.142	-0.115	---	---
GSY	---	---	-0.168	-0.204
BMV	0.174	0.252	---	---
FINANCE	---	---	6.29	0.320
RERG	0.004	0.006	---	---
TTG	---	---	0.035	0.048
DETX	-0.001	-0.110	-0.003	-0.307
Foreign assistance		0.319		-0.196
ODAY	-0.274	-0.610	0.218	0.451
ODAYSQ	0.004	0.929	-0.003	-0.647
FREE	0.57	0.043	0.43	0.030
DEPEND	---	---	0.013	0.009

1/ See Table 3 for definitions of variables.

2/ The coefficients are from Table 6. All estimated coefficients are from regression (1), except for the coefficients for INFSD and RERGSD which are from regressions (3) and (4), respectively.

3/ The beta coefficient of an explanatory variable  $X$ , for example, is obtained simply by multiplying the estimated coefficient of  $X$  by the standard deviation of  $X$ , and then dividing the resulting product by the standard deviation of the dependent variable.

4/ The coefficients are from Table 7. All estimated coefficients are from regression (1), except for the coefficients for INFSD and RERGSD which are from regressions (3) and (4), respectively.

to the opposite effects when evaluated at sample mean. <sup>1/</sup> In addition, the level of development (RYPC\$) exerted the largest impact on PSY, indicating that policies that help to raise the level of real per capita income would also be expected to have a large positive impact on private savings. Furthermore, the external debt ratio (DETX) exerted a relatively large negative impact on private savings. The effects of the explanatory other variables were relatively small.

#### V. Conclusions and Policy Implications

The empirical evidence on the effectiveness of public policies in stimulating private savings and investment in sub-Saharan African countries has been limited, owing mainly to lack of data on private savings and investment, and appropriate indicators of public policies. An attempt has been made in this paper to fill this void by undertaking an empirical examination of the effects of public policies on private savings and investment in sub-Saharan Africa with pooled time-series and cross-section data for a sample of countries in the region during 1986-92. The estimation results are consistent with reasonable theoretical predictions and provide strong support for the important role that macroeconomic and other public policies can play in encouraging private savings and investment. The econometric evidence indicated that public policies aimed at keeping the rate of inflation low, reducing macroeconomic uncertainty, and promoting financial deepening can have significant and positive effects on private savings and investment. The results indicated a particularly large adverse impact of macroeconomic uncertainty on private savings and investment, thus underscoring the importance of establishing and maintaining macroeconomic stability. The estimation results confirmed the potential for significant payoffs relating to the ongoing process of financial deepening in sub-Saharan African economies. The results also confirmed the deleterious effects on private savings and investment of increases in the ratio of external debt to exports, suggesting that strategies aimed at alleviating the debt burden of the region would help to raise private savings and investment.

In addition, measures aimed at restricting the budget deficit without lowering government investment and at promoting structural reforms would help to raise private investment. It should be noted, however, that although efforts to lower the deficit ratio to sustainable levels would stimulate private investment, doing so by cutting government expenditure on the economic and social infrastructure would be largely detrimental to these efforts; the estimation results indicated that the relative impact of increases in government investment on the private investment ratio is quite large. Thus, alternative means of lowering the budget deficit ratios need

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<sup>1/</sup> The reversal in sign of the total impact of external assistance on private savings and investment seems to reflect the fact that the standard deviation of ODAYSQ is much larger than that of ODAY.

to be considered. In particular, as many sub-Saharan African countries are characterized by narrow tax bases, weaknesses in tax administration, and a proliferation of tax exemptions, there is a significant potential for raising tax receipts through a broadening of the tax base, improvements in tax administration, and a rationalization of the tax system. Such reforms would allow an increase in government revenue and investment without necessarily raising tax rates that would tend to undermine private investment.

In the face of increasing competition for the limited international private direct investment funds, more of the resources for attaining satisfactory and sustainable growth rates in sub-Saharan Africa will have to be generated domestically. In this context, the domestic private sector would have to play a major role. Accordingly, public policies will need to be aimed at creating an environment that is conducive to private sector development. The empirical findings of this paper indicate that maintenance of a stable macroeconomic environment is critical for the efforts toward mobilizing private savings and encouraging private investment, and thus toward laying the foundations for sustained economic growth.

### Empirical Methodology

When dealing with pooled time-series and cross-country data, the issues relating to country heterogeneity, time effects, and heteroscedasticity need to be addressed. Failure to account for these problems would result in biased and inefficient parameter estimates.

In regard to the treatment of country heterogeneity, the use of the least squares dummy variables (LSDV) procedure is quite common. This procedure, which is easily implementable in a regression framework, entails the inclusion of a dummy variable for each country in the sample and yields a different slope intercept for each country; these dummy variables can also account for the effects of omitted variables. However, two aspects of the empirical investigation of this paper preclude the implementation of this procedure. First, and most important, with the inclusion of time-invariant variables (RERGSD and INFSD) in the regression analysis, the LSDV procedure cannot be used because the vector of dummy variables would be perfectly collinear with these variables. Second, the inclusion of a large number of dummy variables for the large sample of countries (with a small number of annual observations for each country) included in the empirical analysis would lead to a large loss of degrees of freedom. The current study uses dummy variables for subgroups of countries to account for the possibility of fixed effects stemming from a priori information regarding the characteristics and institutional arrangements of these subgroups; these dummy variables are: CFA, SUS and IMB. <sup>1/2/</sup> In addition, all multivariate regressions in this study were estimated with dummy variables for all the years of the sample period to account for time effects. Thus, since the regressions used six annual observations (one observation was lost with one lag, with data covering 1986-92) for each country, six dummy variables were included in each equation and the resulting regression equation was estimated without an intercept. The dummy variables for the years are expected to capture the effects of shocks that are common to all countries in each of the years, but which are not captured by other included variables.

Furthermore, the Breusch-Pagan (1979) test indicated the presence in the data sample of heteroscedasticity by country. To correct for this problem in the estimation of the regression equations, a feasible generalized least squares (GLS) procedure was implemented in two steps.

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<sup>1/</sup> See Table 3 for the definitions of these variables. The variables SUS and IMB are not included together in the same regressions because they are almost collinear.

<sup>2/</sup> Alternatively, one could use a "random-effects" procedure to account for country heterogeneity. The main disadvantage of this procedure is that if the unobserved effects are correlated with the included regressors, then the resulting estimators would be inconsistent. An assumption underlying the random effects procedure is that the group of countries under investigation is drawn at random from a given population.

First, an ordinary least squares (OLS) procedure was used to estimate the regression equation with pooled data; the residuals from this step were used to calculate the standard deviation for each country. Second, the country-specific standard deviations were used to scale (weigh) all the included variables and an OLS procedure was applied again to the pooled transformed data to obtain the feasible GLS estimators. In most cases, the estimated standard errors of the coefficients derived from the feasible GLS step indicated significance at higher levels of statistical confidence than was the case under the OLS step.

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