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SHOULD WE WORRY ABOUT RISING AID LEVELS?

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John Serieux
University of Manitoba

International Policy Centre for Inclusive Growth

International Policy Centre for Inclusive Growth (IPC - IG)
Poverty Practice, Bureau for Development Policy, UNDP
Esplanada dos Ministérios, Bloco O, 7º andar
70052-900 Brasilia, DF - Brazil
Telephone: +55 61 2105 5000

E-mail: ipc@ipc-undp.org ▪ URL: www.ipc-undp.org

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AID AND SAVINGS IN SUB-SAHARAN AFRICA: SHOULD WE WORRY ABOUT RISING AID LEVELS?

John Serieux*

ABSTRACT

This paper examines the effect of aid on domestic savings in Sub-Saharan Africa. It departs from the previous literature on aid and savings in developing countries by abandoning the pervasive, but untenable, assumption that all aid is used to expand the trade deficit and thus applied wholly to consumption or investment. In fact, for the period 1965-2006, the evidence suggests that 35% of any increase in aid relative to output was used to finance reverse flows (some combination of interest payments, debt amortization, capital flight and reserve increases), 41% was used to increase consumption relative to output (meaning a reduction in the domestic savings rates) and 24% was used to increase the rate of investment. However, during the extended period of increasing aid levels from the early 1970s to mid 1990s, reverse flows were a larger proportion of aid but more aid was invested and less was consumed. Also, concerns about potential aid hangovers, when current high aid levels subside, can be assuaged by the evidence that that effect has been historically uncommon in the region despite many episodes of high aid levels followed by sharp declines.

1 INTRODUCTION

Since the early 1980s, Sub-Saharan Africa has been the recipient of the highest amounts of aid (as a proportion of GDP) among the world's developing regions (Table A1).[1] With the current and anticipated continued scale-up of aid in support of the Millennium Development Goals (MDGs) and debt relief, this region can expect to receive continued high levels of international financial support in the years to 2015 (or thereabouts).[2] However, there is no presumption that this level of external resource availability will continue indefinitely. At some point, likely just before 2015 (or not far beyond), aid receipts will fall and may do so precipitously. Moreover, any prospect of a sustained (moderate to high) rate of economic growth would require the mobilization of additional domestic resources to fund wider development programs (beyond the immediate concerns of the Millennium Development Goals). It is therefore important that these countries continue to develop their capacity for domestic resource mobilization despite the relative abundance of external resources.

However, Africa's record, with respect to domestic resource mobilization, is not an impressive one. Since the mid-1980s, Sub-Saharan Africa has had the lowest investment rate of any region (by a significant margin) and, since the early 1990s, the lowest domestic savings rate as well (Serieux, 2008). This has been so despite widespread financial liberalization, in the mid 1980s to early 1990s, that was meant to boost savings and investment rates. Thus, while

* University of Manitoba.

the high levels of development assistance may be necessary to support programs that address some of the regions chronic human development challenges (such as the HIV/AIDS pandemic), there is legitimate concern that it may worsen already low savings propensities and contribute less to domestic economic activity than the numbers might at first suggest. In the first instance, the abundance of foreign resources may be encouraging higher consumption rates and (by implication) reduced domestic savings rates. Secondly, if these higher consumption patterns become institutionalized, it could lead to protracted delays in the recovery of domestic savings after aid levels had declined - an aid hangover. Thirdly, aid that does not contribute to consumption may not, in fact, contribute to investment but, instead, be diverted to reverse flows in the form of debt amortization, capital flight and reserve accumulation.

This paper seeks to appraise the validity of these concerns. More to the point, the relationship between aid and savings, in the African context, is examined and, related to this, the relative importance of reverse flows. Further, an attempt is made to determine whether the relationship between aid and savings has been significantly different during the period when aid levels were rising (1974-94), and whether there has been any discernible delay in the adjustment of savings during periods when aid levels (relative to income) were being scaled down from very high levels.

In that regard, the motivation, context and results of this research are presented as follows. Section 2 presents the theoretical and empirical background to this research and a reconsideration of one of the central interpretations of the aid coefficient in the savings equation. Section 3 outlines the methodology to be used to derive relevant results. Section 4 presents those results and Section 5 concludes the paper.

2 THE RECORD OF AID AND SAVINGS IN AFRICA: A LITERATURE REVIEW

2.1 AID AND SAVINGS – THEORETICAL PERSPECTIVES

Historically, the interest of economists in the relationship between aid and savings has derived largely from what that relationship can tell us about the robustness of domestic resource mobilization efforts on the one hand and the consumption-investment choice relating to cheap external finance on the other. Since aid is always an inflow of external resources, it provides the receiving authority (usually the government) with increased command over either foreign or domestic resources.[3] The perception has been, that this prerogative could either be used (by domestic authorities) to supplement domestic savings in order to achieve a higher investment rate (or transferred to others to do so), or it can be used to increase consumption. Thus, the theoretical arguments in favour or against aid has rested, in a large part, on the presumed choice between investment and consumption – a choice that is seen to be ultimately reflected in the effect of aid on domestic savings. Largely ignored, except for references in the early heterodox literature, has been the possibility that aid can also be used to fund reverse (or outward) flows – making it available for neither consumption nor investment. This has been largely due to a very strong assumptions made early on in both the theoretical and empirical literature – that of the strict use of aid to expand the trade balance - which have been carried through subsequent work, largely as a matter of course, despite the fact that that assumption does not, and likely never did, stand up to close examination.

The first formal model specifically aimed at explaining the potentially critical role that development assistance could play in allowing countries to achieve desired investment levels and thus, ultimately, targeted growth levels, was the two-gap model (Chenery and Strout, 1966). That model argued, in essence, that, in attempting to achieve the high investment levels necessary for generating and sustaining moderate to high growth rates, developing countries were likely to face one of two binding constraints: either an inability to generate sufficient foreign exchange to purchase the needed capital and intermediate goods to achieve the desired rate or quality of investment (a foreign exchange constraint), or an inability to generate sufficient domestic savings to achieve the desired rate of investment (a savings constraint). Foreign resource inflows, such as aid, could remove either constraint by providing needed foreign exchange and/or filling the gap between domestic savings and required investment levels. In the view of the model's authors, the savings constraint was more likely to be the binding constraint in the early stages of the development process (Chenery and Strout 1966). Under these circumstances, development assistance could be expected to increase investment directly by allowing investment to exceed domestic savings levels. As development progressed, however, the domestic savings rate could be expected to increase, leading to a narrowing and eventual elimination of the savings-investment gap. However, the higher demand for foreign-produced intermediate and capital goods generated by the higher investment rates could exceed that which could be funded from export earnings. The foreign exchange constraint would thus become the binding constraint on investment (and growth). In this case, the easing of that constraint, through aid, could actually *increase* measured domestic savings by allowing desired savings levels to be realized ex post.[4] A straightforward interpretation of this model would suggest that aid should either have no effect on domestic savings or cause domestic savings to increase.[5]

However, from early on, the general presumption that aid encouraged or facilitated growth has been challenged from both the left and the right. From the left, Andre Gunder Frank (1963) argued that aid was a net deterrent to development. Its net effect was to draw capital out of the receiving country and to direct investment into areas that did not enhance the country's long-term growth but, instead, perpetuated the status of underdevelopment (Frank 1963). In effect, aid was merely a tool for sustaining underdevelopment. In this context, aid could be expected to result in a net reduction in domestic savings, as net outflows exceed inflows, and a fall in the long-term trajectory of growth.[6]

From the right, Milton Friedman (1958) argued that the inflow of cheap capital into developing countries would, in most cases, simply result in the substitution of foreign resources for domestic resources. Aid inflows, in effect, would lead to a commensurate reduction in domestic savings. Even in those countries that were able and willing to use foreign resources appropriately, aid was not the appropriate conduit for assistance. In the first place, these countries could obtain capital from other sources and, secondly, the low price of capital implied by aid would produce the wrong incentives, leading to monument building and waste. At an empirical level, aid could be expected to be mostly consumed (meaning a fall in domestic savings rates) and what aid was not consumed would not contribute to long-term growth due to low productivity effects.

Beyond these works, there have been many further contributions to the theoretical debate on aid and savings. These contributions (along with those already discussed) largely viewed aid from diametrically-different perspectives. At one end of the spectrum, aid was seen as purely additional to domestic resources, therefore contributing to higher investment rates,

growth and eventual graduation from aid dependency (McKinnon, 1964; Fei and Paauw, 1965). At the other end of the spectrum, aid was seen as a substitute for domestic savings, resulting in either increased consumption or waste. In that view, aid did not lead to more rapid growth but instead perpetuated underdevelopment (Griffin, 1970; Griffin and Enos, 1970; Bauer 1974). However, few of these models or perspectives seemed wholly incompatible with Weisskopf's (1972) presumption that aid would be used partly to increase consumption and partly to increase investment. In that respect, the theoretical debate appeared to boil down to an argument about proportions rather than absolutes. Was aid mostly invested or mostly consumed? Partial consumption would necessarily mean a negative effect on the domestic savings rate but not a fall in the investment rate. Only full consumption of aid would mean no net investment effect, and only a zero (or positive) savings effect of aid would mean that aid was fully invested and not consumed. That way of framing the argument appeared to present a neat framework that lent itself readily to empirical verification. However, lost in that simplification was the fact that aid could also contribute to outflows of income and capital – meaning that part of aid would not be available for either investment or consumption.

2.2 AID AND SAVINGS – THE EMPIRICAL LITERATURE

2.2.1 Preliminaries

As noted earlier, the differing perspectives on the efficacy of aid, as a means for generating higher investment rates in developing countries, have been recast as divergent presumptions with regard to the degree to which aid displaces domestic savings. Total displacement, which is largely what was presumed by both dependency theories and some neoclassical perspectives (Friedman, 1963; Frank, 1966; Griffin and Enos, 1970), is generally thought to be demonstrated by a coefficient of negative one (or below) for aid in (appropriately-measured) national or domestic savings equations. The essential reasoning is that (because aid and savings are necessarily equal ex post) national (and domestic savings) will contract by the exact amount of aid flows since foreign savings (and consumption) have increased without any change in investment.[7] The alternative view (proposed by the two-gap model as well as those of McKinnon (1964) and Fei and Paauw (1965)), that aid is used to increase investment or to remove a binding foreign exchange constraint, is thought to be demonstrated by a coefficient (for aid) that is close to zero or positive. (Aid either increases or does not affect savings because it increases investment by an amount equal to or greater than the amount of aid). A coefficient between zero and negative one is thought to imply that aid is partially invested and partially saved with a bias in either direction being seen to support one perspective over another. As will be demonstrated in the next section, this view grossly oversimplifies a rather complex relationship. The aid coefficient in the domestic savings equation, if it is appropriately specified, will tell us something about the consumption-savings decision but very little about whether it does or does not contribute to investment. However, this discussion is most appropriately prefaced by the synopsis of the empirical literature which follows.

2.2.2 Global Summaries

In recent years, two studies examined the rather substantial empirical literature on aid and savings with a view to establishing a consensus view on the nature and magnitude of that relationship suggested by the balance of the evidence. Hansen and Tarp (2000) used

constructed t-statistics for a number of studies to determine to what degree the balance of the evidence (from published empirical work) was supportive of the contention that aid was wholly a substitute for domestic savings versus the alternative hypothesis that it was at least partly additional to domestic savings (i.e. some aid was invested). Doucouliagos and Paldam (2006) attempted to derive mean coefficient estimates (for aid in savings equations) from the literature and also subjected the studies to rigorous statistical analyses to determine the reliability of published results in general.

In the review by Hansen and Tarp (2000), the interpretation of the aid coefficient in savings equations is based on the disaggregation and differencing of the investment-savings identity (in ratios relative to GDP), as indicated in Derivation (1), below.[8] More specifically, that derivation is used to conclude that, if the aid coefficient in the domestic savings equation (an estimate of $\partial s_d/\partial a$) is equal to -1, all aid is fully consumed and none is invested.[9] If that coefficient is between -1 and zero, then at least some aid is invested. If it is zero, then aid is fully invested. If aid was used to ease a foreign exchange constraint, that coefficient could be positive. It is notable that this conclusion is predicated on the assumption that aid has no effect on private and other external capital flows (i.e. the differentials for f_p and f_o, with respect to aid, are equal to zero). As will be shown later, these assumptions are not as benign as typically assumed.

$$i \equiv s_n + s_f$$

$$i \equiv s_d + ntr + s_f$$

$$i \equiv s_d + a + f_p + f_o$$

$$\frac{\partial i}{\partial a} \equiv \frac{\partial s_d}{\partial a} + 1 \qquad given \qquad \frac{\partial f_p}{\partial a} \approx \frac{\partial f_o}{\partial a} \approx 0 \qquad [1]$$

Hansen and Tarp (2000) were able to derive the test statistic for the null hypothesis of -1 for the aid coefficient (in the reported savings equations) for 39 of the 41 studies examined. A coefficient of -1 would imply (they argued) that aid displaces domestic savings on a one-to-one basis. They found that, for 20 of the 39 studies, the derived z-statistic did not allow rejection of the (null) hypothesis of a coefficient of -1. However, 18 of those 39 studies did reject that null hypothesis, suggesting, instead, that the coefficient was less negative than -1 (meaning that at least some aid was invested). One study not only rejected the null but also suggested that the coefficient was more negative than -1 (meaning, in that framework, that aid actually increased consumption by more than the total amount of aid). Hansen and Tarp (2000) thus concluded that the balance of the evidence suggests that some aid is invested and some of it is consumed (the aid-savings coefficient lies between 0 and -1).

Doucouliagos and Paldam (2006) used a similar interpretation of the aid-savings coefficient in their review. As Table 1 indicates, if the aid coefficient (in an appropriately-defined domestic savings equation) is negative but less negative than -1 (i.e. between 0 and -1),

it is still seen as contributing to investment (and aid effectiveness) by not completely crowding out domestic savings. At exactly -1, the coefficient presumed to indicates that aid completely crowds out domestic savings and adds nothing to investment activity, and below that value it undermines investment, and is harmful to the economy. If the coefficient is positive, it means that investment increases by more than the amount of aid. In this case, aid does not simply contribute to investment it has a catalytic effect by inducing a higher level of domestic savings than would have been the case without aid. This would be the case, for example, if aid relieved a foreign exchange constraint that had previously discouraged savings because of limited access to capital imports. This is, in fact, part of the argument made by Chenery and Strout (1966).

TABLE 1:

Interpretation of the Aid-Savings Relationship

Equation Specification:	$s_d = \alpha + \mu h + \boldsymbol{\gamma x} + \varepsilon$				
Investment Effect	Super	Full	Some	None	Harmful
Relevant Coefficient Size	$\mu > 0$	$\mu \approx 0$	$0 > \mu > -1$	$\mu \approx 0$	$\mu < -1$

Note: s_d is the domestic savings/GDP ratio; h is the aid/GDP ratio; μ is the aid coefficient; $\boldsymbol{x}$ is a matrix of control variables; $\boldsymbol{\gamma}$ is a vector of other coefficients; ε is the error term

Source: Doucouliagos and Paldam (2006).

Using 23 preferred coefficient observations from 16 studies, they found an unweighted average value of -0.9 for the aid coefficient with a median of -0.79, and a weighted average (weighted by sample size) of -0.85.[10] If we accept the presumption that a coefficient of -1 implies full consumption of aid, these estimates clearly suggest that, on average, the larger proportion of aid is consumed, though a small portion of aid is, indeed, invested. This finding is roughly in line with that of Hansen and Tarp (2000).

2.2.3 Empirical Results for Africa

The majority of the studies summarized above attempted to estimate the aid-savings elasticity for large groups of developing countries covering all or most of the world's developing regions. However, a few studies did look at specific regions, including sub-Saharan Africa.

Doucouliagos and Paldam (2006) noted that, when the sample of countries (used to estimate overall aid-savings elasticities) included Sub-Saharan African countries, the resulting coefficient was generally larger (less negative).[11] The unweighted average, median and weighted average coefficient estimates (for country samples that included Sub-Saharan African countries) were -0.40, -0.51 and -0.42 respectively – significantly lower than the comparative estimates when there was no restriction on regional representation in the samples (-0.66, -0.72 and -0.64). By comparison, when the samples were restricted to those inclusive of Asian countries, the average coefficient estimates were more negative and close to the average for the unrestricted set (of samples). When the samples included Latin American countries the coefficient estimates were substantially more negative than the average for the unrestricted set.

In conformity with the Doucouliagos and Paldam (2006) results, those studies that strictly limited their samples to Sub-Saharan African countries found elasticities between aid and

savings that were generally negative, but smaller than the averages and median suggested by the larger literature (using multi-regional country samples). Lensink (1993), using a sample of 21 Sub-Saharan African countries for the period 1980-88 found statistically-significant aid-saving elasticities of -0.50 and -0.52 (using OLS and 3SLS respectively). Hadjimichael *et al* (1995), using a sample of 39 countries and covering the period 1987-92, reported coefficient estimates of -0.35 and -0.33. Gyimah-Brempong (1992) disaggregated aid into its loans, grants and food aid components to determine the savings elasticities of these types of aid separately. Using a sample of 34 countries, covering the period 1968-87, Gyimah-Brempong (1992) found that grant aid had a strongly negative and significant coefficient (of -1.13) in the savings equation, loans had a positive and significant coefficient (0.42) and food aid had a small, positive, but insignificant coefficient (0.03).

These results present us with something of a conundrum. The small absolute size of the coefficient for Africa seems to suggest that a rather large proportion of aid is invested in Sub-Saharan Africa than most other regions (including Asia). Yet, this region has had the lowest investment rate *and* the highest ratio of aid relative to output among the various regions. If Africa is receiving more aid and investing most of it, why is its investment rate so low? The first step toward answering this question will be to determine whether the presumption that a small coefficient (in absolute value) does in fact imply that less aid in consumed (and thus more is invested).

2.3 FURTHER CONSIDERATIONS: SOME BASIC AID ACCOUNTING

Besides what it says directly about the savings-aid relationship, the typical interpretation of the aid coefficient in savings equation has two aspects. First, it is thought to say something about the proportion of aid consumed - the effect of aid on domestic savings is opposite to its effect on consumption, since that part of aid which displaces savings makes those (displaced) resources available for consumption. Second, it is thought to tell us something about the investment effect of aid - aid adds to investment as long as its savings effect is positive or less negative than then minus one. However, a closer examination will demonstrate that the first presumption is exactly correct (if aid and consumption are measured as ratios relative to income) but the second is not correct – a factor that, in a large part, explains the apparent contradiction in the results for Africa discussed above.

From the definition of domestic savings (domestic savings is equal to output (Y) minus consumption (C)), we get a straightforward relationship between the domestic savings and consumption ratios relative to output (Second line of Derivation 2, below). Thereafter, straightforward differentiation of these ratios, with respect to the aid to output ratio (a), leads to the result that the consumption rate effect of aid ($\partial c/\partial a$) is simply the inverse of the domestic savings rate effect ($\partial s_d/\partial a$). Thus, any negative effect of aid on the savings rate implies, by definition, a positive effect, of equal absolute magnitude, on the rate or consumption and vice versa. In effect, the aid coefficient in the domestic savings rate equation says as much about the effect of aid on the rate of consumption (as a proportion of income) as it does about the savings rate effect.

$$\begin{aligned} S_d &\equiv Y - C \\ s_d &\equiv 1 - c \\ \frac{\partial s_d}{\partial a} &\equiv -\frac{\partial c}{\partial a} \end{aligned} \qquad [2]$$

The implied investment effect can be derived from the income identity, as in Derivation (3) below. From that identity, output (Y) is equal to the sum of total consumption (C), total investment (I) and net exports (NX). Applying the definition of domestic savings, dividing by output (to redefine variables as ratios relative to output) and differentiating with respect to the aid ratio, we derive the condition that the effect of aid on domestic savings is equal to the sum of the investment effect and the trade balance effect (∂NX/∂a). Since this is an identity (and not a behavioural relationship), the presumption in the literature described above ($\partial s_d/\partial a = \partial i/\partial a - 1$) can only be true if the trade balance effect is exactly equal to minus one. But there is no theoretical or practical reason why this needs be the case. In fact, the more likely scenario is that only part of aid receipts will be used to increase imports (and thus contributing to trade balance deterioration). Some aid receipts are likely to be used to accumulate reserves, service debt or for capital flight – meaning the effect of aid on the trade balance ratio can be more properly expected to lie somewhere between 0 and minus 1 but is unlikely to be exactly -1.

$$Y \equiv C + I + NX$$

$$Y - C \equiv S_D \equiv I + NX$$

$$s_d \equiv i + nx$$

$$\frac{\partial s_d}{\partial a} \equiv \frac{\partial i}{\partial a} + \frac{\partial nx}{\partial a}$$

$$\frac{\partial s_d}{\partial a} \equiv \frac{\partial i}{\partial a} - 1 \qquad iff \qquad \frac{\partial nx}{\partial a} = -1 \qquad [3]$$

A more complete understanding of the likely use of aid, other than for consumption and investment, can be gained from disaggregation of the balance of payments identity (Derivation (4) Below). A typical division of the capital and financial account (*ca*) and the current account (*cu*), defined relative to output, into their sub-accounts and utilizing the fact that the combination of net transfers relative to output (*ntf*) and the change in foreign liabilities relative to output (*Δfl*) can be divided into the aid-output ratio and the change in other (non-concessional) foreign liabilities relative to output (*Δofl*),[12] leads to the result that the trade balance effect of an increase in aid (∂*nx/∂a*) is equal to negative one plus: any additional contraction in foreign liabilities induced by aid (-∂*Δfl/∂a*) - such as principal payments on non-concessional debt;[13] any additional increase in foreign assets induced by aid (∂*Δfa/∂a)* - such as capital flight or reserve accumulation; and any net factor payments to foreigners induced by aid (∂*nfp/∂a)* - such as interest payments on foreign debt. Clearly, all three of these types of reverse flows are likely consequences of aid flows and cannot reasonably be assumed to be zero individually or collectively. The larger the sizes of these *reverse flows* the greater the deviation of the trade balance effect from -1.

Combining the results of Derivations (2) – (4) leads to the conclusion that aid has not two but three potential types of application: the displacement of domestic savings (or, equivalently, consumption), investment, and meeting foreign obligation (reverse flows).

$$cu + ca \equiv 0$$

$$-cu \equiv ca$$

$$-ntr + nfp - nx \equiv \Delta fl - \Delta fa$$

$$nfp - nx \equiv ntr + \Delta fl - \Delta fa \equiv a + \Delta ofl - \Delta fa$$

$$\frac{\partial nfp}{\partial a} - \frac{\partial nx}{\partial a} \equiv 1 + \frac{\partial ofl}{\partial a} - \frac{\partial \Delta fa}{\partial a}$$

$$\frac{\partial nx}{\partial a} \equiv -1 - \frac{\partial ofl}{\partial a} + \frac{\partial \Delta fa}{\partial a} + \frac{\partial nfp}{\partial a}$$

$$\frac{\partial nx}{\partial a} \equiv -1 + \frac{\partial rf}{\partial a} \qquad [4]$$

Put differently, aid can be consumed, invested or used for external transactions not related to trade in goods and services. This is shown more clearly in Derivation 5 below. Thus, the degree of displacement of foreign savings indicated by the aid coefficient in the savings rate equation tells us something quite exact about the amount of aid used for consumption but very little about the use of aid for either investment or reverse flows. However, if that information is combined with the net export effect of aid, we can determine the precise division of aid between the three potential types of use.

$$\frac{\partial s_d}{\partial a} \equiv \frac{\partial i}{\partial a} + \frac{\partial nx}{\partial a}$$

$$\frac{\partial nx}{\partial a} \equiv -1 + \frac{\partial rf}{\partial a}$$

$$\frac{\partial s_d}{\partial a} \equiv \frac{\partial i}{\partial a} - 1 + \frac{\partial rf}{\partial a}$$

$$-\frac{\partial s_d}{\partial a} + \frac{\partial i}{\partial a} + \frac{\partial rf}{\partial a} \equiv 1$$

$$\frac{\partial c}{\partial a} + \frac{\partial i}{\partial a} + \frac{\partial rf}{\partial a} \equiv 1 \qquad [5]$$

The above analysis also brings to the fore a missing aspects of previous analyses – the diversion of aid to reverse flows. Whenever aid is used to finance reverse flows (debt servicing, capital flight or reserve accumulation), it is no longer available for increasing imports and, therefore, cannot contribute to either consumption or investment. In effect, the reverse flow decision precedes the consumption-investment decision and places a limit on the amount of aid that can be made available to the domestic economy. How much aid contributes to reverse flows is therefore important for telling us how much of disbursed aid is capable of having some direct effect on domestic economic activity – by contributing to the consumption ratio (savings rate displacement) or the investment ratio. The greater the amount of aid used for reverse flows the smaller is the trade balance deterioration and thus the smaller the sum of the consumption and investment effects. Therefore, the relatively small magnitude of the negative savings effect of aid for Sub-Saharan Africa may be more reflective of a small trade balance effect (and large reverse flows) than of a large investment effect. As will be shown below, this is in fact the case.

3 METHODOLOGY

3.1 THE BEHAVIOURAL EQUATIONS

Specifications for national and domestic savings equations in most recent empirical work have typically been informed by some combination of the permanent income and life cycle income hypotheses.[14] While this combined model offers invaluable insights into savings behaviour in both developed and developing countries, it does not provide complete explanations for some of the relationships consistently encountered in empirical estimations of the savings equations (Schmidt-Hebbel and Servén, 1997). For example, that model combination does not provide a satisfactory explanation for the importance of growth in most (macroeconomic) savings equations.[15] Other models, such as consumption habit (or relative income hypotheses) models and subsistence income models, provide additional and useful insights into savings behaviour. In the consumption habit models, for example, growth is a more credible regressor in the savings equation, because it represents the increased savings induced by the lagged response of consumption to income growth. In the same vein, subsistence-income models offer a credible rationale for the importance of per capita income in explaining savings rates in developing countries (Schmidt-Hebbel and Servén, 1997). Further, neither of these approaches is necessarily inconsistent with the basic premise of the permanent-income hypothesis.
This investigation, therefore, employs a generalized model of savings that nests all of these perspectives. In effect, the ratio of savings to income is presumed to be affected by a range of variables (or proxies for such variables) that have been well-established in the empirical literature and supported by one or more of these empirical models (Table 2). It will be left to the data to establish which model presumptions best approximate the country and regional circumstances.

TABLE 2

The Determinants of Savings

Variables	Symbol	Relevant Effect	Effect
Log of Per capita income	LPCY	Increasing income beyond subsistence	Positive
Rate of GDP growth	G	Delayed consumption response	Positive
Deviation of export growth from recent past performance[16]	NXG	Increased in perceived transitory income	Positive
The Dependency Ratio	DEP	Changing generational effect on savings	Negative
Official development assistance/GDP	ODA/Y		
Concessional Loans/GDP	LO/Y	Increased public sector (and some private sector) income	To be determined
Grants/GDP	GR/Y		
Other Capital Flows	OF/Y		

With respect to the net exports ratio equation, the working assumption is that aid has no direct effect on the ratio of exports to income.[17] Therefore, the net export term in Derivation (4 and 5) can be reduced to the derivative with respect to the import ratio. The relationship to be estimated then becomes that between the import/GDP ratio and ODA/GDP ratio.

$$nx \equiv x - m$$

$$\frac{\partial nx}{\partial a} \equiv \frac{\partial x}{\partial a} - \frac{\partial m}{\partial a} \approx 0 - \frac{\partial m}{\partial a}$$

$$\frac{\partial nx}{\partial a} \approx -\frac{\partial m}{\partial a} \qquad [6]$$

The behavioural equation for the import ratio is described within a straightforward Keynesian framework (augmented by the aid variables). That specification reflects a presumption that the rate of imports relative to output is determined by the export ratio, per capita income, the ODA/GDP ratios and other capital flows (see below).

3.2 MODEL ESTIMATION AND DATA ISSUES

The savings effect of aid was estimated using a (panel) data set covering 29 Sub-Saharan African countries over the period 1965 to 2006. The countries and time periods covered are listed in the Appendix II. The data sources were the OECD Creditor Reporting System (OECD), World Development Indicators (World Bank), International Financial Statistics (International Monetary Fund) and the United Nations Common Data Base (UN Statistical Division). Most of the Sub-Saharan African countries excluded from the sample were due to insufficient data. The one exception was South Africa, which was excluded because several of that country's attributes (such as its level of financial sector development, per capita income, the dominance of commercial loans relative to aid even in the 1960s etc.) made it an outlier relative to the other countries in the sample at many levels.

The model estimation approach was largely determined by the nature of the data and the questions being asked. In the first instance, the fact that each variable is defined for 29

countries over a period of 42 years (for most countries at least) means that the panel data set could be categorized as having a large T as well as reasonably large N. In this context, non-stationarity of the savings variable (as well as other variables) becomes an issue. Secondly, a primary focus of this paper is the long-run relationship between aid and savings. Determining this relationship requires an estimation procedure that distinguishes between the short and long-run determinants of the savings ratio – making an error correction framework the most appropriate estimation approach.

To determine whether non-stationarity was a legitimate concern, a Fisher panel unit root test was applied to the savings variable and the potential explanatory variables. As Table A2 (Appendix I) indicates, the null hypothesis of full panel non-stationarity was rejected for all variables in levels.[18] However, the relevant null hypothesis is a strong one: that the variable is non-stationary for all panels (countries). A more detailed examination of the unit root tests at the panel level (using the KPSS and DFGLS tests) indicates that some variables are often non-stationary.[19] This was true of the savings ratio, the dependency ratio, per capita income, the aid variables and the export and import ratios.[20] However, the rate of output growth, the innovation on export growth, and other external flows are mostly stationary according to both tests. This suggest that the former group of variables likely define long-run relationships (even when non-stationary, these variables may still be fractionally integrated), whereas the latter group of variables is more likely affect short term movements of relevant variables (savings and import ratios).

To accommodate the likely presence of non-stationarity in some panels, the Pooled Mean Group approach of Pesaran, Shin and Smith (1999) was used to estimate long- and short-run relationships within an error-correction framework. The advantage of the pooled mean group approach is that it is designed specifically for panel data with large N and large T where non-stationarity is a concern, but it does not necessarily require non-stationarity across all panels (as does the panel cointegration approaches). Further, it makes more effective use of the available data than the Mean Group approach by employing both pooling and averaging approaches. A long-run equation is estimated by pooling the data for all countries, while individual short-run equations are estimated for each country and averaged to determine the short-run coefficients for the region. Another advantage of the Pooled Mean Group approach is that it is less sensitive to extreme coefficient values at the panel level (Pesaran, Shin and Smith, 1999). The estimation results do indicate that pooling does lead to more definitive results for the long-run equation.

The specifications for the long- and short-run savings rate equations are largely determined by the typical level of integration of the variables (at the panel level). The variables that are often non-stationary are assumed to be part of the long-run equations while the other variables enter the short-run relationships. The specification therefore reflects the presumption that, for these mostly low-income African Countries, over the long run, the savings rate moves together with (the log of) per capita income (LPCY), the dependency ratio (DEP), and total official development assistance relative to output (ODAY) or concessional loans relative to output (LO/Y) and grants relative to output (GR/Y) entered separately (Equation E1 and E1).[21]

$$S_d/Y = \beta_1 LPCY + B_2 DEP + \beta_3(ODA/Y) \qquad [E1]$$

$$S_d/Y = \delta_1 LPCY + \delta_2 DEP + \delta_3(LO/Y) + \delta_4(GR/Y) \qquad [E2]$$

The remaining (mostly stationary) variables are presumed to be involved in the short-run behaviour of the savings rate (together with the first difference of the variables that enter the long-run equation). However, in that equation, the growth rate (g) is substituted for the change in the level of per capita income because, besides the fact that it proxies that variable, it is more directly related to the delayed consumption response suggested by the consumption habit models.[22] Besides the differenced variables, the remaining variables in the short-run equation are the error-correction term (θ), the deviation of export growth from the previous three-year average (NXG) – a proxy for transitory income, and other flows from abroad (OFL/Y).

$$\Delta(S_d/Y)=\beta_0+\beta_1\theta_1+B_2 g+\beta_3 NXG+\beta_4\Delta DEP+\beta_5(OFL/Y)+\beta_6\Delta(ODA/Y) \qquad [E3]$$

$$\Delta(S_d/Y)=\delta_0+\delta_1\theta_2+\delta_2 g+\delta_3 NXG+\delta_4\Delta DEP+\delta_5(OFL/Y)+\delta_6\Delta(LO/Y)+\delta_7\Delta(GR/Y) \qquad [E4]$$

As noted earlier, the estimated equation for the import ratio uses a Keynesian framework which presumes that, over the long-run, the level of imports relative to output (*M/Y*)) is determined by the export ratio (*X/Y*), the log of per capita income (LPCY) and the ODA/GDP ratio (or the loan and grant to GDP ratios separately). *A priori*, there would be good reason to believe that other capital flows help to determine the rate of imports over the long run. However, as Table A2 indicates, this variable is quite strictly stationary (unlike the import, export or aid ratios). Therefore, it is more reasonable to suppose that other flows influence the short- run behaviour of the import ratio – the deviation from long-run equilibrium levels. Given the small size and inconsistency of private flows (which make up the bulk of other flows) into this region, it does seem more likely that these flows would define short-run, rather than, long-run behaviour.[23]

$$M/Y = \beta_1(X/Y) + \beta_2 LPCY + \beta_3(ODA/Y) \qquad [E5]$$

$$M/Y = \delta_1(X/Y) + \delta_2 LPCY + \delta_3(LO/Y) + \delta_4(GR/Y) \qquad [E6]$$

The short-run equations are defined by the differenced versions of the long run variables with the inclusion of a constant, the error correction term and the other flows (from abroad) relative to output (OFL/Y).

$$\Delta(M/Y)=\beta_0+\beta_1\Delta(X/Y)+\beta_2\Delta Lpcy+\beta_3(OFL/Y)+\beta_4\Delta(ODA/Y) \qquad [E7]$$

$$\Delta(M/Y)=\delta_0+\delta_1\Delta(X/Y)+\delta_2\Delta Lpcy+\delta_3(OFL/Y)+\delta_4\Delta(LO/Y)+\delta_5\Delta(GR/Y) \qquad [E8]$$

4 RESULTS AND ANALYSIS

When the pooled mean group procedure is applied to the full sample of countries, the long-run equation for the savings rate indicates a coefficient of -0.41 for the ODA/GDP ratio (Table A3). The estimated coefficient for the grant/GDP ratio was more negative at -0.52, while that for the loan/GDP ratio was negative but insignificant at 0.01. The other included variables in the long-run equation (per capita income and the dependency ratio) were also significant in at least one version of the estimated equations.

The strong t-statistic for the grants coefficient, combined with the statistical insignificance of the coefficient for loans, would seem to suggest that grants are by far the more important form of aid – at least in terms of the long-run relationship with savings. This is not altogether surprising given that loans constitute only a small proportion of ODA for most of these countries (Figure 2). However, it does appear that, at the very least, loans do not have as negative an impact on savings as do grants. Presumably, that fact that loans (though concessional) need to be repaid makes it less likely these flows will be directed toward consumption.

The error-correction term, in both versions of the short-run equation, suggests a modest speed of error correction (around one third of the deviation from the long-term relationship is corrected in the first year). The strongest determinants of short-term movements in the savings rate were the rate of growth in output and the innovation in export growth (measured as deviation from the average of the previous three years). These terms reflect aspects of presumptions of the consumption habits models (delayed response of consumption) and the permanent income hypothesis (high savings rate for transitory income) that have generally been supported in the literature. Surprisingly, however, other flows (from abroad) could not be shown to have any effect on the savings rate. It would seem to suggest that these flows are not sufficiently important to make a measurable impression on consumption choices.[24]

For the full sample period, the results from the Pooled Mean Group estimation of the long- and short-run equations for the import ratio are presented in Table A4. The results for the long-run equation suggest that a one-percentage-point rise in the ODA/GDP ratio is associated with a 0.65 percentage-point rise in the import/GDP ratio over the long run. This means that 35 percent of the increase in the ODA ratio is not used to finance imports (of consumption or investment goods). As Derivation (4) indicates, that part of an increase in ODA not used to finance imports goes toward financing reverse flows - some combination of increases in reserves, capital flight or debt service payments.[25] The precise nature of this 'leakage' cannot be determined without significantly more detailed data (which is not available before 1970) but, given the high level of indebtedness of most of these countries for much of the period in question, it is a fair bet that debt service payments (particularly interest payments) were a major part of that 'leakage' of ODA flows. It is also worth observing that other flows were again not important statistically.

Given the above estimates of the ODA effect on savings and import ratios, we can also estimate the implied investment effect and thus the division of aid between consumption, investment and reverse flows in the region as a whole. Given that the coefficient for the ODA/GDP ratio in the savings equation (-0.41) is the exact opposite of the consumption rate effect (0.41) and the reverse flow is 0.35 (one minus the net import effect of 0.65), we can conclude, from the relationship defined in Derivation (5) above, that the investment rate effect

of a change in the ODA ratio is 0.24 **(or 1 - 0.35 - 0.41).** In effect, for the region as a whole, only 24% of an increase in the ODA/GDP ratio would typically add to the rate of investment. Of the remainder, 35% would contribute to reverse capital flows and 41% would be consumed (meaning a displacement of savings).

As noted earlier, one of the concerns of recent years has been whether the recent increase in ODA/GDP ratios across developing countries in general, and Sub-Saharan African countries in particular, will induce stronger negative effects on savings, thus indirectly compromising domestic resource mobilization efforts. One way of determining whether this concern has strong empirical justification is to examine the region's response during previous periods when ODA/GDP ratios were increasing. As Figure 2 indicates, during the 21-year period from 1974 to 1994, the region experienced a nearly continuous increase in ODA/GDP ratios. If there is indeed an inherent tendency to save less when aid levels are increasing, we would expect to observe regional savings rate effects somewhat above the long-run estimate for the full sample period (1964-2006). As Table A5 indicates, when the saving rate equation is re-estimated for the period of increasing ODA/GDP ratios, the long-run coefficient estimates for the ODA/GDP ratio is less negative than that for the full sample (-0.21 compared to -0.41) and the null hypothesis of equality of coefficients is rejected by the Wald test (Table A5). The coefficient for the Grant/GDP ratio is similar to the estimate for the full sample period (-0.55 compared to -0.52) and the Wald test does not reject the null hypothesis of identical effects. However, for this period, the coefficient for the Loan/GDP ratio is positive, large, and significant (0.40). The implication would seem to be that the effect of the total ODA/GDP ratio on the savings rate was smaller during that period because loans were a larger proportion of total ODA (see Figure 2) and they had, by and large, a positive impact on the savings rate. Thus, the contention that increasing ODA/GDP ratios will encourage weaker domestic savings mobilization efforts is not supported by the experience of that period.

The import equation was also estimated for that increasing-aid period (Table A6). The long-run coefficient for ODA in the import equation was found to be 0.52, meaning that 48% of aid was used to finance reverse flows during that period. When this information is combined with the aid-savings effect, what it says about the broad allocation of aid is only moderately encouraging. Using the Derivation 2 and 5 above, we can determine that 21% of aid was used to increase the rate of consumption (reduce the rate of saving), 31% was used to increase the investment ratio and 48% was used for reverse flows. Thus, during that period, slightly more aid went to increase investment and there was less displacement of savings (consumption). However, only slightly more than half of aid ever made its way into the domestic economy. Close to half of aid receipts were used to meet foreign obligations rather than boost domestic economic activity.

The other issue of concern investigated here was whether the speed of recovery of the savings rate after a period of high aid levels (defined here as ODA/GDP ratios of 10% or higher) was sufficiently rapid to assuage concerns of an aid hangover for these countries – the situation where consumption patterns during periods of high aid inflows (relative to output) become so institutionalized that they change only slowly (despite the fact that the inflows that accommodated high consumption rates are no longer available), thus leading to the further deterioration in savings rates when previously high aid inflows drop.

To determine whether this was a likely scenario, dummy variables for the first year and the first three years after periods of high aid flows were added to the short-run equations for the

Pooled Mean Group analysis. (For the purposes of this exercise, periods of high aid flows were defined as periods of five years of more when the ODA/GDP ratio was persistently above 10%).[26] An aid hangover would be indicated by a significant and negative coefficient for the dummy variables in the years immediately after the high-aid periods - because attempts to sustain high consumption ratios would lead to savings rates below that which would be predicted by the general equation (which covers both high and low aid periods). As Table A7 indicates, none of the dummy coefficients are significant. It appears that, for the region in general, savings rates adjust immediately to changes in the level of aid inflows. There is no evidence of aid hangovers from the past experience of the region.

Since the Pooled Mean Group approach uses the pooled data to estimate the long-run equation, but estimates and then averages individual country estimates of the short-run equation, it is possible to examine the estimated coefficients for the dummy variables for each country. Fifteen of the 29 countries had episodes of high aid ratios followed by a decline. Among these countries the coefficient for the dummy variable for the first year of decline was insignificant (at the 10% level or better) for 10 countries and significant for five. Of the five countries for which the coefficient was significant, it was negative and significant for one (Central African Republic and Mali) and positive and significant for the remaining four (The Gambia, Ghana, Malawi and Mauritania). When the response was examined over a three-year period, only two countries indicated a significant response: Chad, with a positive response and Burundi with a negative response. Thus, only two countries suggest evidence of aid hangovers while five suggest overcompensation – savings levels have risen more sharply when aid levels declined (from very high levels) than would be predicted by the model. In effect, aid hangovers have been neither common nor singular responses to declines in aid levels.

5 CONCLUSION

The relatively rapid rise in ODA flows to Sub-Saharan Africa, in the years following the Enhanced HIPC Initiatives of 1999 and the establishment of the Millennium Development Goals of 2000 (United Nations, 2000), have raised concerns about the effect of these flows on savings in a region that already has a poor savings record. The concerns have been that:

- Rather then being purely additional, aid will displace domestic savings and, thus, reduce domestic resource mobilization efforts;
- That effect will be exacerbated in this period of consistently increasing aid flows;
- Countries may suffer an aid hangover when aid levels decline because the consumption patterns accommodated by high aid levels may become institutionalized, making it difficult for countries to adjust consumption patterns when aid flows decline. In this case, savings rates would actually fall when aid levels decline, as recipient countries attempt to maintain consumption levels at the cost of domestic savings.

These issues were examined individually in this paper. However, this was preceded by an examination and clarification of the interpretation of the coefficient for the aid (ODA) ratio in the savings rate equation. The convention in the literature has been the interpretation that a coefficient of -1 is an indication of full consumption of aid, and full displacement of domestic

savings, while a coefficient of zero (or a positive number) implied full investment of aid and, thus, no displacement of domestic savings. However, this convention implicitly assumes that all aid is used to expand the trade deficit (increase imports) – an unlikely scenario. The need to increase foreign reserves, debt service payments and capital flight all place demands on the foreign resources that aid brings. Thus, how much of aid is invested or consumed can only be determined after its effect on the trade deficit is determined. Without that additional information, any particular coefficient provides very incomplete information about the actual use of aid.

The empirical analysis, using the Pooled Mean Group analysis for a sample of 29 Sub-Saharan African countries, indicates that, for the region and covering the period 1965-2006, on average, 35% of each percentage point of aid relative to GDP was used to finance reverse capital flows, 41% was consumed (thus displacing domestic savings) and 24% was used to increase investment. Thus, the dominant use of aid is not investment but consumption and the financing of reverse flows. More then one third of aid typically did not make it into the domestic economy. Thus, what looks like a relatively small negative savings effect for Africa compared to other regions (-0.41) does not imply, as is often thought, that a large proportion of aid is invested. Instead, only one quarter of aid (24%) was invested for that region over the sample period (1965-2006). The remainder was used to finance reverse flows not directly related to consumption or investment (i.e. dept service payments, capital flight and reserve accumulation).

When aid is disaggregated into grants and loans the former, as expected, showed the most negative impact on domestic savings. The long-run coefficient for grants in the savings equation was more negative than the coefficient for ODA. The coefficient for loans was also negative but small and insignificant. Clearly, with respect to savings, the effect of grants and concessional loans do not appear to be identical.

An examination of a previous period of consistently rising aid flows (1974-94) suggests significantly weaker displacement of domestic savings than was the case for the full sample period (1964-2006). This was due largely to a stronger impact of the loans which entered the equation with a positive and significant coefficient – nullifying a large part of the larger negative effect of grants. In fact, for each percentage point increase in the aid-income ratio, for that period, the domestic savings rate decreased by 0.21%. At the same time, the trade balance deteriorated, on average, by 0.52% for ever one percentage point increase in the aid ratio. These numbers imply that, for that period, 48% of aid was used to finance reverse flows, 21% for consumption and 31% for investment. From an investment perspective, this is a slightly better performance than that for the whole sample period, but it also suggests that less aid made it into the domestic economy.

A test of the hypothesis that savings rates were lower than anticipated in the years when previously high aid levels dropped – indicative of an aid hangover – gives no support to that hypothesis. The coefficient for dummy variables for the first and first three years after a high aid period was not significant. In fact, for the 15 countries that experienced high-aid periods only seven demonstrated a substantive response of the savings rate to a fall in aid-to-output ratio. Further, only two of these indicated a negative response, and the relevant coefficients were only weakly significant. It appears that an aid hangover is an atypical phenomenon for the region.

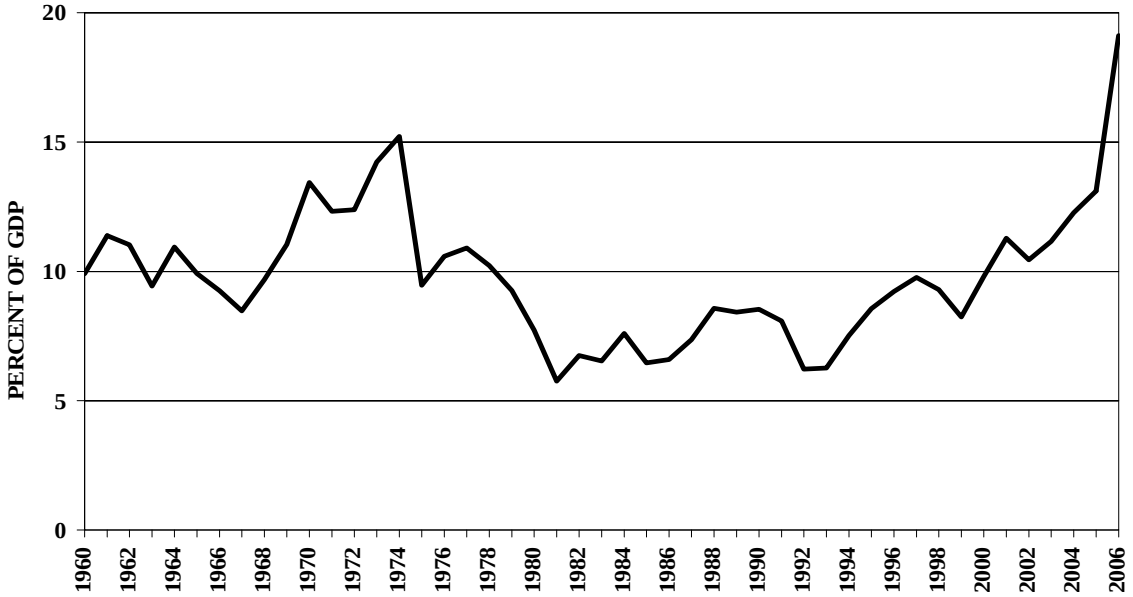
APPENDIX I

TABLE A1

Aid Receipts by Developing Region

Aid Measure	Developing Region	Five-Year Periods								
		1960-65	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-05
Aid as % of GNI	East Asia & Pacific	0.7	1.0	1.2	0.8	0.9	1.1	1.1	0.6	0.4
	Europe & Central Asia	-	-	-	-	-	-	0.8	1.0	0.9
	Latin America & Caribbean	0.7	0.8	0.5	0.3	0.4	0.5	0.4	0.3	0.3
	Middle East & North Africa		2.0	2.8	3.6	2.3	1.5	2.8	1.3	1.7
	South Asia	2.6	2.4	1.7	2.1	1.8	1.6	1.7	0.9	0.9
	Sub-Saharan Africa	2.4	2.5	2.0	2.7	3.2	5.0	6.4	4.9	5.1
	World	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.2	0.2
Aid Per Capita	East Asia & Pacific	0.6	1.0	1.6	1.8	2.6	3.6	5.3	4.9	4.2
	Europe & Central Asia	1.2	0.8	0.5	0.8	1.7	1.0	18.1	21.6	22.5
	Latin America & Caribbean	2.9	3.7	3.4	4.3	6.9	9.7	12.0	12.4	10.9
	Middle East & North Africa	8.4	3.9	11.2	33.6	32.3	20.9	34.0	20.7	33.9
	South Asia	2.1	2.5	2.2	3.9	4.9	5.2	5.6	3.7	4.6
	Sub-Saharan Africa	3.4	4.1	5.4	12.3	18.9	26.4	33.6	25.3	30.1
	World	1.7	1.8	2.5	5.0	6.7	8.1	11.9	10.4	12.1

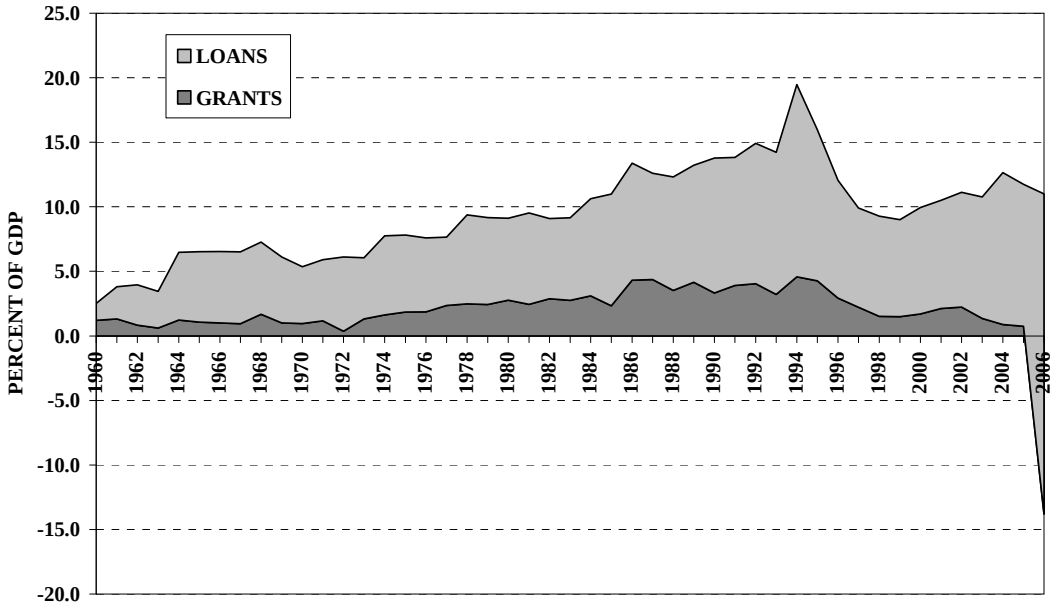
Figure 1: Sub-Saharan Africa - Gross Domestic Savings (Unweighted Average)



Source: WDI (World Bank); IFS (IMF).

Figure 2: Average ODA Rates

(Sample of 29 Sub-Saharan African Countries)



Sources: OECD Development Data (OECD); WDI (World Bank)

TABLE A2

Stationarity Tests for Relevant Variables

Variables	Fisher (Full Panel) Test		Individual Tests by Panel (Country)	
	Level	First Difference	KPSS (# of non-rejectionsof null of stationarity)	DFGLS (# of rejections of null of non-stationarity)
Savings/GDP	145.25***	829.73***	7	3
Dependency Ratio	129.70***	719.02***	1	0
Ln. Per Capita Income	84.82**	94.562***	3	3
GDP Growth	834.26	2282.17***	26	20
Innovation in Export Growth	522.98***	912.62***	28	19
ODA/GDP	137.81***	1479.01***	12	2
Concessional Loans/GDP	176.19***	1349.34***	4	0
Grants/GDP	112.61***	1115.16***	16	4
Other Flows/GDP	534.65***	1988.66***	19	12
Exports/GDP	201.39***	585.19***	9	2
Imports/GDP	187.38***	452.93***	11	5

Notes: *** Indicates significance at the 1% level;
** Indicates significance at the 5% level;
* Indicates significance at the 10% level.

TABLE A3

Pooled Mean Group Estimates of the Savings Equation (1965-2006)

Dependent Variable:	**The Domestic Savings Rate**	
Explanatory Variables	**Long-Run Coefficients**	
Log of Per Capita Income	0.018*** (2.83)	0.009 (1.40)
Dependency Ratio	-0.210*** (-3.08)	-0.293*** (-4.20)
ODA/ GDP	-0.411*** (-7.74)	
Concessional Loans/ GDP		-0.011 (-0.09)
Grants/ GDP		-0.515*** (-9.55)
	Short-Run Coefficients	
Constant	0.120*** (8.46)	0.137*** (8.72)
Error Correction Term	-0.351*** (-9.66)	-0.340*** (-9.31)
GDP Growth	0.177*** (5.40)	0.176*** (5.55)
Innovation in Export Growth	0.059*** (6.05)	0.056*** (5.26)
∆ Dependency Ratio	0.068 (0.10)	-0.030 (-0.05)
Other External Flows/ GDP	0.053 (0.58)	0.018 (0.14)
∆ ODA/ GDP	0.019 (0.33)	
∆ Concessional Loans/ GDP		-0.123 (-0.80)
∆ Grants/GDP		0.100 (1.36)
Number of Observations	1173	1168

Notes: *** Indicates significance at the 1% level;
** Indicates significance at the 5% level;
* Indicates significance at the 10% level.

Figures in brackets are z-statistics.

TABLE A4

Import Equation (1965-2006)

Dependent Variable:	**Imports/GDP**
Explanatory Variables	**Long-Run Coefficients**
Exports/GDP	0.75[5**] (17.31)
Log of Per Capita Income	0.010* (1.90)
ODA/ GDP	0.653* (14.71
	Short-Run Coefficients
Constant	0.030*** (6.16)
Error Correction Term	-0.319*** (-8.25)
∆ Exports/GDP	0.227*** (3.22)
∆ Log of Per Capita Income	-0.019* (-1.33)
Other Flows/ GDP	0.156 (1.32)
∆ ODA/ GDP	0.095 (1.21)
Number of Observations	1185

Notes: *** Indicates significance at the 1% level;
** Indicates significance at the 5% level;
* Indicates significance at the 10% level.

Figures in brackets are z-statistics.

TABLE A5

Pooled Mean Group Estimates of the Savings Equation (1974-1994)

Dependent Variable:	**The Domestic Savings Rate**	
Explanatory Variables	**Long-Run Coefficients**	
Log of Per Capita Income	-0.003 (-0.22)	-0.022* (-1.89)
Dependency Ratio	0.326* (1.88)	0.271** (2.00)
ODA/ GDP	-0.206** (-2.32)	
Concessional Loans/ GDP		0.403*** (2.69)
Grants/ GDP		-0.554*** (-4.98)
	Short-Run Coefficients	
Constant	-0.127 (-5.88)	-0.110*** (-5.21)
Error Correction Term	-0.527*** (-7.76)	-0.535*** (-7.38)
GDP Growth	0.191*** (-3.69)	0.210 (4.29)
Innovation in Export Growth	0.066*** (6.29)	0.068*** (6.81)
∆ Dependency Ratio	-0.916 (-0.82)	-1.514 (-1.32)
Other Capital Flows/GDP	-0.094 (-0.37)	-0.248 (-0.55)
∆ ODA/ GDP	-0.062 (-0.64)	
∆ Concessional Loans/ GDP		-0.366** (-2.55)
∆ Grants/GDP		0.318 (1.02)
Number of Observations	609	609
Test for Equality of ODA/GDP Coefficients (χ^2) (Sub-sample versus full sample)	5.35**	
Test for Equality of Loan/GDP Coefficients (χ^2) (Sub-sample versus full sample)		7.63***
Test for Equality of Grant/GDP Coefficients (χ^2) (Sub-sample versus full sample)		0.13

Notes: *** Indicates significance at the 1% level;
** Indicates significance at the 5% level
* Indicates significance at the 10% level.

Figures in brackets are z-statistics.

TABLE A6

Import Equation (1974-1994)

Dependent Variable: Imports/GDP	
Explanatory Variables	**Long-Run Coefficients**
Exports/GDP	1.028*** (18.52)
Log of Per Capita Income	-0.016** (-1.96)
ODA/ GDP	0.523*** (7.43)
	Short-Run Coefficients
Constant	0.020 (0.85)
Error Correction Term	-0.451*** (-9.03)
∆ Exports/GDP	-0.006 (-0.08)
∆ Log of Per Capita Income	-0.011 (-0.50)
Other External Flows/GDP	0.252 (1.59)
∆ ODA/ GDP	0.178* (1.66)
Number of Observations	607

Notes: *** Indicates significance at the 1% level;
** Indicates significance at the 5% level
* Indicates significance at the 10% level.

Figures in brackets are z-statistics.

TABLE A7

Pooled Mean Group Estimates of the Savings Equation with Dummies

Dependent Variable:	**The Domestic Savings Rate**			
Explanatory Variables	**Long-Run Coefficients**			
Log of Per Capita GDP	0.018*** (2.92)	0.019** (3.03)	0.011* (1.74)	0.010 (1.55)
Dependency Ratio	-0.209*** (-3.08)	-0.177*** (-2.57)	-0.288*** (-4.06)	-0.251*** (-3.42)
ODA/ GDP	-0.430*** (-7.99)	-0.449*** (-8.66)		
Concessional Loans/ GDP			-0.080 (-0.59)	-0.045 (-0.33)
Grants/ GDP			-0.525*** (-9.54)	-0.532*** (-9.83)
	Short-Run Coefficients			
Constant	0.118*** (8.21)	0.112*** (8.32)	0.134*** (8.45)	0.126*** (8.68)
Error Correction Term	-0.325*** (-9.38)	-0.356*** (-9.92)	-0.333*** (-9.11)	-0.344*** (-9.36)
GDP Growth	0.171 (4.98)	0.174*** (5.61)	0.172*** (5.26)	0.174*** (5.83)
Innovation in Export Growth	0.058*** (5.28)	0.059*** (5.80)	0.057*** (5.13)	0.055*** (5.03)
Δ Dependency Ratio	0.127 (0.20)	0.149 (0.23)	0.083 (0.14)	0.050 (0.08)
Other Capital Flows	0.039 (0.42)	-0.030 (0.32)	0.003 (0.03)	0.007 (0.06)
Δ ODA/ GDP	-0.026 (0.46)	0.024 (0.44)		
Δ Concessional Loans/ GDP			-0.086 (-0.57)	-0.112 (-0.74)
Δ Grants/GDP			0.094 (1.23)	0.097 (1.29)
The first year after a high ODA/GDP Period (Dummy)	0.010 (0.74)		0.008 (0.63)	
The first three years after a high ODA/GDP Ratio (Dummy)		0.004 (0.59)		0.003 (0.56)
Number of Observations	1173	1173	1168	1168

Notes: *** Indicates significance at the 1% level;

** Indicates significance at the 5% level

* Indicates significance at the 10% level.

Figures in brackets are z-statistics.

APPENDIX II

Sub-Saharan African Countries in Sample

Country	Years covered
Benin	1965-2005
Botswana	1965-2006
Burkina Faso	1965-2004
Burundi	1965-2005
Cameroon	1965-2006
Central African Rep.	1965-2004
Chad	1965-2006
Congo, Rep.	1965-2006
Cote d'Ivoire	1965-2006
Gabon	1970-2006
Gambia	1966-2005
Ghana	1965-2006
Kenya	1965-2006
Lesotho	1965-2006
Madagascar	1965-2006
Malawi	1965-2006
Mali	1967-2006
Mauritania	1965-2006
Niger	1965-2005
Nigeria	1965-2005
Rwanda	1965-2006
Senegal	1965-2006
Sierra Leone	1965-2006
Swaziland	1965-2006
Tanzania	1965-2005
Togo	1965-2005
Uganda	1965-2006
Zambia	1965-2006
Zimbabwe	1965-2006

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NOTES

1. However, this region has not usually been the highest recipient of aid in per capita terms. That particular honour has mostly gone to the Middle East and North Africa.

2. At least beyond the levels of the 1990s.

3. Strictly speaking, an external resource flow imparts immediate command over foreign (rather than domestic) resources, but that command can be exchanged for command over domestic resources through the sale of foreign currency (or other foreign assets).

4. In the absence of such flows, ex post domestic savings and investment would be lower – constrained by limited access to foreign exchange for the purchase of capital and intermediate inputs.

5. Nevertheless, it should be noted that the model would allow for less than full investment of aid as long as a substantial proportion of aid still goes to investment.

6. It should be noted, however, that the causal chain suggested by Frank (1963) would imply a lag between the timing of aid inflows and capital outflows. Thus, the net effect on savings need not show up in contemporaneous measurements.

7. Friedman's (1964) argument that aid, if invested at all, would most likely be used for monument building, and Gunder Frank's (1963) perspective that aid would perpetuate dependency; both allow for a coefficient larger than negative one because some aid might be invested. Instead, the effect of this use of aid would be demonstrated by the absence of any long-term growth effect. However, this shifts us more directly into the aid-growth debate, which is beyond the scope of this research. Nevertheless, it is important to recognize that neither perspective presumes strict consumption of aid, though there is clear presumption that it is the most likely response.

8. As in all equations to follow, lower case letters imply values relative to GDP.

9. In this set of equations, i is the investment rate, s_n is the national savings rate, s_f is the foreign savings rate, s_d is the domestic savings rate, ntr represents net transfers from abroad, a is aid relative to output (grants plus concessional loans), f_p is net private (nonconcessional) flows relative to output, and f_o is other foreign flows relative to output.

10. There were actually 61 observations overall, and they also looked at eight earlier studies that used proxies for aid in attempting to do the same (adding another 28 observations) but these are not considered here.

11. These are samples that were inclusive of Sub-Saharan African countries, but not necessarily exclusive to them. Thus, most of these country samples would have included countries from other regions as well.

12. Private transfers are assumed to be zero for convenience. Including private transfers would add an extra term without changing the result.

13. Non-aid debt is specified because principal payments on concessional debt are netted out of aid measures.

14. In fact, the term "life cycle permanent income hypothesis" is often used to refer to an amalgam of the two theories because both theories derive from the premise of a strong link between lifetime income and consumption.

15. The permanent income hypothesis predicts the wrong sign for growth and the reasoning provided by the life cycle theory (generational differences in income) is not borne **out** by the microeconomic evidence (Bosworth *et al*, 1991).

16. Estimated as the difference between current export growth and the average growth rate of the previous three years.

17. This is a very reasonable assumption for these low-income countries that mostly export primary products. Aid, in and of itself, is unlikely to have any significant direct effect on either increased factor use or productivity in the export sector.

18. The Augmented Dickey-Fuller version of this test is reported but the results based on the Phillip-Perron tests are similar.

19. The evidence suggests that variables such as the grants to GDP ratio and the import to GDP ratio may be largely fractionally integrated (i.e. long memory series that are not quite non-stationary).

20. The Phillip-Perron test suggests that the level of integration of the dependency ratio is I(2) or higher, but this is not supported by any other tests (including the KPSS and DFGLS tests). This is likely due to the fact that this variable was subject to sudden, post-census adjustments by some countries.

21. An argument can be made, on theoretical grounds, that other flows (OFL/Y) belong in the long run equation as well. However, the stationarity tests do suggest that that variable is mostly stationary and, in the context of Sub-Saharan Africa, where non-aid flows have not been an either large or consistent part of external flows, that argument is weaker. Moreover, that variable performed best in the short-run equation. (It was insignificant in the long-run equation)

22. It was also much more strongly supported statistically, even when entered in lagged form.

23. Besides private flows, the "other flows" variable includes non-aid loans, private grants, emergency aid, food aid, and technical assistance.

24. Including them in the long-run equation did not make a difference either.

25. But not including principal payments on aid-related debt because these are netted out of aid figures.

26. Since 10% is a relatively arbitrary rate, to determine the sensitivity of the result to the definition of "high" aid ratio, 12% and 8% were also used. There was very little difference in results between 10% and 12% but the results for 8% were significantly weaker. This suggest that there is something of a threshold effect at around 10% and it is thus a good choice for defining the cut of level for "high" aid flows.

International Policy Centre for Inclusive Growth (IPC - IG)
Poverty Practice, Bureau for Development Policy, UNDP
Esplanada dos Ministérios, Bloco O, 7º andar
70052-900 Brasilia, DF - Brazil
Telephone: +55 61 2105 5000

E-mail: ipc@ipc-undp.org ▪ URL: www.ipc-undp.org