Aid Effectiveness in Africa*

John Loxley and Harry A. Sackey**

***Abstract*:** This paper revisits the issue of aid effectiveness in Africa by examining the effect of aid on growth. Historically, Africa's development context appears to be an aid-dependent one, and with the New Partnership for Africa's Development (NEPAD) calling for additional capital flows to improve growth levels on the continent, and the attainment of the UN's Millennium Development Goals partly conditioned on aid inflows, there is a new urgency to evaluate the effectiveness of aid. Using a sample comprising 40 member countries of the African Union, and estimating fixed-effects growth models, we find a positive and statistically significant effect of aid on growth. Aid increases investment, which is a major transmission mechanism in the aid-growth relationship. An extension of our analysis to examine sources of growth finance shows aid, workers' remittances, debt-service resources and domestic savings are important sources of development finance. Thus, for now, aid matters for the continent's growth. However, given the apparent donor aid fatigue and the debt servicing implications of concessional loans, the paper supports the need to strategize to reduce future dependence on aid.

1. Introduction

This paper revisits the question of aid effectiveness, with a specific focus on Africa. Most studies on aid effectiveness combine a sample of countries from Africa with others from the developing world. Arguably such an approach does not fully capture the reality that Africa is quite unique in its socio-economic orientation compared to other developing regions in Asia and Latin America. Though diverse structures exist among African countries, there are sufficient basic features common to countries on the continent to make a

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macroeconomic study involving all of them a desirable activity. The New Partnership for Africa's Development (NEPAD) has added a new urgency to evaluate aid effectiveness in Africa separately by calling for additional capital flows of 12 per cent of GDP or about $64 billion per annum to Africa in order to attain a target income growth of 7 per cent per annum. While some of this financing is slated to come from improved domestic resource mobilization, 'the bulk of the needed resources will have to be obtained from outside the continent' (NEPAD, 2001, p. 44). In the short and mid-term, additional inflows are expected from foreign aid and higher levels of debt relief, while in the longer term private capital inflows are expected to take up the slack. The clear assumption here is that additional aid is vital for enhanced growth, at least in the short and mid-term. NEPAD would confine these additional flows to nations participating in an Economic and Political Governance Initiative which would require that they meet some clearly defined standards in terms of economic, administrative and political behaviour (Loxley, 2002). NEPAD raises questions, therefore, about the direct efficacy of foreign aid as well as the link between aid and domestic policy formulation. Moreover, attaining the UN's Millennium Development Goals (MDGs) calls for aid inflows as well as new sources of development finance such as remittances by emigrants and perhaps even a Tobin tax (Atkinson, 2004).

This paper seeks to answer one main issue, namely, the effect of aid on income growth in Africa. In the process of doing that, other sub-issues such as aid-growth transitions for countries on the continent, aid's impact on investment, the exogeneity of aid and other sources of development finance are considered. Unlike other studies, we draw on a larger sample of African countries (i.e., 40 countries) and do so over a 28-year period. We use an aid-growth stratification approach to categorize countries, and a transition matrix to show changes that have occurred in Africa from the 1970s to 2004. Our estimated model also uses a mix of 'traditional' and 'contemporary' variables included in the growth equation, putting it firmly in the 'third generation' category of studies on aid effectiveness (Hansen and Tarp, 2000). We hypothesize that for Africa as a whole, aid has a positive impact on per capita income growth.

The paper is organized as follows. Section 2 contains a brief review of Africa's development context, including data on aid flows. The aid-growth relationship is then examined in the periods 1975–84 and 1995–2004. This is followed in Section 3 by a brief survey of recent literature on aid effectiveness. The methodology to be followed, the models to be estimated and the data sources used are discussed in Section 4. In the ensuing section, we present and discuss the results of our empirical estimations and the implications of those results. This is followed by a conclusion and some plausible policy implications.

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2. The African Development Context: Aid-Growth Nexus

2.1 Aid in Africa: Trends, Intensity and Composition

Africa's share of foreign aid has been no less than 30 per cent of the overall donor aid commitments to developing countries. The geographical distribution of aid is the result of independent allocation decisions of a large number of bilateral or individual donors and multilateral agencies. Such decisions are also contingent on factors such as bilateral donors' national political, economic, security and other interests and objectives as well as the mandate and governance of multilateral agencies (UNCTAD, 2006a; OECD, 1985).

From the mid 1970s, aid to Africa from the Development Assistance Committee increased rapidly in response to development needs, oil price shocks, harvest failures, world economic recession and the African development

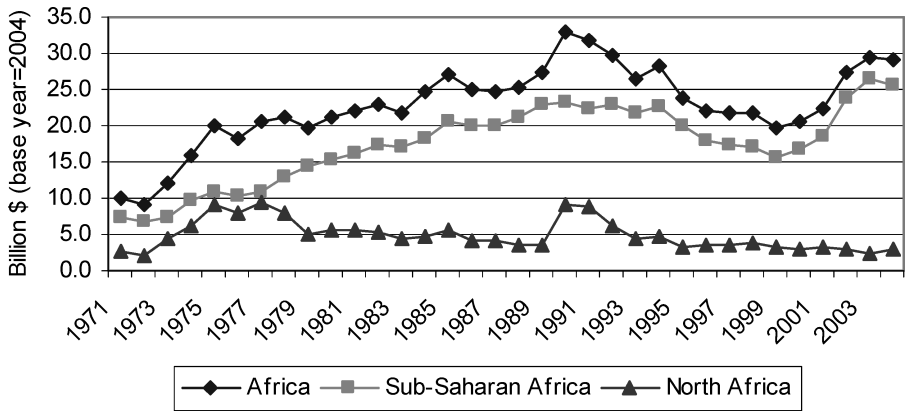
Table 1: Aid disbursements, grant composition and distribution in Africa: 1975–2004

	1975–1984	1985–1994	1995–2004
Africa's total net ODA disbursements (current US$ billion) average per annum	8.9	19.7	20.4
Africa's total real net ODA disbursements (constant 2004 US$ billion)	21.1	27.3	23.4
Total net aid disbursements ratio (%)[a]	91.5	82.0	90.1
Multilateral aid ratio (%)[b]	26.4	30.4	34.3
Multilateral aid disbursements ratio (%)[c]	89.7	78.1	90.1
Grants share in total ODA (%)[d]	58.7	65.4	71.7
Africa's share of total donor aid commitments (%)[e]	33.9	38.4	31.3
West Africa's share of total net ODA disbursements to Africa (%)	22.3	26.8	28.4
North Africa's share of total net ODA disbursements to Africa (%)	38.6	23.8	17.0
Central Africa's share of total net ODA disbursements to Africa (%)	10.0	9.2	10.8
East Africa's share of total net ODA disbursements to Africa (%)	19.1	23.8	25.7
Southern Africa's share of total net ODA disbursements to Africa (%)	10.1	16.3	18.1

Note: The ratios are calculated as follows:
(a) Total aid disbursements as a share of aid commitments to Africa; (b) Multilateral aid disbursements as share of total net aid disbursements from all donors; (c) Multilateral aid disbursements as a share of total multilateral aid commitments to Africa; (d) Total grants as a share of total donor aid commitments to Africa; and (e) Total donor aid commitments to Africa as a share of overall aid commitments to the developing world.
Sources: Authors' calculations based on data from OECD's website: 'Destination of Official Development Assistance and Official Aid- Commitments (Table 3a)'; and 'Destination of Official Aid-Disbursements (Table 2a)'.

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Figure 1: Real net ODA to Africa, 1971–2004 (US$ billion)



Source: OECD database.

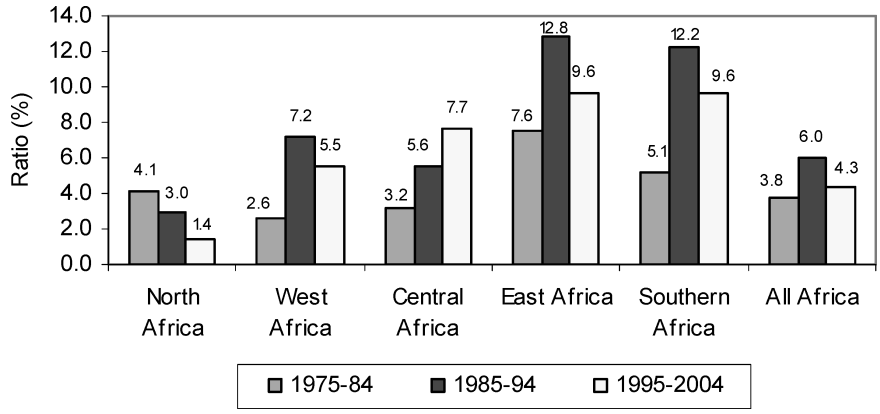
crisis (OECD, 1985).[1] Aid to Africa as a share of total aid, reached a peak in 1985–94, accounting, on an annual average basis, for about 38 per cent of all aid to developing countries (Table 1). By 1995–2004, however, Africa's share of aid had fallen to 31 per cent and total net aid in real terms had decreased to $23.4 billion from the 1985–94 level of $27.3 billion. Aid inflows to the region have come from both bilateral and multilateral sources with the latter ranging between 26 per cent and 34 per cent of total net aid disbursements. About two-thirds of aid received has been in the form of grants and the aid disbursement ratio has in most cases been above 80 per cent.

Real aid disbursements to Africa reached a peak in 1990 at $32.9 billion and followed a downward trend thereafter, reaching a low of $19.7 billion in 1999 (Figure 1). Aid recovery appears to have occurred from 2000 to 2004, partly in response to targets set in the millennium development agenda. The increase in aid has a larger multilateral component due to the increased weight of debt relief (UNCTAD, 2006a).

Figure 2 shows that, for Africa as a whole, the aid–GDP ratio rose from 3.8 per cent in 1975–84 to 6 per cent in 1985–94. In recent times, the aid ratio has fallen to 4.3 per cent. This pattern is not surprising since the 1980s was a decade of adjustment, a period which saw relatively high inflows of donor assistance in support of attempts by African governments to stabilize and restructure their economies. Various reasons have been given for the decline in aid from the mid 1990s. African countries have been vulnerable to donor fatigue amidst growing domestic fiscal pressures and to shifts in donor priorities to other parts of the world such as Eastern Europe and the former Soviet Union (Loxley, 1998). Relatively higher growth rates in Africa might explain the observed pattern. Between 1992 and 2000, real GDP in Africa grew by an annual average of 2.4 per cent compared to 2 per cent in

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Figure 2: Total net ODA to GDP ratio in Africa



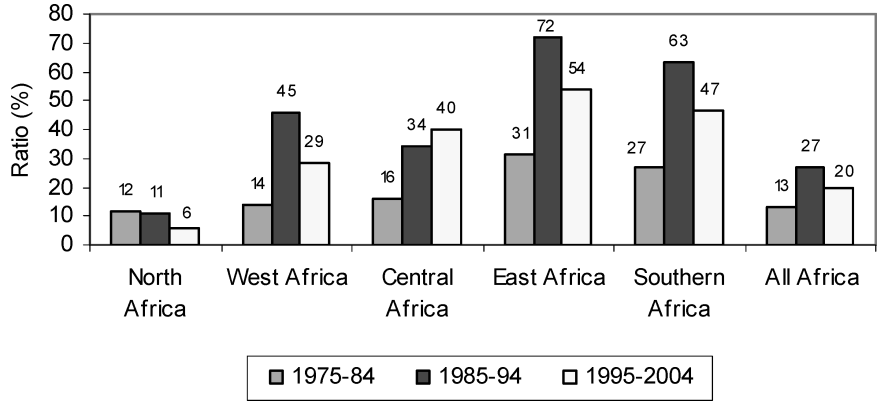
Note: The list of countries used to represent each sub-region is shown in the appendix, Table A1.
Source: Authors' calculations based on data from OECD and the World Bank.

1981–90. For economies in transition, the corresponding growth rates were about –2.5 per cent and 1.8 per cent respectively (UN, 2001).

In terms of sub-regional analysis, the decade 1975–84 saw North Africa having an edge over the other regions in terms of aid receipts as a share of GDP, partly due to Cold War tensions. This pattern changed in the next two decades when the East and Southern Africa sub-regions became prime destinations for bilateral and multilateral aid.

Africa's aid intensity, measured by the share of aid in investment, rose from 13 per cent in 1975–84 to 27 per cent in 1985–94, but fell to 20 per cent in 1995–2004 (Figure 3). A similar pattern is observed for net ODA per

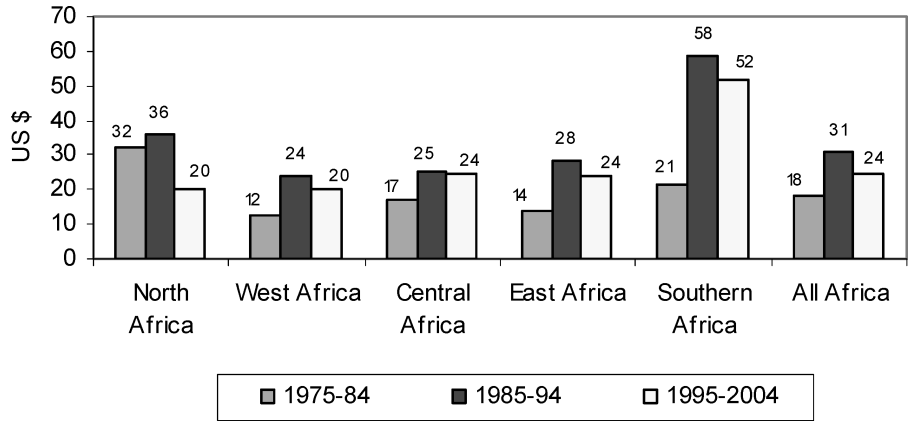
Figure 3: Total net ODA to domestic investment ratio in Africa



Source: Authors' calculations based on data from OECD, and the World Bank.

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Figure 4: Africa's total net ODA per capita (US$ current)



Source: Authors' calculations based on data from OECD and the World Bank.

capita for the region (Figure 4). Thus, compared to the decade 1975–84, it could be said that the region's dependence on aid seems to have deepened. For all the sub-regions, the aid intensity indicators show the decade 1985–94 as the period of highest dependence on aid. The Southern African sub-region recorded the highest net ODA per capita in the recent decade, while the East African sub-region experienced the highest aid-to-investment ratio.

How important aid was in Africa's growth process remains an empirical issue to be explored further with econometric techniques in later sections of this paper. As a first step, we provide in Table 2, a stratification of countries on the basis of their aid-growth performance for two periods, namely 1975–84 and 1995–2004.

2.2 The Aid–Growth Relationship

Table 2 shows that 12.5 per cent of African countries could be classified as high aid–positive per capita income growth performers in 1975–84. During the same period a similar percentage of countries recorded negative growth in per capita income though aid inflows to them were relatively high and comparable to those of the first category. About 38 per cent of countries in our sample were negative growth countries and recipients of low aid ratios. For some 38 per cent of other countries in the region, low receipts of aid appear not to have been a major obstacle to growth as positive per capita income growth rates of between 0.3 per cent and 7.4 per cent per annum were recorded between 1975 and 1984.

The period 1995–2004 shows that transitions have occurred for some countries on the continent. About 45 per cent of countries still retain their 1975–84 aid-per capita income growth status (see Table 3).[2] The number of

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Table 2: Aid–growth performance in Africa: country stratification

High aid and positive per capita income growth				High aid and negative per capita income growth			
1975–1984		1995–2004		1975–1984		1995–2004	
Burkina Faso	(12.4; 0.9)	Burkina Faso	(15.7; 2.4)	Central African Rep.	(12.8; –1.2)	Burundi	(21.8; –2.6)
Gambia	(19.6; 2.0)	Chad	(12.1; 4.6)	Guinea-Bissau	(37.3; –0.3)	Congo, Dem. Rep.	(20.2; –2.8)
Lesotho	(21.0; 2.2)	Ethiopia	(15.4; 2.4)	Mauritania	(27.8; –1.4)	Guinea-Bissau	(41.7; –1.9)
Mali	(15.0; 1.4)	Gambia	(12.2; 0.9)	Mozambique	(5.8; –8.3)	Madagascar	(12.7; –0.1)
Seychelles	(14.5; 2.9)	Malawi	(23.8; 2.3)	Sao Tome & Prin.	(15.9; –8.9)	Niger	(14.2; –0.1)
		Mali	(15.2; 2.9)			Sierra Leone	(25.4; –0.8)
		Mauritania	(21.5; 1.6)				
		Mozambique	(29.7; 5.8)				
		Sao Tome & Prin.	(81.8; 0.5)				
		Tanzania	(13.5; 2.7)				
		Uganda	(12.9; 3.1)				
		Zambia	(21.1; 0.8)				
Observations	*5*		*12*	*Observations*	*5*		*6*
Low aid and positive per capita income growth				Low aid and negative per capita income growth			
1975–1984		1995–2004		1975–1984		1995–2004	
Algeria	(0.5; 2.4)	Algeria	(0.5; 2.2)	Chad	(8.6; –1.3)	Central African Rep.	(9.5; –0.3)
Benin	(7.0; 0.3)	Benin	(10.4; 1.7)	Congo, Dem. Rep.	(2.6; –3.3)	Côte d'Ivoire	(5.5; –0.1)
Botswana	(10.4; 7.4)	Botswana	(1.2; 4.0)	Côte d'Ivoire	(2.0; –1.1)	Senegal	(10.6; 2.4)
Burundi	(11.9; 1.2)	Cameroon	(5.3; 1.9)	Ethiopia	(4.6; –0.6)	Seychelles	(2.4; –1.1)
Cameroon	(3.6; 5.5)	Egypt	(2.1; 2.6)	Ghana	(3.6; –3.7)	Zimbabwe	(3.4; –3.0)
Egypt	(10.3; 5.9)	Gabon	(1.0; 0.1)	Madagascar	(4.6; –2.6)		
Gabon	(1.6; 0.4)	Ghana	(10.7; 2.0)	Namibia	(0.0; –3.0)		
Guinea	(5.9; 1.8)	Guinea	(8.2; 1.3)	Niger	(9.9; –2.7)		

Table 2: (Continued)

Low aid and positive per capita income growth				Low aid and negative per capita income growth			
1975–1984		1995–2004		1975–1984		1995–2004	
Kenya	(5.5; 0.3)	Kenya	(4.4; 0.2)	Nigeria	(0.1; –3.8)		
Malawi	(11.1; 0.5)	Lesotho	(8.0; 2.3)	Senegal	(10.5; –0.3)		
Mauritius	(3.6; 3.1)	Mauritius	(0.6; 3.9)	Sierra Leone	(4.7; –0.1)		
Morocco	(3.8; 2.2)	Morocco	(1.5; 1.4)	Tanzania	(11.2; –0.5)		
Swaziland	(7.9; 0.5)	Namibia	(4.4; 2.1)	Togo	(10.0; –0.7)		
Tunisia	(3.5; 2.9)	Nigeria	(0.6; 1.2)	Zambia	(6.3; –3.1)		
Uganda	(4.0; 0.8)	Swaziland	(2.5; 0.5)	Zimbabwe	(1.6; –1.0)		
		Togo	(6.6; 0.3)				
		Tunisia	(1.1; 3.6)				
Observations	*15*		*17*	*Observations*	*15*		*5*

Note: The two figures in parentheses are net ODA-to-GDP ratio and per capita income growth respectively. 'High aid' and 'Low aid' have been defined simply to be above or below the long-run average, which in our study corresponds to 30 years. This average threshold for the aid variable is 12.1 per cent of the recipient's GDP. In a sense the 'high' and 'low' categorization could be interpreted alternatively as 'above average' and 'below average' respectively.
Source: Authors' calculations and groupings based on data from the OECD's Geographical Distribution of Financial Flows, the World Bank Africa Database 2002 CD-Rom, and the World Bank's Africa Development Indicators 2006.

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Table 3: Africa's aid-PCI growth transition matrix (from 1975–1984 to 1995–2004)

	Initial decade: 1975–1984			
	High aid and positive PCI growth	Low aid and positive PCI growth	High aid and negative PCI growth	Low aid and negative PCI growth
Recent decade: 1995—2004				
High aid and positive PCI growth	**3**[a]	2[b]	2[c]	5[d]
Low aid and positive PCI growth	1[e]	**12**[f]	0	5[g]
High aid and negative PCI growth	0	1[h]	**1**[i]	4[j]
Low aid and negative PCI growth	1[k]	0	1[l]	**2**[m]

Notes: PCI refers to per capita income. Values in the table refer to total number of African countries. Relevant countries in each of the categories are as follows:
(a) Burkina Faso, Gambia and Mali; (b) Malawi and Uganda; (c) Mauritania and Sao Tome; (d) Chad, Ethiopia, Mozambique, Tanzania, and Zambia; (e) Lesotho; (f) Algeria, Benin, Botswana, Cameroon, Egypt, Gabon, Gambia, Guinea, Kenya, Mauritius, Morocco, Swaziland and Tunisia; (g) Ghana, Namibia, Nigeria, Senegal and Togo; (h) Burundi; (i) Guinea-Bissau; (j) Congo Democratic Rep., Madagascar, Niger and Sierra Leone; (k) Seychelles; (l) Central Africa Republic; and (m) Côte d'Ivoire and Zimbabwe.
Source: Based on country classifications in Table 3.

countries receiving high aid and yet recording negative per capita income growth rates has increased from 12.5 per cent in 1975–84 to 15 per cent in 1995–2004, while the number receiving low aid and realizing positive growth has increased from 38 per cent to 42.5 per cent (Table 2). On the other hand about 13 per cent of countries (notably Tanzania, Zambia and Chad) have received a boost in aid inflows, having moved from low aid–negative growth status in 1975–84 to high aid–positive per capita income growth status in the recent decade. Table 3 shows that one country, Seychelles, has moved from a high aid–positive growth status in the decade starting 1975 into a low aid–negative growth status in the period 1995–2004. Generally, comparing the two periods under consideration, the number of countries occupying the low aid-negative growth stratum has fallen from 15 to 5 countries, whereas high aid–positive growth performing countries have increased from 5 to 12 countries.

It must be pointed out that the transitions we are observing may be temporary or permanent in nature. Particularly, given the role of aid in attaining NEPAD's growth targets and the UN's Millennium Development Goals, we are likely to experience some changes in the aid ratios where aid allocations become driven by degree of country poverty, governance and other emerging criteria.

3. Literature Survey

The available literature on aid effectiveness is extensive and dates back over 30 years. Useful summaries are to be found in White (1992) and, more

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recently, in Hansen and Tarp (2000) and Hermes and Lensink (2001). Here we will touch only lightly on earlier literature and concentrate more on recent methodological developments and literature specifically dealing with Africa.

Hansen and Tarp (2000) provide a useful summary of the different methodological approaches that have been adopted in analysing aid effectiveness. First, the impact of aid has been evaluated at both the microeconomic and the macroeconomic level, the former focusing on the analysis of aid-funded projects, the latter addressing the impact of aid on growth, savings, investment, government spending and so on. Second, the sample for study has been either cross-country or single-country case studies. Third, the methods of analysis have been of both a qualitative and inter-disciplinary nature as well as quantitative, the latter using econometric techniques. They also identify three generations of models used in the aid evaluation literature. The first were based on simple Harrod–Domar or two-gap models focusing on the relationship between aid and savings, models which suffer from well-known rigidities in their assumptions. The second, using similar approaches or even a Solow approach, concentrated on the relationship between aid, investment and economic growth, while the third generation, inspired by new growth theory, build institutional and policy variables directly into the regression equations in addition to more traditional macroeconomic variables.

If there is continuity in this literature, it is to be found in the contradictory nature of research findings on aid effectiveness. Aid pessimists abound. Earlier macro, cross-country, econometric studies found a negative relationship between aid (often undifferentiated from other forms of foreign capital inflow) and GDP growth, and sought to explain it by aid reducing domestic savings or increasing the capital output ratio (Griffin, 1970; Griffin and Enos, 1970; Weisskopf, 1972). Papanek (1972) argued that aid might well reduce domestic savings by increasing total income and consumption, but could still increase total savings and investment. He found a positive relationship between GDP growth and aid, but wide unexplained variations in aid effectiveness between countries. Newlyn (1973) built on Papanek's insights by showing that if the marginal savings rate was between 0 and -1 total savings would still increase with an inflow of aid, leading to an equivalent increase in investment. In a survey of 41 studies of the relationship between aid and savings (17 of which covered all foreign resource inflows), Hansen and Tarp (2000) found that the majority concluded that total savings increased but by less than the amount of the aid inflow, that is, the marginal savings rates were within the critical values identified by Newlyn. In the framework of the models used, this would increase economic growth.

Aid pessimists were well represented in the second-generation models that emphasized the aid-investment-growth link. While almost all studies have shown a positive relationship between aid and investment, several studies have failed to find a link between aid and GDP growth (Mosley *et al*.,

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1987; Boone 1994, 1996). These findings have been at odds with micro studies of the impact of aid (Cassen *et al*., 1986 and 1994; World Bank, 1998). In an influential study, Mosley *et al.* (1987) failed to establish any statistically significant relationship between aid inflows and real GDP growth in developing countries.[3] They stressed the possibility of aid leaking into non-productive public sector spending or of it changing relative prices in ways that adversely affect the private sector. They called on donors to direct development assistance to countries with high aid effectiveness. The criteria they put forward to ascertain aid effectiveness, which were drawn from their model, were rates of return to investment, the proportion of aid allocated to the recurrent budget, and the impact of aid on private investment. Mosley *et al.* argued that these factors should find reflection in aid conditionality. The methodology of this study came in for vigorous criticism (White, 1992; Newlyn, 1990; Hansen and Tarp, 2000). Indeed, many of the second-generation models have been found lacking, in using total capital inflows instead of aid, in having too few degrees of freedom or in failing to test properly the aid-savings-investment causal chain (Hansen and Tarp, 2000; Clemens, Radelet and Bhavnani, 2004). Where these deficiencies are not present, the evidence is overwhelmingly in favour of a positive link between aid and growth.

In recent times the focus has shifted to look at the implications for growth of the interaction of aid with the policy environment. The World Bank's *Assessing Aid* (1998) concluded that aid has a positive impact on growth only when governments pursue sound fiscal, monetary and trade policies and, hence, should be targeted to low-income countries pursuing sound economic management. This selectivity, based on observed economic performance, would replace 'ex ante' aid conditionality applied to a larger number of countries. Background studies were drawn upon for these findings, in particular those by Burnside and Dollar (1997, 2000) and Collier and Dollar (1999). The former studied 56 low-income countries (25 of which were from Africa) using cross-country regression analysis. What was distinctive about it was the use of an aid-policy interaction term where policy is represented by an index measuring inflation, the budget deficit and trade openness. Their study covered the period 1970–93 and found a link between aid, sound policy environment and growth. Other notable aspects of the Burnside–Dollar study are the use of political and institutional variables and a variable measuring initial levels of GDP to capture the negative correlation between per capita income growth and the initial per capita income (i.e., the issue of convergence). The Collier and Dollar study argued that, after reaching a certain level, aid was subject to diminishing returns, creating dependency and encouraging poor economic policies. The relationship between aid and growth is best described, therefore, as an inverted 'U' shape. On this basis, they made the case that reallocating aid to governments of low-income

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countries pursuing sound economic policies would reduce the number of people living in poverty by an additional 18 million a year. Dollar and Easterly (1999), looked at the relationship between aid and the policy environment specifically in Africa in an effort to probe a little deeper behind the findings of Burnside and Dollar (1997). They found that the linkages between aid, investment and growth in Africa are not very robust, but there is a strong relationship between pursuit of 'sound' economic policy and growth. They conclude that 'foreign aid can play a powerful supporting role, bringing ideas, technical assistance and money. The combination of private investment, good policies and foreign aid is quite powerful' (p. 574). Ali *et al.* (1999) reach similar conclusions, arguing that aid to Africa can be particularly effective in the context of properly aligned exchange rates (as a proxy for 'sound' policy).

While the World Bank's *Aid Effectiveness* report has had an impact on aid policy, the findings of these studies have been challenged by a number of other third-generation studies. Hadjimichael *et al.* (1995), Durbarry *et al*. (1998) and Hansen and Tarp (2000, 2001) all found that aid had a significant impact on growth, regardless of the policy environment, 'as long as the aid-to-GDP ratio is not excessively high' (Hansen and Tarp, 2000, p. 389). In each of these studies the non-linear effects of aid were captured by an aid squared term, a refinement of the simple policy interaction term used by Burnside and Dollar (see Hansen and Tarp, 2000, p. 391, for an explanation of this). Hansen and Tarp (2000) showed that Burnside and Dollar's findings were extremely sensitive to five outliers which, when included, render their policy interaction findings insignificant. Dalgaard and Hansen (2001) arrive at the same conclusion but go further, arguing that, on the basis of exactly the same data as that used by Burnside and Dollar, 'if anything, good policy is likely to reduce the growth effect of aid because they act as substitutes in the growth process' (pp. 37–38). They conclude that, while good policies spur growth, one may show that aid has an unconditional, statistically significant, positive effect on growth, regardless of the policy environment.

Easterly, Levine and Roodman (2003) extended Burnside and Dollar's study up to 1997 and found that the aid–policy interaction variable became insignificant, even when only low income countries were studied. Bosworth and Collins (2003) also found that sound macroeconomic policy is not a significant determinant of growth but initial conditions, sound institutions (such as absence of corruption and protection of property rights) are. Dalgaard *et al.* (2004) found that, though aid is a significant determinant of growth in the developing world, the magnitude of its impact depends on climate-related circumstances.

Lensink and White (2001) examined whether empirical evidence supports the notion of negative effects of high aid inflows (captured by a quadratic aid variable).[4] They found that aid has a positive and significant effect on growth

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but aid-squared had a negative effect on growth, though this latter finding was very sensitive to the choice of countries and to model specification. Though evidence of negative returns to aid was found, this occurred at very high levels of aid inflows, that is, at an aid-GNP ratio of about 50 per cent for the receiving country. This is roughly in line with the finding of Durbarry *et al.* (1998), but at least double the findings of around 25 per cent by Dalgaard and Hansen (2001), Hansen and Tarp (2000) and Hadjimichael *et al.* (1995). The turning point implicit in Collier and Dollar has been estimated by Lensink and White (2001, p. 61) to be only 18.5 per cent of GDP. The Lensink and White study also concluded that aid could be considered an exogenous variable, and not an endogenous one.

Guillaumont and Chauvet (2001) also found little support for a link between aid and policy and concluded that 'aid's contribution to growth depends significantly on the environment' (p. 67). The worse are such environmental factors as the terms of trade, the instability of real export earnings, climatic shocks, etc., the greater is the need for aid.[5] In a recent paper, Gomanee *et al.* (2005) examined aid and growth transmission in sub-Saharan Africa with a focus on how investment is treated in the aid-growth model. Using a panel dataset on 25 countries over the period 1970–97, the authors found that aid had a positive effect on growth and that this effect was through aid-financed investment.[6] More recently, Karras has found that 'the effect of aid on growth is positive, permanent, statistically significant and not negligible in size' (Karras, 2006, p. 25), even when the effects of policies are not controlled for.

From a micro perspective, the issue of fungibility, or the ability of recipient governments to direct aid or resources replaced by aid, to uses other than those intended by donors, is a major consideration in aid effectiveness and cannot simply be assumed, as some authors would have us believe (e.g. Boone, 1996). Reviewing fungibility of aid in Africa, Lancaster (1999) drew on a study of 16 African countries by Devarajan *et al.* (1998). Some evidence of fungibility was found in that about 90 per cent of aid increased government expenditures (rather than decreased taxes). The allocation of aid was disbursed as follows: one-half went into financing external debt service payments, one-quarter was used to finance investments, and the other one-quarter was for current account financing. The fungibility of the aid that financed investment varied greatly from sector to sector. Health, industry and agriculture-related projects exhibited the highest fungibility in that, despite the availability of aid for projects in these sectors, total expenditures in these sectors by recipient governments did not increase. Aid to the energy, transport and communication sectors was found to be partially fungible and education was the least fungible sector. Mavrotas (2002) has found project aid to be more fungible than program aid when it comes to replacement of government funding.

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McGillivray and Morrissey (2001) argue that fungibility should be secondary to the overall fiscal response of governments to the receipt of aid, including impact on investment, consumption and borrowing by government, as well as on tax effort.

In terms of Dutch disease, massive inflows of foreign capital, including aid as well as booming export receipts, can lead to inflation and real exchange rate appreciations, a finding supported by the work of Ali *et al.* (1999). In practice, however, the use of aid to finance imports or debt servicing rather than purchase domestically produced goods, has lessened the Dutch disease effects of aid.

Currently, the literature on aid seems to focus on the changing face of international co-operation (Manning, 2006), bilateral donors' interests vis-à-vis recipients' development motives in aid allocation (Berthélemy, 2006), innovative ways of making aid effective in a specific country (Quartey, 2005), the costs of bilateral aid tying (Osei, 2005), and aid, governance and private foreign investment (Harms and Lutz, 2006).[7] Quartey (2005) notes that at the country level, one way to ensure aid effectiveness is to design measures to reduce the debt burden, otherwise aid inflows may be used by recipients to service their debt. Osei (2005, p. 360) notes that 'there is a significant mark-up on the prices of tied aid imports in relation to the price of non-aid imports', which tends to impose additional cost on aid recipients. In the context of recent upsurge in 'emerging donors', Manning (2006) argues that members of the Development Assistance Committee (DAC) 'should develop constructive dialogue with other bilateral donors based on recognition that sustainable development and poverty reduction should be the core purpose of aid' (p. 372).[8] In this regard, the findings of Verschoor and Kalwij (2006), that aid can contribute not just to growth but to pro-poor growth, are very encouraging.

4. Data, Methodology and Models for Estimation

Our estimation uses pooled cross-section time series data. Spanning 1973 through 2004, data for eight 4-year averages is used. This approach is in line with current empirical studies revolving around foreign aid in particular and cross-sectional analysis in general.[9] Our sample for examining aid effectiveness in Africa comprises 40 out of 53 member countries of the African Union.[10] Countries were excluded due to missing data on the relevant variables. The main source of secondary data was obtained from the World Bank (2002, 2006) Africa database 2002 CD-Rom. This has been supplemented by data from the OECD's 'Geographical Distribution of Financial Flows to Developing Countries' as well as data from its website; UNDP's 'Handbook of International Trade and Development Statistics' and

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'Least Developed Countries Report' and the World Bank's 'World Tables'; Africa Development Indicators (2006); World Development Indicators (on line database); and UNCTAD's Handbook of Statistics (online version).

Our model on aid effectiveness within the context of income growth in Africa is of the following general form:

$$Y_{it} = \alpha_0 + \alpha_n N_{it} + \alpha_x X_{it} \tag{1}$$

where Y_{it} is per capita income growth of the ith country for period t; N_{it} is a vector of variables of interest to us (i.e., aid and aid-squared); and X_{it} is a vector of exogenous variables typically included in growth models (notably physical and human capital accumulation and policy variables).

Following from the general model above, the specific model we estimate is:

$$\begin{aligned} Y_{it} = {} & \alpha_0 + \alpha_1 A_{it} + \alpha_2 A_{it}^2 + \alpha_3 I_{it} + \alpha_4 E_{it} \\ & + \alpha_5 H_{it} + \alpha_6 M_{it} + \alpha_7 C_{it} + \alpha_8 F_{it} \\ & + \alpha_9 P_{it} + \alpha_{10} R_{it} + \alpha_{11} T_{it} + \varepsilon_{it} \end{aligned} \tag{2}$$

where the subscripts 'it' refer to the ith country in time period t, and Y is the growth rate of per capita income; A is foreign aid (measured in three ways by the current net ODA, lagged net ODA, and grants, as shares of recipient's GDP); A^2 is foreign aid squared (to capture non-linear effect of aid on growth); I is investment (as proxy for physical capital accumulation and measured by gross domestic investment/GDP); E is adult literacy rate (as proxy for human capital); H is life expectancy rate (as proxy for quality of life and human capital); M is initial per capita income (measured in constant 1995 US$); C is civil liberty restrictions (measured on a scale of 1–7, with 7 being the worst restriction); F is government consumption rate (measured by government consumption expenditure/GDP); P is inflation (measured by average annual changes in consumer price index); R is openness of the economy (measured by the sum of exports and imports expressed as a share of GDP); T is time period dummy variables; and ε is the error term.

In terms of marginal impact analysis, the following are our *a priori* expectations.

$$\partial Y/\partial A > 0; \quad \partial Y/\partial A^2 < 0; \quad \partial Y/\partial I > 0; \quad \partial Y/\partial E > 0; \quad \partial Y/\partial H > 0$$

$$\partial Y/\partial C < 0; \quad \partial Y/\partial F < 0; \quad \partial Y/\partial P < 0; \quad \partial Y/\partial R > 0$$

We use ordinary least squares to estimate the above fixed-effects model and conduct joint tests to check for the significance of three groups of variables, namely, aid, physical and human capital, and economic policy variables. An exogeneity test is conducted to ascertain the econometric status of aid to Africa (i.e., it being exogenous or endogenous). A similar test is conducted for the investment variable in the aid-growth model.

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Table 4 provides some descriptive statistics (mean and standard deviation) of the major variables in our models to be estimated. The average aid-GDP ratio for the eight four-year periods spanning 1973 through 2004 is about 12 per cent for Africa and 13 per cent for sub-Saharan Africa, while per capita income growth has been 0.5 per cent for the entire continent but 0.3 per cent for sub-Saharan Africa. On average, domestic investment is slightly lower for sub-Saharan Africa than all Africa (i.e., 19.5 per cent and 20.3 per cent respectively). Civil liberties appear to be quite restricted with an average index of about 5, with the value of 7 representing the worse case of limitations on civil rights.

5. Empirical Results

5.1 Aid-Growth Relationship

Table 5 shows the results from estimating our empirical models. Fixed effects are taken into account, and dummy variables which capture the effects of time have been used to estimate these effects. Arguably, each period could be seen as unique and should be accounted for as such. In model 1, the aid variable is measured by current net ODA while, in model 2, previous year's inflows (i.e., lagged aid) have been used to represent the aid variable. The rationale is that, if current aid inflows are assumed to be endogenous, then using the lag of aid could serve as a good instrument for current aid. The third model focuses on the grant component of foreign aid. In model 4, the lags of both foreign aid and investment have been used in the estimation of the model. It is common to find the use of lagged investment in the literature on the investment-growth relationship. At the same time if current investment is assumed to be endogenous, then lagged investment could be considered as an instrumental variable for current investment.

In all the four models, the foreign aid variable is seen to have a positive impact of growth, and it is statistically significant. A percentage point increase in current aid leads to about 0.13 percentage point increase in growth. The coefficients for the aid-squared variables bear negative signs, which suggest some diminishing impact of aid on growth. However, this variable is not statistically significant in all the models. The turning point of aid occurs at very large additional increases in aid. Based on model 2, this 'diminishing' effect of aid on growth occurs at an aid/GDP ratio of 39 per cent.[11]

Additions to the stocks of physical and human capital exert a positive impact on growth in Africa. Inflation has a negative impact on growth. In the case of current domestic investment, the findings in models 1–3 that this variable is statistically significant are consistent with those of Gomanee

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Table 4: Descriptive statistics

	Data source	Africa		Sub-Saharan Africa	
		Mean	Std dev	Mean	Std dev
Per capita income growth rate (%)	World Bank Africa database CD (2002); ADI (2006)	0.52	3.67	0.33	3.79
Net ODA/GDP (%)	World Bank Africa database CD (2002); OECD (2006)	11.82	13.59	12.84	13.97
Grants/GDP[a] (%)	World Bank Africa database CD (2002); OECD (2006)	6.37	7.77	6.98	7.98
Domestic investment/GDP (%)	World Bank Africa database CD (2002); World Bank (2006)	20.30	9.10	19.45	9.04
Adult literacy rate (%)	World Bank Africa database CD (2002); WDI (2006)	46.09	20.67	45.83	21.41
Civil liberty [b]	Freedom House	4.88	1.26	4.85	1.31
Initial per capita income (US$)	World Bank Africa database CD (2002); World Bank (2006)	783.23	1031.66	711.44	1061.02
Govt. consumption/GDP (%)	World Bank Africa database CD (2002); World Bank (2006)	15.48	6.74	15.44	7.06
Inflation (%)	World Bank Africa database CD (2002); WDI (2006)	16.05	24.91	16.96	26.21
Openness (Trade/GDP) (%)	World Bank Africa database CD (2002); WDI (2006)	67.30	32.60	68.10	34.05
Net foreign direct investment/GDP (%)	OECD online database (2006)	1.31	2.94	1.31	3.10
Workers' remittances/GDP (%)	World Bank Africa database CD (2002); UNCTAD (2006)	1.39	2.72	0.99	2.42
Domestic savings/GDP (%)	World Bank Africa database CD (2002); World Bank (2006)	9.44	16.62	7.97	16.75

Table 4: (Continued)

	Data source	Africa		Sub-Saharan Africa	
		Mean	Std dev	Mean	Std dev
Debt Service/Exports (%)	World Bank Africa database CD (2002); WDI (2006)	17.92	12.96	17.24	12.73
Infant mortality rate (per 1,000 births)	World Bank Africa database CD (2002); WDI (2006)	102.30	35.76	106.24	33.93
Life expectancy (years)	World Bank Africa database CD (2002); WDI (2006)	50.08	8.05	48.49	6.65
Private sector credit/Total domestic (log)	World Bank Africa database CD (2002); IFS (2005)	4.02	0.80	4.04	0.83

Note: ADI = African Development Indicators; WDI = World Development Indicators.
[a]Grants refer to official grants, excluding technical cooperation.
[b]Civil liberties/rights as used here follow the definition by Freedom House (2003) which includes the freedom to develop opinions, institutions and personal autonomy without interference from the state. The ratings are from 1 through 7, with severe liberty restrictions occurring as we approach 7. A country rating of 7 represents virtually no freedom.

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Table 5: Regression results on aid effects on per capita income growth in Africa

Dependent variable: Per capita income growth	Model 1		Model 2		Model 3		Model 4	
	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value
Net ODA	0.127	2.39**						
Net ODA squared	−0.001	−1.33						
Lagged ODA			0.142	2.63*			0.145	2.67*
Lagged ODA squared			−0.002	−1.69***			−0.002	−1.60
Current grants					0.281	3.25*		
Current grants squared					−0.006	−2.20**		
Domestic investment ratio	0.065	2.44**	0.064	2.40**	0.060	2.30**		
Adult literacy rate	0.022	1.98**	0.022	1.95**	0.026	2.34**	0.025	2.28**
Civil liberty	−0.587	−3.55*	−0.572	−3.46*	−0.592	−3.60*	−0.594	−3.57*
Initial income per capita ($\times 10^{-2}$)	0.055	1.55	0.059	1.66***	0.060	1.75***	0.061	1.70***
Govt. consumption ratio	−0.124	−3.89*	−0.122	−3.86*	−0.130	−4.09*	−0.121	−3.81*
Inflation	−0.020	−2.73*	−0.018	−2.50**	−0.020	−2.85*	−0.020	−2.73*
Trade openness	0.005	0.80	0.005	0.79	0.006	0.98	0.007	1.09
Net direct foreign investment	0.258	3.44*	0.250	3.36*	0.263	3.55*	0.280	3.74*
Sub-Saharan Africa	−1.371	−2.22**	−1.395	−2.25**	−1.540	−2.46**	−1.691	−2.74*
Lagged investment							0.031	1.17
Constant	3.870	2.59*	3.742	2.52**	4.059	2.80*	4.575	3.09*
F-statistic		8.84		8.86		9.18		8.39
R-squared		0.345		0.346		0.356		0.333
Sample size		250		250		248		250

Note: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. Each of the models includes time dummy variables.

et al. (2002, 2005). In model 4, lagged investment appears to be statistically insignificant, which confirms the results obtained by Dollar and Easterly (1999).

Inflation and government consumption are found to be negatively associated with growth. As Romer (2001) observed, empirical studies such as those by Fischer (1993), and Bruno and Easterly (1998) also show a negative association between inflation and growth. The negative relationship between the government consumption ratio and growth has been found in studies such as Gomanee *et al.* (2005). One interpretation provided by Khan and Villanueva (1991) is that government consumption spending, financed by either higher tax rates or higher inflation via deficit financing, tends to introduce distortions that reduce saving and growth. Our results also show that though trade openness has a positive impact on growth, this impact is not statistically significant. Arguably, it is not mere openness that matters. Rather, the conditions governing trade relations and the structure of exports may have important effects on growth in Africa.

5.2 Examination of Exogeneity of Aid

In recent times, a major concern in econometric estimation with aid as an independent variable is to test for the exogeneity of aid: does aid respond to internal factors, such as poverty, internal or external deficits etc., or is it driven by purely external concerns, such as famine, political strategic considerations etc. From an econometric modelling point of view, if aid is exogenous, then examining its effectiveness using ordinary least squares is appropriate. On the other hand, if aid is endogenous, then the appropriate estimation technique is two-stage least squares or instrumental variable estimation.

Applying the approach outlined in Gujarati (2003), the first step in the exogeniety test involves regressing aid on the set of explanatory variables listed in Table 5 together with a set of instruments believed to be correlated with aid. Major issues which tend to influence the decisions of aid donors, notably health conditions (reflected in such variables as infant mortality rates and life expectancy rate) and governance issues (such as civil rights) are used as instruments to explain the variations in aid. Following Lensink and White (2001), Stata Corporation (2001) and Gujarati (2003), an exogeneity test is then conducted in the second stage by taking the fitted value of aid obtained in the first step and including it in the original per capita income growth model. In our study this involved adding the fitted value of aid to the other variables shown in the models of Table 5 and re-estimating those models.[12]

The results from providing instruments for aid are shown in Tables 6a and 6b. Table 6b shows that the aid variable can be considered to be exogenous,

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Table 6a: Test on exogeneity of aid in the aid–growth model

Stage 1
Dependent variable: Foreign aid

	Model 1 Current net ODA		Model 2 Lagged net ODA		Model 3 Current grants	
	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value
Domestic investment ratio	0.205	2.14**	0.229	2.43**	0.040	0.96
Adult literacy rate	−0.058	−1.75***	−0.058	−1.73***	−0.028	−1.38
Civil liberty	−0.755	−1.68***	−0.963	−2.14**	−0.427	−1.65***
Initial income per capita ($\times 10^{-2}$)	−0.242	−3.13*	−0.263	−3.40*	−0.156	−3.22*
Govt. consumption ratio	0.196	1.72***	0.139	1.00	0.123	1.72***
Inflation	0.062	1.63	0.049	1.33	0.031	1.40
Trade openness	0.036	1.89***	0.040	2.04**	0.020	1.51
Net direct foreign investment	−0.344	−1.65***	−0.268	−1.11	−0.162	−1.11
Sub-Saharan Africa	6.507	3.53*	5.831	3.03*	3.090	2.62*
Life expectancy	0.347	2.59**	0.274	2.04**	0.181	1.90***
Debt service ratio	0.151	3.00*	0.148	2.93*	0.094	3.02*
Infant mortality rate	0.215	6.04*	0.201	5.70*	0.117	4.63*
Constant	−44.871	−3.90*	−37.929	−3.25*	−23.266	−2.91*
F-statistic		15.94		14.55		15.51
R-squared		0.554		0.535		0.55
Sample size		249		249		247

Notes: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. Each of the models includes time dummy variables.

at least from an econometric modelling perspective. The *t*-values for the fitted-aid variables based on the three models specified in Table 6b are clearly not statistically significant. Thus, using ordinary least squares in modelling aid effectiveness is appropriate. In terms of the models being estimated, exogeneity of the aid variable means its value is not determined by other independent variables in the models. The result suggests that donors have their own priorities and determine how much aid to give as well as who gets what.[13]

5.3 Aid–Growth Transmission Mechanism

It is common to think of aid's impact on growth to be an indirect one, with aid exerting a positive impact on some key variables in the growth process. One of such variables is investment. Until now, we have partially ignored the potential endogeneity of the investment ratio. We say, partially, because in model 4 of Table 5, we tried to overcome this problem by using the lagged investment ratio in place of current investment ratio. In this section, we

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Table 6b: Test on exogeneity of aid in the aid–growth model

Stage 2
Dependent variable: Growth rate of per capita income in Africa

	Model 1		Model 2		Model 3	
	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value
Current net ODA	0.072	2.90*				
Lagged net ODA			0.065	2.48**		
Current grants					0.119	2.39**
Domestic investment ratio	0.071	2.13**	0.070	2.02**	0.074	2.57**
Adult literacy rate	0.015	1.31	0.015	1.31	0.015	1.37
Civil liberty	−0.598	−3.32*	−0.591	−3.28*	−0.600	−3.36*
Initial income per capita ($\times 10^{-2}$)	0.021	0.63	0.022	0.64	0.022	0.62
Govt. consumption ratio	−0.107	−3.51*	−0.106	−3.55*	−0.109	−3.45*
Inflation	−0.018	−2.16**	−0.018	−2.22**	−0.018	−2.20**
Trade openness	0.007	0.86	0.007	0.86	0.007	0.88
Net direct foreign investment	0.243	3.05*	0.240	3.00*	0.242	3.00*
Sub-Saharan Africa	−1.045	−1.55	−1.052	−1.54	−1.022	−1.62
Fitted Aid variable	−0.044	−0.81	−0.036	−0.63	−0.071	−0.78
Constant	4.205	2.98*	4.176	2.98*	4.203	3.02*
F-statistic		8.72		8.31		8.84
R-squared		0.329		0.325		0.330
Sample size		249		249		247
Test for Fitted Aid Value = 0		0.66		0.40		0.60
Prob. > F-statistic		0.42		0.53		0.44

Note: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. The *t*-values are obtained from White heteroscedasticity-consistent standard errors. Each of the models includes time dummy variables.

examine the effect of aid on investment in Africa, and then test to see if investment can be regarded as an exogenous variable. We recognize the fact that aid is not the only variable that influences investment and therefore to avoid misspecification of the model, we include other pertinent variables conventionally thought to influence investment. The results are shown in Table 7.

There appears to be a significant link between aid and investment. A percentage point increase in aid, leads to a 0.2 percentage point increase in investment. Our test results show the fitted investment variable to be insignificant in our second stage regression in Model 2 of Table 7. This suggests that including the investment variable in the growth model, and estimating using OLS, yields consistent estimates.

Having estimated models on aid and investment, and having found the aid and investment variables to be exogenous, we estimate an exclusive and robust aid-growth model for sub-Saharan Africa. The results are shown in Table 8. Current aid is still observed to show a positive impact on growth but its impact on growth is lower than the case for all Africa (i.e., about 5 per cent). Additions to the stocks of physical and human capital exert positive

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Table 7: Testing for the exogeneity of investment in the aid–growth model

Model 1: Stage 1 Dependent variable: Domestic investment ratio			Model 2: Stage 2 Dependent variable: Per capita income growth		
	Coef.	t-value		Coef.	t-value
Current Net ODA	0.221	3.80*	Current Net ODA	0.082	1.98**
Adult literacy rate	0.132	4.43*	Domestic investment ratio	0.062	2.30**
Civil liberty	−0.536	−1.59	Adult literacy rate	0.032	1.76***
Initial income per capita ($\times 10^{-2}$)	0.040	0.46	Civil liberty	−0.568	−3.11*
Govt. consumption ratio	−0.001	−0.01	Initial income per capita ($\times 10^{-2}$)	0.005	0.14
Inflation	−0.043	−3.29*	Govt. consumption ratio	−0.136	−4.19*
Trade openness	0.048	2.28**	Inflation	−0.027	−2.84*
Net direct foreign investment	1.001	5.00*	Trade openness	0.017	1.32
Sub-Saharan Africa	−9.681	−8.04*	Net direct foreign investment	0.373	2.75*
Domestic credit ratio	2.151	2.79*	Sub-Saharan Africa	−2.773	−2.01**
Terms of trade	0.036	3.29*	*Fitted Investment*	−0.116	−0.87
Constant	9.636	2.17**	Constant	7.036	2.33**
F-statistic		19.88	F-statistic		8.55
R-squared		0.521	R-squared		0.318
Sample size		232	Sample size		232
Test for Fitted investment = 0					0.76
Prob > F-statistic					0.38

Note: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. The *t*-values are obtained from White heteroscedasticity-consistent standard errors. Each of the models includes time dummy variables.

Table 8: AID–growth models for sub-Saharan Africa

Dependent variable: Per capita income growth in Sub-Saharan Africa	Model 1		Model 2		Model 3	
	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value
Net ODA	0.122	2.13**				
Net ODA squared	−0.001	−1.21				
Lagged ODA			0.141	2.41**		
Lagged ODA squared			−0.002	−1.46		
Current Grants					0.272	2.92*
Current Grants squared					−0.006	−1.92***
Domestic investment ratio	0.076	2.57*			0.071	2.44**
Adult literacy rate	0.020	1.65	0.024	1.98**	0.024	2.02**
Civil liberty	−0.575	−3.12*	−0.590	−3.18*	−0.582	−3.18*
Initial income per capita ($\times 10^{-2}$)	0.064	1.66***	0.069	1.76***	0.070	1.88***
Govt. consumption ratio	−0.123	−3.63*	−0.121	−3.56*	−0.130	−3.82*
Inflation	−0.019	−2.40**	−0.019	−2.43**	−0.019	−2.56**
Trade openness	0.004	0.58	0.006	0.85	0.005	0.73
Net direct foreign investment	0.253	3.16*	0.278	3.47*	0.261	3.29*
Lagged investment			0.041	1.40		
Constant	2.259	1.60	2.689	1.91***	2.280	1.67***
F-statistic		7.86		7.37		8.24
R-squared		0.334		0.320		0.346
Sample size		218		218		216

Notes: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. Each of the models includes time dummy variables.

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impact on growth in sub-Saharan Africa. Inflation has a negative impact on growth.

Table 9 provides a comparison of the linear effects of aid in Africa and sub-groups on the continent. Our results show the following: (i) that the impact of pure grants on growth is higher than the impact from total net ODA; and (ii) that irrespective of how aid is measured (i.e., whether current net ODA, lagged-aid, or grants) the impact on growth is relatively smaller for the list of African countries located in the tropics than it is for either sub-Saharan Africa or all Africa, a finding which is consistent with what was found by Dalgaard *et al.* (2004).

5.4 Financing Growth in Africa

As discussions take place on what strategies need to be put in place to enable Africa to realize her growth and development aspirations, the issue of growth financing emerges. In this section, we analyze the potential sources of finance that have been suggested in policy debates. NEPAD advocates for more foreign aid. In an analysis of new sources of development finance for the MGDs, Atkinson (2004) identifies workers' remittances as a potential source of finance. There are also calls for debt relief — forgiveness, conversions etc. — and therefore we include debt-service obligations as a proxy for resource losses and the adverse effect of this on growth. The need to step up domestic efforts in terms of savings mobilization is also an issue of much concern, especially against the backdrop of faltering foreign aid inflows.[14] Finally, we include resource flows from direct foreign investment as a potential source to be harnessed to facilitate the growth process in Africa.

The results of the impact of these finance flows on growth per capita in Africa are shown in Table 10. These variables, with the exception of debt service obligations, exert a positive impact on growth. Though the annual average domestic savings rate in Africa has been about 10 per cent for the last three decades, this variable is seen to exert a positive impact on growth on the continent. One reason for the low domestic savings rate is the high incidence of poverty (UNCTAD, 2006b). Addressing poverty issues on the continent could result in an increase in domestic savings rate in Africa.

The impact of pure grants in aid is seen to be about twice the impact of total net ODA. This suggests the need for more aid in the form of pure grants. While there has been a tendency for greater equality in the distribution of real grants per capita in Africa, as shown by the downward trend in the Gini coefficient from 1971–2004, there have been periods of modest rise in inequality (see Figure 5). Moving towards sustainable equality in grants distribution, especially to the least developed countries in the sub-region, would be an important step in strategies for realization of the MDGs. Linking

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Table 9: Linear effects of aid on per capita income growth in Africa, sub-Saharan Africa and tropical Africa

Dependent variable: Per capita income growth rate									
	Africa Coef	SSA Coef	Tropics Coef	Africa Coef	SSA Coef	Tropics Coef	Africa Coef	SSA Coef	Tropics Coef
Current Net ODA	0.053**	0.058*	0.047**						
	(2.56)	*(2.62)*	*(2.06)*						
Lagged-Net ODA				0.049**	0.055**	0.043***			
				(2.42)	*(2.49)*	*(1.89)*			
Current Grants							0.095*	0.107*	0.094**
							(2.82)	*(2.95)*	*(2.54)*
Adjusted R2	0.294	0.300	0.305	0.292	0.287	0.302	0.297	0.295	0.312
Sample size	250	218	202	250	218	202	248	216	200

Notes: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. The *t*-values are in parentheses and italics. SSA represents sub-Saharan Africa. 'Tropics' includes all countries in sub-Saharan Africa with the exception of Lesotho and Swaziland. Each of the models includes time dummy variables, policy variables, investment, adult literacy rate, initial per capita income and constant terms.

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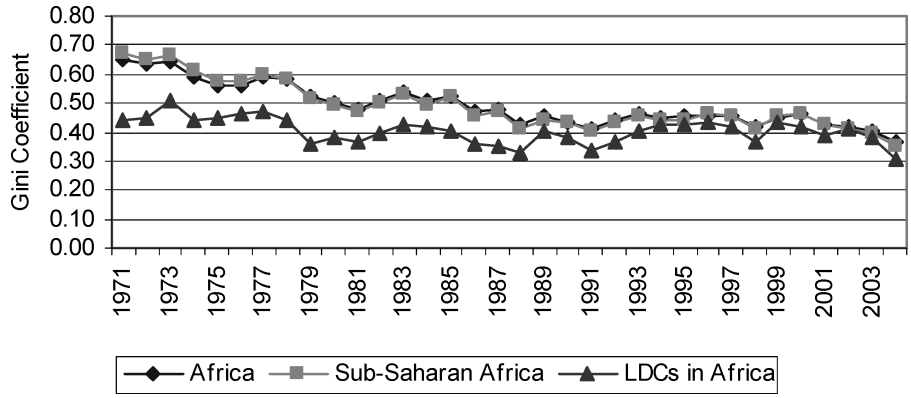
Table 10: Sources of growth financing in Africa

Dependent variable: Growth rate of income per capita in Africa	Model 1: Total ODA		Model 2: Total ODA		Model 3: Pure Grants		Model 4: Pure Grants	
	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value
Foreign aid/GDP	0.042	2.23**	0.034	1.84***	0.084	2.32**	0.068	1.81***
Workers' remittances/GDP	0.225	2.57**	0.197	2.26**	0.227	2.59*	0.201	2.28**
Domestic savings/GDP	0.053	3.62*	0.048	3.27*	0.053	3.55*	0.049	3.21*
Debt service/Exports	−0.045	−2.41**	−0.043	−2.32**	−0.050	−2.64*	−0.044	−2.30**
Foreign direct investment/GDP			0.177	2.13**			0.158	1.85***
F-statistic		3.94		4.00		3.81		3.80
Adjusted R-squared		0.075		0.085		0.073		0.081

Note: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. The *t*-values are obtained from White heteroscedasticity-consistent standard errors. Each model was estimated with a constant term and had time dummy variables to control for fixed effects. In models 1 and 2, the foreign aid variable refers to net ODA, while in models 3 and 4, it refers to pure grants.

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Figure 5: Inequality incidence in the distribution of real grants per capita in Africa



Source: Calculations based on OECD data on real grants disbursement and World Bank data on population.

aid to good governance and poverty reduction strategies in order to achieve the MGDs has been suggested by Radelet (2004). While workers' remittances show a relatively strong impact on growth, it must be noted that these have generally been low, with an average value of 1.2 per cent of GDP in Africa, and 0.7 per cent in sub-Saharan Africa.

6. Conclusion

This paper revisited the issue of aid effectiveness in Africa from a macroeconomic perspective. The large coverage of countries implies issues of selectivity are quite minimal and the possibility of generalizing is reasonable, though with some caution. On an annual basis, aid inflows to Africa are falling both in nominal and real terms. Africa's share of total aid to developing regions has also fallen in recent times, though the need for aid, as argued by African leaders through the NEPAD, remains quite strong.

As we hypothesized, our econometric estimations show that aid has a positive and significant effect on per capita income growth in Africa. Aid increases investment, which is a major transmission mechanism in the aid-growth relationship. Furthermore, grant aid is more effective than other forms. All of this suggests that NEPAD's policy thrust of pursuing more aid on concessional terms is well grounded. So too is NEPAD's emphasis on good governance, as our results show a clear relationship between poor growth performance and high rates of inflation, high rates of government (non-social sector) consumption spending and restrictions on civil liberties. Improvements in infant mortality rates, adult literacy and life expectancy,

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which can be shaped by social sector government consumption spending, can significantly increase aid. All of this has important policy implications for African governments.

Thus, for now, aid matters for the continent's growth. There is, however, a need for Africans to strategize to reduce future dependence on aid, given the apparent donor aid fatigue and the future debt servicing obligations that are entailed by aid in the form of concessional loans. Some important first steps have already been taken in this direction (Ali *et al*., 1999). Such a strategy would entail, of necessity and as our analysis suggests, more debt reduction and debt forgiveness, larger inflows of workers' remittances and direct foreign investment and much greater efforts to raise domestic savings. In the long run, and if recent Asian experience is a guide, it is likely to be policies that encourage domestic savings that will make the biggest contribution to sustained growth.

Notes

1. Newlyn (1990) points out that the effects of depression in the industrial countries coupled with deflationary measures tailored towards adjustment reduced investment and otherwise created a growth-stifling situation.
2. The specific number of countries is shown in 'bold' along the diagonal in Table 3.
3. Mosley *et al.* (1987) study was from 1960–83 and used a sample of 81 developing countries with 34 of these being from Africa.
4. Lensink and White (2001) used a dataset comprising 110 countries, 46 of which were from Africa.
5. Guillaumont and Chauvet (2001) used a sample of 66 developing countries, 31 of which were from Africa.
6. While building on this insightful paper by Gomanee *et al.* (2005), our study differs in the following ways: (i) we carry out an analysis on aid-and-per capita income growth transition in Africa; (ii) we explicitly examine growth financing sources, which include 'emerging' resources flows such as workers' remittances and debt forgiveness grants; (iii) we provide a brief analysis on aid inequality in Africa; (iv) we include direct foreign investment in our aid-growth models which allow for a comparison between public and private flows to Africa; and (v) we use a larger sample based on 40 countries in Africa and data spanning 1973 through 2004. Arguably, including most recent data on aid flows to

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Africa allows for current aid dynamics to be included in the analysis under consideration.

7. Studies by Quartey (2005) and Osei (2005) used Ghana as a country case study.

8. The term 'emerging donors' refers to the following: (i) OECD members which are not members of the DAC (e.g., Turkey and Korea); (ii) new EU member states; (iii) Middle East and OPEC countries; and (iv) non-OECD donors which do not fall under groups (ii) and (iii) (e.g. Israel). See Manning (2006).

9. For studies employing this approach see Lensink and White (2001), Dalgaard and Hansen (2001), Guillaumont and Chauvet (2001) and Gomanee *et al*. (2002).

10. Since 36 of these are located in sub-Saharan Africa, we constructed a dummy variable for this and included it in our aid-growth model. In terms of tropical location, 34 of these are located in the tropics. Some recent studies (Dalgaard *et al.*, 2004; Roodman, 2004) have found location in the tropics as a determinant of aid performance. To ascertain such findings, we decompose our sample into tropical Africa, in one stance, and sub-Saharan Africa in another instance, and examine the linear impact of aid on growth (Table 10).

11. This is calculated as follows: coefficient on aid variable / ($-2 \times$ coefficient on aid squared). The studies by Lensink and White (2001) and Durbarry *et al.* (1998) had turning points of aid to GNP ratio at about 50 per cent and 51 per cent respectively. The consistency is in terms of the turning point occurring at very high aid/GNP ratio.

12. In carrying out an exogeneity test for foreign aid, the null hypothesis is that the coefficient of the fitted value of aid is zero (i.e., not statistically significant). According to this test proposed by Davidson and MacKinnon (1993), if the null hypothesis is confirmed, then aid is indeed exogenous, otherwise it is endogenous.

13. In a sense, though, one can argue that aid is influenced by recipients, and that social, economic and political conditions prevailing in aid receiving nations tend to influence the level of aid they receive.

14. One of the outcomes of the International Conference on Financing for Development held in Monterrey, Mexico in March 2002 was the need to mobilize domestic financial resources (i.e., savings) for development by improving governance, macroeconomic policies and social safety nets (World Bank, 2003).

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References

Ali, A. A. G., C. Malwanda and Y. Suliman (1999), 'Official Development Assistance to Africa: An Overview', *Journal of African Economies*, Vol. 8, No. 4, pp. 504–27.

Atkinson, A. B. (2004), 'New Sources of Development Finance: Funding the Millennium Development Goals', *Policy Brief*, No. 10, pp. 1–26.

Berthélemy, J. C. (2006), 'Bilateral Donors' Interest vs. Recipients' Development Motives in Aid Allocation' Do all Donors Behave the Same?', *Review of Development Economics*, Vol. 10, No. 2, pp. 179–94.

Boone, P. (1994), 'The Impact of Foreign Aid on Savings and Growth', mimeo, London School of Economics.

Boone, P. (1996), 'Politics and the Effectiveness of Foreign Aid', *European Economic Review*, Vol. 40, No. 2, pp. 289–329.

Bosworth, Barry P. and Susan M. Collins (2003), 'The Empirics of Growth: An Update', Brookings Papers on Economic Activity, Washington, D.C.: Brookings Institution, Vol. 2003, No. 2, pp. 113–179.

Bruno, M. and W. Easterly (1998), 'Inflation Crises and Long-run Growth', *Journal of Monetary Economics*, Vol. 41, pp. 3–26.

Burnside, C. and D. Dollar (1997), 'Aid, Policies and Growth', *World Bank Research Working Paper No. 569252*, Washington, DC.

Burnside, C. and D. Dollar (2000), 'Aid, Policies and Growth', *American Economic Review*, Vol. 90, No. 4, pp. 847–68.

Cassen, R. (1986 and 1994), *Does Aid Work?* Oxford: Oxford University Press.

Clemens, M., S. Radelet and R. Bhavnani (2004), 'Counting Chickens When They Hatch: the Short-Term Effect of Aid on Growth', Center for Global Development Working Paper 44, Washington: Center for Global Development.

Collier, P. and D. Dollar (1999), 'Aid Allocation and Poverty Reduction Policy', *Research Working Paper 2041*, Washington, DC: World Bank.

Dalgaard, C. J., H. Hansen and F. Tarp (2004), 'On the Empirics of Foreign Aid and Growth', *Economic Journal*, Vol. 114, pp. 191–216.

Dalgaard, C. J. and H. Hansen (2001), 'On Aid, Growth and Good Policies', *Journal of Development Studies*, Vol. 37, No. 6, pp. 17–41.

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Davidson, R. and J.G. MacKinnon (1993), *Estimation and Inference in Econometrics*, New York: Oxford University Press, pp. 236–42.

Devarajan, S., A.S. Rajkumar and V. Swaroop (1998), 'What Does Aid to Africa Finance?' African Economic Research Consortium and Overseas Development Council project on 'Managing a smooth Transition from Aid Dependence in Africa', Washington, DC, October.

Dollar, D. and W. Easterly (1999), 'The Search for the Key: Aid, Investment and Policies in Africa', *Journal of African Economies*, Vol. 8, No. 4, pp. 546–77.

Durbarry, R., N. Gemmell and D. Greenaway (1998), 'New Evidence on the Impact of Foreign Aid on Economic Growth', *CREDIT Research Paper 98/9*, University of Nottingham.

Easterly, W., R. Levine and D. Roodman (2003), New Data, New Doubts: Revisiting 'Aid, Policies and Growth', *Working Paper 26, Center for Global Development*, Washington, DC., June

Economic Commission for Africa and Africa Union (2007), *Economic Report on Africa 2007: Accelerating Africa's Development through Diversification*, Addis Ababa.

Elbadawi, I. A. (1999), 'External Aid: Help or Hindrance to Export Orientation in Africa?', *Journal of African Economies*, Vol. 8, No. 4, pp. 578–616.

Fischer, S. (1993), 'The Role of Macroeconomic Factors in Growth', *Journal of Monetary Economics*, Vol. 12, pp. 485–512.

Freedom House (2003), Freedom in the World 2003: Survey Methodology, http:/www.freedomhouse.org/research/freeworld/2003/methodology.htm.

Gomanee, K., S. Girma and O. Morrissey (2002), 'Aid and Growth in Sub-Saharan Africa: Accounting for Transmission Mechanisms', *CREDIT Research Paper*, Vol. 5, No. 2.

Gomanee, K., S. Girma and O. Morrissey (2005), 'Aid and Growth in Sub-Saharan Africa: Accounting for Transmission Mechanisms', *Journal of International Development*, Vol. 17, pp. 1055–75.

Griffin, K. B. (1970), 'Foreign Capital, Domestic Savings and Economic Development', *Bulletin of the Oxford University Institute of Economics and Statistics*, Vol. 32, No. 2, pp. 99–112.

Griffin, K. B. and J. L. Enos (1970), 'Foreign assistance: Objectives and Consequences', *Economic Development and Cultural Change*, Vol. 18, No. 3, pp. 313–27.

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Guillaumont, P. and L. Chauvet (2001), 'Aid and Performance: A Reassessment', *Journal of Development Studies*, Vol. 37, No. 6, pp. 66–92.

Gujarati, D. (2003), *Basic Econometrics*, McGraw-Hill, New York, 4th Edition

Hadjimichael, M.T., D. Ghura, M. Muhleisen, R. Nord, and E.M. Ucer (1995), 'Sub-Saharan Africa: Growth, Savings and Investment, 1986–93', *Occasional Paper 118*, International Monetary Fund.

Hansen, H., and F. Tarp (2000), 'Policy Arena: Aid Effectiveness Disputed', *Journal of International Development*, Vol. 12, pp. 357–398.

Hansen, H. and F. Tarp (2001), 'Aid and Growth', *Journal of Development Economics*, Vol. 64, No. 2, pp. 547–570.

Harms, P., and M. Lutz (2006), 'Aid, Governance and Private Foreign Investment: Some Puzzling Findings for the 1990s', *Economic Journal*, Vol. 116, pp. 773–90.

Hermes, N. and R. Lensink (2001), 'Changing the Conditions for Development Aid: A New Paradigm', *Journal of Development Studies*, Vol. 37, No. 6, pp. 1–15.

Karras, G. (2006), 'Foreign Aid and Long-run Economic Growth: Empirical Evidence for A panel of Developing Countries', *Journal of International Development*, Vol. 18, pp. 15–28.

Khan, M.S. and D. Villanueva (1991), 'Macroeconomic Policies and Long-term Growth', African Economic Research Consortium Special Paper 13, pp. 1–40.

Lancaster, C. (1999), 'Aid Effectiveness in Africa: The Unfinished Agenda', *Journal of African Economies*, Vol. 8, No. 4, pp. 487–503.

Lensink, R. and H. White (2001), 'Are there Negative Returns to Aid', *Journal of Development Studies*, Vol. 37, No. 6, pp. 42–63.

Levine, R. and D. Renelt (1992), 'Sensitivity Analysis of Cross-Country Growth Regressions', *American Economic Review*, Vol. 82, No. 4, pp. 942–63.

Loxley, J. (1998), *Interdependence, Disequilibrium & Growth - Reflections of the Political Economy of North-South Relations at the Turn of the Century*. Macmillan, London, St Martinís, New York and International Development Research Centre, Ottawa March 1998.

Loxley, J. (2003) 'Imperialism and Economic Reform in Africa: What's New About the New Partnership for Africa's Economic Development (NEPAD)?', *Review of African Political Economy*, Vol. 30, No. 95, March.

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Maddison, A. (2002), *The World Economy: A Millennial Perspective*, Development Centre of the Organisation for Economic Cooperation and Development, Paris: OECD.

Mavrotas, G. (2002), 'Foreign Aid and Fiscal Response: Does Aid Disaggregation Matter?', *Weltwirtschafliches Archiv*, Vol. 138, No. 3, pp. 534–559.

Manning, R. (2006), 'Will "Emerging Donor" Change the face of International Co-operation?', *Development Policy Review*, Vol. 24, No. 4, pp. 371–85.

McGillivray, M. and O. Morrissey (2001), *New Evidence of the Fiscal Effects of Aid',* CREDIT Research Paper, No. 01/13, Centre for Research in Economic Development and International Trade, University of Nottingham, Nottingham.

Mosley, P., J. Hudson and S. Horrell (1987), 'Aid, the Public Sector and the Market in Less Developed Countries: A Note', *Economic Journal*, Vol. 97, No. 387, pp. 616–41.

Mosley, P. (1980), 'Aid, Savings and Growth Revisited', *Oxford Bulletin of Economics and Statistics*, Vol. 42, No. 2, pp. 79–95.

NEPAD (2001), *The New Partnership for Africa's Development (NEPAD)*, OAU, Abuja, Nigeria.

Newlyn, W.T. (1973), 'The Effect of Aid and Other Resource Transfers on Savings and Growth in Less Developed Countries: A Comment', *Economic Journal*, Vol. 83, No. 331, pp. 863–69.

Newlyn, W.T. (1990), 'Aid, the Public Sector and the Market in Less Developed Countries: A Note', *The Economic Journal*, Vol. 100, No. 399, pp. 220–23.

OECD (Organization for Economic Cooperation and Development) (1985), *Twenty-five Years of Development Co-operation: A Review*, 1985 Report, Paris: OECD.

Osei, B. (2005), 'How Aid Tying Can Impose Additional Cost on Aid Recipients: Evidence on Ghana', *African Development Review*, Vol. 17, No. 3, pp. 384–65.

Papanek, G.F. (1972), 'The Effect of Aid and Other Resource Transfers on Savings and Growth in Less Developed Countries', *Economic Journal*, Vol. 82, No. 327, pp. 935–50.

Quartey, P. (2005), 'Innovative Ways of Making Aid Effective in Ghana: Tied Aid Versus Direct Budgetary Support', *Journal of International Development*, Vol. 17, pp. 1092–92.

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Radelet, S. (2004), 'Aid Effectiveness and the Millennium Development Goals', *Center for Global Development Working Paper*, No. 39, pp. 1–31.

Romer, D. (2001), *Advanced Macroeconomics*, 2nd edn, Toronto: McGraw Hill.

Roodman, D. (2004), 'The Anarchy of Numbers: Aid, Development, and Cross-country Empirics', *Working Paper 32, Center for Global Development*, Washington, DC., June

Stata Corporation (2001), *Stata Reference Manual*, Release 7, col 2 H-P, pp. 134–35.

Snyder, D.W. (1990), 'Foreign Aid and Domestic Savings: A Spurious Correlation?', *Economic Development and Cultural Change*, Vol. 39, No. 1, pp. 175–81.

UNCTAD (United Nations Conference of Trade and Development) (1983), *Handbook of International Trade and Development Statistics*, United Nations: Geneva.

UNCTAD (1984), *The Least Developed Countries 1984 Report*, Geneva: United Nations.

UNCTAD (2006a), *Economic Development in Africa, 2006*, Geneva: United Nations.

UNCTAD (2006b), *The Least Developed Countries Report 2006*, Geneva: United Nations.

United Nations (2001), *World Economic Situation and Prospect, 2001*, Department of Economic and Social Affairs, New York.

United Nations (2006), 'Definition of Major Areas and Regions', *World Migration Stock: The 2005 Revision Population Database*, http://esa.un.org/migrationindex.asp?panel=3.

Verschoor, A. and A. Kalwij (2006), 'Aid, Social Policies and Pro-Poor Growth', *Journal of International Development*, Vol. 18, pp. 519–32.

Weisskopf, T. (1972), 'The Impact of Foreign Capital Inflow on Domestic Savings in Underdeveloped Countries', *Journal of International Economics*, Vol. 2, No. 1, pp. 25–38.

White, H. (1992), 'The Macroeconomic Impact of Development Aid: A Critical Survey', *Journal of Development Studies*, Vol. 28, No. 2, pp. 163–240.

World Bank (1984), *World Tables: Volume I – Economic Data*, 3rd edn, Baltimore: The Johns Hopkins University Press.

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World Bank (1993), *World Tables: 1993*. Baltimore: The Johns Hopkins University Press.

World Bank (1998), *Assessing Aid – What Works, What Doesn't and Why*, Washington, D.C.

World Bank (2002), *Africa Development Indicators 2002*, Washington, D.C.

World Bank (2003), *World Development Report 2003: Sustainable Development in a DynamicWorld-Transforming Institutions, Growth and Quality of Life*, Washington, DC: World Bank.

World Bank (2006), *Africa Development Indicators 2006*, Washington, DC: World Bank.

Appendix

Table A1: List of countries representing each of the sub-regions in Africa

North Africa	West Africa	Central Africa	East Africa	Southern Africa
Algeria	Benin	Cameroon	Burundi	Botswana
Egypt	Burkina Faso	Sao Tome	Ethiopia	Lesotho
Morocco	Cote d'Ivoire	CAR	Kenya	Malawi
Tunisia	Gambia	Chad	Madagascar	Mozambique
	Ghana	Congo DR	Mauritius	Namibia
	Guinea	Gabon	Seychelles	Swaziland
	Guinea Bissau		Tanzania	Zambia
	Mali		Uganda	Zimbabwe
	Mauritania			
	Niger			
	Nigeria			
	Senegal			
	Sierra Leone			
	Togo			
4	12	6	8	8

Note: The country groupings are based on the UN (2006) classification. The same classification is used by World Bank (2003), and the 2007 Economic Report on Africa published by the ECA and African Union.

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Table A2: Inclusion of tropics variable in the aid–growth model in Africa

Dependent variable: Per capita income growth in Africa	Model 1		Model 2		Model 3		Model 4	
	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value	Coef.	*t*-value
Net ODA	0.110	2.08**						
Net ODA squared	−0.001	−1.10						
Lagged ODA			0.124	2.31**			0.126	2.33**
Lagged ODA squared			−0.002	−1.43			−0.001	−1.32
Current grants					0.239	2.81*		
Current grants squared					−0.005	−1.78***		
Domestic investment ratio	0.074	2.69*	0.074	2.66*	0.071	2.64*		
Adult literacy rate	0.017	1.54	0.017	1.50	0.020	1.82***	0.019	1.74***
Civil liberty	−0.548	−3.26*	−0.535	−3.18*	−0.550	−3.29*	−0.565	−3.33*
Initial income per capita ($\times 10^{-2}$)	0.070	1.99**	0.073	2.08**	0.076	2.23**	0.077	2.17**
Govt. consumption ratio	−0.121	−3.79*	−0.120	−3.76*	−0.127	−3.94*	−0.119	−3.69*
Inflation	−0.020	−2.68*	−0.018	−2.47**	−0.020	−2.80*	−0.020	−2.70*
Trade openness	0.002	0.29	0.002	0.28	0.002	0.38	0.003	0.44
Net direct foreign investment	0.246	3.27*	0.239	3.19*	0.250	3.35*	0.268	3.55*
Tropics	*−0.564*	*−1.06*	*−0.585*	*−1.10*	*−0.639*	*−1.20*	*−0.887*	*−1.67***
Lagged-investment							0.037	1.38
Constant	3.130	1.98**	3.017	1.92***	3.240	2.11**	4.017	2.57**
F-statistic		8.43		8.45		8.69		7.91
R-squared		0.334		0.295		0.343		0.32
Sample size		250		250		248		250

Note: *, ** and *** show significance at the 1%, 5% and 10% levels respectively. Each of the models includes time dummy variables.