Consulting Assistance on Economic Reform II

Discussion Papers

The objectives of the Consulting Assistance on Economic Reform (CAER II) project are to contribute to broad-based and sustainable economic growth and to improve the policy reform content of USAID assistance activities that aim to strengthen markets in recipient countries. Services are provided by the Harvard Institute for International Development (HIID) and its subcontractors. It is funded by the U.S. Agency for International Development, Bureau for Global Programs, Field Support and Research, Center for Economic Growth and Agricultural Development, Office of Emerging Markets through Contracts PCE-C-00-95-00015-00 and PCE-Q-00-95-00016-00. This paper was funded by contract PCE-C-00-95-00015-00, Task Order No. 42

The Impact on Economic Growth in Africa of Rising Costs and Labor Productivity Losses Associated with HIV/AIDS

Malcolm F. McPherson
Deborah Hoover
Donald R. Snodgrass

CAER II Discussion Paper No. 79
August 2000

For information contact:
CAER II Project Office
Harvard Institute for International Development
14 Story Street
Cambridge, MA 02138 USA
Tel: (617) 495-9776; Fax: (617) 495-0527
Email: caer@hiid.harvard.edu

The Impact on Economic Growth in Africa of Rising Costs and Labor Productivity Losses Associated with HIV/AIDS

Malcolm F. McPherson*

in association with

Deborah A. Hoover and Donald R. Snodgrass

Final revision: 16th August, 00

John F. Kennedy School of Government
Harvard University
Cambridge, Massachusetts

- We are grateful to Clive Gray of Harvard University and Orest Koropecky of USAID for helpful comments on our earlier drafts. We thank Seth Kirschenbaum for editorial assistance.

Executive Summary

Conventional models explaining the impact of HIV/AIDS on economic growth typically present projections based on scenarios computed 'with AIDS' and 'without AIDS.' When the disease was in its early stages, that approach was a reasonable "first cut." However, with HIV/AIDS now an epidemic in many African countries, such comparisons are no longer valid. The impact of the disease cannot be treated as an 'exogenous' influence that can be 'tacked on' to models derived on the presumption that the work force is HIV-free. HIV/AIDS has become an 'endogenous' influence on most African countries that has adversely affected their potential for growth and development. In some cases, such as Zambia, Zimbabwe, and the region covering the former Zaire, the spread of HIV/AIDS may have already undermined their ability to recover economically.

This paper analyzes the impact of HIV/AIDS using a model of economic retrogression. Derived from reversing direction in an endogenous growth framework, the model provides a fresh perspective of the impact of HIV/AIDS on economic growth. Many analysts have now recognized that their best estimates of the effect of the epidemic have been systematically understated. What they have failed to fully account for is that the HIV/AIDS epidemic has been having a non-linear effect on economic growth. Our model incorporates this element by including the feedback to the rate of economic growth of declining savings and investment due to rising costs and falling productivity associated with HIV/AIDS.

The paper concludes with recommendations designed to assist the most seriously affected countries to begin looking beyond the HIV/AIDS epidemic. First, governments and donor agencies working in Africa should devise programs and responses that deal constructively with individuals who are HIV-positive. The challenge is to understand how large segments of the population, who know they will die prematurely, can be trained, managed, and motivated in ways that maintain (or, at least, do not undermine) productivity. Second, donor agencies and African governments need to devise broad-based programs of technical assistance specifically to stabilize the operations of the key social and economic organizations. Third, governments should work with employers to ensure that efforts to minimize the private costs of HIV/AIDS do not generate unacceptable social costs. Fourth, African governments need to rid themselves of all activities that do not contribute to the immediate tasks of promoting economic growth and development. The spread of HIV/AIDS has progressively undercut the capacity of African states. This requires a sharp scaling back of government activities. For their part, donors should ensure that the measures they promote, such as "comprehensive development frameworks," "poverty reduction and growth strategies," and "country strategies," do not place unsustainable demands on over-stretched and (often) dwindling state capacity. Finally, as a general matter, no African country can hope to recover economically (even if HIV/AIDS has not yet become a major problem) if the pattern of economic mismanagement and start-stop approach to economic reform continues. Such mismanagement and halting reform wastes resources and further undermines the capacity for growth and development.

Bios

Malcolm F. McPherson, formerly a Fellow of the Harvard Institute for International Development, is now a research fellow at the Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University. He is senior advisor on the Equity and Growth through Economic Research (EAGER) Project and principal investigator for the study "Restarting and Sustaining Growth and Development in Africa." He holds a Ph.D. in Economics from Harvard University.

Deborah A. Hoover is an independent consultant who served as the Training Officer and Administrator on HIID's Macroeconomic Technical Assistance Project in the Ministry of Finance in Zambia. Ms. Hoover has undertaken extensive research on the problems of training under conditions of economic and social stress and of devising methods to motivate individuals who work on their own account and in large organizations.

Donald R. Snodgrass in an Institute Fellow *emeritus* of the Harvard Institute for International Development. Trained as a labor economist, he holds a Ph.D. from Yale University. He is the author of several books and numerous articles. With Malcolm Gillis, Dwight Perkins and Michael Roemer, he is the author of *Economics of Development* (Norton), which is currently being revised for its fifth edition.

Table of Contents

List of Tables

Introduction

At a public lecture at Harvard University in 1999, Dr. Peter Piot, Director of UNAIDS, made an interesting comment. He noted that despite having worked on HIV/AIDS for most of the last two decades, he continues to be surprised by the inaccuracy of predictions about the course of the epidemic, including those that he, himself, has made.[1] Dr. Piot singled out the extent to which the economic and social impacts of the disease have been understated.

Our paper builds on this point. We argue that, with respect to the economic impact of HIV/AIDS in Sub-Saharan Africa (henceforth Africa), the dynamics of the disease have been widely misperceived. Important economic thresholds have been crossed as the epidemic has intensified. There are at least three reasons for these misperceptions.

One. The conceptual model commonly used to trace the dynamic effects of HIV/AIDS on economic growth is seriously flawed. The most common projection models are linear in growth rates.[2] Emerging evidence suggests that they should be curvilinear with growth rates declining at an increasing rate as the epidemic intensifies.[3]

Two. The main official responses to the epidemic so far have been focused on prevention and cure. Generally overlooked have been the tasks of training, managing, motivating, and otherwise constructively engaging the large numbers of people who are HIV-positive and whose productive lives are being prematurely shortened.[4] Because of this bias, maintaining labor productivity has become increasingly difficult. We argue that without a special effort to raise (or maintain) the productivity of those who are HIV-positive, economic growth cannot be maintained let alone increased.

Three. The full implications for economic recovery and subsequent growth and development of the loss of skills and erosion of institutions across Africa remain largely unrecognized.[5] With the exception of Botswana (where the prevalence of HIV/AIDS is high) and Mauritius (where it is not) all other African countries (including South Africa) have been engaged in efforts to reverse years of economic stagnation and decline. Though some analysts had claimed that Africa was "on the move,"[6] economic reform was eluding most African countries even before HIV/AIDS began decimating their work forces and eroding the performance of their major organizations. Indeed, a case can be made that the cumulative losses due to HIV/AIDS are preventing recovery in some countries. For countries, such as Zambia, Zimbabwe, Uganda, and Malawi where a high proportion of the adult population is HIV-positive[7], barriers to reform and future growth may already exist that are not fully understood.[8]

The paper is organized as follows. Section 2 provides background material on the issues being examined. Section 3 sketches a conceptual approach for examining the dynamic impact of HIV/AIDS on economic growth. The model is derived from theoretical work on economic retrogression that involves "running in reverse" an endogenous growth model. The spread of HIV/AIDS reduces national savings and investment. The ensuing (endogenous) reduction in the growth of productive capacity systematically undermines

economic growth and development. Section 4 indicates how such a model might be tested. The final section has concluding comments.

The paper has three annexes. Annex A, by Deborah Hoover, is a review of the literature of work place responses to HIV/AIDS in Southern Africa. Annex B, by Donald Snodgrass, examines the influence of HIV/AIDS on labor productivity. Annex C, by Malcolm McPherson and Tzvetana Rakovski, reports econometric evidence using Zambian data on the non-linear growth effect due to the intensification for the HIV/AIDS epidemic. As such it offers a test of the theoretical approach developed in the text.

1. Background to the Study

The literature on HIV/AIDS is truly enormous.[9] Two aspects of that literature concern us here, namely the economic impact of HIV/AIDS in Africa[10] and the implications of HIV/AIDS for public policy.[11]

Analyses of the costs of HIV/AIDS have focused primarily on the impact on the labor force, the family, the education system, and national economies. A major area of emphasis has been the rising costs due to the progressive debilitation and loss of workers. These studies highlight other negative effects including: the impact on organizations (public and private) associated with the added cost of training replacement workers, higher wage bills as additional staff are retained to compensate for absenteeism and worker debility, the costs incurred when work schedules are disrupted, the increase in employer provided health and medical costs, and the unanticipated depletion of pension and insurance funds.[12] The early literature suggested that these costs were small. More recent contributions are showing that these costs are rising rapidly. The implication is that both the rate of economic growth and the prospects for future growth have been compromised.[13]

Since the losses from HIV/AIDS are cumulative and data on the effects of the impact of the epidemic are unreliable (see Annex A), the overall impact of HIV/AIDS on the labor force has been subject to considerable uncertainty.[14] As noted in the discussion below, an important source of that uncertainty has arisen because analysts have tended to ignore critical aspects of the underlying dynamics when calculating the costs of HIV/AIDS. A major focus in the literature has been work place prevention. Far less attention has been given to the types of behavioral, social, and structural changes needed within the work place to prevent productivity and growth from falling.[15]

This has occurred despite important efforts to identify and advertise "best practices" for dealing with HIV/AIDS.[16] As Annex A shows, such practices have not been widely used. The reality is that, for many organizations and enterprises (and one might argue most of the countries of Southern Africa), the epidemic has elicited few constructive responses let alone the adoption of "best practices." Indeed, a major gap in the research (and practice) has been how to deal with a large and growing number of workers who know (or suspect) that their lives are being dramatically foreshortened.

Under conditions of high AIDS prevalence, as in Africa, conventional approaches to training, managing, organizing, and motivating workers need to be fundamentally re-thought.[17] There is little to suggest that HIV-positive trainees or workers should respond (or can be expected to respond) in the same way as those with a "normal" life expectancy. Moreover, the prospect of large losses of skilled workers from HIV/AIDS makes the value of long-term degree-based training problematic. One question that has not been answered is whether donor agencies are prepared to continue supporting long-term training in the face of rising attrition rates?

For employers, a key issue is the type of (cost-effective) incentives they can devise to induce HIV-positive workers to maintain their productivity. Faced with high and rising incidence of HIV/AIDS, no one should be surprised that employers (alone and collectively) are taking measures (often draconian) to contain their costs.[18]

One of the purposes of the review in Annex A is to show how organizations and businesses have sought to maintain productivity (and profitability) when significant numbers of workers will become debilitated and die. Such measures include the "externalization" of costs, the use of expatriate labor, and forced retirement of infected workers. These measures often reflect attempts by employers to shift the costs of HIV/AIDS onto the infected worker's family or onto society at large. Such practices will undoubtedly continue. Nonetheless, it should be recognized that employers are constrained in their ability to shift these costs. Some employers can succeed in the short-run. But, as the HIV/AIDS epidemic intensifies, the macroeconomic effects of these rising costs will feedback to affect the employers' output, sales, taxes, or access to social services.[19]

Cost shifting is a defensive strategy. What has not been widely considered is how to take a more constructive approach. Such an approach will emerge as managers begin to grapple with the following questions. How they can continue managing their operations effectively and efficiently when the incidence of HIV/AIDS is high and rising? This matter becomes increasingly complicated when the managers themselves are HIV-positive or suspect that they are. What institutional or organizational changes (to goals, workflow, or operational procedures) will enable productivity to be maintained? What actions will help counteract the lack of motivation, low morale, and counterproductive behavior (pilfering, absenteeism, asset stripping) that progressively encumbers an organization as more staff become debilitated and die? Finally, what measures can be taken *now* so that, when countries eventually begin to move beyond the HIV/AIDS epidemic, the damage to personal and social relations and economic growth is not irreparable?

The above questions have a common theme. They relate to the organizational, social, and economic dynamics of situations where a large (and increasing) number of productive lives are being dramatically shortened. This, we argue, is the context in which the impact of HIV/AIDS on economic growth (and development) has to be understood.

That context is missing from most analyses of the effect of HIV/AIDS on economic growth. The most common approach has been for analysts to provide a model of what they believe is the present structure of an economy. Then, based on their best estimates of trends in the incidence of HIV/AIDS, they derive alternative growth paths reflecting situations 'with' and 'without' HIV/AIDS. Kambou, Devarajan and Over, in one of the earliest examples of this approach, studied the impact of HIV/AIDS in Cameroon.[20] Using a Computable General Equilibrium (CGE) model, they derived two sets of projections. The first was a base case that abstracted from the effects of HIV/AIDS. The second allows for those effects. They did that by reducing the supply of labor by an estimate of what the losses to HIV/AIDS were expected to be over the projection period.

The results derived by Kambou, Devarajan and Over (and those of other studies cited below) underscore Dr. Piot's observation noted earlier. Subsequent evidence has shown that their projections grossly understated the effect of the epidemic on Cameroon and, by extension, other African countries.

There are several reasons for this, but two stand out. First, Kambou *et al*. could not have foreseen that new, virulent sub-types of the disease would emerge.[21] Second, using a CGE model to derive the alternative scenarios, 'with' and 'without' AIDS, is inappropriate. As the HIV/AIDS epidemic has intensified, economies have experienced substantial structural change.[22] This does not get adequately reflected in CGE models (or other fixed coefficient models) upon which the 'with AIDS' scenario was based.[23] Kambou *et al*. (and other analysts who have followed their lead) did not modify their basic model to reflect these changes.[24]

When their research was undertaken (1990), such an approach could be defended as a "rough first cut." At that time, the spread of HIV/AIDS was just beginning to accelerate. What cannot be defended, however, was the continued use of such comparative scenarios. This point, however, has not been widely appreciated. For example, the *Sunday Times* in South Africa reported that in mid-1997 the impact of the HIV/AIDS epidemic in 2005 would be to reduce overall growth rates of the economy by 1 percent per annum.[25] This projection has startling implications. It means that, with more than 20 percent of the adult population infected with HIV and likely to die within five years, the impact on South Africa's economic growth is expected to be incidental. Clearly, something is amiss.

Projection errors like these would be significantly less consequential if officials and the general public across Africa were more forthcoming about the extent of the epidemic. Indeed, with very few exceptions, the official and private response has been denial.[26] Events, however, may be changing that. During the last week of May 2000, viewers of Cable News Network around the world saw Thabo Mbeki, President of South Africa, at the time on a visit to the United States, attempting to justify his reluctance to face the reality of HIV/AIDS in his country.[27] Whether Mbeki has come to grips with the problems South Africa is facing or not, others have. The theme of the Durban conference in July 2000 was "breaking the silence." Mbeki gave a keynote speech. His predecessor, Nelson Mandela, whose tenure was notable for its absence of any serious effort to

confront the issue, has at last noted that history will judge harshly those who sit idly by. History so far has shown that until mid-2000, both Mandela and Mbeki ducked the issue. In the interim, South Africa (and Southern Africa in general) has borne a terrible cost. Millions of people have died and millions more will die because of their leaders' silence and/or ambivalence.[28] Their inaction or, at best, lukewarm response has killed large numbers of their own citizens.[29]

Unfortunately, there is nothing new about denial and limited recollections of (traumatic) events. History has many examples of societies and groups that exhibit such behavior. Wars and organized mayhem have been particularly fertile periods for generating selective social amnesia. Yet, in most cases, the denial relates to *events*. By contrast, the HIV epidemic is a *process*. Rather than dulling its impact, denial allows the epidemic to intensify.[30]

Scholars and practitioners dealing with HIV/AIDS on a day-to-day basis understand the folly of denial. Yet, there are many reasons why it has persisted. For example, as noted in Annex A, governments were reluctant to openly deal with HIV/AIDS because officials argued it would adversely affect tourism and foreign investment. Others have boxed themselves in by years of silence or cant. African journalists, for example, who failed to write candidly about the disease, and leaders who avoided the issue, face a dilemma. President Chiluba of Zambia provides an example. Though the conference was held in Lusaka, Chiluba failed to attend the "International Conference on AIDS and Sexually Transmitted Diseases in Africa" in September 1999. From his inauguration as president until the time of that conference, more than 500,000 Zambian children have become AIDS orphans.[31] Attending the conference risked advertising his lack of attention to the toll HIV/AIDS has had and was having on the citizens whose welfare he had sworn to protect. Though his absence from the conference received little attention in Zambia (where observers understood it was consistent with his past behavior), the foreign press took note.[32]

Donor agencies, too, have been caught in a web of denial. Although they generously support work by health ministries on prevention and treatment of HIV/AIDS, most donor agencies have failed to scale back their "development" agendas in line with the erosion of skills and institutional capacity in Africa as a result of HIV/AIDS. For example, both the World Bank and the International Monetary Fund have proceeded with their sector investment programs, comprehensive development frameworks, poverty reduction and growth strategies, as though the capacities of African governments remained unimpaired.[33] This directly contradicts the message the World Bank conveyed in its 1999 study *Confronting AIDS*. That study made referred to the *World Development Report* of 1997 where it was suggested that developing countries should ensure their development programs were consistent with "State capacity."[34]

African countries themselves have compounded these problems. Though they lack the relevant capacity to implement the donor-driven agendas, their key policy makers continue to accede to the various World Bank, IMF (and other donor) "initiatives." The

(predictable) result has been that most donor-supported adjustment programs are pre-programmed to fail.[35]

The above examples could be multiplied as the material in Annex A shows. The implication is that our basic conceptual models for dealing with the impact of HIV/AIDS are flawed. Understanding the social and behavioral dimensions of the HIV/AIDS requires that we correct these flaws. The model presented below is one option for doing that.

2. A Conceptual Framework

a. A Model of Retrogression

The basic framework adopted here for thinking about the dynamic impact of HIV/AIDS on economic growth draws on models of economic retrogression. These models were developed in the early 1990s[36] to examine the effects of rising levels of corruption and inefficiency on the growth paths of developing countries. The objective was to explain why a large number of countries in Africa had been exhibiting "patterns of growth" that did not conform to the (so-called) "normal" time paths derived by Kuznets and Chenery and his colleagues.[37] Economic regression became so pronounced in some countries (such as Zambia, Tanzania, and Senegal) that the relative contribution to GDP of agriculture had risen over time.[38]

Few of the plausible explanations for retrogression of this nature were 'exogenous.' (Drought "might" be seen as an exception.[39]) To capture these effects, the principal features of a regressing economy were modeled by reversing the direction of an endogenous growth model. Corruption, measured as an increase in the unlawful "diversion" of public resources, reduced the investible surplus. As corruption intensified, public confidence declined. There was an increase in capital flight (and other defensive actions by asset holders). This led to further reductions in investment. That, in turn, reduced the growth rate of income and lowered savings and investment even further. The model also incorporated a "backlash" feature that hinged on the reactions of groups most seriously affected by resource diversion. The same effect is produced in outside agents, e.g., donor organizations began forcing the governments they were supporting to observe principles of 'good governance.' This helped boost investor confidence, raising the rate of investment and helping spur income growth. Such a diversion/backlash mechanism generated a wide range of time paths for retrogression and recovery.

The above framework can be readily adapted for examining the dynamic impact of HIV/AIDS on economic growth. The rising prevalence of HIV/AIDS lowers worker efficiency, raises costs, and reduces individual savings and firms' profits. Individuals who are HIV-positive increase their consumption, in part to combat the effects of the disease and, in part, because the prospect of a premature death raises the opportunity cost of time.[40] These changes lower the supply of investible resources, at both the individual and national levels, and reduce the efficiency with which the existing stock of productive

assets is used. Those effects, in turn, lower the rate of growth of per capita incomes, setting off a further cycle of declining savings and investment.

One could imagine that such a process might have a "floor" that provides the basis for economic recovery if measures were devised to prevent the overall efficiency of the labor force from declining. Several mechanisms might suffice. One would be to lower the rate of infection of workers through reductions in the costs of combating HIV/AIDS.[41] Another would be to manage, train, and motivate workers who are HIV-positive in ways that maintain (and even improve) their productivity.[42] A third would be to use external resources (foreign aid and technical assistance) to compensate for the decline in the local supply of investible resources and loss of domestic skills.

A major problem with these measures is that, to be effective, they all require additional resources. This places many African countries, where HIV/AIDS is widespread, in a bind. To prevent further retrogression due to HIV/AIDS, they need additional resources. The resources, however, are not available because saving and investment have fallen as a result of the HIV/AIDS epidemic.

b. HIV/AIDS and Retrogression

The above description broadly summarizes our conceptual framework linking the effects of the spread of HIV/AIDS to economic growth. When an individual becomes HIV-positive, his/her productivity declines, medical expenses and other costs rise, and economic behavior changes (if for no other reason than economic horizons shorten).

The principal building blocks of this framework include:

- The theory of endogenous growth
- Falling rates of savings and investment
- Rising opportunity costs of time for those who are HIV-positive
- Declining labor productivity
- Progressive loss of skills and the increasing erosion of the effectiveness of key (social and economic) organizations

Each of these points is discussed in turn.

Endogenous Growth: Theories of endogenous growth derive their inspiration from a number of sources.[43] The principal idea is that increasing returns to scale (resulting largely from the accumulation of knowledge) boosts the rates of savings and investment. The higher rate of investment leads to an acceleration of the rate of economic growth. There are several "knowledge-based" explanations that are used to support this theory. These include "learning-by-doing",[44] "induced innovation",[45] the effects of rising population,[46] and "learning-by-trading."[47] In many African countries, particularly those that have had poor economic performance over extended periods, there is also the prospect of "learning-by-reforming," most notably during the transition period.[48]

Whether the resulting growth path involves a "permanent" acceleration of the rate of growth or cycles in the rate of growth (e.g., as in the so-called "new economy") is still subject to debate. The essence of endogenous growth is that there are "spread" effects that raise efficiency more generally in the economy. Adam Smith captured this idea when he described the advantages of the 'division of labor' that was earlier stimulated by the 'expansion of the market.'[49] The efficiencies resulting from specialization and the division of labor lowered costs thereby further expanding the market. In more recent times, Gunnar Myrdal described this as a process of "cumulative causation."[50] The basic idea is that existing economic activities benefit from the fact that improving efficiency in other enterprises help to lower their costs. The overall effect is for all enterprises whose costs are falling to take action to expand their output. This sets off another round of spillover effects.

These insights help explain why endogenous growth is such a useful framework for understanding the micro- and macro-economic effects of HIV/AIDS. The reduction in savings and loss of efficiency associated with the spread of the disease is akin to "running Adam Smith in reverse." As an increasing number of workers become debilitated and drop out of the labor force, many of the advantages of specialization and the division of labor are lost. Moreover, the loss of labor is a direct reduction of the nation's productive capacity.

Falling Savings and Investment: The basic problem with attempts to tease out an independent influence for the impact of HIV/AIDS is that the economic performance of many African countries had deteriorated even before HIV/AIDS began to spread.[51] For most African countries, the decline began with the oil and food "shocks" of the mid-1970s. Because of limited internal adjustment and frequent policy reversals, African countries were already heavily in debt and in precarious financial circumstances by the early 1980s. The HIV/AIDS epidemic compounded their problems. The difficulties were evident in adverse trends in key macroeconomic data. The following tables show that for most countries real income was declining, rates of investment and savings were falling, foreign aid flows rose rapidly, and there was a sharp increase in the debt burden. The data in the table covers the period 1970 to 1998 for SSA excluding South Africa and Nigeria.[52]

The data show that average real per capita income was lower in the 1990s than in the 1970s. Savings rates have declined over time. Investment has fallen by less than savings but only because of a major increase in foreign aid and foreign borrowing. The size and duration of these external flows has been unprecedented. No region of the world has received such extensive support for so long. Yet, even these large and persistent resource flows have been unable to maintain investment at levels that will raise national income on a sustained basis.[53] The severity of the economic stress has compromised recovery efforts. The spread of HIV/AIDS has further aggravated the situation.

In this regard, it is useful to recall Harry Johnson's characterization of economic development as a "generalized process of capital accumulation" where capital is broadly defined to include physical and human capital as well as institutions and organizations.[54]

Sub-Saharan Africa: Selected Macroeconomic Indicators, 1970-1998

Year	GDP per capita (1995 USD)	Gross Dom. Invest. share of GDP (%)	Gross Dom. Savings share of GDP (%)	Net ODA all donors (bill. USD)	Net ODA all donors share of GDP (%)	Total External Debt ratio to GDP (%)
1970	612.0	17.3	21.1	1.1	1.6	..
1971	634.0	18.0	20.2	1.2	1.8	14.7
1972	623.3	16.8	22.2	1.3	1.7	15.0
1973	642.2	19.1	25.2	1.6	1.7	15.2
1974	681.8	21.0	28.1	2.4	1.9	14.5
1975	670.3	22.6	23.4	3.3	2.3	15.6
1976	669.5	23.6	25.5	3.1	1.9	16.2
1977	649.6	20.6	26.4	3.6	2.1	21.1
1978	641.0	20.4	24.1	4.9	2.6	24.8
1979	644.7	18.4	25.5	6.3	2.7	24.0
avg. 70s	**646.8**	**19.8**	**24.2**	**2.9**	**2.0**	**17.9 ***
1980	660.9	20.2	28.5	7.4	2.5	22.9
1981	671.7	22.8	23.2	7.3	2.5	26.4
1982	648.0	19.8	21.1	7.5	2.8	31.5
1983	617.3	16.2	20.5	7.3	2.9	37.1
1984	623.0	15.5	21.0	7.6	3.3	41.4
1985	601.6	13.8	21.2	8.5	4.1	54.2
1986	595.4	14.6	20.9	10.5	4.6	56.2
1987	591.8	14.6	20.5	12.1	4.8	58.6
1988	599.2	16.5	19.2	13.7	5.2	56.9
1989	599.0	15.8	19.4	14.5	5.4	58.3
avg. 80s	**620.8**	**17.0**	**21.5**	**9.6**	**3.8**	**44.4**
1990	587.2	14.2	17.9	17.3	5.8	59.7
1991	573.5	17.0	18.2	17.0	5.6	60.6
1992	550.2	14.7	13.0	18.3	5.8	60.0
1993	542.6	16.2	14.5	16.8	5.5	65.5
1994	541.5	17.5	16.5	18.2	6.3	78.1
1995	548.5	18.5	16.2	17.9	5.6	73.6
1996	558.8	17.7	17.7	15.7	4.7	69.5
1997	561.9	17.4	16.4	14.2	4.1	63.6
1998	558.2	17.8	14.8	..	..	54.5
avg. 90s	**558.0**	**16.8**	**16.1**	**16.9 ***	**5.4 ***	**65.0**

Notes: * - Average for the years with observations

Source: World Bank Africa 2000 CD-ROM Database

Sub-Saharan Africa excl. South Africa and Nigeria: Selected Macroeconomic Indicators, 1970-1998

Year	GDP per capita (1995 USD)	Gross Dom. Invest. share of GDP (%)	Gross Dom. Savings share of GDP (%)	Net ODA all donors (bill. USD)	Net ODA all donors share of GDP (%)	Total External Debt ratio to GDP (%)
1970	334.6	15.0	24.9	0.9	3.4	..
1971	344.7	15.7	22.3	1.1	3.6	25.3
1972	347.6	16.1	23.7	1.2	3.7	25.9
1973	349.5	16.9	25.2	1.5	3.8	26.6
1974	363.5	19.4	26.9	2.4	4.9	28.1
1975	362.6	20.2	23.0	3.2	5.6	29.8
1976	372.3	19.9	25.5	3.1	4.8	32.1
1977	370.0	19.5	24.5	3.6	5.0	38.4
1978	367.1	19.1	22.1	4.9	6.0	42.6
1979	366.2	17.6	20.5	6.3	6.6	42.7
avg. 70s	**357.8**	**17.9**	**23.9**	**2.8**	**4.7**	**32.4 ***
1980	357.4	18.1	20.4	7.4	6.5	45.4
1981	362.0	18.8	18.6	7.3	6.3	50.7
1982	359.8	17.7	19.4	7.5	6.7	57.4
1983	353.4	15.3	19.2	7.2	6.9	64.0
1984	348.7	14.2	20.7	7.5	6.8	67.2
1985	346.9	14.7	20.8	8.5	7.3	78.7
1986	349.4	15.2	20.6	10.4	7.7	75.8
1987	347.0	15.4	19.2	12.0	8.4	82.6
1988	349.2	16.7	16.5	13.6	9.1	80.5
1989	348.3	15.3	15.9	14.2	9.5	84.4
avg. 80s	**352.2**	**16.1**	**19.1**	**9.6**	**7.5**	**68.7**
1990	341.5	16.0	15.0	17.0	11.0	91.7
1991	336.4	20.1	16.6	16.7	10.8	96.7
1992	322.7	15.7	7.0	18.0	12.5	109.2
1993	316.3	17.3	10.1	16.3	11.4	120.8
1994	314.1	19.3	14.3	17.7	14.3	135.4
1995	322.6	19.3	12.6	17.3	12.5	126.0
1996	330.9	20.2	13.3	15.1	10.0	113.5
1997	335.5	19.6	14.4	13.5	8.6	105.4
1998	338.3	19.3	13.3	..	..	..
avg. 90s	**328.7**	**18.5**	**13.0**	**16.5 ***	**11.4 ***	**112.4 ***

Notes: * - Average for the years with observations

Source: World Bank Africa 2000 CD-ROM Database

Much of what African countries have experienced over the last two decades, as a result of economic decline and the spread of HIV/AIDS, can be seen as a generalized process where capital (as defined above) has been decumulating. Since income is the return on wealth and wealth is the capitalized value of income, the reduction in the stock of (all types of) capital has led to lower rates of income growth (with declines in numerous instances), lower savings and (despite large amounts of foreign aid) lower investment.

Another factor that has endogenously lowered savings and investment has been the general loss of confidence among (local and foreign) investors in Africa. The process whereby that has happened can be understood in terms of the theories of irreversibility and options values. Investment is defined as an action that involves a certain present outlay in the expectation of a future return. All investment is characterized by some sunk costs, or "irreversibility." Those costs may be reflected in the purchase of specialized equipment, the time taken to conceive of and develop the investment project, or the opportunity cost of alternative investments passed over once the decision to pursue a particular course of action is taken. These costs, by definition, cannot be retrieved should the investment be liquidated. Investors expect, however, that future returns from the investment will amortize these sunk costs.

The prospect of irreversible costs adds to the uncertainty. It also raises the question of the value of alternative options. These "option values" exist because all investors have alternatives, the most obvious of which is to do nothing, i.e., decide to wait. But, like all investment, "waiting" has an opportunity cost as well. When there is growing uncertainty, as has been the case in African countries where growth has been so low, the costs of waiting are more likely to be small relative to the potential costs associated with irreversibility. For many potential investors in African countries, especially those with connections to international financial markets, the alternative activities may be lucrative, low risk and highly attractive.

Taken together, the notions of irreversibility and options values are crucial considerations when both locals and foreigners contemplate investing in African countries. Investors are more likely to wait when they have information indicating that the spread of HIV/AIDS will affect adversely the cost structure of any investment they are contemplating. Under these circumstances, waiting provides time to reassess and re-evaluate their options. Having a low-risk, secure (foreign) alternative investment reduces the urgency of committing their resources.[55] The outcome has been devastating in terms of stimulating new activity across Africa. As the perceived costs of dealing with the spread of HIV/AIDS rises, the rate of investment tends to decline. This has reinforced the decline in the supply of investible resources, already under pressure through falling productivity due to the spread of HIV/AIDS.

Rising Opportunity Cost of Time: One microeconomic mechanism that has reinforced the decline in savings has been the diminished incentive for those who are HIV-positive to save. Although many people who are HIV-positive also have lower incomes from which to save, especially as they become increasingly debilitated, the two effects need to be analyzed separately. The prospect of a premature death raises the opportunity cost of

time. There is now a wealth of research, dating back to Irving Fisher, tracing the systematic changes that occur in the ratio of consumption to saving as patterns of time preference change.[56] For risk averse individuals, the standard result is that time preference is inversely proportional to the length of the decision horizon. The relevant decision horizon for people with HIV/AIDS shortens dramatically. As noted in Annex B, it is normally five to seven years from the diagnosis of HIV to the onset of AIDS. Death comes within one or two years after that.

A similar response can be derived from the 'life-cycle' model of savings.[57] The underlying theory recognizes that there is a systematic shift in the relationship between a worker's earning potential and the pattern of family formation over his/her life cycle. Early in a person's working life, income streams and resource demands are rising. With the expectation of a "normal" life span of work, the person has the capacity to finance his/her consumption and asset accumulation goals based on the expectation of higher income flows later in his/her productive life. The spread of HIV/AIDS, however, has sharply reduced what individuals can "normally expect" from their (truncated) life span of earnings. Once an individual is HIV-positive, his/her consumption rises while at the same time his/her potential future earnings stream is cut. Thus, when viewed in terms of the 'life-cycle' model, we would expect to see a major reduction in individual savings. To the extent that the individual has accumulated wealth during his/her working life, there will be dissaving.[58]

Much the same result can be derived from the notion of 'overlapping generations.' The typical approach is to assume two generations – one generation produces, the other consumes. (The effect is the same as a continuous two-part 'life-cycle'.) In this formulation, accumulation and growth occurs because the output (or income) produced by the generation of producers exceeds the output absorbed (or expenditure) of the generation of consumers. With the spread of HIV/AIDS, this balance between production and consumption shifts in ways that reduce this inter-generational surplus, thereby reducing accumulation. This effect is reinforced as the dependency ratio (the ratio of workers to persons under 15 years of age) shifts. A major feature of the HIV/AIDS epidemic has been the sharp rise in the number of orphans.[59] The implication is that the extent to which the generations overlap has undergone a serious, systematic, and adverse change. The net outcome is to reduce the capacity of economies with a high prevalence of HIV/AIDS to save and invest, and ultimately to accumulate and grow.

Declining Labor Productivity: Factors that reduce the rate of investment lower labor productivity by reducing the level and/or rate of growth of physical capital with which labor is combined to generate output and income. From the usual conditions attached to production functions (positive productivity of all factors, diminishing marginal productivity of individual factors), a decline in capital per worker reduces output per worker (all other things being equal). Further reductions in productivity occur when workers are demoralized and distracted.

Apart from those who are in complete denial, individuals with HIV recognize that they face a premature death and a shortened decision horizon. Under normal circumstances,

individuals facing rising opportunity costs of time would invest in labor saving capital and technology. This option is often unachievable for those who are HIV-positive due to higher costs they incur for (formal or traditional) medical services. Thus, while the spread of HIV/AIDS induces the need for higher rates of investment to help maintain worker productivity, it erodes the means by which such investment can be financed.

If finance could be arranged (for example, through the efficient use of foreign assistance), the strategic use of new technology would allow countries to compensate for the loss of labor due to HIV/AIDS. The obvious drawback to such a strategy is that it takes resources to acquire new technologies and skilled personnel to operate them. Though a drawback, this should not be an insurmountable problem, particularly if attention is given to devising goal-oriented practical training.[60]

A further element reducing labor productivity is the reduction in real effective demand associated with the decline in real per capita income. As already noted, real incomes across Africa were declining well before the onset of the HIV/AIDS epidemic.[61] Adding HIV/AIDS to the equation has reinforced the decline. This has occurred through a mechanism described by Adam Smith over two centuries ago. But, while Smith described the benefits (to output, productivity, and growth) of expanding the "extent of the market," the circumstances in Africa have been equivalent to running the mechanism he described in reverse. The decline in real effective demand raises the unit costs of all domestic activities. For African countries where infrastructure is poorly developed, one obvious change is an increase in transport and distribution costs as a proportion of total costs. The relevance of this point becomes increasingly evident when one distinguishes, as T.W. Schultz did, between the economic and the physical supplies of land.[62] The latter is the land base of a country or region. The former is the land area that, for given technology and market conditions, yields a positive net rent. Declining real effective demand reduces the net rent from all economic activities and by extension reduces the productivity of all factors including the labor that contributes to these activities. The outcome is contraction in the economic supply of land. Furthermore, since land is an important component of wealth in African countries, the declining economic supply of land reduces the value of wealth. This leads to a further contraction in real effective demand, further lowering the productivity of associated factors of production.

Other factors contribute to the decline in labor productivity. The theory of efficiency wages is based on the recognition that, because of fixed costs of employment (hiring, training, settling-in), firms will have an incentive to pay above-market wages in order to keep their employees. A further aspect of the theory is that firms will pay workers above-market wages because of the direct link between wages and worker productivity.[63] Annex A reviews what employers have been doing in Southern Africa through training and reorganization of work schedules to maintain productivity. Annex B explains the incentives employers have to providing training.[64]

In these matters, one can readily imagine that both these processes work in reverse as the HIV/AIDS epidemic intensifies. Because of increasing debility and absenteeism, the marginal value product of workers who are HIV-positive is less than the wage being paid

by the employer. Faced with this situation, firms have an incentive to reduce employment and/or take steps to reduce labor costs. Doing this, however, reduces the incomes of all their employees whether they are HIV-positive or not.[65] To the extent that the efficiency theory of wages holds, overall efficiency declines.

The severity of the economic decline in Africa, however, has resulted in some practices that tend to contradict the efficiency theory of wages. There is mounting evidence that working hours have tended to increase across Africa as a means of counteracting the decline in reward per hour. The problem has been compounded by the inability of most African countries to generate increases in net employment in their formal sectors. In Zambia, for example, there has been no increase in formal sector employment for more then two decades.[66]

This "informalization" of employment has increased average hours worked in a number ways. Employers in the informal sector, by definition, are not subject to government regulation. Individual workers have the option of remaining unemployed or accepting the conditions offered. A second factor has been the proliferation of "coping strategies." Such strategies are low productivity, time-intensive activities that are characterized by extreme risk aversion. They generate limited amounts of income but because the risks of disruption created by government interference have been minimized, the variability of income is low.

The trends are antithetical to efforts to raise growth since they work in ways that tend to lower productivity. The growth accounting literature, for example, has shown that a major source of productivity growth in developed countries has been the *reduction* in hours worked.[67] Several factors contributed. Shorter working hours reduce worker fatigue, improve motivation, and require employers to pay closer attention to organization and management. Since much of the change in hours of work has come from dropping the half-day on Saturday, there was also an increase in the ratio of productive work time to travel time.

A negative link can emerge between the process of economic retrogression and declining labor productivity. As economies regress, the lower level of output systematically lowers the average product of labor. Unless real wages fall at a rate faster than the decline in productivity, or the exchange rate depreciates correspondingly, unit labor costs will rise. Without these adjustments, the rising prevalence of HIV/AIDS will further undermine international competitiveness across Africa. Since African countries have already undergone considerable "marginalization" due to the inability to compete in international markets[68] and to grow,[69] a continued loss of competitiveness will undermine their capacity for sustained growth and development.

There is an ironic twist in these changes. The typical argument has been that globalization and premature liberalization lead to the loss of competitiveness as goods produced by "cheap" labor out-compete local products. The logic of the argument above is that, in countries where HIV/AIDS is spreading rapidly, real unit costs of labor will need to decline (i.e., labor will need to become correspondingly "cheaper") if these

countries are not to suffer adversely from competitive labor in countries (both developed and developing) where HIV/AIDS has a less severe impact on productivity.

We conclude this section by noting the special problems facing agriculture. There is now widespread evidence pointed to exceedingly high rates of HIV infection in many farming and fishing villages.[70] The death of large numbers of working age adults in rural areas has led to a dramatic increase in the number of child-headed households and orphans living with their grandparents.[71] For years, agricultural specialists have argued that in order to boost agriculture across Africa there has to be an expansion of technology and knowledge-based production. Governments and donor agencies have devoted large amounts of effort "extending" such technology and knowledge through a variety of (often costly) programs. The emerging dilemma is how the farming households headed by children and grandparents can raise the resources and absorb the knowledge (and hence take the steps) needed to raise agricultural productivity.

Agricultural scientists and professional extension workers were encountering major difficulties formulating and conveying information about appropriate "packages" to African farmers well before problems associated with the spread of HIV/AIDS emerged. Their task is orders of magnitude more difficult now, particularly since the loss of adult workers has lowered the average educational levels in rural areas. Without potential solutions, the productivity of agriculture will decline and the one sector in Africa that has the prospect of stimulating growth and reducing poverty, namely agriculture, will continue to falter.

Progressive Loss of Skills and Erosion of Institutional Capacity: A major consequence of HIV/AIDS in organizations such as government departments and agencies is the loss of "institutional memory." As more senior members of the staff become debilitated and die, there are fewer people with the experience to help younger staff members place their work in perspective. There is also a decline in the amount and scope of on-the-job guidance ("mentoring") that is common to all large organizations. The loss of senior staff affects the consistency and direction of organizations as well. For example, budget offices and central banks depend for their effectiveness on a set of well-established procedures being followed. The loss of key staff from these (and other) organizations has undermined the ability of African governments to provide the services crucial to operating a modern economy.

Countries where HIV/AIDS has spread rapidly have major difficulties maintaining the integrity of these organizations and their procedures. In Zambia, for example, the rate of staff attrition has been so high in these key organizations that they have been progressively unable to fulfill their roles in effectively managing the economy.[72] Loss of staff is only one of several issues. Because the Public Service Commission has been slow to confirm staff in their positions, the number of "acting" appointments has proliferated. This reinforces the sense of impermanence in the civil service further reducing morale and performance. An added outcome has been an increase in irresponsible behavior and opportunism that (due to lack of monitoring and declining morale) remains largely undetected and un-remedied.

In the *limits of organization*, Nobel laureate Kenneth Arrow explained why modern economies and societies have large organizations. Arrow noted that when viewed in purely economic terms "…organizations are a means of achieving the benefits of collective action in situations in which the price system fails."[73] Their purpose, Arrow asserted, is "…to exploit the fact that (virtually all) decisions require the participation of many individuals for their effectiveness."[74] The pervasive character, persistence, and cost of uncertainty imply a special need for cooperative decisions and, consequently, for organizations. Arrow discussed how improvements in organizational design that enhance the flow of information improve the effectiveness of collective actions. He also noted the importance of education (referring specifically to Pareto's notion of the "circulation of elites", i.e., the highly skilled) as providing the basis for redefining the agendas of organizations and raising their performance and thereby adding to social welfare.[75]

As we have done earlier, one can readily imagine this process running in reverse. As HIV/AIDS takes an increasing toll on skilled workers (particularly those who provide the administrative and strategic capacities), the performance of critical organizations will decline. In extreme cases, the organizations may even become dysfunctional, especially in cases where HIV/AIDS compounds the operational difficulties of organizations that were already under serious economic stress. Obvious examples are the many state-owned enterprises across Africa whose effectiveness has diminished as they scale back to curtail their deficits and pay off their accumulated debt.

Overview: The above points have highlighted some of the considerations that underpin the approach taken here to the impact of HIV/AIDS on economic growth. All of the mechanisms described draw on well-established theoretical constructs. We have taken advantage of the fact that economic regress, like economic growth, is a systematic process. Most of the familiar relationships that we habitually see as fostering "progress," can also be reversed.

The problem with regression, however, is that once underway, there has (so far) been no easy stopping point. Some African countries --- Ghana, Zambia, Tanzania, Senegal, Cameroon, and Chad come readily to mind --- have experienced long periods of economic decline and dissipation. Re-creating the conditions for growth and development has been far more difficult than simply reversing the direction. Attitudes shift, behavior changes, and the demands for additional "safety-margins" and "security" intensify before individuals will re-embrace the economic reforms. When the damage wrought by the spread of HIV/AIDS is added, the difficulties are compounded.

3. Testing the Model

a. Some Preliminary Results

It is beyond the scope of this paper to formally develop and broadly test a cross-country model of HIV/AIDS-induced retrogression described above. In Annex C, however, we

have estimated a small (four equation) econometric model using Zambian data to determine if two variables most directly related to the spread of HIV/AIDS, changes in life expectancy at birth and changes in the dependency ratio, have had an independent effect on economic growth.

The model covers the period 1968 to 1998. It was estimated using three-stage least squares (3SLS).[76] The four equations explain the growth of real income, the growth of real investment, the change in the nominal exchange rate, and the change in the domestic price level. The last two variables have been included to capture the effects of the underlying economic disruption to which the problems created by the spread of HIV/AIDS have added.

Zambia's present economic problems began in the mid-1970's, when in response to a major output and price shock in the copper sector, the government attempted to finance the resulting economic imbalances rather than adjust. The combination of large amounts of foreign assistance (well over 20 percent of GDP for extended periods), a series of failed adjustment programs (eleven so far), large budget deficits, rapid monetary growth, and manipulated exchange rates, have led to a sustained decline in real per capita income in Zambia. Under Kaunda's second republic (1972-1991), that decline was close to 50 percent. So far, under Chiluba's third republic (1992 to the present), the decline has been around 30 percent.

The HIV/AIDS epidemic has been superimposed upon this broad-based and (essentially) unrelieved pattern of economic regress. With HIV infection rates for the adult population of well over 20 percent, Zambia's experiences, unfortunately, offer an opportunity to gauge the value of the endogenous growth model as a framework for linking the effects of HIV/AIDS to economic growth.

The growth equation contains the change in real investment, the change in the real exchange rate, the change in life expectancy at birth, and the change in foreign aid. The investment equation includes the growth of real income, the growth of the labor force, and the change in the real exchange rate. The intention is to determine the direction and strength of the relationships among growth, investment, life expectancy, and age dependency within the context of a simultaneous system. A full explanation of these variables and the results are reported in Annex C.

The change in the life expectancy ratio is included in the growth equation to measure, to the extent possible, the independent effect of HIV/AIDS. Since investment is a major determinant of growth and age dependency has an important effect on savings behavior, we expect the link from age dependency to growth to be indirect. Sharp changes in life expectancy and age dependency have been evident in Zambia from the early 1990s, the period when HIV/AIDS became a full-blown epidemic. The labor force growth rate (which began to decline during the 1990s) is included in the investment equation to capture the effect on investment demand of the growth of the labor force. A key element of all theories of economic growth (dating from the Harrod-Domar model) is that

employers attempt to maintain the stock of capital per worker. Such behavior would keep investment (adjusted for depreciation) growing at least at the rate of the labor force.

Preliminary results from this small empirical model show that change in the life expectancy at birth and the age dependency ratio have statistically important effects on the rate of economic growth with the expected respective signs. The coefficient of the change in life expectancy in the growth equation is 0.68 and is highly statistically significant. The coefficient on age dependency in the investment equation is –1.159 and is also highly significant.

Although they are explained in more detail in Annex C, these results show that the dramatic drop in life expectancy recorded in Zambia during the 1990s has reduced the rate of economic growth. Furthermore, the increase in age dependency has reduced investment. Because of the direct links from investment to growth, this too has reduced the rate of economic growth.

b. Developing a Full Scale Model

While the results we have obtained are suggestive, there are important issues not addressed here. What economic responses can be expected as the HIV/AIDS epidemic intensifies? What is the feedback from declining growth rates to the spread of HIV/AIDS? Is there evidence that the spread of HIV/AIDS is creating barriers to economic recovery? Testing these ideas will require the specification and estimation of a broader, more comprehensive, comparative model. The remainder of this section discusses issues involved in doing that.

From the outset, the endogenous growth framework we have proposed already provides useful insights regarding the dynamics of HIV/AIDS. There is a problem with using the model to make projections. Earlier, we noted that the conventional estimates of growth scenarios based on estimates derived 'with AIDS' and 'without AIDS' misrepresent the underlying dynamic relationship between HIV/AIDS and economic growth. African countries have been experiencing the progressive (and cumulative) effects of the epidemic for most of the last two decades. Thus, there is no model of an African economy that can be constructed *without* the impact of HIV/AIDS having already influenced its basic structure. In practical terms, this implies that any projections made using a model will need to be updated on a regular basis as more information emerges on the changing structure of the underlying economy due to the spread of HIV/AIDS.

Another factor hindering the construction of any model is the general lack of data on the course of the epidemic. As noted in Annex A, the data that are available are not highly reliable or complete due to the widespread pattern of denial and official obfuscation. Faced with these circumstances, modelers invariably turn to proxies as we have done above. Proxies are variables that are highly correlated with the variables that cannot be fully observed.

Obvious proxies are those used above (life expectancy and age dependency). Many more could be used. Some of these include the growth rate of population, trends in the production of staple foods (which in Africa are typically highly labor-intensive), the gap between actual and expected death rates, changes in the flow of foreign aid devoted specifically to health, the number of extraordinary deaths among health workers and teachers, and the increase in "acting" staff in the civil service. These variables would be included in a broader econometric model for a particular country, or set of countries, and examined for both the sign and significance of their coefficients. As demonstrated by the example provided in Annex C, there are now a host of small-scale models that include some of the key macroeconomic variables containing the main elements of a model of retrogression.[77]

It is always difficult and somewhat presumptuous to predict the sign and significance of variables in simultaneous equation models. That difficulty is accentuated in an African context where many countries for many years have had large internal and external imbalances. Because many of these economies are in transition as they reform, empirical estimates often show estimated relationships that run the wrong way. For example, it is common to find that imports and the nominal exchange rate are positively related. In this case, the problem is that most countries receive additional foreign assistance on condition that they devalue their currency. Thus, a depreciation of the exchange rate is often associated with a surge in imports. Both variables, however, are highly correlated with a "third variable", namely, foreign aid.

The role of simultaneous estimation is to help sort out the various direct and indirect associations among the key variables. Nonetheless, because most African countries have been operating well inside their production possibility frontiers for so long, many of the normal "trade-offs" that apply when the economy is in general equilibrium do not hold. They only begin to take effect once most of the slack has been eliminated from the economy.

Where does this analysis leave us? The theoretical discussion and empirical results in Annex C suggest that that the model of retrogression (based on endogenous spillover effects) is a useful direction to pursue. Furthermore, as expected, the initial results suggest that there is a curvilinear relationship between the course of the HIV/AIDS epidemic and economic growth. Initial evidence from the model is that the elasticity of income with respect to changes in life expectancy is less than unity. Does this imply that some important thresholds (with respect to the supply of skills or the performance of key organizations) have already been crossed? Such details will have to await studies of individual countries.

In Zambia's case, however, we do know that the country has been undergoing sustained economic decline since the mid-1970s. Despite almost a dozen formal adjustment programs, successive Zambian governments have been unable to reform the economy in ways that produce sustained economic growth and development. What is clear from those who have studied the economy closely is that the accelerating loss of skilled personnel and the increasing pattern of institutional dysfunction among key organizations

(central bank, ministry of finance, ministry of agriculture) suggest that economic recovery will not be automatic or rapid.[78]

What are the next steps? What does the above approach suggest about the implications of HIV/AIDS on economic growth? Under present circumstances, African countries will remain in a downward spiral so long as behavior patterns do not change. These changes need to occur on three levels. First, the personal and collective behaviors that lead to the spread of HIV have to be modified. Second, governments have to ensure they devote their full attention to promoting and sustaining economic reform. And third, foreign agencies interested in helping African countries move beyond the ravages of HIV/AIDS have to radically restructure their assistance so that it does not overload the agendas of governments that are already severely over-stretched.

Are the prospects high that these three requirements will be met? High-risk activities in many parts of the continent are being modified. This may be happening too slowly for some specialists. Nonetheless, knowledge about HIV/AIDS is widespread and national leaders are beginning to speak out, after years of irresponsible and, for many of their citizens, fatal silence. The challenge is to sustain the progress that is being made. Of course, for some collapsed and collapsing states (the former Zaire, Congo-Brazzaville, Sierra Leone, Zimbabwe, Angola, Somalia, Liberia, Rwanda) much more will have to be done before progress of even the most rudimentary form emerges.

On the second point, African governments have development agendas that keep them over-committed.[79] The result is that much of the efforts towards economic reform across Africa have essentially been preprogrammed to fail. This matter can only be resolved if African governments, and those whose representatives assemble periodically in Brussels, Paris, London and Washington to determine Africa's development agenda, reduce what is being attempted so that whatever is achieved can be sustained. In this regard, the experience of Asian countries over the last three decades has a clear lesson for Africa.[80] Focus on a few priorities that matter most. Make progress on them, and build upon that.[81]

Regarding the third point, the majority of donor agencies continue to pursue a muddle of jumbled initiatives and distorted priorities. Being the largest and most prominent, the World Bank and the International Monetary Fund, are perhaps the easiest to categorize. After fifty plus years of operation, World Bank management is still groping to discover the types of actions and activities essential to economic development.[82] The World Bank supports some excellent research. Nonetheless, there has been a major disconnect between the lessons of that research and the conclusions drawn by the Bank's management. This has greatly diminished the contribution to development that the Bank could have made if its resources (financial and intellectual) had been selectively and judiciously applied.

For much of the last three decades, the IMF has attempted to soften its 'sharp-pencil' image. Its latest venture in this direction is to encourage developing countries to formulate and implement "poverty reduction and growth strategies." There are serious

doubts about whether the IMF can (or even should) attempt to deal with poverty in a systemic way. At the very least, the emphasis in the strategy is back to front. Without an emphasis on growth, poverty reduction has proven to be impossible. Furthermore, as recent debates surrounding the Meltzer report to the U.S. Congress have shown, we are not alone in arguing that any focus by the IMF on "poverty reduction" misconstrues the role of the Fund and pushes it into areas where it has a major comparative disadvantage.[83]

The implication is clear: to borrow Wellington's phrase, much "hard pounding" is needed. To be effective, African citizens, policy makers, and the donors that wish to help will have to confine their attention (and keep it confined) to the issues instrumental to growth. Since that has not happened across Africa in the last three decades, what are the indications that it will begin to happen?

Unless one begins to look beyond the depth and breadth of the tragedy that has been unfolding with the spread of the HIV/AIDS epidemic, it would be difficult to believe that circumstances can change dramatically. Yet, as President Clinton noted in his inaugural speech "there is nothing wrong with America than cannot be cured by what is right in America."[84] Africa and Africans are resilient. Some, like the editors of *The Economist*, may have given up and branded the continent as "hopeless."[85] For others, the challenge is to continue striving. HIV/AIDS has exacted and will continue to exact a terrible toll. After a belated response there are indications that major efforts are being made to change behavior and contain the disease. These efforts will slowly take effect and provide Africans with the hope that they can begin to think about tackling the development challenges they face as they move beyond HIV/AIDS.

4. Concluding Comments

This paper describes a conceptual framework for assessing the effects of HIV/AIDS on economic growth. The framework we use has a number of novel features. It dispenses with the conventional approach of comparing scenarios that purportedly pertain to situations 'with AIDS' and 'without AIDS'. We argue that such approaches are fundamentally flawed. In particular, they grossly misrepresent the dynamics of the HIV/AIDS epidemic.

The approach we follow takes its inspiration from endogenous growth theory. That theory explicitly recognizes the spillover effects that result from increasing returns to the generation, dissemination, and use of knowledge. The spillovers raise the rate of savings and investment, and ultimately the rate of growth. The spread of HIV/AIDS has negative spill-over effects that undermines a country's capacity to save and invest. To measure the impact of the epidemic, we imagine an endogenous growth model "running backwards." Using this mechanism, we can explain why and how economic growth will decline as HIV/AIDS intensifies.

We further enhance the dynamics of the model by taking advantage of several other theoretical concepts --- the opportunity cost of time, irreversibility and option values,

efficiency wages, over-lapping generations (or 'life-cycle') theories of saving, and coping strategies. These ideas help explain the various incentives that individuals and employers confront as they deal with issues related to HIV/AIDS. We conclude that when the prevalence of HIV/AIDS is high and rising, as has been the case in most African countries, the incentives are skewed towards greater consumption and reduced investment. The consequence is a decline in the rate of growth.

Most African countries have been under extreme economic stress as a result of the shocks of the mid- and late-1970s and weak (mainly failed) attempts to adjust to these shocks. The HIV/AIDS epidemic has added to the stress. By stripping countries of some of their best talent and undermining the incentive to invest, these difficulties may be condemning African countries to extended periods of stagnation and decline.

The challenge for policy makers and agencies that seek to help promote growth and development across Africa is to understand how the epidemic is affecting the behavior and activities of everyone in society. Special attention needs to be given to the challenge of maintaining (and even increasing) productivity of those who are HIV-positive. Doing this will require a shift in attitudes and the re-orientation of current programs. A further dimension will be to help stabilize the key organizations responsible for managing the economy and maintaining the integrity of basic social processes. This is an area where the donor community can make an effective contribution. Though it appears to be "turning back the clock", donor agencies have a special role in providing technical assistance to strengthen the performance of these organizations. In the absence of such support, it is difficult to see how African countries, on their own, can break out of the pattern of regression that the spread of HIV/AIDS has been reinforcing.