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EXTERNAL DEBT AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICAN COUNTRIES: AN ECONOMETRIC STUDY

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I accept responsibility for the views and ideas expressed in this report.

Abstract

This econometric study takes a sumulation approach to investigate the impact of external debt on economic growth in sub-Saharan African countries using a small macroeconometric model estimated for 1970–1994. An important finding was the significance of debt overhang variables in the investment equation, suggesting that mounting external debt depresses investment through both a "disincentive" effect and a "crowding out" effect.

Policy simulation was undertaken to investigate the impact of alternative debt stock reduction scenarios (debt reduction packages of 5%, 10%, 20% and 50%), effective in 1986, on investment and economic growth in the subsequent years. It was found that debt stock reduction would have significantly increased investment and growth performance. A 20% debt stock reduction would, on average, have increased investment by 18% and increased GDP growth by 1% during the 1987–1994 period.

Thus, the results demonstrate that debt forgiveness could provide a much needed stimulus to investment recovery and economic growth in sub-Saharan Africa.

I. Introduction

The socioeconomic conditions in African countries deteriorated sharply during the 1980s, a decade that is widely regarded as Africa's "lost decade" of development opportunities. Available empirical evidence shows that in sub-Saharan Africa (SSA), per capita income (measured by gross national product per person) declined at an average annual rate of 2.2%). Per capita private consumption fell by 14.8%; export volume was stagnant while import volume plummeted at an average annual rate of 4.3%; and the terms of trade fell by 9.1% (see Table 1). Using data on gross domestic product (GDP) instead of gross national product (GNP) improves the picture marginally but the situation is still nothing short of catastrophic. An analysis of Tables 2 and 3 confirms that between 1981 and 1990 the average annual growth rate of real GDP in sub-Saharan Africa was 1.7%. Given the region's high population growth rate, however, the average annual growth rate of real GDP per capita between 1981 and 1990 was -0.9%. Among all the regions constituting developing countries, sub-Saharan Africa's performance was the poorest, with the exception of the Middle East and North African region.

Indeed, sub-Saharan Africa's negative growth rate (-0.9%) contrasts sharply with East Asia's impressive real per capita GDP growth rate of 6.3% and China's fantastic growth rate of 8.2% during the decade. Nor did the economic performance of sub-Saharan Africa improve in the early years of the 1990s. From Table 3, it is confirmed that between 1991and 1993, SSA's growth rate of real per capita GDP was negative, averaging -2.3% annually. In 1994, real per capita GDP remained negative at -0.7%. Only in 1995 did the growth rate become positive, reaching 1.1%. This, of course, still fell short of the 8.0% growth rate posted by East Asia and the 9.2% growth rate of real GDP per capita achieved by China.

The bottom line is that the 600 million people inhabiting the 50-odd countries in sub-Saharan Africa are among the poorest in the world. The World Bank classifies 74% of the countries of SSA as "low-income economies" while the United Nations Development Programme classifies 79% of them as "low human development" countries. Finally, out of the 41 countries in the world classified as heavily indebted poor countries by the World Bank and International Monetary Fund, 33 (or 80%) are in sub-Saharan Africa. (See Table 4.) Thus, the great majority of the countries in sub-Saharan Africa are not only poor (regardless of the standards of evaluation) but also report low or negative rates of growth of per capita income. The conclusion is therefore inescapable that the income gap between SSA countries and the rest of the world continues to widen.

A close examination of Table 3 shows that the relative position of SSA countries started to deteriorate significantly in the 1980s when sub-Saharan Africa found itself in

Table 1: Comparative economic indicators

Economic Indicators	Sub-Saharan Africa	Low income economies	High income economies
1. Growth of per capita GNP (%), 1980-89	-2.2	2.3	2.5
2. Change of per capita private consumption (%), 1980-90	-14.8	31.3	24
3. Gross domestic savings as % of GDP, 1990	16	28	22
4. Gross domestic investment as % of GDP, 1990	19	31	22
5. Growth of export volumes (annual %)	0.2	5.4	4.3
6. Growth of import volumes (annual %)	-4.3	2.8	5.3
7. Change in terms of trade (%), 1985-90	-9.1	-6.5	3.1
8. Gross international reserves in months of import coverage, 1990	2.3	3.4	3.1

Source: IMF, *World Economic Outlook* (various issues).

a quagmire of economic problems. The acute economic crisis of the last 15 years—which resulted in the extremely poor growth performance–is attributable to a host of factors, both internal and external. The internal factors are connected with domestic macroeconomic policy weaknesses that have led to inflation, unemployment, rising fiscal deficits and capital flight. The effects of domestic macroeconomic policy mistakes have been exacerbated by structural weaknesses in the economies, particularly a narrow and technologically backward production base and heavy dependence on the exportation of a narrow range of primary products. The external factors reflect an increasingly hostile international economic environment characterized by low and falling primary commodity prices, declining terms of trade, soaring global interest rates, rising protectionism in the industrialized countries, and dwindling capital flows into African countries that have resulted in mounting current account and balance-of-payments deficits, and an escalating external debt stock.

SSA's total external debt stock,[2] which was US$84.049 billion in 1980, had jumped to US$164.981 billion in 1988 and US$190.206 billion in 1990. By 1995, SSA's total external debt stock amounted to US$223.298 billion (World Bank data). Note that between 1980 and 1995, the debt stock increased by US$139.249 billion or at an average annual rate of 6.7%. Associated with the rising external debt stock has been a crushing debt service burden. From a level of US$6.374 billion in 1980, the total debt service on long-term debt rose to US$12.264 billion in 1990 and then dipped to US$8.784 billion in 1995 (due largely to reschedulings and some amount of debt forgiveness). The debt service ratio (measured by the ratio of actual debt service payments to exports of goods and services), which was a mere 5.4% in 1970, jumped to 21.3% in 1985 before falling to 14.7% in 1995. (See Table 5.)

One disturbing aspect of the macroeconomic management of sub-Saharan African economies in the 1980s was their failure to respond favourably to the ministrations of structural adjustment programmes (SAPs). Structural adjustment programmes were

Table 2: Growth of real GDP, 1966–95

	Annual averages					
	1966–73	1974–80	1981–90	1991–93	1994	1995
World total	5.1	3.4	3.2	1.2	2.9	2.8
Industrial countries	4.8	3.0	3.2	1.3	3.0	2.5
Developing countries*	6.9	5.0	3.3	4.6	4.6	4.9
East Asia	7.9	6.8	7.6	8.7	9.3	9.2
China	8.5	6.3	9.9	12.3	12.2	10.2
South Asia	3.7	4.0	5.7	3.2	4.7	5.5
Sub-Saharan Africa	4.7	3.4	1.7	0.6	2.2	3.8
Latin America & Car	6.4	4.8	1.7	3.2	3.9	0.9
Middle East & North	8.5	4.7	0.2	3.4	0.3	2.5

Source: ILO. *World Employment 1996.*
* Excluding Eastern Europe and former Soviet Union.

Table 3: Growth of real per capita GDP, 1981–95

	Annual averages			
	1981–90	1991–93	1994	1995
World total	1.2	-0.4	1.2	1.4
Developed countries	2.2	0.7	2.4	1.8
Developing countries	1.2	2.6	2.7	3.2
East Asia	6.3	7.2	7.6	8.0
China	8.2	11.0	10.5	9.2
South Asia	3.1	1.1	2.7	3.6
Sub-Saharan Africa	-0.9	-2.3	-0.7	1.1
Latin America & Caribbean	-0.5	1.3	2.0	-0.7
Middle East & North	-3.0	0.7	-2.2	0.1

Source: ILO, *World Employment 1996.*

recommended by the World Bank and IMF as an antidote to the economic crisis brought on by the debt crisis, among other factors. Structral adjustment was presented as a programme that would restore stabilization in the short term and facilitate sustainable growth in the medium to long term. Accordingly, a majority of SSA countries adopted SAPs in the 1980s. Unfortunately, in virtually all sub-Saharan African countries, SA has meant a period of austerity, declining income and living standards, mounting unemployment, and increasing poverty (ILO, 1996). Devaluation, which featured in virtually all SAPs, led to an increase in total debt and debt service payments denominated in domestic currency. The deflation required by the SAPs led to a fall in domestic product and a reduction in national income available for consumption, provision of public services and investment. A reduction in investment meant a fall in economic growth. Meanwhile, foreign investment, which was expected to increase on the adoption of SAPs failed to

Table 4: Poverty in SSA: Alternative classification schemes

Country	Low income (World Bank)	Low human development (UNDP)	Heavily indebted poor country (WB/IMF)
1. Angola		X	
2. Benin	X	X	X
3. Botswana			
4. Burkina Faso	X	X	
5. Burundi	X	X	X
6. Cameroon		X	X
7. Cape Verde			
8. Central African Republic	X	X	X
9. Chad	X	X	X
10. Comoros	X	X	X
11. Congo	X		X
12. Côte d'Ivoire	X	X	X
13. Djibouti	X	X	
14. Equatorial Guinea	X	X	X
15. Eritrea	X	n.a.	
16. Ethiopia	X	X	X
17. Gabon			
18. Gambia	X	X	X
19. Ghana	X	X	X
20. Guinea	X	X	X
21. Guinea-Bissau	X	X	X
22. Kenya	X	X	X
23. Lesotho	X	X	
24. Liberia	X	X	X
25. Madagascar	X	X	X
26. Malawi	X	X	X
27. Mali	X	X	X
28. Mauritania	X	X	X
29. Mauritius			
30. Mayotte		n.a.	
31. Mozambique	X	X	X
32. Namibia			
33. Niger	X	X	X
34. Nigeria	X	X	X
35. Reunion		n.a.	
36. Rwanda	X	X	X
37. São Tomé and Principe	X	X	X
38. Senegal		X	
39. Seychelles			
40. Sierra Leone	X	X	X
41. Somalia	X	X	X
42. South Africa			
43. Sudan	X	X	X
44. Swaziland			
45. Tanzania	X	X	X
46. Togo	X	X	X
47. Uganda	X	X	X
48. Zaire	X	X	X
49. Zambia	X	X	X
50. Zimbabwe	X		

Source: Griffin, (1996); World Bank (1996).

materialize, due to a lethal combination of political instability, poor macroeconomic policies, weak economic performance and the debt overhang syndrome. In addition, heavy debt service payments have been shown to also "crowd out" foreign investment. Indeed, aid and other foreign investment were routinely diverted into debt service payments mainly to pay the multilateral institutions (World Bank and IMF) as debt owed to the multilateral institutions cannot be rescheduled or written off (Kapijimpanga, 1996). Besides, debt rescheduling by bilateral donors does not constitute true debt relief; it leads to further build-up of debt stock as rescheduled debt often attracts higher interest rates while the interest accumulated is capitalised. "So, rescheduling has not solved the African debt problem but rather intensified it" (Kapijimpanga, 1996:14).

With the rapid build-up of external debt and the poor economic performance of the domestic economies, sub-Saharan Africa's debt crisis has deepened and the debt burden has become even more crushing. Indeed, relative to exports and economic activity (measured by the GNP),[4] SSA's debt is the highest of any region in the world (Klein, 1987; Iyoha and Iyare, 1994; ILO, 1995). According to the ILO (1995: 3),

> Africa's external debt is the highest in the world as a proportion of GDP; some countries in the region are spending more than half of their export earnings to service foreign debts. The debts of many African countries are so large in relation to their foreign exchange earnings potential that it would be impossible to pay them off even if growth resumed and was sustained at unrealistically high levels. Largely as a consequence of debt servicing, flow of capital *from* Africa is significantly more than flow of new capital *to* the region.

As a result of deterioration in the terms and conditions of SSA's debt in the 1980s, sub-Saharan Africa's debt export ratio (measured as the ratio of debt outstanding and disbursed to exports of goods and services) doubled between 1980 and 1985, when it rose from 78.6% to 173.3%, and almost doubled again between 1985 and 1991 when it further increased to 329.4%. (See Table 5 and Figure A2.) The ratio of actual to scheduled debt service payments of SSA countries deteriorated during the 1980s–falling from 66% in 1983 to 47% in 1989. Between 1989 and 1995, the average ratio of actual debt service due was 58.9%. (See Table 6 and Figure A4.) Further evidence of debt distress is found in the fact that in 1986, 27 of the 44 countries in Africa had payments arrears. Also, between 1986 and 1987, 23 SSA countries renegotiated their official bilateral debt through the Paris Club. In the mid 1980s, 30 SSA countries were officially classified as "debt distressed" (Klein, 1987). In the 1990s, 33 SSA countries have been classified as heavily indebted poor countries (World Bank, 1996). Finally, the huge burden of SSA debt constitutes a serious obstacle to employment creation and growth as "investment resources for productive pursuits are consistently used to meet external debt service obligations" (ILO, 1995: 3).

These two issues–debt and lack of growth–are clearly interrelated. Indeed, all indications are that the excessive stock of external debt is retarding the growth and hampering the socio–economic development of SSA countries. The large debt stock and crushing debt service burden have now introduced a new "vicious circle" to the analysis

Table 5: Sub-Saharan Africa: Debt indicators, 1970–95

Year	EDT/XGS (%)	DOD/XGS (%)	EDT/GNP (%)	DOD/GNP (%)	TDS/XGS (%)	RES/MGS (months)	RES (US$m)
1970	91.0	63.2	20.5	14.3	5.4	2.5	2,028
1971	105.8	73.5	24.2	16.8	6.2	2.2	1,899
1972	113.0	76.2	20.0	13.5	7.0	2.3	2,139
1973	106.9	70.0	22.6	14.8	8.8	2.5	3,027
1974	77.6	50.4	23.8	15.5	4.5	4.7	8,167
1975	93.7	61.6	24.3	16.0	5.8	3.4	7,908
1976	98.1	64.7	24.5	16.2	5.8	3.1	7,696
1977	98.6	64.3	25.6	16.7	4.8	2.4	7,475
1978	138.4	92.4	28.9	19.3	7.1	1.6	5,407
1979	129.8	85.2	30.7	20.2	7.1	3.0	10,215
1980	119.7	78.6	30.6	20.1	7.8	3.4	22,249
1981	143.4	108.4	28.7	21.7	10.3	1.7	7,870
1982	199.7	152.9	32.0	24.5	15.0	1.4	5,335
1983	259.2	197.2	42.2	32.1	20.3	1.5	4,713
1984	203.3	155.7	47.9	36.7	18.3	1.5	5,127
1985	227.9	173.3	55.1	41.9	21.3	1.7	6,519
1986	223.7	183.2	56.2	46.0	22.0	1.8	7,075
1987	244.1	199.7	64.3	52.6	18.4	1.9	8,090
1988	242.9	198.9	67.2	55.2	20.7	1.5	10,378
1989	237.7	195.4	69.1	56.8	17.9	1.7	12,129
1990	225.7	183.9	70.8	57.7	17.8	2.0	15,597
1991	239.4	195.8	70.6	57.7	16.4	2.3	18,054
1992	235.6	188.7	69.8	55.9	15.7	1.8	14,280
1993	251.9	195.2	73.2	56.7	14.9	1.9	15,310
1994	265.7	206.4	78.7	61.1	14.0	2.1	20,107
1995	269.8	210.5	74.1	57.8	14.7	n.a.	n.a.

Legend:
EDT = total external debt stock
XGS = exports of goods and services
DOD = total debt outstanding and disbursed
GNP = gross national product
TDS = total debt service
RES = international reserves
MGS = imports of goods and services

Source: Computed from World Bank, *World Debt Tables* (various issues).

Table 6: Indicators of debt distress, 1989–95

Year	Actual Debt service (TDS paid)	Scheduled Debt service (TDS due)	Ratio of actual to scheduled DS
1989	12,880	20,551	62.7
1990	14,999	25,618	58.5
1991	13,376	20,999	63.7
1992	12,843	21,191	60.6
1993	11,710	21,225	55.2
1994	11,212	21,776	51.5
1995	12,207	20,154	60.6
Average	12,746.7	21,644.9	58.9

Source: World Bank (1996).

of the development problem of SSA. In many sub-Saharan African countries, debt servicing in the face of inadequate foreign exchange earnings leads to severe import strangulation. Import strangulation holds back export growth, thus perpetuating import shortages. The debt overhang and other uncertainties created by the debt situation further depress investment. Falling investment combined with shortages of essential imports results in declining real output. Declining output and escalating current account deficits lead to increasing debt and rising debt service obligations.

It seems incontestable that given the structural weakness of most SSA economies, their low income, low savings and low investment, the current high levels of debt and debt servicing would militate against rapid economic growth and development. Indeed, analysts and international policy makers appear to have reached a consensus to the effect that a satisfactory recovery of investment and output growth in indebted SSA countries will remain difficult, perhaps unattainable, as long as they are saddled with a burden of debt servicing that requires a sizeable net transfer of resources abroad. Stated simply, there is no way in which many SSA countries can service their debt and still have adequate resources left for development finance. Thus, many now believe that a necessary condition for economic growth and development in SSA is debt relief. This must go beyond debt reschedulings and even beyond the "Naples terms" (the latest initiative by executive countries). It could be a policy package that combines debt reduction (debt or debt service write-down) with a significant amount of debt forgiveness (write-off of official debt and perhaps write-down of commercial debt) for the low-income SSA countries.

This econometric study uses a simulation approach to investigate the impact of external debt on economic growth in sub-Saharan African countries. In particular, it undertakes policy simulations (using alternative debt stock reduction scenarios) to analyse the effect of debt on investment and output in SSA countries between 1987 and 1994.

In addition to this introduction, the study contains four other sections. The next section offers a discussion of the scope, nature and severity of the debt crisis in sub-Saharan Africa. Section III presents a specification, estimation and discussion of an econometric

model of external debt and economic growth for SSA countries. The basic model consists of two stochastic equations explaining output and investment, and two identities (a capital accumulation identity and a debt accumulation identity). The simultaneous equation model is estimated by the two-stage least squares technique. The model is dynamically simulated in Section IV which includes a discussion of the results of historical simulations carried out for the 1971–1994 period and policy simulations performed over the 1987–1994 period. The policy simulations involved assessing the impact of alternative debt stock reduction scenarios (effective in 1986) on investment and output in the 1990s. The last section contains policy recommendations, a summary and some concluding remarks.

II. External debt of SSA countries: Scope, nature and severity

In order to fully understand the debt crisis of sub-Saharan African countries, this section first presents the background of the debt crises, and then analyses the scope, nature and severity of SSA's external debt.

Genesis of the debt crisis

The external debt crisis of sub-saharan Africa is best understood when considered as an integral part of the global debt crisis that emerged in 1982. The global debt crisis arose as a result of:

- over-borrowing by the developing countries and reckless lending by international commercial banks in the 1970s
- the collapse of world commodity prices (including especially petroleum) in the early 1980s
- the sharp increase in international interest (lending) rates in 1982

The phenomenal increase in foreign borrowing that preceded the debt crisis was triggered by the oil price shocks of 1973 and 1979, which resulted in acute current account deficits in most non-oil producing less developed countries. These countries resorted to foreign borrowing to tide them over the problems raised by the internationally generated shocks to their balance of payments. At the same time, during the period following the oil price hike of November 1973, the international commercial banks were awash with "petro dollars" that they were anxious to recycle. Thus the needs of the cash-strapped developing countries and the excessively liquid international financial institutions seemed to complement each other and loans were liberally, if not recklessly, approved. Things appeared to go on smoothly for some years as the debts of these countries were rolled over as they fell due. However, the era of easy availability of credit came to a sudden end with the global financial crisis of 1982. This financial crisis was precipitated by the collapse of oil prices and the sharp increase in interest rates that led to the Mexican debt default. The immediate effect of the financial crisis was that developing countries debts could no longer be rolled over--debtor countries could only service their debts by increasing exports or reducing imports. Many debtor countries in the developing world were ill-prepared for the required belt tightening. Nor were world trade conditions conducive to any significant increase in these nations' export earnings. The crisis was further aggravated

by the actions of the international banks who belatedly scrambled to cover dangerously exposed positions. This was the genesis of the global debt crisis, which saw a real fear of the falling "domino effect" resulting in massive defaults by the highly indebted countries of Latin America. Such an eventuality would certainly have shaken the international financial system to its very foundations and possibly led to a global depression.

The external debt of sub-saharan African countries witnessed a rapid build-up during the period immediately following the global debt crisis with external debt obligations skyrocketing from US$84 billion in 1980 to US$223.3 billion in 1995. (See Table 7 for details.) Thus, SSA's external debt stock increased by 265.8% in 15 years, i.e., it grew at an average rate of 6.7% per annum.

Table 7: Total external debt, 1970–95 (US$ million)

Year	Total external debt	Growth in external debt (%)
1970	8,296	—
1971	9,772	17.79
1972	11,235	14.97
1973	15,168	35.01
1974	19,340	27.51
1975	22,721	17.48
1976	26,996	18.82
1977	33,705	24.85
1978	43,655	29.52
1979	55,485	27.10
1980	84,049	51.48
1981	75,668	-9.97
1982	81,946	8.30
1983	88,233	7.67
1984	83,866	0.72
1985	96,396	8.47
1986	127,145	31.90
1987	162,629	27.91
1988	164,981	1.45
1989	171,236	3.79
1990	190,260	11.11
1991	194,779	2.38
1992	192,781	-1.03
1993	197,886	2.65
1994	212,416	7.34
1995	223,298	5.12

Source: World Bank (1996).

The sharp external debt build-up in the post 1989 period is attributable to several factors, including:

- continued decline in the terms of trade
- uncontrolled fluctions in export earnings
- higher interest rates
- re-alignment of exchange rates
- rescheduling and refinancing of SSA's external debt, which only served to increase the debt stock

Thus, it would be erroneous to attribute the current debt crisis in sub-Saharan Africa to purely wasteful and unproductive expenditures by these countries. The fact is that a significant proportion of the increase in SSA's external debt since 1982 can be attributed to exogenous factors largely beyond the control of the countries. Indeed, the doubling of SSA's external debt stock in the 1980s took place against the background when the countries borrowed virtually no additional money for productive investment and the meagre borrowings were directed mainly to debt service and occasionally to the maintenance of minimal import requirements.[5] Many analysts have pointed out that the rapd build-up in external debt in the 1980s occurred notwithstanding the sharp cutback made in their expenditures and the tenacious implementation of futile economically ad socially debilitating IMF/World Bank inspired structural adjustment programmes (SAPs). Despite the adoption of SAPS by most SSA countries, there was a sharp fall in the real net resource flows especially from the IMF and the IBRD (World Bank) during the 1980s. (See Table 8.) Besides, the implementation of SAPs has led to the sacrifice of the medium-to long-term objectives of growth in SSA countries (Iyoha, 1991b; UNECA, 1989).

Several factors have brought the issue of external debt to the forefront of the problems facing the SSA countries. They include:

a) the rapid rise of the stock of external debt, especially since 1982
b) the deterioration in the terms and conditions of debt caused partly by changes in the composition of debt but mainly by the rise in interest rates
c) the rapid increase in debt servicing obligations arising from (a) and (b)
d) the emergence of debt servicing problems including risk of default and loss of credit worthiness
e) the stubborn problem of debt overhang
f) the adverse effects of (a)–(d) on the growth prospects of SSA countries

It is now generally agreed that the combined effects of (a)–(e) and a sharp fall in the real net resource flows since the early 1980s have had a debilitating impact on the economies of SSA countries. Most of the economies have shrunk during this period and there has been a significant decline in the standard of living. Real per capita incomes in SSA coutries were on the average lower at the end of the 1980s than at the beginning. See Figure 1 for graph of GNP per capita between 1970s and 1994 and Figure 2 for a graphical representation of SSA's real GDP during the period under study. In addition, consequent to the collapse of investment, a large part of SSA's infrastructure has disappeared and gains made in education, health and nutrition during the previous decades have been dissipated.

Table 8: The IMF, the World Bank and external transfers to Africa, south of the Sahara, 1980-89 (US$ millions)

	1980	1983	1984	1985	1986	1987	1988	1989
IMF								
Gross disbursements*	1217	1618	952	738	735	678	1033	865
Repayments & interest**	487	739	993	1172	1689	1541	1495	1593
Net transfer	730	879	-41	-434	-954	-863	-462	-728
IDA								
Disbursements	424	637	778	881	1400	1681	1697	1700
Repayments & interest	21	44	56	79	94	111	128	126
Net transfer	403	593	722	802	1306	1570	1569	1574
IBRD								
Disbursements	400	708	832	647	898	998	581	835
Repayments & interest	328	438	527	616	865	1073	1306	1226
Net transfer	72	270	305	31	33	-75	-725	-391
IMF/IDA/IBRD								
Total Net transfers	1205	1742	986	399	385	632	382	455
Other net transfers								
Multilateral+	707	664	442	487	650	709	672	607
Bilateral+	1657	2295	1925	472	1210	1194	630	945
Private***	2818	270	-1667	-2648	-1132	-213	-434	-428
Total debt-related Net Transfers	5657	4092	1727	-856	2067	3185	1712	2307
Total net transfers, including grants & direct foreign investment	5843	6606	4460	3213	6163	7626	7973	9420

Source: Derived from World Bank, *World Debt Tables, 1990-91*, pp. 130-133.
* Purchases ** Repurchases and charges
*** Publicly guaranteed and unguaranteed, excluding direct foreign investment
\+ Excluding grants

Scope of SSA's external debt

Since 1970, there has been a pronounced upward trend in the external debt stock of SSA. (See Table 7 for data on level and growth of SSA's external debt from 1970 to 1995.) From a level of US$8.3 billion in 1970, SSA's total external debt stocks increased rapidly to US$22.7 billion in 1975. During this period, external debt grew at an average annual rate of 22.55%. The highest annual growth rate of 35% was recorded in 1973. The growth in external debt was even more rapid during the next five years. Between 1976 and 1980, the average annual rate of growth of total external debt amounted to 30.4%. The highest annual growth rate during this period was 51.5%, which was reported in 1980. With total external debt at the alarming level of US$84 billion in 1980, the rate of growth of the debt moderated. Thus, between 1981 and 1985, the average annual growth rate of external debt was a mere 3%. The next two years witnessed a renewed upsurge in the growth of

external debt with a growth rate of 32% in 1986 and 30% in 1987. In 1987, total external debt stock stood at the alarming level of US$162.6 billion. Since 1988, the annual growth rate of external debt has been 7% or less, except in 1990 when it jumped to 11.1%. Despite the moderate growth rate in the 1990s, however SSA's total external debt stood at the astronomical level of over US$223 billion in 1995.

During the decade of the 1980s, despite a reduction in the tempo of its growth, the external debt of SSA increased faster than that of all developing countries (Iyoha and Iyare, 1994).

Structure and composition of SSA's debt

Compared to Latin America, Africa depends more on official borrowing and less on commercial borrowing from the international banks. According to Klein (1987:12)

> Official debt dominates the external obligations of most African countries. Only five sub-Saharan African countries–Congo, Côte d'Ivoire, Gabon, Nigeria and Zimbabwe–owe more to commercial banks than to official creditors.

However, while available empirical evidence shows that there was a shift in the source of Africa's external finance during the 1980s, that of SSA has hardly changed. Official bilateral and multilateral loans still account for the bulk of SSA's external debt. According to the World Bank (1996a:170),

> Seventy percent of outstanding debt at the end of 1995 was owed to official creditors—90 percent if Nigeria and South Africa are excluded. The region is a major recipient of inflows, most on concessional terms, from multilateral institutions. Thirty percent of long-term debt outstanding at the end of 1995 is owed to the World Bank Group, the International Monetary Fund, and the African Development Bank and Fund.

Available World Bank data also show that sub-Saharan Africa, as a region, receives the largest share of official development assistance (ODA). Indeed in 1994, ODA constituted 12.4% of SSA's GNP. This percentage is far above that of other low- and middle-income regions. For the Middle East and North Africa, official development assistance was only 1.6% of GNP; for South Asia, ODA comprised only 1.4% of GNP; for East Asia and Pacific, ODA was a mere 0.8% of GNP; and ODA was only 0.3% of GNP for Latin America and Caribbean and for Europe and Central Asia (World Bank, 1996b:193). In quantitative terms, ODA flows to SSA reached US$16.9 billion in 1995 (up from US$15.4 billion in 1994) (World Bank, 1996a:170). Nevertheless, since the outbreak of the debt crisis, there has been a tendency for the middle-income countries in sub-Saharan Africa to depend slightly more on commercial (private) external finance than was previously the case. Table 9 gives data on the structure and composition of SSA's external debt–by maturity and type of creditor, while Figures A1 and A3 provide graphical illustrations. In the second half of the 1980s, loans from the multilateral agencies,

particularly the IMF, began to dry up. By 1989, net transfers from both the IMF and World Bank (IBRD) had become negative. This means that sub-Saharan African countries were, on a net basis, transferring resources to the Bretton Woods institution. (See Table 8 for the relevant data.) Since many sub-Saharan African countries are low income countries, IDA disbursements have remained relatively buoyant. IDA disbursements actually jumped from US$424 million in 1980 to US$1.700 million in 1989.

The share of long-term debt in the total external debt of SSA rose from 77.4% in 1980 to a peak of 85% in 1987; thereafter it declined slightly but steadily, reaching 83.8% in 1991. The share of short-term credit in total external debt fell from 17.2% in 1980 to 12.5% in 1991, while the share of IMF finance in SSA's total external debt declined from 5.4% in 1980 to 3.7% in 1991. See Figure A1 for a diagrammatic illustration.

The severity of the debt problem

The severity of SSA's problems is best appreciated by undertaking a comprehensive analysis of debt indicators. Debt indicators or debt ratios are measures of debt burden. They can be used as analytical tools or for policy purposes; they may also be used for descriptive or predictive purposes (Nowzad and Williams, 1981). As a descriptive measure, external debt indicators provide in an understandable and functional way a history of the terms, structure and scale of past borrowing. They may therefore be used in intertemporal analysis to examine the level and rate of change in debt capacity and debt service capability.

In the analysis that follows, primary emphasis is placed on an examination of the two most important debt indicators, the debt ratio and the debt service ratio. Other commonly used debt indicators include:

- the ratio of amortization payments to disbursements
- the ratio of interest payments to export earnings
- the ratio of net resource transfer to GDP (or the associated concept, the ratio of net flow to GNP)
- the net external debt ratio
- the ratio of international reserves to total external debt
- the ratio of international reserves to debt service payments
- the ratio of actual debt service payments to scheduled debt-service payments

Table 5 presents data concerning the key debt indicators for sub-Saharan Africa during the 1970-1995 period and Figure A2 provides a graphical illustration. The debt ratio is conventionally measured by the ratio of total external debt to GDP or total external debt to export earnings of goods and services.[6] The debt service ratio is conventionally measured by the ratio of debt-service payments to exports of goods and services. An examination of Table 5 shows that the ratio of external debt (EDT) to GNP increased by 50%, from 20.5% to 30.7%, between 1970 and 1979. In the 1980s, Africa's "lost decade" of development opportunities, GNP declined. With external debt growing faster than GNP, the ratio of external debt to GNP increased sharply. SSA's debt/income ratio doubled in five years, rising from 28.7% in 1981 to 56.2% in 1986. Though moderating somewhat,

the debt/income ratio continued to rise in the late 1980s, reaching 70.8% in 1990. The 1990s witnessed a continued increase in the debt/income ratio, which peaked at 78.7% in 1994 before dipping to 74.1% in 1995.

The story told by the ratio of debt (measured as total debt outstanding and disbursed) to GNP is similar, though slightly more serious. While the EDT/GNP ratio increased by 361.5% between 1970 and 1995, the DOD/GNP ratio increased by 404.2% during the same period. In SSA countries, debt grew more rapidly than exports during the period under study. Thus, the debt/export ratio rose sharply during the period. The ratio of EDT to exports increased by 296.5% during the period, rising from 91% in 1970 to 269.8% in 1995. The ratio of DOD to exports rose by 333%, from 63.2% in 1970 to 210.5% in 1995. The debt service ratio, measured as the ratio of total debt service payments to exports of goods and services, rose from 5.4% in 1970 to 22.0% in 1986 before falling to 14.7% in 1995. Specifically, the debt service ratio doubled in the 1970s, rising from 5.4% in 1970 to 10.3% in 1981. It doubled again between 1981 and 1986, rising from 10.3% in 1981 to 22% in 1986. It remained rather steady between 1986 and 1988, and has fallen ever since (as a result of debt restructuring, debt reschedulings and debt/interest forgiveness), reaching a level of 14.7% in 1995.

This decline in debt service payment hides more than it reveals. For many countries in SSA that are poor, highly indebted and deficient in export earnings, there is often a wide divergence between actual and scheduled debt service payments. Thus, there is generally a significant difference between the ratio of actual debt service to export earnings and the ratio of scheduled debt service to export earnings. (See Table 6.) It is the scheduled debt to export earnings ratio that is the more accurate measure of pressure of debt service on export earnings and on the economy. According to Kapijimpanga (1996:12):

> The external debt burden reflects itself in the inability of a country to meet its debt service obligations (scheduled debt service) in relation to its foreign currency earnings. In Eastern and Southern Africa, the respective figures for this ratio during 1994 were Ethiopia 53%; Kenya 51%; Madagascar 53%; Mozambique 91%; Tanzania 64%; Uganda 50%; Zambia 51% and Zimbabwe 26%. It is evident from these figures that debt is a serious problem for many of these countries. Mozambique was supposed to pay 91% of its foreign exchange earnings to service its external debt. In reality, simply because of lack of resources, Mozambique only paid 23% during the year.

Thus, for SSA countries at least, the actual debt service to export ratio grossly underestimates the true nature of the debt burden and the debt crisis. The ratio of international reserves to total external debt, which reached 27.3% in 1980, collapsed during the period–falling to a low of 6.3% in 1988 but recovering slightly to 8.2% in 1994. The reserve/import ratio also deteriorated, falling from 3 months in 1980 to a low of 1.5 months in 1988 and recovering to 2.1 months in 1994.

In sum, it seems clear that without any exception there was a deterioration in all the debt indicators during the period under study. The debt burden increased, while the debt service capacity deteriorated. Countries of sub-Saharan Africa are heterogeneous in size,

Table 9: The composition of Sub-Saharan Africa's external debt, 1980–95 (US$ billion)

Year	EDT	Long - term debt				Use of IMF Cr		Short-term debt	
		P & PG	PNG	Total	% of total	Amount	% of total	Amount	% of total
1980	84.0	53.8	4.6	58.4	69.5	3.0	3.6	22.6	26.9
1988	165.0	130.7	4.8	135.5	82.1	7.0	4.3	22.5	13.6
1989	171.2	135.7	5.0	140.7	82.2	6.4	3.7	24.1	14.1
1990	190.3	149.8	5.3	155.1	81.5	6.6	3.5	28.6	15.0
1991	194.8	154.0	5.4	159.4	81.8	6.6	3.4	28.8	14.8
1992	192.8	149.3	5.1	154.4	80.1	6.4	3.3	32.0	16.6
1993	197.9	148.3	5.1	153.4	77.5	7.0	3.5	37.5	19.0
1994	212.4	159.5	5.6	165.1	77.7	7.9	3.7	39.4	18.6
1995	223.3	167.5	6.8	174.3	78.1	7.2	3.2	41.8	18.7

Source: World Bank, *World Debt Tables*, various issues.

Table 10: Comparative debt indicators, 1990–95

Country group	Share of 1995 total debt	Debt to export ratio (%)					
		1990	1991	1992	1993	1994	1995[a]
All developing countries	100	161.6	175.3	166.7	168.6	162.8	150.0
By region							
Sub-Saharan Africa	11	225.7	239.4	235.6	251.9	265.7	269.8
East Asia & the Pacific	23	106.6	106.0	101.6	101.3	93.3	83.3
South Asia	8	315.9	311.7	319.4	287.9	271.6	245.7
Europe & Central Asia	18	120.2	157.8	143.6	151.5	153.7	144.6
Latin America & Caribbean	29	277.4	282.0	276.2	274.6	258.6	254.2
Middle East & North Africa	11	109.8	129.2	126.1	134.5	148.5	136.9
Highly indebted poor countries	11	489.2	529.9	531.8	561.3	526.3	565.4

Source: World Bank (1996).

Based on (nominal) debt stock at year-end.
a. Preliminary

income, total external debt owed, debt service obligations and hence debt burden. The impact of debt on the different economies has thus varied. While some countries have managed to stay afloat, many are on the brink of collapse.

Consider the following facts: in 1986, "27 out of the 44 countries" in SSA had payments arrears (Drouin, 1989: 3); between 1982 and 1987, "27 sub-Saharan African countries have renegotiated their official bilateral debt through the Paris Club" (Klein, 1987: 10). Note that while the aggregate SSA debt/GNP ratio was 97.1% in 1988, that of Madagascar reached 192%, that of People's Republic of Congo was 205% and Mozambique's was a crushing 375% (Iyoha, 1996: 11). Klein (1987) has further pointed out that some low-income African countries have been unable to repay debt rescheduled with a standard ten-year maturity, even with a five-year grace period. Increasingly, many SSA countries are being compelled to reschedule already rescheduled debt, and being forced to borrow to pay interest on past borrowing, thus escalating total debt and falling deeper into the debt trap.

The severity of the debt crisis in SSA may be better appreciated when it is realized that since 1982, external debt has been escalating at a time of massive decline in export revenues and dwindling capital inflows. According to Drouin (1989: 3) "over the last decade, the foreign debt burden of the [SSA] region grew worse than that of any other category of country facing debt servicing problems". According to Gonçalves (1996: 5), "The devastating impact of debt on the fragile African economies can easily be illustrated by revelations that Uganda, for example, spends only US$3 per person on health compared to US$17 per person on debt payments. From 1990 to 1993, Zambia spent 35 times more on debt payments than it did on primary school education". Indeed, relative to exports and economic activity, SSA's debt is among the highest of any region in the world (Iyoha and Iyare, 1994). Table 10 presents data on debt indicators for developing countries by region. It is easily verified that in the early 1990s, SSA's debt to export ratio was higher than that of any region except Latin America and the Caribbean. However, by 1995, SSA's debt to export ratio of 269.8% was the highest of any region. Notice also that in 1995, the debt to export ratio of the highly indebted poor countries, 80% of which are in sub-Saharan Africa, was an astronomical 565.4%.

The fiscal dimension of the debt burden also needs to be highlighted. Given that the composition of debt is heavily tilted to the public domain, responsibility for debt service also falls heavily on the public sector. The heavy debt service payments have inevitably put great pressure on budgets, leading to rising fiscal deficits in the highly indebted countries. Several problems arise. The first is that taxes need to be increased in order to raise the resources (in domestic currency) to service the debt. One of the consequences of the anticipated tax burden is to depress investment–the debt overhang effect. Second, it is necessary to transform the domestic resources to foreign exchange in which debt service must be paid. The desperate demand for foreign exchange to service debt often results in aid resources being routinely diverted to finance debt service payments. Third, the stiff demand of high debt service payments on the budget results in forced reductions in public investment and also reduced spending on education and health. The "diversion" of resources from public investment to debt service payments is related to the "crowding out" hypothesis. Thus, pressures of debt service payments have relevance for the fiscal

sustainability of debt in addition to the sustainability of high investment as demonstrated in the debt overhang and "crowding out" hypotheses. Certainly, the brutal pressure of debt service payments on the budget explains not only the escalating budget deficits but also the increasingly large discrepancy between actual and scheduled debt service payments in many SSA countries. Thus growth is likely to be retarded because of the depressing effect on investment of heavy debt service payments and the reduction of growth-supporting government expenditures.

As matters now stand, sub-Saharan African countries are constrained to use approximately 20% of their export earnings for debt servicing. Since the foreign exchange earnings of many of these countries are inadequate to begin with, it is apparent that reducing the already insufficient amount by 20% would leave grossly inadequate resources for financing development.[7] This is why a UNECA (1991: 10) study has concluded that:

> It is increasingly clear that very little progress, if any, can be made in Africa without the resolution of the debt crisis; and that there is no way in which Africa can service its existing debt and still have resources left for development financing.

There is a growing consensus among analysts, experts and researchers that there is need to go beyond traditional debt-relief mechanisms, which include IMF and World Bank loans and Paris Club[8] reschedulings. Consequently, in September 1999, the IMF and Word Bank jointly introduced the IPC initiative, a program designed to reduce the debt burden of eligible HIPCs (highly indebted poor countries). However, it seems clear that for highly indebted low-income countries in SSA, even the full use of traditional debt-relief mechanisms and the HIPC initiative would continue to prove insufficient in helping them achieve debt sustainability. As a result, many now believe that it is necessary to go beyond the traditional debt-relief mechanisms if many SSA countries are to achieve sustainable debt levels within reasonable time horizons. In particular, because of the inadequate relief offered by debt reschedulings, some analysts now consider debt forgiveness, i.e., debt cancellation, as the most appropriate way of reducing the debt burden of heavily indebted low-income countries. According to Ogbe (1992: 29):

> Debt forgiveness or cancellation is, no doubt, the most complete and effective strategy of debt relief. The principal debt is not only extinguished but also the steady accumulation of debt that comes from repeated debt rescheduling and the resulting capitalization of interest and arrears are eradicated. Moreover, the sizeable administrative and financial burdens associated with periodic debt rescheduling are also eliminated.

III. A model of external debt and growth in SSA

This section presents a small macro model that permits simulation of the effect of external debt on economic growth in sub-Saharan African countries. The basic macroeconometric simulation model consists of three equations, of which 2 are stochastic and one is an identity. The two stochastic equations relate to the production function (output equation) and an investment demand equation incorporating a debt overhang variable in addition to a variable to capture the "crowding out" effect of debt service payments. The third equation is debt accumulation identity.

The output equation

The inspiration for the output equation used in this study is neoclassical, tracing its roots to Solow (1957) who hypothesized that output depended on capital and labour inputs and on disembodied technical change. It also owes much to the modifications introduced by development economists, particularly Chenery and his associates (e.g., Chenery and Strout, 1966), which emphasized the role of investment and the investment-income ratio. This combination is now becoming standard in the development literature and variations of the model have been used by Oseghale and Amenikienan (1987), Ram Rati (1985), Mjema (1996), Iyoha (1997a, 1997b), Khan and Kumar (1993). In this study, it is hypothesized that output depends on labour and investment per capita (used as a proxy for capital stock). Thus, the output equation to be estimated econometrically using time-series data is

$$\ln GDP = a_0 + a_1 \ln L + a_2 \ln PCI + e_t \qquad (1)$$

where GDP stands for gross domestic product and L stands for labour force. PCI is per capita gross domestic investment, ln stands for natural logarithms, e_t is the random error term assumed to be Gaussian white noise, $a_1>0$ is the elasticity of output with respect to labour and $a_2>0$ is the elasticity of output with respect to investment per head.

Equation 1 was estimated using the ordinary least squares regression method, the MICROFIT (MFIT 386) econometric software for PCs and data for 1970-1994. From preliminary ordinary least squares regression calculations, it was found that the one-period lagged value of PCI gave better and more consistent results than its contemporaneous value. It was therefore decided to use PCI_{t-1} in place of PCI_t. The estimated output equation obtained was:

$$\ln GDP = 6.32 + 1.04 \ln L + 0.13 \ln PCI_{t-1} \quad (2)$$
$$(16.6)\ (19.5)\qquad (4.2)$$

$R^2 = 0.964 \qquad \bar{R}^2 = 0.96 \qquad F(2, 21) = 279$

see = 0.03
Mean of Dependent Variable = 12.266
DW-statistic = 0.58

where t-values are reported in parentheses below the coefficients. Given the value of the R^2, it can be concluded that the two independent variables (labour and per capita investment) together explain over 96% of the systematic variations in output during the period being studied. The F value of 279 is highly significant, passing the significance test at the 1% level. Thus, the hypothesis of a significant linear relationship between output and the two independent variables is validated. The signs of both coefficients are correct and the t-values of the two independent variables are highly significant; the t-values of both coefficients pass the two-tailed test of significance at the 1% level. The high significance of $\ln PCI_{t-1}$ suggests the existence of a distributed lag relationship. In other words, investment affects output with a lag. The Durbin-Watson statistic is very low, however, indicating the existence of positive first order serial correlation.

In attempting to correct for autocorrelation, we experimented with both first order and second order autoregressive schemes using both the Cochrane-Orcutt method and the Newton-Raphson iterative inverse interpolation method. The most satisfactory results were obtained with a first order autoregressive scheme using the Newton-Raphson method. It converged after only seven iterations. The estimated regression equation was:

$$\ln GDP = 6.97 + .97 \ln L + 0.05 \ln PCI_{t-1} \quad (3)$$
$$(11.1)\ (8.5)\qquad (1.62)$$

$$U_t = .89 U_{t-1} \quad (4)$$
$$(9.6)$$

$R^2 = 0.984 \qquad \bar{R}^2 = 0.98 \qquad F(3, 20) = 408$

see = 0.02
Mean of Dependent Variable = 12.266
DW-statistic = 1.73

where, as before, t-values are reported below the coefficients. An examination of Equations 3 and 4 confirms that we have improved on Equation 2. The serial correlation has been eliminated as indicated by a Durbin-Watson statistic of 1.73. The first order autoregressive parameter, P lies between zero and unity in absolute value. Its t-value is significantly different from zero at the 1% level. With an R^2 of 0.984, it is apparent that

we are able to explain over 98% of the systematic variations in GDP by the two independent variables. Both variables are correctly signed. Labour force passes the significance test at the 1% level. Investment fails the significance test at the usual 5% level, but passes the test at the 10% level. The F-statistic of 408 is significant at the 1% level. Thus the hypothesis of a significant linear relationship between GDP and the two regressors is validated.

Investment equation

Gross domestic investment collapsed in sub-Saharan Africa in the 1980s, especially starting from 1983. According to World Bank data, from a level of US$44 billion in 1981, gross domestic investment rapidly fell to a low of US$23 billion in 1984. From that level, it rose slowly, reaching US$37.6 in 1991. According to the World Bank (1994b), the average annual growth rate of gross domestic investment was 5.1% between 1970 and 1980, but was -3% between 1980 and 1992. As may be expected, the investment/GDP ratio also declined sharply. In analysing the movement of the investment/GDP ratio, the World Bank (1992b) shows that while the annual average ratio was 21.5% in1975-1979, it collapsed to 15.6% in1980–1985. Indeed, if the period 1983-1986 is considered, it is found that the average investment/GDP ratio was only 13%. In fact, from a ratio 26% of GDP in 1977, the investment ratio fell to a catastrophic 12.8% in 1984. No doubt, a fall in gross domestic saving partly accounts for this. World Bank (1992b) statistics show that the ratio of gross domestic saving to GDP, which averaged 18.9% in1975–1979, had fallen to 13.4% in1980–1985.

Many analysts believe that the poor investment and growth performance of many highly indebted less developed countries (including those in sub-Saharan Africa) since the onset of the global debt crisis in 1982 can be attributed in part to the disincentive effect of their external debt burden. This phenomenon is often referred to as the "debt overhang" problem. The debt overhang hypothesis posits that the accumulated external debt of these countries acts as a tax on future output and thus discourages private investment. The theoretical case for debt overhang has been made by several authors, including Dooley (1986), Krugman (1988), Sachs (1989), Froot (1989) and Calvo (1989). Some attempts have also been made to test the hypothesis empirically. Among these are Sachs (1989), Claessens (1990), Borensztein (1990, 1991), Cohen (1990), Warner (1992), Degefe (1992), Savvides (1992), Chhibber and Pahwa (1994), and Iyoha (1997a, 1997b). Researchers like Sachs (1989) and Krugman (1988) have also analysed the "crowding out" effect of debt service payments. This arises from the fact that many highly indebted poor countries frequently divert resources, including foreign aid and other foreign exchange resources, to take care of pressing debt service obligations, particularly debt owed to the multilateral institutions, which is deemed "non-reschedulable".

Borensztein (1990) provided a major and interesting attempt to test the debt overhang effect empirically. Using data for the Philippines, he found that the debt overhang hypothesis was largely valid. Specifically, he found that debt overhang had an adverse effect on private investment. The effect was strongest when private debt, rather than total debt, was used as a measure of debt overhang.

Following Sachs (1988), Krugman (1988), Borensztein (1990), Chhibber and Pahwa (1994), and Iyoha (1997a, 1997b), we specify an investment demand function that has its roots in neoclassical optimization theory. We also make allowance for the potential existence of both a debt overhang effect and a "crowding out" effect of external debt. Finally, we allow for the possible existence of an "investment accelerator" effect. In the specification, investment per capita is hypothesized to depend negatively on domestic interest rate, positively on the marginal product of capital, negatively on the price of investment goods, positively on growth in real GDP, negatively on the external debt-income ratio and negatively on the ratio of debt service to exports. Thus, the basic specification of the investment demand function is given by

$$PCGDI = b_0 + b_1 r + b_2 MPK + b_3 P^I + b_4 GDPGR + b_5 (D/Y) + b_6 (DS/X) + u \qquad (5)$$

$b_1 < 0$, $b_2 > 0$, $b_3 < 0$, $b_4 > 0$, $b_5 < 0$, $b_6 < 0$, where *PCGDI* is per capita gross domestic investment, r = interest rate (commercial lending rate), *MPK* = marginal product of capital,[10] P^I = price of investment goods and *GDPGR* = growth rate of real output, which is expected to capture the "investment accelerator" effect. *D/Y* is the ratio of external debt stock to *GNP*, (which is the usual measure of debt overhang), *DS/X* is the ratio of total debt service payments to export of goods and services, which is expected to capture the "crowding out" effect of external debt, and u is a stochastic error term assumed to be Gaussian white noise.

Some researchers, including Borensztein (1990), have suggested that the debt overhang effect is expected to be particularly strong when considering private investment and private debt. This hypothesis could not be tested in this study due to the unavailability of the requisite data.[11]

From preliminary ordinary least squares regression calculations, it was found that the partial regression coefficient of the price of investment goods (P^I) in Equation 5 was not statistically significant and fluctuated in direction. This variable was therefore dropped in the final equation. The one-period lagged values of the interest rate and the debt-GNP ratio were also found to give better and more consistent results than their contemporaneous values. It was therefore decided to use r_{t-1} in place of r_t and DYR_{t-1} in place of DYR_t. The amended equation was then estimated by the OLS technique and the following results obtained:

$$PCGDI = -123 + 3.5\, I_{t-1} + 407\, MPK + 2\, GDPGR - .7\, D/Y_{t-1} - 2.5\, DS/Y \qquad (6)$$
$$(-1.8)\quad (2.4)\quad (3.6)\quad (1.9)\quad (-3.1)\quad (-4.3)$$

$R^2 = 0.88$ $\quad \bar{R}^2 = 0.84$ $\quad F(5, 18) = 26$

see = 9.49
Mean of dependent variable = 78.33
D-W statistic = 1.4

In Equation 6, t-values are again given in parentheses below each coefficient. Judging from the value of R^2, it can be concluded that the independent variables in this equation explain over 87% of the systematic variations in per capita gross domestic investment during the period under study. The F-value of 26 is significant at the 1% level, indicating that there is a significant linear relationship between the independent variables taken together and per capita investment. All the signs are correct except that of the interest rate. Of the four correctly signed independent variables, three (MPK, debt-income ratio and debt service ratio) pass the significance test at the 1% level. The fourth variable, growth rate of real GDP, misses the two-tailed test significance at the traditional 5% level. It nevertheless passes the significance test at the 8% level. Thus, there is some evidence of an "investment accelerator" effect, but it is not very strong. Since the debt overhang variable (D/Y) and "crowding out" effect variable (DS/X) are highly significant, there is clear evidence of both a debt overhang effect and a "crowding out" effect. Since their signs are negative, as postulated, their effect is to depress the level of investment. However, the D-W statistic shows evidence of serial correlation.

In attempting to correct for autocorrelation, we experimented with both first order and second order autoregressive schemes using both the Cochrane-Orcutt method and the Newton-Raphson iterative method. The most satisfactory results were obtained with a second order autoregressive scheme using the Newton-Raphson iterative method. It converged after only nine iterations. The estimated regression equation was:

$$PCGDI = \underset{(-1.8)}{-129} + \underset{(1.5)}{2.3T_{t-1}} + \underset{(3.4)}{450MPK} + \underset{(1.7)}{1.4GDPGR} - \underset{(-2.2)}{.6(D/Y)_{t-1}} - \underset{(-3.2)}{2.0\,(Ds/X)} \qquad (7)$$

$$U_t = \underset{(2.5)}{.49\,U_{t-1}} - \underset{(-1.6)}{.32U_{t-2}} \qquad (8)$$

$R^2 = 0.9 \qquad \bar{R}^2 = 0.86 \qquad F(7, 16) = 20.7$

see = 9.11
Mean of dependent variable = 78.33
D-W statistic = 2.09

where t-values are reported in parentheses below the coefficients. An examination of Equations 7 and 8 confirms that we have improved upon Equation 6. The serial correlation has been removed as indicated by a D-W statistic of 2.09. The second-order autoregressive parameters, $\hat{p}_1$ and $\hat{p}_2$, lie between zero and unity in absolute value. Their t-values are significantly different from zero at the 2% level and at the 12% level, respectively. With an R^2 of 0.9, it is clear that we are able to explain 90% of the systematic variations in SSA's per capita gross domestic investment by the five independent variables. All the variables except interest rate have the correct signs but only three are significantly different from zero, using traditional levels. MPK passes the significance test at the 1% level. The debt-service ratio is also significantly different from zero, using a two-tailed test, at the 1% level. The debt overhang variable (D/Y) passes the significance test at the 5% level.

The investment accelerator variable (GDPGR) only passes the two-tailed significance test at the 10% level. The F-statistic of 20.7 is significant at the 1% level. Thus, the hypothesis of a significant linear relationship between per capita investment and the five independent variables is validated. A plot of actual and fitted values of per capita investment is given in Figure 4.

The results offer a confirmation of the debt overhang hypothesis for SSA countries. The debt overhang variable, proxied by the ratio of external debt to GNP, is negative and highly significant. The elasticity[12] of investment with respect to the debt overhang variable is -0.337. Thus, a 10% decrease in the debt-GNP ratio results in a 3.37% increase in investment per capita. This means that a debt reduction of 10% will lead approximately to a 3% increase in investment. Notice that the debt-income ratio affects investment with a lag. The effect of the combination of this lagged response of investment to changes in the debt level and the lagged response of output to changes in investment (arising *inter alia* from the existence of gestation lags) means that the impact of a reduction in debt stock on output will not be instantaneous. Rather, it will manifest after a time lag of about two years. Nevertheless, the effect of a debt reduction on the investment climate and investors' perceptions will be immediate.

The results also provide confirmation of the existence of a "crowding out" effect in SSA countries. The coefficient of the crowding out effect variable, proxied by the ratio of total debt service payments to exports of goods and services, is negative and significantly different from zero at the 1% level. The elasticity of investment with respect to the crowding out variable is -0.335. Thus, a 10% reduction in the debt service ratio would increase investment by approximately 3%.

Now, let us summarize the empirical results. We find, using econometric techniques, that SSA's heavy external debt stock and debt service payments act to reduce investment through both the debt overhang effect and the "crowding out" effect. There is evidence of a distributed lagged response of investment to changes in the debt-income ratio (and of a distributed lagged response of output to changes in investment). Thus, reductions in debt stock will affect investment and output after some lag in time (rather than instantaneously).

A simultaneous equation model of external debt and economic growth in SSA

In order to make explicit allowance for interaction between external debt and economic growth, a truly simultaneous equations model is now specified. In particular, the output equation and investment demand function are now considered as a system of simultaneous equations. The simultaneous equations system is given by these modified equations:

$$\ln GDP = \alpha_0 + \alpha_1 \ln L + \alpha_2 PCGDI_{t-2} + U_{1t} \quad (9)$$

$$PCGDI = \beta_0 + \beta_1 T_{t-1} + \beta_2 MPK + \beta_3 \ln GDP + \beta_4 GDPGR$$

$$+ \beta_5 D/Y_{t-1} + \beta_6 DS/Y + U_{2t} \quad (10)$$

where u_{1t} and u_{2t} are stochastic error terms. In this system of equations, there are two endogenous variables, ln GDP and PCGDI. There are seven predetermined variables, namely, lnL, in $PCGDI_{t-2}$, r_{t-1}, MPK, GDPGR, $(D/Y)_{t-1}$ and DS/X. Using the order condition of identification, it can be ascertained that both equations are over-identified. The two-stage least squares (2SLS) regression method can therefore be used to estimate the equations of the model.[13] Given the identification status of the equations of the model, econometric theory assures us that the resulting estimates of the structural coefficients will be consistent and asymptotically efficient.

Preliminary econometric estimation of our simultaneous equations model using the two-stage least squares regression method showed that the output equation exhibited serial correlation. It was therefore re-estimated with the instrumental variable technique using the Cochrane-Orcutt iterative technique for removing first-order serial correlation of the error. These final equations were obtained (where t-values are reported in parentheses below the appropriate coefficients):

$$\ln GDP = \underset{}{7.39} + \underset{(15.1)}{0.91} \ln L + \underset{(10.7)}{0.2} PCGDI_{t-2} \quad (11)$$
$$\qquad\qquad\qquad\qquad\qquad\qquad\quad (2.92)$$

$$\beta = 0.3$$
$$(1.5)$$

$R^2 = 0.923 \qquad \bar{R}^2 = 0.915 \qquad \text{see} = 0.027$

D-W statistic = 1.76
Log of likelihood function = 50.17

$$PCGDI = \underset{(-1.70)}{-1992.7} - \underset{(-0.37)}{1.22} T_{t-1} - \underset{(-0.29)}{95.8} MPK + \underset{(1.61)}{181.1} \ln GDP \quad (12)$$

$$+ \underset{(2.22)}{2.38} GDPGR - \underset{(-2.66)}{1.60} D/Y_{t-1} - \underset{(-3.24)}{2.0} DS/X$$

$R^2 = 0.90 \qquad \bar{R}^2 = 0.86 \qquad F(6, 17) = 24.9$

see = 8.96
D-W statistic = 1.85

In order to test whether it makes much difference empirically which definition of debt is used–total external debt stock (EDT) or debt outstanding and disbursed (DOD–the system of equations was re-estimated using DOD/GNP instead of EDT/GNP as the

measure of debt overhang. The estimated results using DOD instead of EDT (with t values in parentheses under the coefficients) were:

$$\ln GDP = 7.34 + .87\ InL + .09PCi_{t-1} \qquad (13)$$
$$(22.3)\ (19.7)\quad (3.2)$$

$R^2 = 0.96 \qquad \bar{R}^2 = 0.956 \qquad F(2, 21) = 250$

see = 0.03
Mean of dependent variable = 12.26
D-W statistic = 0.78

$$PCGDI = -2373.2 - 2.92T_{t-1} - 232.2MPK + 218.71nGDP \qquad (14)$$
$$(-2.1)\quad (-.88)\quad (-.71)\qquad (2.0)$$

$$+2.33GDPGR - 2.0DCD/t_{t-1} - 1.53DS/X$$
$$(2.31)\qquad (-3.1)\qquad (-2.34)$$

$R^2 = 0.909 \qquad \bar{R}^2 = 0.876 \qquad F(6, 17) = 28.2$

see = 8.465
Mean of dependent variable = 78.33
D-W statistic = 1.84

A comparison of Equations 12 and 14 shows that the overall fits are about the same.[14] The same variables, GDPGR, debt-income ratio and debt service ratio, are also significant in both. Thus, there is little difference as to whether we use EDT or DOD as our measure of debt. However, we choose to use EDT since it is a broader and more comprehensive measure of external debt.

Debt accumulation identity

The model is closed with an identity, a debt accumulation identity. Given the knowledge of the SSA debt situation, it was decided to use the following identity:

$$DTOTAL = (1 + AVINT)\ DTOTAL\ (-1) - DSPAY \qquad (16)$$

where DTOTAL = total debt, DSPAY = total debt service payments and AVINT = average interest paid on debt.

IV. Simulation results

Historical simulation

An historical simulation, also called an ex post simulation, is performed over the estimation period of a macroeconometric model. The main reasons for historical simulation are model validation and evaluation. A comparison of the actual or historical series for the endogenous variables with the simulated series for the same variables is often used to test the validity of a macroeconometric model. This is because such a comparison allows an analyst or policy maker to determine how well a macroeconometric model "tracks" the economy and, specifically, how well each simulated data series tracks or approximates the corresponding actual series. Measures used to test how closely a simulated series of an endogenous variable tracks its corresponding historical series include:

- the root-mean-squared simulation error (rms)
- the root-mean-squared percent error
- Theil's inequality coefficient, U[15]

In this study, the root-mean-squared simulation error and Theil's inequality coefficient are used in addition to the correlation coefficient between the actual and simulated data series. In order to achieve a more efficient simulation and obtain richer results, the number of endogenous variables was increased to six by specifying an identity for the debt-GNP ratio, the debt-service ratio and the lagged value of per capita investment.

Dynamic simulation was then undertaken using the micro TSP 4.3 computer software. Simulations for the six endogenous variables were obtained. These are the log of GDP, per capita investment, total external debt, debt-GNP ratio, the debt-service ratio, and the lagged value of per capita investment. The historical simulations for investment, output and external debt are shown in Figures 3, 4 and 5 respectively. Table 11 contains key simulation statistics–correlation coefficient, root mean squared error and Theil's inequality coefficient (U)–for the three key endogenous variables, viz., log of GDP, investment per capita, and external debt. Notice that the values of U, Theil's inequality coefficient, for output, investment and external debt are very small, signifying a close fit between the simulated and actual series. Also, the correlation coefficients between their simulated and actual series are uniformly high, ranging from 93% to 98.6%.

Policy simulation

Policy simulation is the term applied to experimentation with a macroeconometric model using alternative policy scenarios. A key objective of policy simulation is "to forecast the effects of alternative economic policies by formulating these policies in terms of trajectories for the exogenous policy variables" (Pindyck and Rubinfeld, 1976: 434). In this way, the researcher or policy maker can examine the effect of changes in economic policy on key endogenous variables like investment and GDP.

In this study, the main objective of the policy simulation exercise was to examine the effect of debt stock reduction on the endogenous variables, particularly investment and output. Results of this type of simulation for Nigeria were recently reported by Chhibber and Pahwa (1994) and by Iyoha (1997a). As an illustrative example, this study considers policy scenarios of a reduction of 5%, 10%, 20% and 50% in the external debt stock of SSA effective from 1986. Dynamic simulations for the 1987–1994 period were then undertaken to investigate the effects of the alternative packages of debt reduction on key endogenous variables. In the simulations, it was assumed that a given debt stock reduction led to a corresponding reduction in the debt service ratio after a one-year lag.

The simulation results came out as expected. A reduction in the debt stock led to a rise in per capita investment, an increase in GDP (for sufficiently large reductions in debt), a fall in total external debt, a fall in the debt/GNP ratio and a fall in the debt service-export ratio. The results of the policy simulations for investment and output with a 5%, 10%, 20% and 50% debt reduction packages are summarized in Tables 12 and 13.

An analysis of the results reported in Table 12 shows that between1987 and 1994 the simulated levels of per capita investment with a debt stock reduction were invariably higher than actual. From Appendix IV, it can be verified that between 1987 and 1994, the average level of per capita investment of SSA was US$53.75. Now compare this with an average level of per capita investment of US$55.99 with a debt stock reduction of 5%; US$58.5 with a debt stock reduction of 10%; US$63.5 with a debt stock reduction of 20%; and US$78.6 with a debt stock reduction of 50%. It follows then that during the 1987–1994 period, per capita investment would have risen on the average by 4.16% if the debt stock had been reduced by 5%; per capita investment would have increased by 8.84% if debt stock had been reduced by 10%; it would have risen by 18.2% if debt stock had been reduced by 20%; and SSA per capita investment would have jumped by 46.3% if debt stock had been slashed by 50%. Thus, a 50% reduction in the debt stock in 1986 would have increased per capita investment during the 1987-94 period, on average, by over 46%; thus, it would have had a major impact on investment, raising it by almost one-half.

An examination of Table 13 indicates that the simulated average level of the natural logarithm of GDP with debt stock reduction did not differ significantly from the average actual level except for fairly high percentage debt reductions. From Appendix II, the actual average level of GDP between 1987 and 1994 can be obtained as US$249.7. Thus, it is seen that for low percentages of debt stock reduction, say less than or equal to 10%, there is no significant change in the average level of GDP. However, for more substantial

Table 11: Historical simulation: Summary statistics

	Correlation coefficient	Root mean squared error	Theil's inequality coefficient 1961	1966
1. lngdp	0.985	0.024	0.00097	0.0019
2. PCGDI	0.93	8.895	0.0545	0.1086
3. External debt	0.986	12.426	0.0509	0.1011

Source: Author's calculations, 1999

Table 12: Policy simulations: Investment under 5%, 10%, 20% and 50% debt reduction scenarios

Year	Investment per capita (US$) Debt reduction option 5%	10%	20%	50%
1987	58.02872	60.73594	66.15040	82.39377
1988	49.75667	52.71081	58.61908	76.34389
1989	52.50642	55.11606	60.33533	75.99316
1990	45.56657	48.24107	53.59008	69.63709
1991	53.68879	56.11893	60.97922	75.56010
1992	56.55009	58.92995	63.68966	77.96881
1993	64.01367	66.23949	70.69115	84.04608
1994	67.81478	69.93542	74.17669	86.90050
Average	55.99071	58.50346	63.52895	78.60543

Source: Author's calculations, 1999

Table 13: Policy simulations: GDP under 5%, 10%, 20%, and 50% debt reduction scenarios

Year	Output (lnGDP) (US$million) Debt reduction option 5%	10%	20%	50%
1987	12.35601	12.36081	12.37040	12.39917
1988	12.36377	12.36866	12.37844	12.40778
1989	12.39480	12.39933	12.40840	12.43559
1990	12.40485	12.40979	12.41969	12.44936
1991	12.43272	12.43709	12.44583	12.47205
1992	12.44378	12.44826	12.45721	12.48408
1993	12.48095	12.48501	12.49315	12.51757
1994	12.50940	12.51339	12.52136	12.54527
Memorandum items:				
Mean lnGDP	12.42329	12.42779	12.43681	12.46386
Mean GDP	248522.0	249644.3	251905.6	258812.4

Source: Author's calculations, 1999

percentage reductions in debt stock, say greater than or equal to 20%, there is a significant increase in the average level of GDP. Specifically, if the debt stock is reduced by 20%, average GDP would rise by approximately 1% while if the debt stock were reduced by 50%, average GDP would increase by an impressive 3.7%. Note that between 1987 and 1994, the average recorded growth rate of real GDP in SSA was 2.1%. Adding 3.7% to this figure, we get 5.8%. Therefore, the implication of our results is that if there had been a 50% debt stock reduction in 1986, the average growth rate of real GDP in SSA during the 1987-1994 period would have been a healthy 5.8% instead of the anaemic 2.1% actually achieved (without debt stock reduction). Results obtained in this study are similar to those obtained by Chhibber and Pahwa (1994) for Nigeria. In that study, which simulated a 50% debt reduction for Nigeria, also starting in 1986, They found that during the 1987–1991 period, GDP growth would have averaged 2.9% higher. Thus, with a 50% debt stock reduction, Nigeria's average GDP growth during the 1987-1991 period would have been 7.28% instead of the recorded 5.18% (Chhibber and Pahwa, 1994).

It is necessary to re-emphasize that due mainly to the operation of the debt overhang effect and the "crowding out" effect there would have been a substantial recovery of investment and an increase in the growth of real output in SSA as a result of a significant reduction in debt stock.[19]

V. Summary and conclusion

This study has presented a small macroeconometric model that facilitated simulations of the impact of external debt on economic growth in sub-Saharan Africa. The complete simultaneous equations model consisted of two stochastic equations (for output and investment demand) and four identities. The four identities in the dynamic simulation were for debt accumulation, the debt/GNP ratio, the debt-service ratio and the lagged value of per capita investment. The simultaneous equations model was estimated by two-stage least squares for the 1971–1994 period. It was found that there is a significant debt overhang effect as well as a "crowding out" effect. In other words, the large stock of external debt and heavy debt service payments have had a depressing effect on investment in SSA.

Historical simulation was undertaken in order to assess the validity of the model. On the whole, the model performed well with the simulated values of the two key endogenous variables (investment and output) closely tracking their corresponding actual data series. In this respect, Theil's inequality coefficient of less than 0.06 was obtained for both investment and output.

Policy simulation was also carried out. In particular, the effect of alternative debt stock reduction packages (5%, 10%, 20% and 50% debt reductions) effective in 1986 was simulated. It was found that the hypothesized debt reductions assumed effective in 1986, would have significantly increased investment and, to a lesser extent, GDP during the subsequent period. Similarly, the various debt stock reduction scenarios would have reduced, to corresponding degrees, total external debt stock, the debt/GNP ratio and debt service ratio. The policy simulations showed that a 50% debt stock reduction would have raised per capita gross domestic investment by over 40%, and increased GDP growth by over 3%, on average, during the 1987–1994 period. These results largely mimic those obtained for Nigeria by Chhibber and Pahwa (1994) and by Iyoha (1997a).

Results obtained in this study confirm that an excessively high stock of external debt depresses investment and lowers the rate of economic growth. Thus, heavily indebted countries in sub-Saharan Africa need to articulate creative strategies for bringing about debt reduction so that the high debt stock and associated crushing debt service burden would not have such a negative impact on economic growth. Traditional debt relief mechanisms currently being used by SSA countries include debt restructuring, debt rescheduling, reduced debt servicing, debt buy-backs, interest rate options, and various debt conversion schemes like the debt-equity swap. Overall, the effectiveness of these techniques in significantly reducing the debt stock has been rather limited (Ogbe, 1992).

New steps that could be taken to effectively reduce SSA's external debt stock include, among others:

- adoption and implementation of macroeconomic policies that would encourage repatriation of flight capital;
- adoption of a medium term economic programme approved by the IMF/IBRD in order to qualify for debt reduction under the enhanced Toronto terms, the Naples terms the IDA reduction facility and the HIPC initiative
- pressing for debt forgiveness or debt cancellation through diplomatic action

Given the potential beneficial effects of debt stock reduction on investment and GDP in sub-Saharan Africa, it is recommended that the international community make a greater effort to provide debt reduction, preferably through debt forgiveness, as a matter of priority. It seems clear that, provided appropriate domestic macroeconomic policies are adopted and implemented along with debt reduction packages, debt reduction would provide a much needed stimulus to investment recovery and growth in sub-Saharan African countries in the years ahead.

While plausible, the results obtained in this study by use of two stochastic equations and four identities should nevertheless be considered as preliminary. It is expected that more robust results would be obtained by carrying out the simulations with a larger macroeconometric model of sub-Saharan Africa.

Figure 1: SSA: GNP per capita, 1970–1994

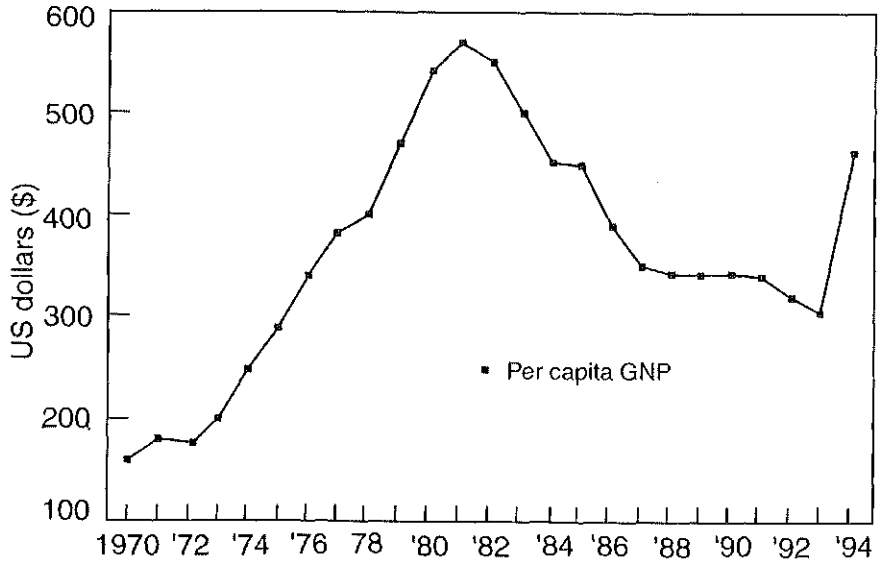


Figure 2: GDP growth rate, 1970–1995

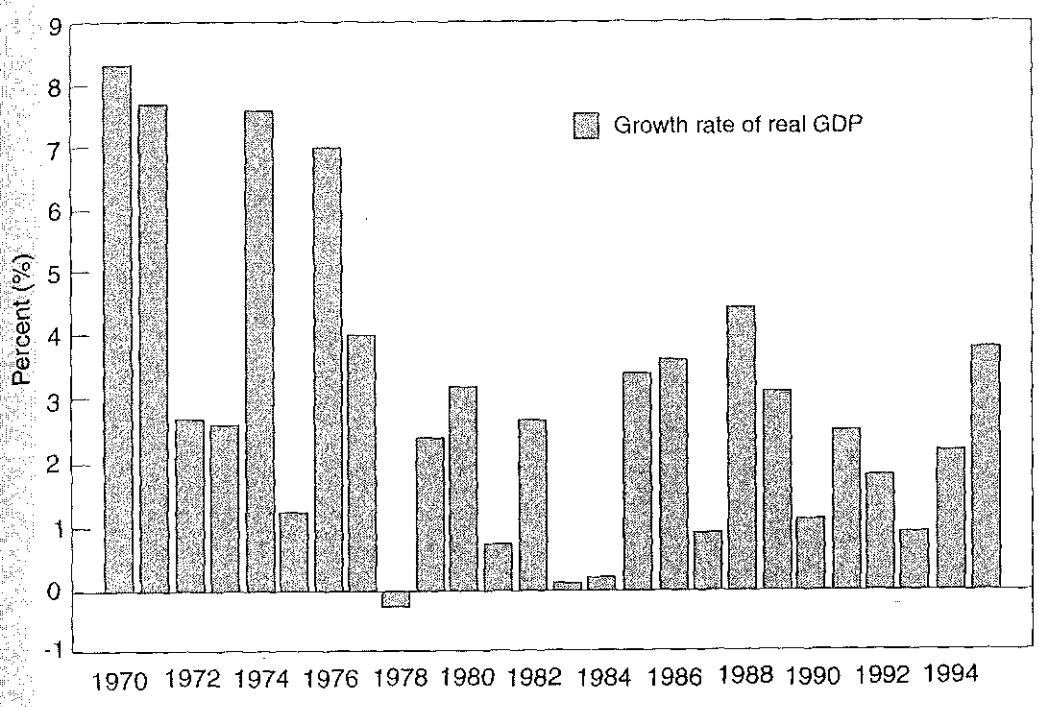


Figure 3: Output equation

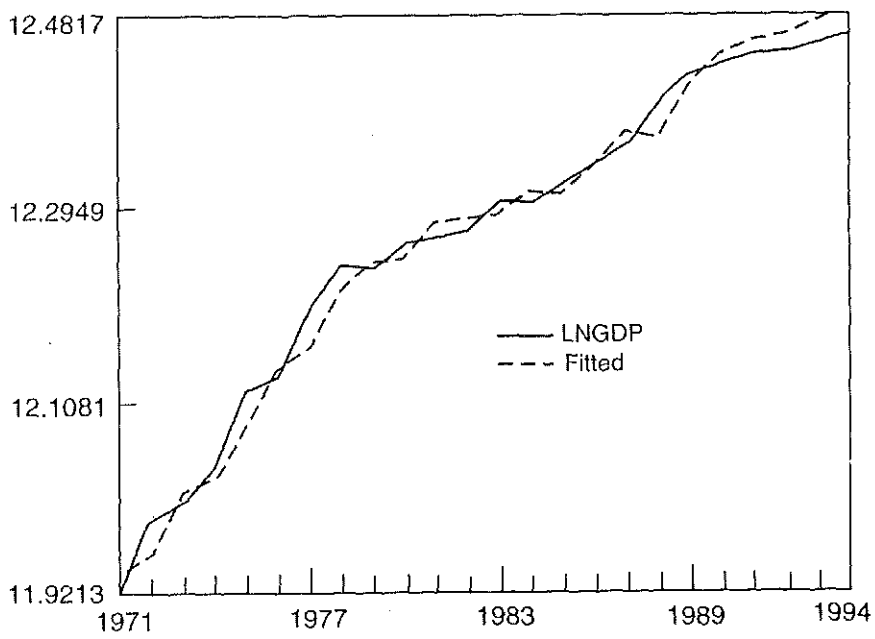


Figure 4: Investment equation

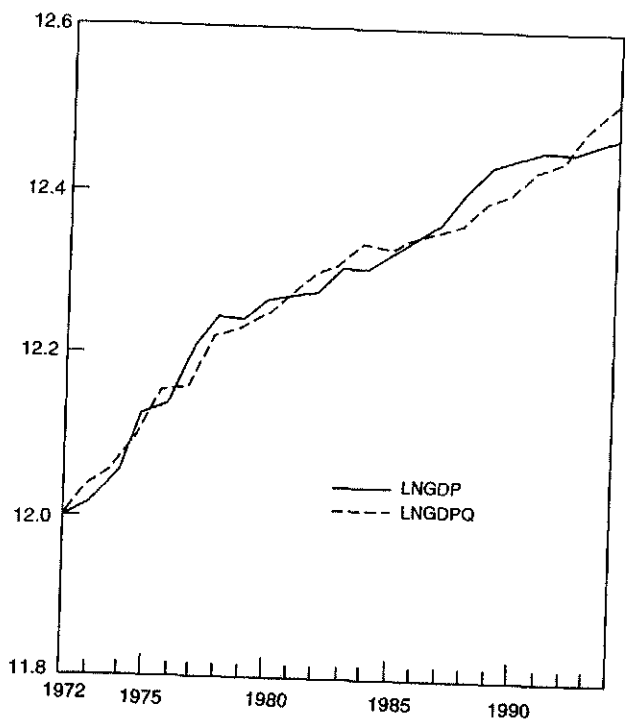


Figure 5: Dynamic simulation of investment

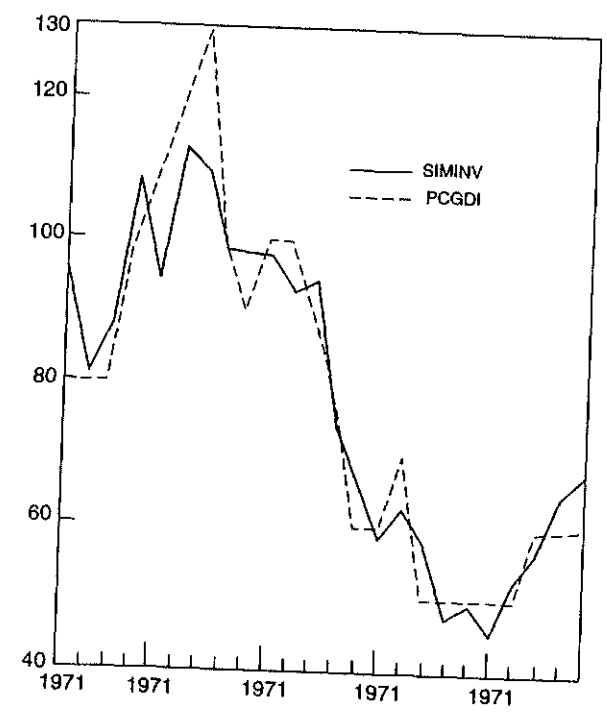


Figure 6: Dynamic simulation of output

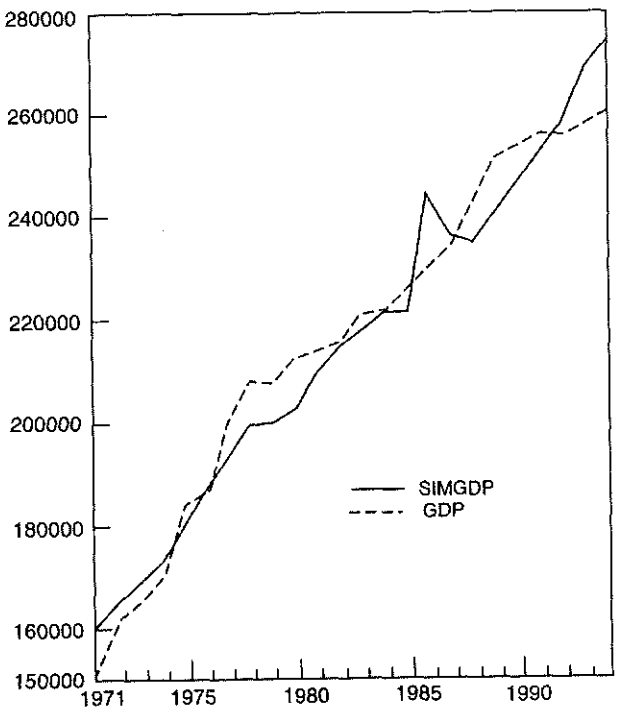


Figure 7: Investment under 75% debt reduction

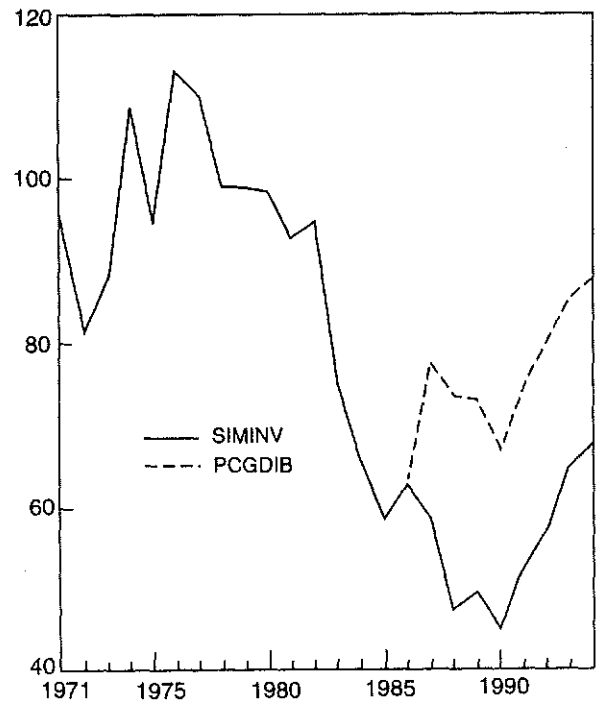
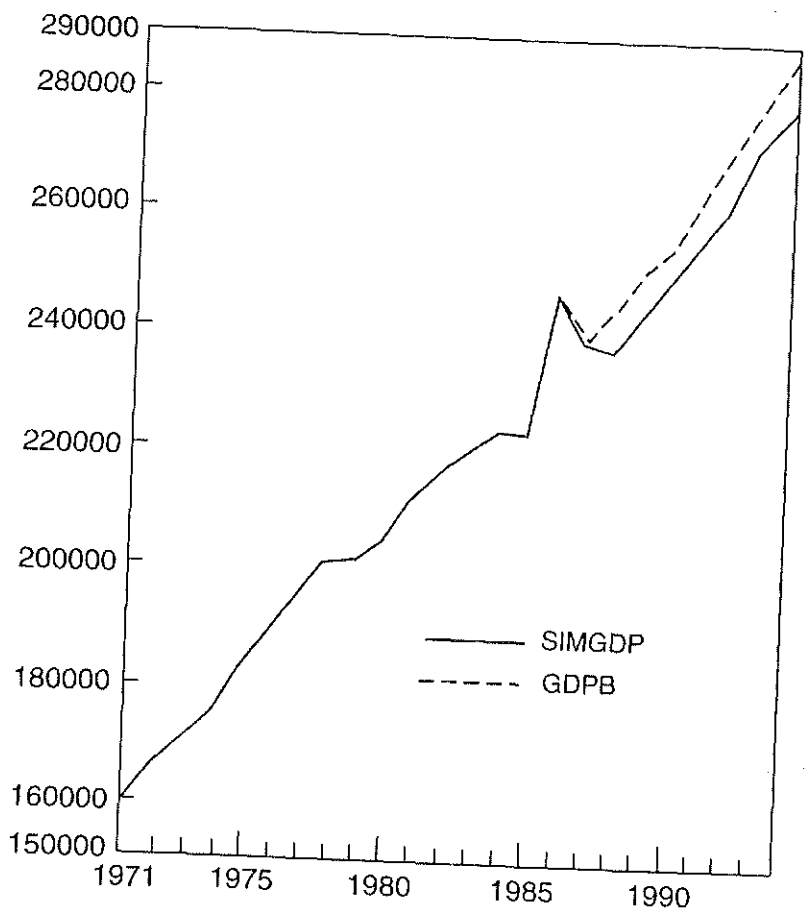


Figure 8: Output under 75% debt reduction



Notes

1 The Sub-Saharan African countries are Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, São Tomé and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zaire, Zambia and Zimbabwe.

2 Total external debt stocks (EDT) consist of public and publicly guaranteed long-term debt plus private non-guaranteed long-term debt plus the use of IMF credit plus estimated short-term debt. This is to be distinguished from debt outstanding and disbursed (DOD), which is defined as the total debt outstanding and disbursed of long-term official concessional, official non-concessional and private loans. Long-term external debt is defined as debt that has an original or extended maturity of over one year that is owed to nonresidents and repayable in foreign currency, goods and services.

3 Total debt service (TDS) measures the debt service payments on long-term debt (public and publicly guaranteed and private non-guaranteed), use of IMF credit, and interest on short-term debt.

4 According to the World Bank (1996b), sub-Saharan Africa's net present value of external debt amounted to 50% of GNP in 1994. This compares unfavourably with the ratios for other low and middle income regions of the world: Latin America and Caribbean, 39%; Middle East and North Africa, 32% ; East Asia and Pacific, 28%; South Asia, 26%; and Europe and Central Asia, 25%.

5 There is some debate as to what variable should be properly used for normalization, i.e., as the denominator of total external debt and debt service payments. Taking a short-term view, export of goods and services would appear to be the more appropriate scalor as it is the main source of foreign exchange resources that can be used to service debt. However, taking a longer term view, GDP seems to be the appropriate scalor since the foreign exchange constraint may be lessened by growth in the non-traded sector provided prices are flexible (Nowzad and Williams, 1981). Iyoha (1994) argues for using different scalors for total external debt and debt service. According to him, GDP should be used to normalize total external debt while export of goods and services should be used as the denominator for debt service payments. Thus the external debt/GDP ratio may be interpreted as a measure of "debt capacity" or "debt burden" while the debt service/export ratio would be interpreted as a measure of

"debt service capacity" or "debt service burden".

6 This is why Goran Ohlin (1966) maintained that a poor country has no debt servicing capacity at all. According to Ohlin, for low-income developing countries, debt service competes with essential imports for foreign exchange earnings, which are insufficient to begin with, and also competes with the investment needs of the country for savings, which are often deficient and inadequate. Besides, high debt service ratios make the country extremely vulnerable to pressures on its balance of payments, thus further hampering the development effort.

7 The Paris Club of Creditors represents only government guaranteed creditors. Its membership includes Canada, Federal Republic of Germany, France, the United Kingdom and the United States of America. These governments guarantee the export activities of their nationals through their official Export Credit Agencies. The first Paris Club meeting was held in 1956. Meetings are held to discuss repayment problems and negotiate debt relief agreements for debtor nations.
The London Club of Creditors deals with uninsured and unguaranteed debts extended by their commercial banks to nationals of debtor countries. Thus, the members of the Club are commercial banks based in the industrialized countries. The first London Club meeting was held in 1976. Meetings are called to discuss repayment problems and conclude restructuring agreements with debtor nations.

8 All the empirical data used are supplied in the Appendix.

9 Following Borensztein (1990), we approximate MPK by the real average product of capital multiplied by the relative share of capital in output. The capital stock and MPK series used in the empirical work will be made available to readers on request.

10 Iyoha (1997a) also finds econometric evidence of a private debt overhang for Nigeria. He finds that there is both a debt overhang and "crowding out" effect with respect to private investment. Thus, the evidence is that heavy debt service payments "crowd out", i.e., reduces, not only public investment but also private investment.

11 Since this is a linear equation, the elasticity-at-the-mean of a given independent variable is obtained as the coefficient of that variable multiplied by its mean and divided by the mean of the dependent variable.

12 Two-stage least squares is a generalized instrumental variable technique. It is a regression method for obtaining point estimates of structural coefficients by direct estimation. Estimates of such coefficients are known to be consistent and asymptotically efficient.

14 The estimated coefficients for the output equation in the two sets are identical because the system is recursive.
The three measures are defined thus:

(1) rms error = $\sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^s - Y_t^a)^2}$

$$(2)\quad \text{rms percent error} = \sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\frac{Y_t^s - Y_t^a}{Y_t^a}\right)^2}$$

$$(3)\quad U = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^s - Y_t^a)^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^s)^2}\ \sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t^a)^2}}$$

15 A 50% reduction in debt stock is close to the effective debt reduction receivable by eligible low-income highly indebted countries under the so-called "Naples terms" agreed on in December 1994 by creditor countries. For more on this, see CBN (1996), p. 10.

16 Note that the small macroeconometric model used in this study permits debt (or debt stock reduction) to affect growth only via investment. A larger model would, in addition, allow for a direct transmission channel from debt to growth. These direct effects are linked to the impact of debt on growth supporting expenditures such as human capital and on expenditures which enhance investment productivity. In such a case, debt stock reduction would increase growth via a rise in investment and also increase growth directly by inducing increased growth promotion expenditures. Conceivably, then, such a specification would increase the impact of debt stock reduction on economic growth.

17 There would also have been corresponding improvements in debt indicators.

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Appendix A

SSA: Gross national product per capita, Atlas methodology (US dollars)

Year	PCGNP
1970	160
1971	180
1972	180
1973	200
1974	250
1975	290
1976	340
1977	380
1978	400
1979	470
1980	540
1981	570
1982	550
1983	500
1984	450
1985	450
1986	390
1987	350
1988	340
1989	340
1990	340
1991	340
1992	321
1993	306
1994	460

Source: World Bank. *World Tables 1992*; *African Development Indicators*; and *World Development Report 1996*.

Appendix B

SSA: Gross domestic product and growth rates of GDP

Year	GDP (US$ million)	Growth rate (%)
1970	138,913	8.3
1971	150,442	7.7
1972	162,027	2.7
1973	165,000	2.6
1974	170,727	7.6
1975	183,703	1.2
1976	185,908	7.0
1977	198,921	4.0
1978	206,878	-0.2
1979	206,465	2.4
1980	211,420	3.2
1981	212,426	0.7
1982	213,913	2.7
1983	219,689	0.05
1984	219,799	0.2
1985	223,763	3.4
1986	228,821	3.6
1987	232,577	0.9
1988	241,765	4.4
1989	249,466	3.1
1990	251,969	1.1
1991	254,205	2.5
1992	253,863	1.8
1993	256,154	0.9
1994	258,460	2.2

Source: World Bank (1996). *African Development Indicators, 1994-95*; World Bank, *World Debt Tables 1992*.

Appendix C

SSA: Labour force and population (millions)

Year	Labour force	Population
1970	130.0	287
1971	133.5	295
1972	137.4	303
1973	141.2	311
1974	145.2	320
1975	149.3	329
1976	153.7	339
1977	157.8	349
1978	162.1	359
1979	166.5	370
1980	171.0	380
1981	175.8	391
1982	180.7	403
1983	185.8	415
1984	191.0	427
1985	196.4	440
1986	201.8	453
1987	207.5	467
1988	213.4	481
1989	220.0	496
1990	226.0	511
1991	232.0	526
1992	238.0	542
1993	244.4	558
1994	251.0	575
1995	257.8	592

Source: World Bank: *African Development Indicators, 1992*; *World Development Report 1994* and *1996*.

Appendix D

SSA: Gross domestic investment per capita (1987 US dollars) and investment and savings ratios

Year	PCGDI	INV/GDP (%)	SVG/GDP (%)
1970	70	16.7	15.5
1971	80	18.8	15.1
1972	80	19.5	16.8
1973	80	19.8	18.4
1974	100	19.6	21.9
1975	110	23.3	16.6
1976	120	25.9	20.5
1977	130	26.0	19.5
1978	100	23.5	15.1
1979	90	21.0	16.7
1980	100	21.9	19.7
1981	100	22.0	13.0
1982	90	19.9	11.5
1983	80	15.8	10.8
1984	60	12.8	12.3
1985	60	13.1	13.1
1986	70	16.7	12.5
1987	50	15.9	12.6
1988	50	15.7	11.5
1989	50	15.9	13.4
1990	50	16.1	15.5
1991	50	15.9	12.7
1992	60	16.0	14.0
1993	60	15.7	14.8
1994	60	17.0	

Source: World Bank. *World Tables 1992*; *African Development Indicators, 1994-95*; *World Development Report 1996*.

Appendix E

SSA: Capital stock and marginal product of capital

Year	Capital stock* (US$ billion)	MPK**
1970	457.7	0.22809
1971	446.6	0.24140
1972	441.3	0.25243
1973	439.8	0.25159
1974	439.5	0.25482
1975	440.0	0.26677
1976	449.8	0.26456
1977	464.2	0.27571
1978	481.1	0.28132
1979	493.7	0.27380
1980	500.0	0.27350
1981	508.8	0.26829
1982	517.4	0.26394
1983	521.1	0.26348
1984	516.8	0.25781
1985	506.1	0.25548
1986	497.5	0.25572
1987	498.4	0.25334
1988	498.0	0.25680
1989	498.6	0.25855
1990	500.8	0.25495
1991	503.9	0.25007
1992	506.5	0.24415
1993	509.1	0.23988
1994		

Source: * Computed by the author using the CAPITL sub-program of TSP 4.3 using a 5% depreciation rate.
** Computed by the author.

Appendix F

SSA: External debt stock (EDT), total debt outstanding and disbursed (DOD) and total debt service (TDS) (US$ million)

Year	EDT	DOD	TDS
1970	8,296.0	5,761.4	522.9
1971	9,772.0	6,769.3	516.7
1972	11,235.0	7,571.0	648.8
1973	15,168.0	9,928.5	1,165.5
1974	19,340.0	12,558.1	1,046.5
1975	22,721.0	14,879.7	1,300.9
1976	26,996.0	17,807.5	1,476.2
1977	33,705.0	21,968.3	1,554.0
1978	43,655.0	29,142.7	2,103.3
1979	55,485.0	36,422.8	2,853.3
1980	84,049.0	58,208.0	3,977.7
1981	75,668.0	57,190.0	4,576.6
1982	81,946.0	62,393.0	5,235.0
1983	88,233.0	67,164.0	6,411.1
1984	88,866.0	68,046.0	7,885.1
1985	96,396.0	75,979.0	8,918.9
1986	127,145.0	104,116.0	8,975.0
1987	162,629.0	133,135.0	8,296.0
1988	164,981.0	135,476.0	10,974.0
1989	171,236.0	140,735.0	9,761.0
1990	190,260.0	155,088.0	12,264.0
1991	194,779.0	159,364.0	11,176.0
1992	192,781.0	154,439.0	10,862.0
1993	197,886.0	153,372.0	9,890.0
1994	212,416.0	165,048.0	9,315.0
1995	223,298.0	174,281.0	8,784.0

Source: World Bank. *World Debt Tables*, various issues; *African Development Indicators, 1994–95.*

Appendix G

SSA: Average terms of new commitments (all creditors) and commercial bank lending rate

Year	AVINT (%)	CLENDRT (%)
1970	3.6	6.7
1971	4.2	6.8
1972	4.4	7.0
1973	5.5	6.9
1974	5.2	7.1
1975	5.6	7.5
1976	5.5	8.6
1977	5.5	8.0
1978	6.6	10.1
1979	8.1	10.8
1980	7.3	12.0
1981	10.1	13.4
1982	8.5	13.7
1983	8.2	14.6
1984	6.3	14.5
1985	5.9	14.5
1986	5.1	13.5
1987	4.5	13.5
1988	4.0	13.6
1989	4.1	15.1
1990	4.3	16.0
1991	4.1	16.2
1992	3.3	16.8
1993	3.3	18.0

Source: World Bank: *World Debt Tables* (various issues); *Annual Reports* (various issues).

Figure A1: Composition of external debt

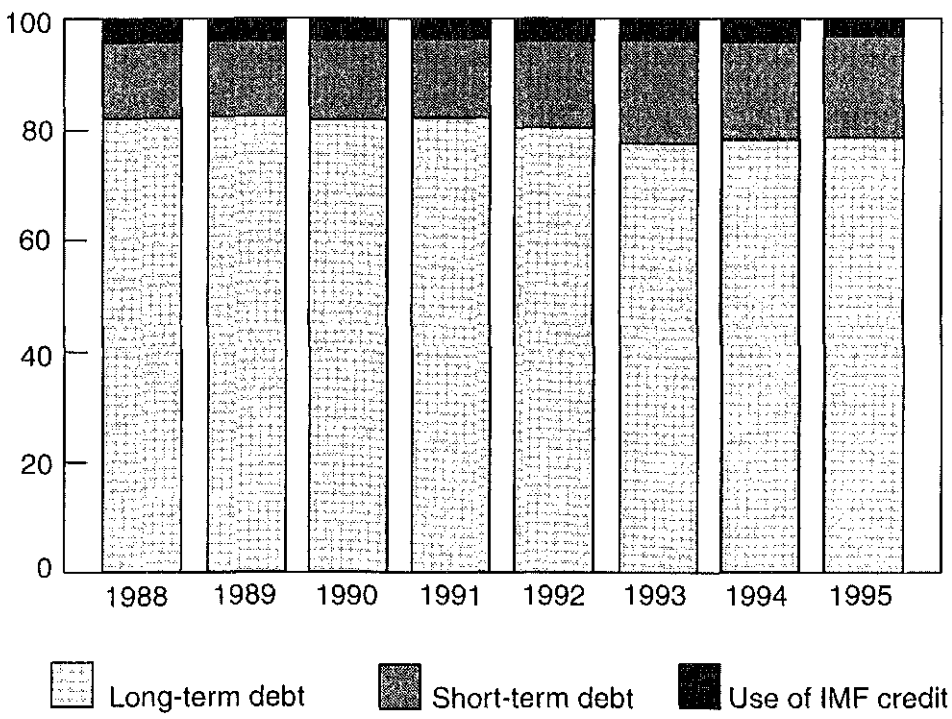


Figure A2: SSA: Debt indicators, 1970–1995

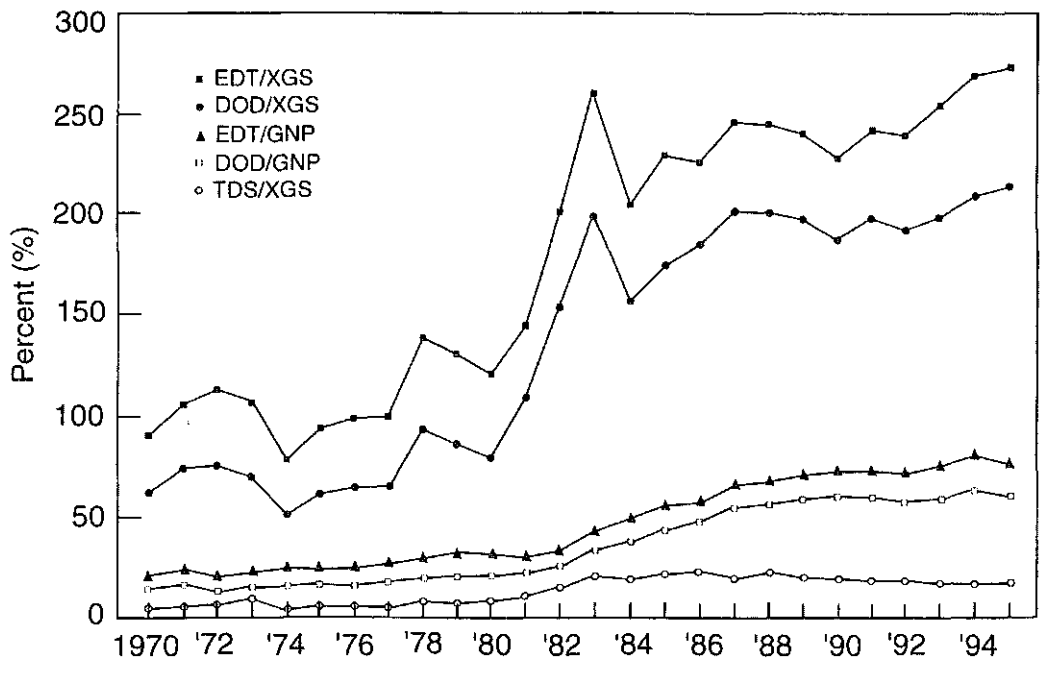


Figure A3: Composition of external debt

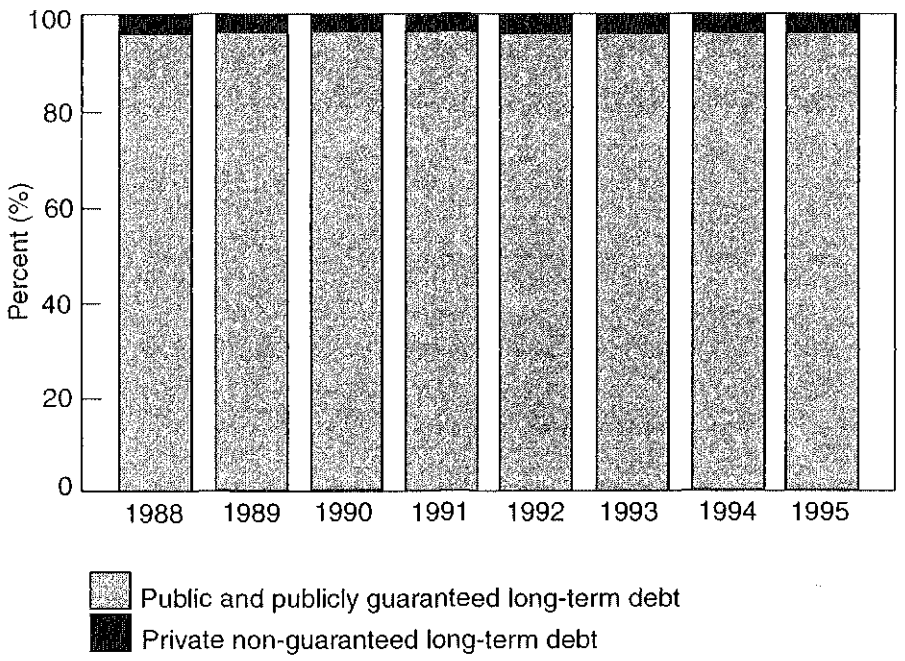
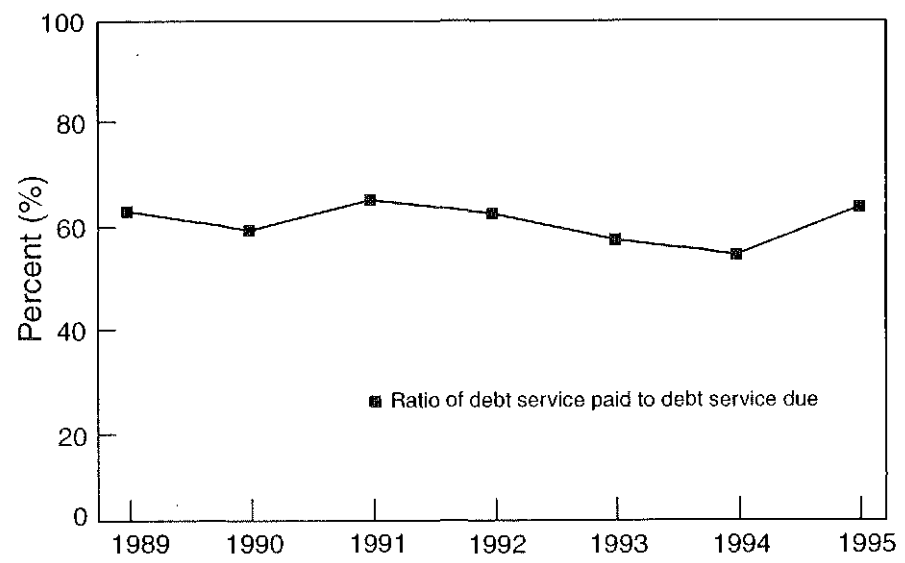


Figure A4: Ratio of TDS paid to TDS due



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