More Growth or Fewer Collapses?
A New Look at Long Run Growth in Sub-Saharan Africa

Jorge Saba Arbache and John Page
TheWorld Bank

October 2007

Abstract

Low and highly volatile growth define Africa's growth experience. But there is no evidence that growth volatility is associated to long term economic performance. This result may be misleading if it suggests that volatility is not important for economic and social progress. In this paper we use a variant of the method developed by Hausmann, Pritchett, and Rodrik (2005) to identify both growth acceleration and deceleration episodes in Africa between 1975 and 2005. We find that Africa has had numerous growth acceleration episodes in the last 30 years, but also nearly a comparable number of growth collapses, offsetting most of the benefits of growth. Had Africa avoided its growth collapses, it would have grown 1.7% a year instead of 0.7%, and its GDP per capita would have been more than 30% higher in 2005. We also find that growth accelerations and decelerations have an asymmetric impact on human development outcomes. Finally, our results suggest that it is easier to identify the likely institutional and policy origins of growth decelerations than of growth accelerations.

Corresponding author: Jorge Saba Arbache, World Bank, 1800 H St, NW, Washington, DC, 20433; email jarbache@worldbank.org.

1. Introduction

During the last three decades growth in Sub-Saharan Africa (hereafter Africa) has been both low and highly variable (Ndulu et al., 2007). Between 1975 and 2005 per capita income PPP grew by 0.7% per year, by far the lowest figure among developing regions. At the same time country growth rates were highly volatile. Interestingly, however, there is no evidence that growth volatility was associated with Africa's poor long term economic performance (Arbache and Page, 2007a). This result is unexpected (Ramey and Ramey, 1995, Hnatkovska and Loayza, 2004) and may be misleading. Perhaps because no statistical association exists between Africa's long term growth rate and its volatility, most attempts to explain Africa's growth performance have focused on investigating the determinants of growth overtime and across countries using standard models and techniques (Ndulu et al., 2007, O'Connell and Ndulu, 2000, Collier and Gunning, 1999). Instead, given Africa's high growth volatility, it may be more relevant and rewarding to examine the causes and consequences of medium term deviations from the long run trend – growth accelerations and decelerations.

Building on the work by Hausmann, Pritchett and Rodrik (2005) (hereafter HPR), we propose in this paper an empirical method to identify growth accelerations and decelerations relative to a country's long term growth trend. Focusing on both good times and bad times gives us a broader view of the growth experience, which we believe to be particularly relevant for Africa. To reflect the heterogeneity of African countries' long run performance, we endogenize economic conditions into the methodology by defining episodes of growth and decline relative to each country's long run trend growth. In contrast, HPR and related literature impose common parameters across countries to identify growth accelerations.

Using our methodology, we find that African countries have experienced numerous growth acceleration episodes in the last 30 years, but also a comparable number of growth collapses. In short, Africa's long run record of slow and volatile growth reflects a pattern of alternating, identifiable accelerations and declines, rather than random variations of growth rates around the long run trend. We also find that growth volatility – when viewed as the product of accelerations and declines – is not neutral and indeed matters for economic and social outcomes. To begin to address the public policy questions posed by these results, we

look for correlates associated with acceleration and deceleration episodes and examine the probability that an economy will undergo a growth acceleration or deceleration.

This paper is organized as follows. Section 2 briefly discusses the Africa's growth experience. Section 3 presents the methodology for identifying growth accelerations and decelerations. Section 4 presents the main results. Section 5 examines whether growth accelerations and decelerations matter for economic and social outcomes and looks at correlates of accelerations and decelerations. Section 6 concludes.

2. Africa's growth 1975-2005

Data on GDP per capita (PPP at 2000 international prices) and its growth rate are taken from the World Development Indicators, unless otherwise specified. Our sample includes all Sub-Saharan countries, except Liberia and Somalia, for which there are no GDP per capita PPP data.[1] Because we are primarily interested in examining the representative country, we use unweighted country data in the aggregate analysis unless otherwise stated.

Our time series spans from 1975 to 2005.[2] We thus have an unbalanced panel of data with T=31 and N=45. This period follows the first oil-shock and includes the commodities prices plunge, when many African economies collapsed and several conflicts erupted, the introduction of structural reforms, which brought significant changes in many economies, and the recently observed growth recovery.

Figure 1 shows that mean GDP per capita in Africa had a slow, positive long term trend, consisting of about 20 years of virtual stagnation with a point of inflexion upwards in mid-1990s. Since then, actual income has remained above the trend most of the time and the variance appears to have declined.[3] Figure 2 shows Africa's growth path over the same period. Trend growth declined until the late 1980s, and increased thereafter, although there is evidence of a slowdown in the last years. Variance has declined since the mid-1990s and actual growth has tended to be above and closer to the trend.

---

[1] Our sample accounts for more than 98% of population and 99% of the regional GDP in 2005.
[2] The WDI's GDP per capita PPP series starts in 1975.
[3] We employ the Hodrick-Prescott filter in Figures 1 and 2 to smooth the estimate of the long term trend component of the GDP series.

Figure 1: GDP per capita
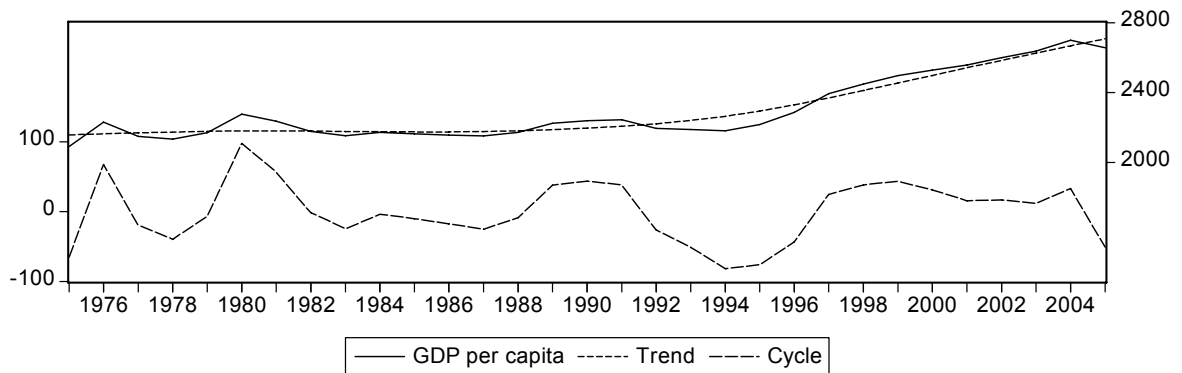
Figure 2: GDP per capita growth
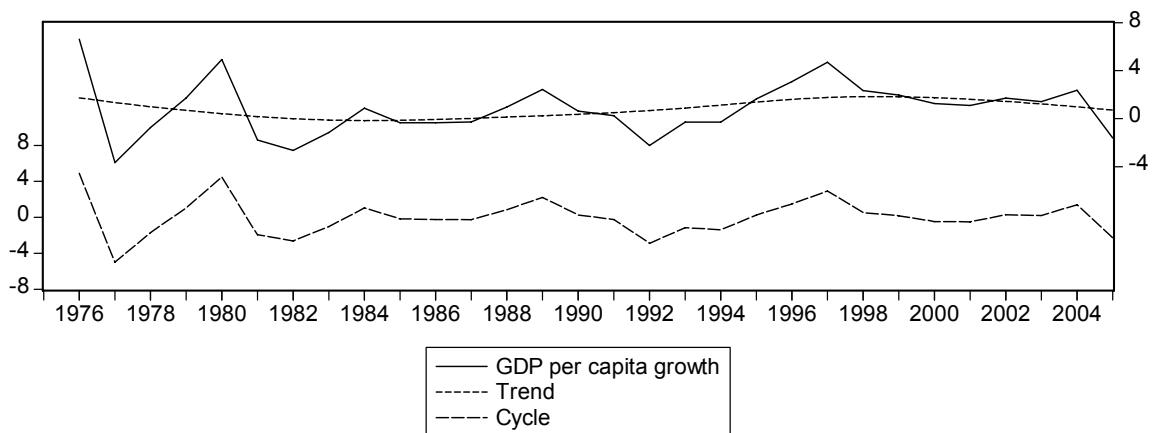
At the aggregate level, growth increased substantially during 1995-2005 and was accompanied by a sharp reduction in the coefficient of variation. The per capita growth rate rose to 1.88% in this period from -0.23% of the previous decade, and the coefficient of variation fell to 3.2% from -25.5%. This shift implies an increase of 2% in growth, which is about three-times the long term growth rate of 0.7%. Income per capita went up to $2,486 in 1995-2005, which represents an increase of about $300, or 11%, as compared to previous periods. Recursive residual estimations, Chow breakpoint tests, and Chow forecast tests, do not reject the hypothesis that a structural break in the growth series occurred between 1995 and 1997 (Arbache and Page, 2007b).

3. Identifying good times and bad

We define a growth acceleration as a period that satisfies the following four conditions:

> *Condition 1* – The forward four-year moving average growth minus the backward four-year moving average growth > 0 for a given year; i.e., the forward moving average window (t, t+1, t+2, t+3) must be higher than the backward window (t, t-1, t-2, t-3) and above 0. A signal change from (+) to (–) or vice-versa suggests growth trend shift;[4]
>
> *Condition 2* – The forward four-year moving average growth exceeds the country's average growth, meaning that the pace of growth during acceleration is higher than the country's trend;
>
> *Condition 3* – The forward four-year moving average GDP per capita exceeds the backward four-year moving average;
>
> *Condition 4* – A growth acceleration episode requires at least three years in a row satisfying conditions 1-3. An episode includes the three subsequent years after the last year that satisfies conditions 1-3; i.e., we attach the moving average window to the years identifying the growth acceleration.[5]

Condition 2 endogenizes the country's economic conditions, because its growth trend is a key parameter for identifying growth acceleration episodes. There is clearly a risk that by identifying a period of modest, sustained growth in a low growth economy as a growth acceleration episode we will assign too much significance to a minor change in economic performance. But it is also true that a period of relatively modest per capita growth, say 2%, may well be a genuine growth boom in a country enduring very low growth rates, and a decline in per capita income of equal magnitude could spell a serious economic collapse in a stagnant economy.

Condition 2 also helps to limit the number of identified accelerations in countries with sustained, long run growth: if a country, for example, is growing rapidly it will lift the growth trend, reducing the number of estimated accelerations. This is particularly significant for countries experiencing very low or very high growth rates. Condition 3 ensures that the growth acceleration episode is not a recovery from a recession.

---

[4] The window size may change according to the long term growth volatility of a set of countries and/or region: the higher the volatility, the lower should be the window size if one wants to observe the effects of volatility on economic performance.

[5] As an example, if conditions 1 to 3 identify growth acceleration during, say, 1991 to 1995, the years 1996, 1997 and 1998 are included as part of the episode. Thus, this growth acceleration episode comprises a period that starts in 1991 and ends in 1998.

The identification of growth deceleration episodes requires the following adjustments: in *Condition 1*, the forward four-year moving average growth minus the backward four-year moving average growth < 0 for a given year; in *Condition 2*, the forward four-year moving average growth is below the country's average growth; in *Condition 3*, the forward four-year moving average GDP per capita is below the backward four-year moving average.

The methodology has three main characteristics that affect the interpretation of the results: first, it identifies good and bad times rather than only focusing on rapid growth spells or deep collapses; second, it carries over inertia when identifying growth accelerations and decelerations; and third, it is sensitive to the length of time series.

Figures 3-5 illustrate the methodology at work. Condition 1 alone would identify 1993-2005 in Tanzania as a growth acceleration episode (Figure 3). But only the period 1998-2005 satisfies Conditions 1-4 and is identified as a growth acceleration. Condition 3 identifies 1993-1998 is a recovery from a recession.

Figure 3 : Tanzania - GDP per capita growth rate and growth acceleration
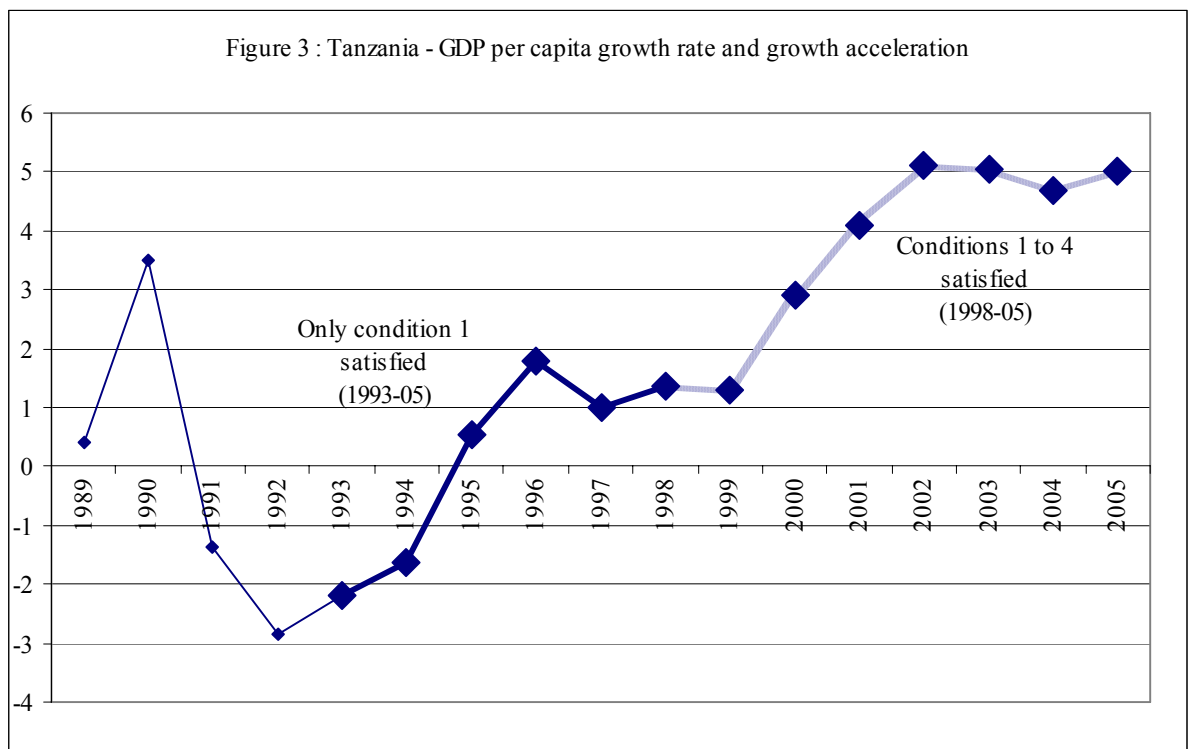
The cases of Senegal and South Africa illustrate the method further. The dotted lines show deceleration periods, while the shaded lines identify acceleration periods. Senegal experienced a contraction between 1988 and 1994; the average growth rate during this period

was -1.4%, well below the average of 0.35% (Figure 4). In contrast, average growth in 1994-2001 – a growth acceleration – was 1.75%.

Figure 4: Senegal - GDP per capita growth rate and growth acceleration and deceleration
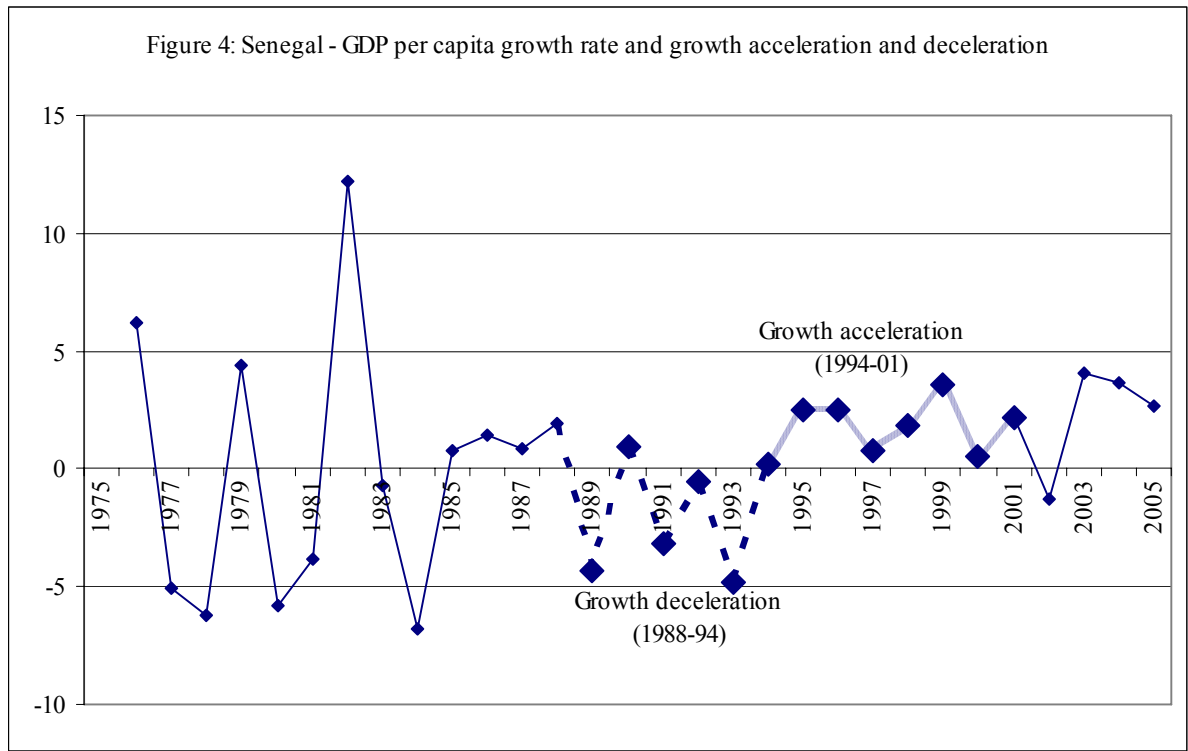
In the case of South Africa, the average growth rates during the downturns 1982-1987 and 1989-1994 were -1.91% and -1.54%, respectively, compared to the overall mean of 0.12% (Figure 5). During the growth acceleration period, 1999-2005, growth was 1.96%.

Table A1 in the Appendix shows the start years of growth acceleration and deceleration episodes and compares our results with those from two closely related studies. HPR in their seminal work identify growth accelerations worldwide using GDP per capita growth from 1950 to 1999 from the Penn World Tables. They compare seven-year forward and backward moving average growth windows and impose a cutoff that the forward moving average window should exceed the backward moving average window by at least 2%. They further require that average growth must be at least 3.5% during the acceleration episode.

Figure 5: South Africa - GDP per capita growth rate and growth acceleration and deceleration
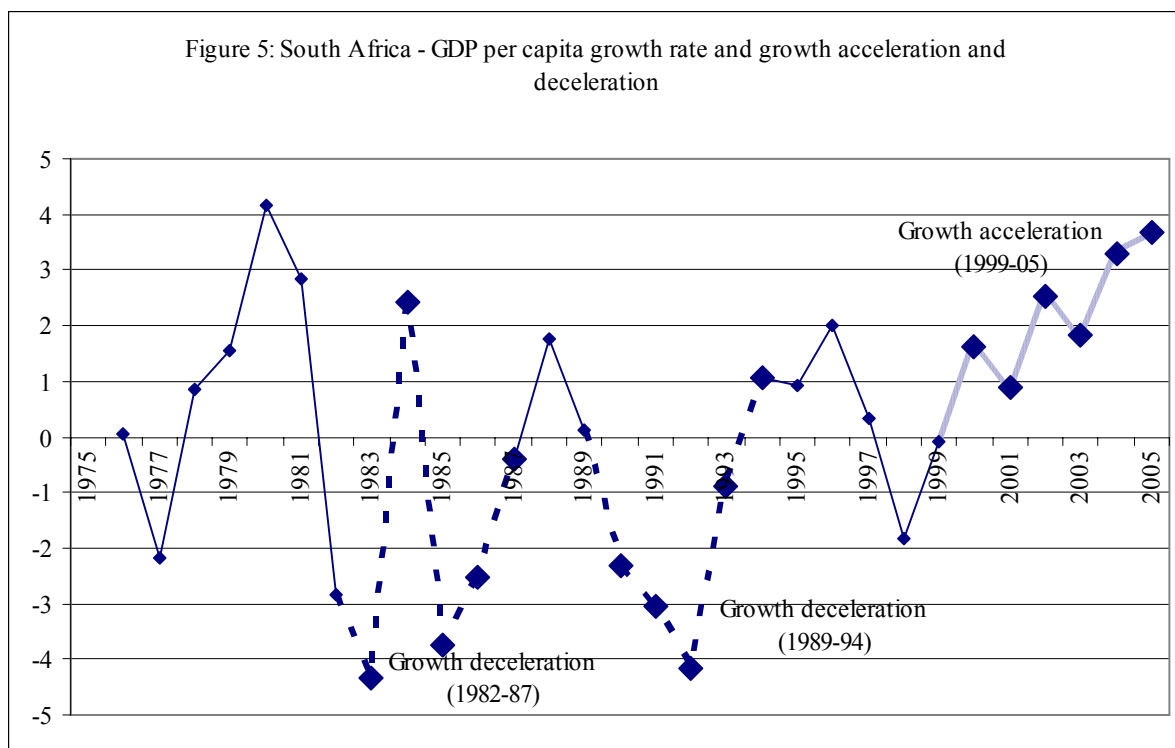
Pattillo, Gupta, and Carey (2005) (hereafter PGC) have applied a similar methodology to Africa only, using GDP per capita PPP growth between 1980 and 2004 from the IMF World Economic Outlook.[6] To address the higher volatility and lower overall rate of growth in Africa the authors use a five-year window and require that growth average be at least 2% during the acceleration.

The main differences between these two methodologies and the one proposed here are that: first, the moving average windows are bigger than ours. Second, they impose a cutoff of at least 2% in the forward minus backward moving average window, whereas we impose a cutoff of zero. Third, they impose a common minimum growth rate to define an acceleration for all countries, whereas we use the country's growth trend as the cutoff. In general, our calculations accord with those the other two studies, but since our filter is more flexible – and identifies decelerations – it picks up more episodes; we find 32% more episodes for Africa than PGC and 114% more than HPR.

---

[6] PGC calculated the growth acceleration episodes using the HPR methodology and PPP growth data. So results in Table A1 are fairly comparable to ours, despite slight differences between the IMF and WDI data. The IMF's and WDI's data generally follow the same pattern. However, the WDI's GDP per capita tends to be slightly lower than the IMF's. For a discussion on the discrepancies between the IMF and WDI GDP data see Africa Development Indicators 2006 (p. 114).

4. Results

Table 1 shows the frequency of accelerations and decelerations and their associated growth rates during selected periods. For the full period there is a slightly higher probability of a growth acceleration than deceleration: 25% of the 1,243 country-year observations (total of valid observations per country per year) belong to growth accelerations, while 22% are classified as growth decelerations.[7]

Between 1975 and 2005 countries in Africa that experienced growth accelerations managed to grow on average by 3.6% during those episodes, compared with the region-wide average of 0.7%. During decelerations countries contracted on average by -2.7%. Given the almost equal probabilities of growth accelerations and decelerations, most of the benefits of growth accelerations in the continent were offset by growth collapses, leading to the region's overall tepid rate of growth. Had Africa avoided its growth collapses it would have grown at 1.7% a year in per capita terms instead of 0.7%. Figure 6 shows the actual and simulated GDP per capita at these growth rates. Income per capita would have been at least 30% higher in 2005 from avoiding bad times.[8] Growth decelerations matter a great deal for fighting poverty in Africa

The relative frequency of good and bad times is reflected in Africa's long run pattern of growth. Accelerations are more frequent in 1995-2005; decelerations are more common in the two preceding decades. Forty two percent of the 494 country-year observations of 1995-2005 occur in countries experiencing growth accelerations, and only 12% in countries undergoing growth decelerations. The remaining 46% of observations belong to years in which countries were experiencing neither growth acceleration nor deceleration. In 1975-1984 growth decelerations were 350% more frequent than accelerations.[9] In 1985-1994 this ratio had dropped to 71%, mainly due to a sharp rise of accelerations to 21% from 4%.

---

[7] To check the robustness of our results we also identified growth accelerations and decelerations by replacing 0 with +1% and -1% for acceleration and deceleration, respectively, in condition 1, but the results did not change substantially. We therefore report only the base case results because they are less restrictive.

[8] The simulated growth rate without collapses takes into account growth rate during all country-years but growth deceleration years. The additional GDP per capita results from the difference in compound growth at 1.7% and 0.7% in 1975-2005.

[9] Calculated as $((0.18/0.04)-1)*100$.

Table 1: Frequency of growth acceleration and deceleration, growth rates, and GDP per capita

Period	GDP			Growth acceleration			Growth deceleration		
	Observations	GDP growth	GDP per capita	Frequency (country-years)	Growth rate	GDP per capita	Frequency (country-years)	Growth rate	GDP per capita
1975-2005	1,243	0.70	2,299	0.25	3.64	2,598	0.22	-2.74	1,794
1975-1984	316	0.13	2,180	0.04	4.61	2,796	0.18	-3.06	1,765
1985-1994	433	-0.23	2,183	0.21	3.21	2,907	0.36	-3.18	1,804
1995-2005	494	1.88	2,486	0.42	3.76	2,449	0.12	-1.29	1,797
1975-1994	749	-0.07	2,182	0.14	3.39	2,892	0.29	-3.14	1,794

Figure 6: Actual and simulated GDP per capita
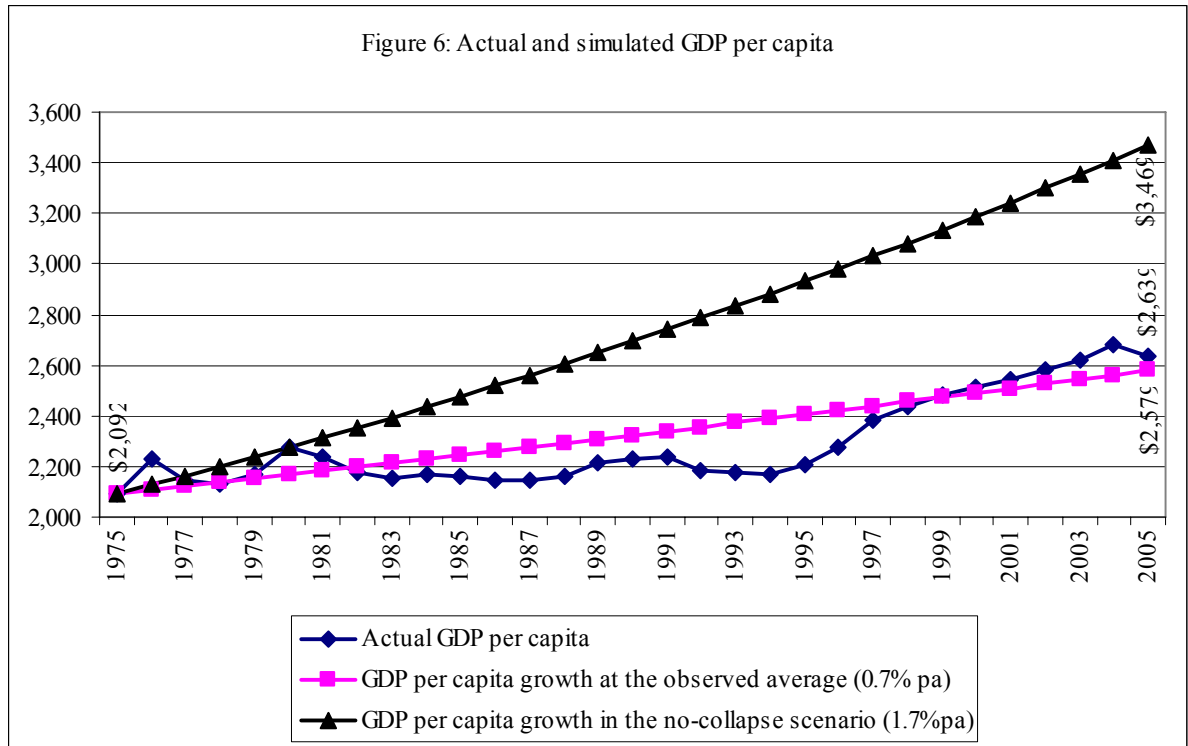
In 1995-2005, the average growth rate for countries during acceleration episodes was 3.8%, the second highest average among the three ten year periods. Interestingly, it was in 1975-1984, a period of very modest regional economic growth, that average growth during accelerations reached its highest rate. This reflects a compositional effect at work. In the last decade even long stagnant economies such as the Central African Republic, Ethiopia, Mali, Mozambique, Sierra Leone, and Tanzania, experienced some sustained growth, pushing down the averages during acceleration episodes, whereas in 1975-1984 the high average growth rate was mainly due to a small number of growth accelerations over all and very rapid growth in the Republic of Congo.

The average (negative) growth rate for countries experiencing growth decelerations in 1995-2005 was less than half that in previous decades, contributing to the more positive overall economic performance of the period. Economic declines had both the highest frequency – double that of the next highest decade – and the greatest impact on countries during the period 1985-1995.

Over the entire 30 year period richer countries have had more growth accelerations and poorer countries more growth collapses. This is of course to some

extent endogenous; average income per capita will tend to rise in countries with more frequent growth accelerations and fall in countries with more frequent collapses. But this result also holds in each ten year period, where the compounding effects may be assumed to be less important. This may indicate that richer countries are better able to take advantage of propitious circumstances and that poorer countries are less able to avoid bad times. There is one interesting exception. Income per capita for countries experiencing growth accelerations in 1995-2005 is slightly below the average for the region overall, indicating that growth successes have been spreading to poorer countries in the past decade.

Table 2 shows the frequency of growth acceleration and deceleration episodes by country category and compares them with the mean. In general, there is no substantial difference in the probabilities of growth acceleration and deceleration episodes for a given country category. But, while geography does not appear to matter, geology and conflict do.[10] As might be expected, oil exporters and resource rich countries have more frequent growth accelerations, but somewhat unexpectedly, the same frequency of growth decelerations as the regional average. Conflict is also important in determining good times and bad. Major conflict countries had fewer growth accelerations than the regional average but also fewer decelerations. They also had significantly lower average growth than the regional average. Taken together these results suggest that major conflict countries were trapped in a low level equilibrium. Minor conflict countries have a substantially higher probability of a growth deceleration than the average and are much more likely to experience bad times than good times.

Table 2: Frequency of growth acceleration and deceleration by country category

Country category	Growth acceleration		Growth deceleration	
	Frequency (country-years)	Above/below all countries' mean	Frequency (country-years)	Above/below all countries' mean
All countries' mean	0.25	-	0.22	-
Coastal	0.26	Above	0.22	Equal
Landlocked	0.23	Below	0.22	Equal
Coastal without resources	0.24	Below	0.23	Above
Landlocked without resources	0.22	Below	0.22	Equal
Oil exporters	0.29	Above	0.23	Above
Non-oil exporters	0.24	Below	0.22	Equal
Resource countries	0.30	Above	0.21	Below
Non-resource countries	0.23	Below	0.23	Above
Major conflict	0.16	Below	0.17	Below
Minor conflict	0.19	Below	0.32	Above

---

[10] See country assignment in Table A2 in Appendix.

Table A3 in the Appendix shows the unconditional probabilities of growth acceleration and deceleration at the country level and the growth rates during these episodes. The gaps between growth rates during accelerations and decelerations at the country level tend to be high, generating the high growth volatility observed in Africa. The high average growth rates observed in many economies during acceleration episodes also show the resilience and capacity of the region's economies to grow when economic and political conditions favor growth. The magnitude of economic contractions during deceleration episodes similarly indicates the severity of the consequences when economic and political conditions are unfavorable.

There are 16 countries in our sample that have avoided growth decelerations altogether. Many – Botswana, Cape Verde, Equatorial Guinea, Lesotho, Mauritius, Mozambique, Uganda – are among the region's top performers in per capita income growth over the three decades, but not all. Burkina Faso, Guinea, Namibia, São Tomé and Príncipe, and Swaziland are not among the region's growth leaders. Avoiding growth collapses is important for long run success at the country level, but is not the only factor contributing to robust long term growth.

Seven countries – DRC, Eritrea, Gabon, The Gambia, Madagascar, Mauritania and Niger – have never had a growth acceleration. Of these only Eritrea shows good long term per capita income growth. Four of the seven had long run declines in per capita income.

5. Do growth accelerations and decelerations matter?

We have shown that growth accelerations and decelerations are an important feature of Africa's low and volatile long run growth, but do they matter for economic and social outcomes beyond their direct consequences for the rate of growth? If growth accelerations and decelerations have non-neutral impacts, one would expect that economic, social, and governance indicators will be different during such episodes than during normal times. In this section we investigate the hypothesis of non-neutrality of growth volatility by examining differences in mean values in countries experiencing growth acceleration and deceleration episodes and simple correlations between changes in key economic and social variables and the presence or absence of growth

accelerations/decelerations. Table 3 shows sample averages during growth accelerations, decelerations, and "normal" times. – defined as the absence of either. Table 4 gives the correlation coefficients between a number of economic, social governance and institutional characteristics and the frequency of acceleration and deceleration episodes.

Table 3 reveals an asymmetric relationship between growth accelerations and decelerations and some economic indicators. The major changes in national accounts during growth episodes take place in investments and savings rather than in consumption. Savings and investments are higher during accelerations as compared with normal times, and substantially lower during deceleration episodes. Foreign direct investment during accelerations is six-times the figure for deceleration episodes.

Table 4 shows that countries that have high savings and investment have a higher probability of growth acceleration and less probability of deceleration. Consumption is relatively lower during growth accelerations, which is consistent with the higher allocation of resources for investment. But consumption is also lower during decelerations, which is probably due to the fall in purchasing power of households.

With regard to the structure of the economy, the share of the agriculture sector is slightly higher in countries experiencing decelerations, while industry's share is slightly larger in countries going through accelerations. Correlations suggest that countries that rely more on agriculture have more spells of growth deceleration, possibly because of higher exposure to insects, draughts and other natural disasters, but also because of swings in agriculture commodity prices.

Macroeconomic management appears to be an important factor in both good times and bad times. Decelerations are accompanied by high inflation; one recent example is Zimbabwe. There is a positive correlation between inflation and the frequency of growth decelerations. Public debt is higher during both acceleration and deceleration episodes than during normal times, and government consumption falls during both accelerations and decelerations. Correlations suggest that countries that increased their debt also experienced more growth accelerations and decelerations, which may support the view that prudent debt management is important for reducing growth volatility.

Table 3: Differences between sample averages

	Growth acceleration			Growth deceleration		
	During	**Otherwise**	**t-test**	**During**	**Otherwise**	**t-test**
Savings (% GDP)	15.2 (.77)	10.2 (.43)	*	7.46 (.61)	12.7 (.45)	*
Investments (% GDP)	23.7 (.71)	19.4 (.32)	*	15.9 (.43)	21.9 (.36)	*
Private sector investment (% GDP)	13.71 (.66)	11.22 (.29)	*	9.20 (.42)	12.8 (.34)	*
Foreign direct investments net flow (% GDP)	4.12 (.63)	1.97 (.17)	*	.77 (.15)	3.05 (.26)	*
Consumption (% GDP)	88.5 (.99)	92.3 (.59)	*	89.4 (.74)	91.9 (.62)	*
Agriculture value added (%GDP)	28.6 (.91)	30.4 (.49)	*	31.9 (.89)	29.4 (.46)	*
Industry value added (% GDP)	26.9 (.82)	24.0 (.43)	*	24.6 (.75)	25.8 (.44)	
Service value added (% GDP)	44.3 (.83)	44.5 (.37)		43.5 (.64)	44.7 (.40)	
Trade (% GDP)	75.4 (2.29)	70.1 (1.26)	*	58.8 (1.6)	75.1 (1.3)	*
Exports (% GDP)	31.6 (1.15)	29.0 (.63)	*	26.7 (.88)	30.4 (.66)	*
Imports (% GDP)	43.1 (1.4)	40.9 (.77)	*	32.1 (.83)	44.5 (.82)	*
Real effective exchange rate (2000=100)	114.4 (3.05)	155 (10.3)	*	183.1 (21.5)	124.6 (3.21)	*
Terms of trade (2000=100)	102.5 (1.3)	110.9 (1.4)	*	114.4 (2.6)	107.3 (1.19)	*
Current account (% GDP)	-5.7 (.84)	-5.9 (.32)		-5.9 (.39)	-5.8 (.49)	
ODA (% GDP)	13.6 (.79)	13.6 (.51)		11.9 (.69)	14.11 (.52)	*
ODA per capita (US$)	68.3 (4.4)	53.2 (2.04)	*	41.5 (1.9)	61.2 (2.3)	*
Consumer price index (%)	15.1 (1.6)	75.2 (32.9)		177 (101)	23.2 (5.4)	*
GDP deflator (%)	16.6 (1.80)	69.5 (30.26)		168.1 (98.6)	23.7 (5.81)	*
Public debt (% GNI)	112.0 (6.72)	95.5 (2.84)	*	115.3 (5.3)	95.2 (3.15)	*
Government consumption (% GDP)	15.9 (.47)	16.7 (.28)		15.1 (.37)	16.8 (.29)	*
Life expectancy (years)	51.3 (.80)	50.1 (.41)		48.1 (.68)	51.0 (.42)	*
Dependency ratio	.91 (.00)	.93 (.00)	*	.93 (.00)	.92 (.00)	*
Under 5 mortality (per 1,000)	145.8 (8.33)	161.9 (4.93)		187.1 (8.99)	148.8 (4.68)	*
Infant mortality (per 1,000 live births)	84.3 (4.58)	93.9 (2.92)		113.2 (4.96)	85.5 (2.71)	*
Primary completion rate (% of relevant age group)	52.5 (2.14)	49.9 (1.41)		41.4 (2.05)	52.9 (1.34)	*
Country Policy and Institutional Assessment (scale 1=low to 6=high)	3.19 (.04)	3.10 (.04)		2.77 (.06)	3.18 (.03)	*
Voice and accountability (-2.5 to +2.5, low to high)	-.46 (.71)	-.72 (.74)	*	-1.07 (.39)	-.56 (.75)	*
Political stability (-2.5 to +2.5)	-.46 (.84)	-.56 (.97)		-1.06 (.70)	-.46 (.92)	*
Government effectiveness (-2.5 to +2.5)	-.59 (.58)	-.71 (.59)		-1.01 (.38)	-.62 (.60)	*
Regulatory quality (-2.5 to +2.5)	-.46 (.65)	-.67 (.66)	*	-.94 (.74)	-.56 (.64)	*
Rule of law (-2.5 to +2.5)	-.66 (.62)	-.71 (.67)		-1.11 (.52)	-.64 (.64)	*
Control of corruption (-2.5 to +2.5)	-.57 (.57)	-.61 (.61)		-1.11 (.52)	-.64 (.65)	*
Minor conflict (frequency)	.08 (.01)	.11 (.01)		.15 (.02)	.09 (.00)	*
Major conflict (frequency)	.05 (.01)	.10 (.01)	*	.07 (.01)	.09 (.00)	*

Notes:

(*) t-test that means are not equal significant at the 5% level.
Standard error in parentheses.

15

Table 4: Correlation coefficients between growth acceleration and deceleration and economic, social and governance indicators

Variable	Growth acceleration		Growth deceleration		
	Coeff.	p-value <05	Coeff.	p-value <05	N
Savings (% GDP)	.180	*	-.177	*	1,060
Investments (% GDP)	.176	*	-.236	*	1,202
Private sector investment (% GDP)	.125	*	-.166	*	1,027
Foreign direct investments net flow (% GDP)	.130	*	-.135	*	1,274
Consumption (% GDP)	-.091	*	-.058	*	1,201
Agriculture value added (%GDP)	-.050		.069	*	1,220
Industry value added (% GDP)	.061	*	-.042		1,220
Service value added (% GDP)	-.044		-.040		1,220
Consumer price index (%)	-.034		.084	*	1,026
GDP deflator (%)	-.028		.078	*	1,231
Public debt (% GNI)	.077	*	.089	*	1,175
Government consumption (% GDP)	-.038		-.084	*	1,194
Trade (% GDP)	.065	*	-.176	*	1212
Exports (% GDP)	.056	*	-.083	*	1,213
Imports (% GDP)	.054		-.217	*	1,212
Real effective exchange rate (2000=100)	-.107	*	.168	*	452
Terms of trade (2000=100)	-.102	*	.082	*	1,046
Current account (% GDP)	.011		.011		1,056
ODA (% GDP)	.001		-.059	*	1,212
ODA per capita (US$)	.100	*	-.122	*	1,221
Life expectancy (years)	.062		-.136	*	512
Dependency ratio	-.067	*	.053		1,213
Under 5 mortality (per 1,000)	-.108		.237	*	248
Infant mortality (per 1,000 live births)	-.108		.277	*	267
Primary completion rate (% of relevant age group)	.049		-.178	*	451
Country Policy and Institutional Assessment (scale 1 to 6)	.065		-.206	*	401
Voice and accountability (-2.5 to +2.5)	.168	*	-.209	*	307
Political stability (-2.5 to +2.5)	.051		-.200	*	307
Government effectiveness (-2.5 to +2.5)	.100		-.203	*	307
Regulatory quality (-2.5 to +2.5)	.129	*	-.176	*	307
Rule of law (-2.5 to +2.5)	.037		-.227	*	305
Control of corruption (-2.5 to +2.5)	.025		-.182	*	295
Minor conflict (frequency)	-.046		.082	*	1,243
Major conflict (frequency)	-.070	*	-.044		1,243

The real effective exchange rate is more competitive during growth accelerations, and highly appreciated during decelerations. Correlations suggest that exchange rate appreciation is associated with growth deceleration, whereas depreciation is associated with acceleration. There is no evidence that current accounts change during growth acceleration and deceleration.

Trade is substantially lower during decelerations. Exports and especially imports drop sharply. Correlations indicate that countries that trade less are more exposed to growth decelerations. Somewhat surprisingly, the terms of trade are lower during growth accelerations. This result may indicate that while high commodity prices trigger growth, they may not be the main factor behind medium term growth spells in Africa.

ODA as percentage of GDP is similar in both good and normal times but falls during growth decelerations. Per capita ODA, however, is higher during growth accelerations and lower during decelerations. The correlation analysis suggests that a higher share of ODA in GDP is associated with fewer growth collapses, and that countries with higher ODA per capita experience more growth accelerations have, and fewer collapses. These results indicate that ODA has been pro-cyclical, reinforcing arguments for greater predictability of ODA to underpin sustained growth.

Growth variability also impacts a number of important human development indicators. Life expectancy is substantially lower in countries experiencing growth decelerations than in normal times. The correlation coefficient is negative, suggesting that more collapses are associated with lower life expectancy. The dependency ratio is slightly lower during growth accelerations, and the correlation coefficient is negative as expected. Under 5 mortality and infant mortality are substantially higher during growth decelerations than in normal times, but they do not improve during growth accelerations. Correlation coefficients suggest that and growth collapses are associated with increases in mortality. The primary completion rate is substantially lower in countries experiencing growth decelerations and is negatively correlated with growth collapses.

Policies and institutions are also closely associated with both good and – especially – bad times. The World Bank's CPIA score, a broad measure of policy and institutional performance, is lower during decelerations, but not significantly different

between accelerations and normal times. The correlation coefficients suggest that countries with lower CPIA scores tend to experience more economic collapses.

All of the governance indicators – political stability, government effectiveness, rule of law, and control of corruption – are lower for growth decelerations than for the region as a whole.[11] Correlation coefficients are negative, suggesting that a deterioration of governance is accompanied by more frequent growth decelerations. Voice and accountability scores are higher during growth accelerations. The correlations also suggest that countries that experience more growth accelerations have more voice and accountability and better regulatory quality.

Minor conflicts are more frequent during growth deceleration episodes than during normal times. Major conflicts are less frequent during acceleration and deceleration episodes than for the region as a whole. The correlation coefficients suggest that minor conflicts are associated with collapses, and that major conflicts hamper chances of a growth acceleration.

These results reinforce the findings of other empirical studies (Ndulu et al., 2007, Dufrénot et al., 2006) of the close relationship between institutions and governance and economic performance in Africa. However they also reveal that governance appears to be more relevant to understanding how to avoid a growth deceleration than how to promote an acceleration.

Table 5 shows the conditional probabilities of a country experiencing a growth acceleration and deceleration at the aggregate level. Models 1-4 refer to growth accelerations and Models 5-12 to growth decelerations. These regressions represent a further search for stylized facts about acceleration and deceleration episodes. No causality is inferred from the relationships and no attempt has been made to control for endogeneity of some of the right hand side variables.

Model 1 shows that a one percent change in investment is on average associated with a higher probability of a growth acceleration of about 0.1%. So, an increase of, say 10%, in investment is associated with an increase of 1% in the probability of a growth acceleration. Voice and resource-endowment (Models 2 and 3) are also positively

---

[11] Governance indicators are available for the following years: 1996, 1998, 2000, 2003, 2003, 2004, and 2005.

associated with a growth acceleration. However, all coefficients are significant at only the 10% level and the R^2 are low. Model 4 shows a regression with all these correlates together. Only voice and resource-endowment remain significant at the 10% level.

All estimated coefficients of Models 5-11 have the expected sign and are significant at the 5% level. They show that more investment, higher ODA per capita, increased imports, and better governance indicators are associated with fewer growth decelerations. Model 12 shows the coefficients for all of the non-governance indicators together. In this case, only investment remains significant. The governance indicators were not regressed together because of their very high collinearity.

Only investment is significantly associated with the conditional probability of both acceleration and deceleration episodes. This suggests that it is likely to be an important factor for predicting spells of growth and collapse at the aggregate level, but we cannot assert with confidence that it is a leading indicator, due to its probable endogeneity. Better governance indicators reduce the likelihood of growth decelerations, but they are not closely associated with more frequent accelerations.

Table 6 shows fixed effect logistical models that predict the presence of a growth acceleration or deceleration at the country level. Increases in savings, foreign direct investments, and consumption increase the odds of a growth acceleration, while government consumption and major conflicts reduce the odds. In the deceleration regression, increases in savings, investment, foreign direct investment and trade reduce the odds of a growth deceleration, while inflation and minor conflicts increase the odds of collapse.[12] Only savings, foreign direct investment, and conflict appear in both regressions. These results suggest that policies aimed at attaining sustained growth and preventing growth collapses need to focus on ways to increase savings, attract foreign investments, and reduce conflicts.

---

[12] We ran random effect models including dummies for oil-producer countries, and/or landlocked and/or resource-rich, but they returned statistically insignificant results. Hausman tests suggest fixed effect estimates are preferable to random effect.

Table 5: Conditional probability of growth acceleration and deceleration at the aggregate level

Variable	Dependent variable: frequency of growth acceleration per country				Dependent variable: frequency of growth deceleration per country							
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Ln investment	110 (1.70)			.047 (.72)		-.253 (-3.23)						-.233 (-1.97)
Voice (governance indicator)		.056 (1.87)		.061 (1.98)								
Resource rich country			.082 (1.77)	.082 (1.73)								
Ln ODA per capita					-.078 (-2.17)							-.036 (-.84)
Ln imports							-.145 (-2.40)					.020 (.21)
Political stability (governance indicator)								-.068 (-2.08)				
Government effectiveness (governance indicator)									-.127 (-2.63)			
Rule of law (governance indicator)										-.115 (-2.60)		
Control of corruption (governance indicator)											-.132 (-2.68)	
R2	.06	.08	.06	.16	.10	.19	.12	.09	.14	.14	.15	.21
N	45	44	45	44	45	45	45	44	44	44	44	44

Note: t-test in parentheses.

Table 6: Predicting growth acceleration and deceleration - panel data

Variable	Dep. variable: dummy of growth acceleration		Dep. variable: dummy of growth deceleration	
	Odds ratio	p-value	Odds ratio	p-value
Savings	1.152	.000	.929	.000
Investment in fixed capital			.956	.062
Foreign direct investments net flow	1.146	.000	.811	.000
GDP deflator			1.010	.016
Consumption	1.051	.004		
Government consumption	.904	.000		
Trade			.980	.008
Minor conflict			1.744	.045
Major conflict	.435	.064		
LR (chi2)	127.6	.000	97.4	.000
N	825		647	

Note: fixed effect logit regression.

Taken together our results suggest that growth decelerations are more predictable than growth accelerations. In the African context it may be easier to understand what policy makers should avoid to prevent growth collapse rather than what they should do to achieve sustained growth.[13]

6. Conclusions

This paper investigated growth acceleration and deceleration in Africa, seeking to uncover stylized facts and identify growth challenges not captured by standard long term growth analyses. Contrary to the common wisdom, African countries have experienced numerous growth acceleration episodes in the last 30 years, but have also gone through a comparable number of growth collapses that cancelled out most benefits of growth. We find that during growth accelerations the representative African country managed to grow by 3.6%, while during decelerations it grew by -2.7%. Ceteris paribus, had Africa avoided its growth decelerations, it would have grown in per capita terms at 1.7% a year instead of 0.7%, and GDP per capita would have been more than 30% higher in 2005.

We find that it is easier to predict a growth deceleration than an acceleration. One explanation is that there may be few commonalities among success stories. Opportunities for growth vary with sound policies and good governance, but also with timing, initial conditions, inherited institutions, geography, availability of natural resources. Leadership, and other less observable factors may also have a role in achieving

---

[13] HPR using a much larger set of countries also find that growth accelerations tend to be highly unpredictable, even after controlling for the standard determinants of growth, including political changes and economic reforms.

sustainable growth. Doing the wrong things – poor macroeconomic management, poor structural policies and institutions, and poor governance – appears to be a relatively broadly based predictor of a descent into bad times, heterogeneity among countries not withstanding.

We find strong evidence that economic, social, governance, and institutional variables are significantly different during acceleration and deceleration episodes. Thus, despite the apparent lack of a significant statistical relationship between growth volatility and the long run growth rate, volatility is indeed important for economic and social progress.

We also find an important asymmetry between how growth accelerations and decelerations affect human development outcomes. While growth accelerations result in relatively small improvements in human development, decelerations have important negative impacts on education and health outcomes. These results suggest that preventing growth collapses is essential should Africa want to attain the Millennium Development Goals.

Finally, we conclude that preventing growth collapses must be a central element of any long run growth and poverty reduction strategy for Africa. Had Africa's economies avoided growth decelerations the continent would have grown one percent faster in per capita terms over the past 30 years. But policies to accelerate growth are also important. Per capita growth of 1.7 percent per year – the simulated average if collapses could have been completely avoided – is still not sufficient to eradicate poverty in the medium term. The keys to better long economic performance are both more growth *and* fewer collapses.

References

Africa Development Indicators 2006, Washington, DC: World Bank.

Arbache, J.S. and J. Page (2007a), Patterns of Long Term Growth in Sub-Saharan Region, mimeo, World Bank.

Arbache, J.S. and J. Page (2007b), Is Africa's Recent Growth Robust?, mimeo, Office of the Chief Economist, African Region, World Bank.

Collier, P. and J.W. Gunning (1999), Explaining African Economic Performance, Journal of Economic Literature, 37, 64-111.

Dufrénot, Gilles, Sanon, Gilles and Diop, Abdoulaye (2006), Is Per-Capita Growth in Africa Hampered by Poor Governance and Weak Institutions? Examining the Case of the ECOWAS Countries. Available at SSRN: http://ssrn.com/abstract=904546

Guillaumont, P., Jeanneney, S.G., and Brun, J.F. (1999), How Instability Lowers African Growth, Journal of African Economies, 8, 87-107.

Hausmann, R., L. Pritchett, and D. Rodrik (2005), Growth Accelerations, Journal of Economic Growth, 10, 303-329.

Hnatkovska, V. and Loayza, N. (2004), Volatility and Growth, World Bank Research Paper #3184.

International Monetary Fund (2005), Regional Economic Outlook – Sub-Saharan Africa, May.

Ndulu, B.J. (2007), Challenges of African Growth – Opportunities, Constraints, and Strategic Directions, Washington, DC: The World Bank.

O'Connell, S.A., and B.J. Ndulu (2000), Africa's Growth Experience: A Focus on Sources of Growth, Working Paper Series, African Economic Research Consortium.

Pattillo, C., S. Gupta, and K. Carey (2005), Sustaining Growth Accelerations and Pro-Poor Growth in Africa, International Monetary Fund Working Paper # 05/195.

Ramey, G., and Ramey, V.A. (1995), Cross Country Evidence on the Link between Volatility and Growth, American Economic Review, 85, 1138-1151.

Appendix

Table A1: Growth acceleration and deceleration start years

Country	Acceleration			Deceleration
	HPR	PGC	Authors' methodology	Authors' methodology
Angola	1993	1993	1984, 2000	1989
Benin		1993	1993	1985
Botswana	1986, 1996	1986, 1996	1985, 1996	
Burkina	1994	1983, 1994	1993, 2000	
Burundi		1983	1983	1991
Cameroon			1995	1986
Cape Verde	1992	1992	1992, 1996	
Central African Rep.			1995	1985
Chad	1983, 1999	1983, 1999	2000	1990
Comoros			1999	1985
Congo, Dem. Rep.				1987
Congo, Rep.	1984	1984	1979	1984, 1990
Cote D'Ivoire	1993	1993	1994	1988, 1999
Eq. Guinea	1994	1994	1993	
Erithrea				
Ethiopia	1992	1992	1993	1988
Gabon		1986		1984, 1997
Gambia, The		1995		1991
Ghana		1983	1993, 2000	1979
Guinea		1994	1993	
Guinea Bissau			1986	1996
Kenya		1984	1985	1990, 1997
Lesotho	1986	1986	1986	
Madagascar				1979, 1988
Malawi	1994	1994	1992	1979, 1984
Mali			1994	1979
Mauritania				
Mauritius	1984	1984	1984	
Mozambique	1986, 1994	1986, 1994	1994	
Namibia			1998	
Niger				1980, 1989
Nigeria			1986, 1997	1979
Rwanda	1996	1996	2000	1991
Sao Tome and Principe			1997	
Senegal		1994	1994	1988
Seychelles	1987	1987, 1995	1983, 1995	
Sierra Leone	1999	1999	2000	1982, 1989
South Africa			1999	1982, 1989
Sudan			1995	
Swaziland			1983	
Tanzania	1999	1985, 1999	1998	
Togo			1994	1980, 1988, 1998
Uganda	1986	1986	1992	
Zambia		1999		1981, 1988
Zimbabwe		1986	1993	1998
Total number of episodes	21	34	45	40

Notes:

The results using HRP parameters were calculated by PGC.

HPR and PGC did not investigate growth deceleration.

Table A2: Country categories assignment

Country	Oil exporter	Coastal	Resource-rich
Angola	1	1	1
Benin	0	1	0
Botswana	0	0	1
Burkina Faso	0	0	0
Burundi	0	0	0
Cameroon	1	1	1
Cape Verde	0	1	0
Central African Republic	0	0	0
Chad	1	0	1
Comoros	0	1	0
Congo, Dem. Rep.	0	0	0
Congo, Rep.	1	1	1
Cote d'Ivoire	0	1	0
Equatorial Guinea	1	1	1
Eritrea	0	1	0
Ethiopia	0	0	0
Gabon	1	1	1
Gambia, The	0	1	0
Ghana	0	1	0
Guinea	0	1	1
Guinea-Bissau	0	1	0
Kenya	0	1	0
Lesotho	0	0	0
Madagascar	0	1	0
Malawi	0	0	0
Mali	0	0	0
Mauritania	0	1	0
Mauritius	0	1	0
Mozambique	0	1	0
Namibia	0	1	1
Niger	0	0	0
Nigeria	1	1	1
Rwanda	0	0	0
Sao Tome and Principe	0	1	1
Senegal	0	1	0
Seychelles	0	1	0
Sierra Leone	0	1	1
South Africa	0	1	0
Sudan	1	1	1
Swaziland	0	0	0
Tanzania	0	1	0
Togo	0	1	0
Uganda	0	0	0
Zambia	0	0	1
Zimbabwe	0	0	0

Table A3: Frequency of growth acceleration and deceleration and growth rate at the country level

Country	Frequency of growth acceleration	Frequency of growth deceleration	Growth rate (1976–2005)	Growth rate during growth acceleration years	Growth rate during growth deceleration years
Angola	0.48	0.28	0.70	3.93	-5.48
Benin	0.27	0.23	0.59	1.60	-0.99
Botswana	0.43	0.00	6.24	6.87	
Burkina Faso	0.43	0.00	1.21	1.39	
Burundi	0.20	0.23	-0.47	1.48	-4.45
Cameroon	0.23	0.23	0.81	2.21	-5.34
Cape Verde	0.42	0.00	3.26	3.57	
Central African Republic	0.23	0.53	-1.27	0.89	-1.95
Chad	0.20	0.20	1.34	7.66	-1.66
Comoros	0.24	0.28	-0.14	0.11	-1.89
Congo, Dem. Rep.	0.00	0.30	-3.94		-7.60
Congo, Rep.	0.20	0.43	0.61	10.05	-2.25
Cote d'Ivoire	0.20	0.63	-1.57	1.82	-3.81
Equatorial Guinea	0.42	0.00	10.55	20.88	
Eritrea	0.00	0.00	1.96		
Ethiopia	0.25	0.25	0.42	3.71	-3.05
Gabon	0.00	0.40	-0.91		-1.52
Gambia, The	0.00	0.23	0.29		-0.99
Ghana	0.43	0.20	0.60	2.15	-4.33
Guinea	0.37	0.00	0.98	1.78	
Guinea-Bissau	0.23	0.20	-0.70	0.76	-1.87
Kenya	0.20	0.40	0.48	1.76	-0.75
Lesotho	0.23	0.00	3.27	3.83	
Madagascar	0.00	0.43	-1.38		-2.12
Malawi	0.23	0.37	0.22	1.68	-2.12
Mali	0.33	0.23	0.86	2.75	-3.09
Mauritania	0.00	0.00	0.10		
Mauritius	0.28	0.00	4.22	5.65	
Mozambique	0.32	0.00	2.08	5.08	
Namibia	0.32	0.00	0.15	2.14	
Niger	0.00	0.43	-1.01		-3.55
Nigeria	0.53	0.20	0.27	1.99	-4.79
Rwanda	0.20	0.20	1.68	2.27	2.12
Sao Tome and Principe	0.47	0.00	0.31	0.99	
Senegal	0.27	0.23	0.36	1.75	-1.38
Seychelles	0.53	0.00	2.46	4.01	
Sierra Leone	0.20	0.47	-0.57	7.95	-2.92
South Africa	0.23	0.40	0.12	1.96	-1.72
Sudan	0.30	0.00	1.72	3.90	
Swaziland	0.27	0.00	1.15	4.63	
Tanzania	0.47	0.00	1.69	3.69	
Togo	0.20	0.60	-0.60	4.27	-2.61
Uganda	0.30	0.00	1.92	3.69	
Zambia	0.23	0.50	-1.23	2.35	-2.38
Zimbabwe	0.20	0.27	-1.26	2.61	-5.34

Note: blank space means country did not experience growth acceleration and/or deceleration.