HOW INSTABILITY LOWERS AFRICAN GROWTH*

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Abstract

This paper aims to assess the role of instabilities on Africa low rates of growth during the seventies and eighties, using cross-section econometric estimates, on a sample of African and non African countries and two pooled decades. Africa exhibits higher "primary" instabilities (climatic, terms of trade and political instabilities), i.e. instabilities which are structural rather than the result of policy. These "primary" instabilities influence Africa growth, through a lower growth residual more than a lower average rate of investment. They do so by their impact on economic policy, which is evidenced by their influence on two "intermediate" instabilities, the instabilities of the rate of investment and of the real exchange rate, which significantly lower the rate of growth.

Résumé

Cet article vise à apprécier le rôle des "instabilités" dans le faible taux de croissance que les pays africains ont connu au cours des années 70 et 80. Les hypothèses sont testées sur un échantillon de pays africains et non africains, en utilisant un pooling des deux décennies. L'Afrique a connu de plus fortes instabilités "primaires" (instabilités climatiques, de termes de l'échange et sociaux politiques), lesquelles sont structurelles plutôt que le résultat de la politique économique. Ces instabilités primaires influencent la croissance africaine, en abaissant le résidu de croissance plutôt que le taux moyen d'investissement. Elles ont cet effet en raison de leur impact sur la politique économique, ce que fait apparaître leur influence sur deux instabilités "intermédiaires", celle du taux d'investissement et celle du taux de change effectif réel. Ces deux instabilités intermédiaires, elles-mêmes aussi plus élevées en Afrique, diminuent significativement le taux de croissance.

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1 - Introduction

There is a strong contrast between the proliferation of cross-sectional studies contributing to a general understanding of the factors underlying economic growth, and the debatable conclusions about the sources of lower growth in Africa.[1] One of the main elements of the debate concerns the relative roles of structural versus policy factors.

One class of factors in particular seems to have received insufficient attention. Africa has suffered, during the previous decades, from various forms of "primary" instability, which have been more important there than in other countries. We argue that these forms of instability constitute a part of the explanation for lower African growth. They are to a large extent structural, i.e. not the result of policies. But in turn they often induced bad policies, which reinforce economic instability.

Here we try to assess this role of instabilities in Africa through a cross-sectional study of the factors explaining the rates of growth of a sample of developing countries during the years 1970 to 1990.

The relatively higher level of "primary" instabilities in Africa is evidenced in section 2.

Section 3 briefly reviews some methodological problems raised by cross-sectional investigations of African growth, and underlines the need to rely on a general model, rather than on a model specific to African countries.

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[1] On average between 1960 and 1990 the rate of growth of GDP per capita has been of 0,4% per year in Africa South of the Sahara, and 2,3% in the other developing countries (UNCTAD, 1994). For a comprehensive analysis of the stagnation in Africa see Collier 1995.

Section 4 attempts to pinpoint the channels through which "primary" instabilities influence African growth. They appear to affect growth mainly through the growth residual rather than through lower average rates of investment.

Section 5 examines the relation between "primary" instabilities and economic policy and assesses the impact of investment and of relative prices instabilities.

Some policy implications are spelled out in the conclusion.

2 - Unstable Africa

For the sake of simplicity, let us consider three kinds of "primary" instability in so far as they are structural rather than the result of policy. When they can be measured, they appear to be higher in Africa than in other developing countries (cf. Table I).

These instabilities result from the traditional shocks affecting developing countries and examined in the literature: climatic shocks, changes in the international environment and socio-political troubles. These shocks directly affect economic results, but they also influence economic policy management and lead to unstable policy. Due to external shocks, many developing countries have conducted stop and go policies, adjustment periods following booms. It is then difficult to have indicators of instability reflecting only exogeneous shocks.

This point is well illustrated by climatic instability. Because it may be linked either to droughts or floods or cyclones or other events such as rainfall delays, it is not possible to focus on a single direct indicator. A proxy might be given by the instability of agricultural value added with respect to its trend, even if it cannot be assumed to be entirely independent of policy (Guillaumont P. and S. 1988).

This index of instability, as with other indices of instability used in this paper, has been calculated in a traditional manner, as the square root of the average squared deviation from the trend value (either linear or exponential, depending on the best adjustment), in percentage terms with respect to this trend value. But in order to capture what may have been the "feeling" of instability on average during the period, the index used for each period is a moving average of elementary instability indexes measured on ten years periods, the first of which begins ten years before the first year of the covered period.

Table I (in annex)

As the potential impact of climatic instability is expected to be greater the higher is the ratio of agricultural value added to GDP, the indicator should be weighted by this ratio. Whether it is weighted or not this indicator of instability is significantly higher in African countries than in other developing countries.

Among international shocks, those cited most often are terms of trade shocks. They may be assumed to be independent of policy, at least for small developing countries which are price takers. But there are other external shocks. Some stem from export volume instability (due either to external demand or to domestic supply shocks) which in combination with terms of trade instability determines the purchasing power of exports instability (i.e. income terms of trade instability). Other external shocks are due to exogeneous capital flows: even if the fluctuations of capital flows in poor countries result mainly from external decisions, they are also influenced by domestic policies. Import volume instability[2], here measured in the same way as agricultural value added instability, appears to be a convenient indicator since it reflects both instabilities of the income terms of trade and of capital inflows, though it does also stem from policy decisions which influence the volume of exports and the capital inflows.

Since the potential effect of external shocks depends on the magnitude of trade, these instability indexes -all measured according to the same method- have themselves to be weighted[3] by an index of openness, such as the export or import to GDP ratio. Depending on data availability, terms of trade instability appears to have been slightly higher in Africa than in other LDCs, though not significantly so. The same is true for the instability of the purchasing power of exports (income terms of trade), which also depends on fluctuations in the volume of exports. Finally import volume instability (weighted by the import to GDP ratio) has been considerably higher in Africa than in other LDCs.[4]

Thirdly, Africa seems to have suffered these last decades from strong sociopolitical instability. Several studies have already examined the impact on African growth of political variables (Azam, Berthelemy and Calipel 1995, Easterly and Levine 1995, De Haan and Siermann 1996, Fosu 1992, Ghura 1995, Ojo and Oshihoya 1995). Of course, the indicators differ according to the definition of what is considered to be political instability and are unavoidably rough, due either to the limitations of their scope or to the weighting of the various events. Moreover, political instability is likely to be affected by economic policy, in a way which can differ according to the social and political features of the countries (cf. for

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[2] Used notably by Helleiner (1986).

[3] We have done so in previous studies (Guillaumont 1994, Deméocq and Guillaumont 1989). In the same sense see Dawe (1996).

[4] Many cross-sectional studies have been devoted to the effects of export instability, though they do not generally focus on Africa.

instance Calipel and Donsimoni 1994). Here we use a data base built at the CERDI recording and classifying different kinds of political events, relying on different sources[5] among which we have retained coups (either successful or not) and foreign and civil wars (and other violent events). An index of political instability has been computed as the sum of the number of "coups" and the number of years of foreign and civil wars (and other violent events)[6]. This indicator of political instability so appears to be higher in Africa than in other developing countries, and more significantly so during the eighties than during the seventies.

Since African countries appear more unstable than other developing countries, it is relevant to look at the role played by these instabilities in generating their lower rates of growth. We try to assess this role through a cross sectional study of the factors explaining the rates of growth of a sample of developing countries during the years 1970 to 1990.

3 - Assessing African Growth: General Versus "African" Models

Any assessment of slow African growth during the two or three last decades implicitly or explicitly relies on a model or a theory of growth.

A preliminary question is the following: is slow African growth (compared to that of other developing countries) better explained by a model specific to African countries or by a general model where the explanatory variables have on average different levels in Africa than elsewhere? In other words, are the coefficients or the level of the variables different in Africa? The majority of studies looking for the causes of slow African growth considers only a sample of African countries, assuming a specific model.[7] Among the studies considering a world-wide sample, the specificity of Africa often appears through an African dummy variable, which only indicates that some explanatory variables, different in Africa from elsewhere, have been omitted in the model.[8] Other studies, though they are exceedingly rare, try to compare the coefficients of the variables of the African and non African countries of the model (its stability from one sub-sample to the other).[9] Here we consider African countries within a larger sample of developing countries, assuming a general model, and try to substitute additional explanatory

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[5] *L'Etat du monde*, Ed. de la Découverte, several years. *L'histoire du monde au jour le jour*, *Le Monde*, several years.

[6] Note that this index refers only to what has been observed during each of the two decades, not to a moving average of past events, as the indices of perceived instability previously presented.

[7] Assane and Pourgerami 1994, Azam, Berthelemy, Calipel 1995, Fosu 1992, 1993, Ghura 1995a, 1995b, Gyimak-Brempong 1991, Hadjimichael and alii 1995, Lussier 1993, Ojo and Oshikoya 1995, Savvides 1995.

[8] Barro 1991, Levine and Renelt 1992, Easterly and Levine 1995, De Long and Summers 1993.

[9] Grier and Tullock 1989, Fosu 1990, De Long and Summers 1993, De Haan and Sierman 1996.

variables for the Africa dummy. We also test the stability of the coefficients for the African sub-sample (Chow test).

A second methodological problem concerns the measurement of growth and data. Many cross-sectional growth studies use World Bank data, while others use the Penn World Tables. Following Nuxoll (1994), and as done by Easterly and Levine (1997), we use the purchasing power parity estimates (Penn Tables) for the level of GDP per capita and the national accounts (World Bank Tables) for the GDP per capita growth rate. Again following Nuxoll, we use the Penn Tables estimates for the investment to GDP ratio, as they are more relevant for estimating the physical relationship between capital and output. It should be noted, however, that the results of our regressions are similar whether one uses one data source or the other.

Moreover, it clearly appears from a survey of cross-sectional studies of African growth, that the number of African countries covered by the sample is limited. Often data are missing for precisely those countries which probably displayed worst growth performance. The factors underlying their poor performance are therefore not taken into account, thus weakening the diagnosis of the causes of African stagnation. Further doubts emerge about the reliability of growth estimation in African countries during the past fifteen years because of a relative increase of the informal sector's share in GDP, an increase which is probably not independent of the policies being pursued[10]. It has not been possible to address these problems in the present study. Facing the trade off between the size of the sample and the sophistication of the explanatory variables, we have chosen a rather simple model, in order to constitute a sample including a significant number of African countries (23-24 African countries within a sample of 54 developing countries).

A third methodological problem, pragmatically related to the previous one, concerns the time period under consideration. We are indeed interested here in the causes of long term African stagnation (20-30 years). But the larger the period, the more data are missing. So the paper does not cover the period before 1970. Understanding growth relationships involves considering variables averaged over a sufficient number of years. But since the average level of the explanatory variables, are they instability indicators or policy variables, may strongly change over the years, the time frame of the study must not be too long. In the present paper we have retained a pooled sample of two ten-year periods, which doubles the number of observations (but not of course the country coverage). A dummy variable has been introduced for one of the decades, its purpose being to capture sub-period-

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[10] We have briefly considered the problem of an informal bias in the estimation of GDP growth during the eighties in Guillaumont P. and Guillaumont S. 1994.

specific fixed effects. But again such a dummy only indicates that some factors which are more "active" in the sub-period have not been appropriately controled for in the model.

4 - The Ways through which Instabilities Lower Growth: the Level of Investment or the Growth Residual?

The literature about the effects of instability on the growth of developing countries has been mainly concerned with export proceeds instability, but its conclusions have long been considered ambiguous (see for instance Moran 1983, Combes 1993). The reason is that this literature has focused on the effects of this form of instability on the rates of savings and investment, which are indeed ambiguous. But the effects on growth residual seem to be unambiguously negative (Guillaumont 1987, 1994, Guillaumont and Deméocq 1989, Gyimah-Brempong 1991, Fosu 1992, Dawe 1996). In this paper again it will become clear that the different forms of instability identified above and prevailing in Africa affect growth less by their impact on the rate of investment than *directly,* after controlling for investment (cf. a similar view in Ramey and Ramey 1995).

The model

The models used for explaining growth, in Africa and elsewhere, generally include both structural factors and policy variables. The main structural factors generally used are the initial level of GDP per capita (convergence effect), the initial level of education (proxied by enrolment ratios or the average number of years of schooling in the adult population) and the rate of population growth. To these basic factors we add the (linear) trend of the terms of trade, weighted by the average export to GDP ratio[11] (eq. 1 and 2, Table II).

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[11] If we add, to this "conventional wisdom" model, a more controversial variable such as the index of ethno-linguistic fragmentation (used by Mauro (1994), Easterly and Levine (1995), Collier et al. (1997), this variable does not appear to be significant. It has then been deleted.

Table II and Table III (in Annex)

Assuming that policy is influenced by the level of instabilities, we have introduced, besides structural variables, indicators of the main kinds of primary instability identified above, related respectively to agricultural value-added, terms of trade and purchasing power of exports (eq. 3 to 6, Table II).

Among cross-sectional growth studies, depending on their purpose, some include the ratio of investment to GDP, besides labor force growth, as an explanatory variable, which is considered as a proxy for capital growth, while others do not. In the first case[12], the other variables are interpreted as explaining the growth residual[13]. In the second case, they also explain growth through possible effects on the rate of investment. In this paper we use two series of regressions, with and without the rate of investment, in order to examine the manner through which instabilities affect economic growth. In each case we add a dummy variable for African countries.

The results

Let us consider in Table II the equations with the different indices of instability (eq. 3, 4, 5, 6). The coefficient on the instability of agricultural value-added is never significant, and that on the political instability index is always significantly negative, and the purchasing power of exports instability as well. But terms of trade instability have a significant negative effect only when the rate of investment is introduced in the regression. This suggests that the instability of the terms of trade has a positive impact on the rate of investment, probably due to a positive effect on savings, as often argued in the literature, but a negative impact on the growth residual, as explained below.

This assumption is supported when one examines the results stemming from the estimation of an investment function (eq. 1 and 2 in Table III): the rate of investment appears to depend negatively on political instability, but positively on terms of trade instability; control variables are the same as for the growth equations of Table I, but they are not significant in these regressions.

We note that the Nakamura and Nakamura test does not allow one to reject the null hypothesis that terms of trade instability, purchasing power of export instability, political

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[12] Including most of the conditional convergence studies.
[13] The "growth residual" estimated in a function where the ratio of investment to GDP is used as a proxy for capital growth rate, represents the growth of the global factor productivity only when the capital output ratio is the same across time and across countries.

instability, agricultural value added instability are exogenous. Of course it does not follow that exogeneous policy choices may altogether influence performance.

Thus the primary instabilities identified in this paper seem to have lowered the rate of GDP growth more through their effect on total factor productivity growth than by diminishing the rate of investment.

The Africa dummy

What about the Africa dummy in the growth regressions? When the model does not include any policy or instability variables, the Africa dummy is negative, either with or without the rate of investment among the explanatory variables (eq 1), but it is only significant at the 16% level when the rate of investment is included (eq 2).

When the model includes primary instability variables, the Africa dummy remains significant if the rate of investment is not in the regression as an explanatory variable, but it is no longer significant when investment is introduced (compare eq. 3 and 4 or 5 and 6 in Table II). This is probably so because the rate of investment is on average lower in Africa than in other developing countries. The primary instabilities identified above thus explain the lower rate of growth in Africa by their effect on the growth residual rather than by their effect on the rate of investment. Indeed, the rate of investment is influenced negatively by political instability but positively by terms of trade instability, which are both higher in Africa.

Of course the rate of investment has been negatively influenced in Africa by other risk factors, such as political instability (as it appears in Table III, eq. 1 and 2). Climatic instability, which does not appear to be a significant factor, may not have been adequately proxied by agricultural value added instability.

We note that after deleting the Africa dummy, a Chow test allows us not to reject the null hypothesis that the model tested in eq. 3 and 4 is stable when the sample is divided into two subsamples (African and non African countries).

5 - Instability and Economic Policy: the Role of Investment Instability and Relative Prices Instability

A major assumption of the previous model is that the influence of primary instabilities on the economic growth residual results from their impact on economic policy. It can indeed be assumed that both the instability of the terms of trade and political instability (coups, wars, and so on) lead to stop and go policies. It is well known that, during the past twenty-five years, African countries facing instabilities have conducted inappropriate monetary and fiscal policies. We assume that these policies have led to strong instabilities of the rate of investment and the instability of relative prices, so called "intermediate" instabilities, which were detrimental to growth.

From "primary" to "intermediate" instabilities

Both the instabilities of the rate of investment and of relative prices appear to depend on the primary instabilities examined above (cf. Table IV, eq. 1, 2, 3, 4). Investment rate instability is positively related to the (weighted) instability of the terms of trade and to political instability. The instability of relative prices, proxied by an index of the instability of the real rate of exchange instability, is positively related to the (unweighted) instability of the terms of trade, to political instability and even to agricultural value-added instability. These three instabilities appear to be exogeneous according to the Nakamura and Nakamura test.

We assume that these two instabilities of the investment ratio and of the real exchange rate have a negative effect on per capita GDP growth. But they do not operate exactly in the same way, as we shall see by substituting them, in the growth regression, for primary instabilities. An additional control variable must then be introduced: the trend of the real exchange rate. This captures a possible long term misalignment of relative prices, relatively to which the real exchange rate instability has been measured[14].

Investment instability lowers the growth residual

We assume that the most important channel through which trade and political instabilities affect growth is through their effect on investment instability. It is well known that, during boom periods, projects undertaken, or simply decided, especially

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[14] Political instability first introduced as a primary instability could also have been maintained as an intermediate instability, besides investment rate instability and real exchange rate instability. But when done, it does not appear significant (nor exogeneous).

Table IV and Table V (in annex)

public projects, are often underprepared, oversized and weakly productive. Indeed, during periods of recession, the quality of projects improves, but the improvement involves a lower level of investment, so that the net effect of investment instability on average productivity is negative. As a result of a declining marginal productivity of capital, the gain in total output due to a high level of investment is less than the loss due to a low level of investment. This effect is reinforced to the extent that the marginal productivity of capital probably declines more during periods of rapid investment expansion than it increases during periods of investment shortfall. In other words, the asymmetry effect appears stronger the more concave is the curve representing the marginal productivity of capital as a function of investment. The more severe the limits to absorptive capacity, the greater the concavity of this curve. It may be assumed that this effect is particularly high in African countries due to the limitations of their absorptive capacity.

The results (cf. Table V) clearly support the assumption that the instability of the rate of investment has a strong negative effect on the growth residual (cf. eq. 2). It is highly significant, and, once tested, it appears to be exogenous. Moreover, according to a Chow test, the model again appears to be stable between African and Non African countries.

Finally for a GDP per capita growth about 1.5 (point of percentage) lower in African than in other developing countries both in the seventies and in the eighties, it appears that the higher investment rate instability explains 0.5 point of this gap in the first decade and 0.8 in the second one, which is about the same impact as that of the lower average rate of investment.

Relative prices instability lowers both the rate of investment and the growth residual

As we have seen, trade and political instabilities induce not only instability of investment, but also contribute to the variability of the inflation rate and relative prices[15], proxied here by an index of real effective exchange rate instability. This variability is generally considered as a factor which lowers productivity. It blurs the market signals and induces a misallocation of investment. So it is expected to lower the rate of return on investment. It may also lower the rate of investment, due to the uncertainty that it generates.

Indeed the effect of the real effective exchange rate instability index on the rate of growth appears to be significantly negative with a coefficient that is a little smaller in absolute terms when the rate of investment is introduced in the regression than when it is not. This

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[15] cf. the analysis of trade shocks, in particular Collier and Gunning, 1997.

suggests that it does not only affect the growth residual, but also lowers the rate of investment. This last assumption is supported by the fact that this source of instability, when introduced into the investment function previously tested, appears to have a significant negative effect (Table III, eq. 2). This result is in line with the findings of the literature (cf. for instance about Africa, Ghura and Grennes 1993, Serven 1997). On the other hand the trend (appreciation) of the real exchange rate has a significant negative effect on growth, which is the same with or without the rate of investment in the regression[16].

Since real exchange rate instability is not on average very different in African than in other developing countries, this variable explains a small part of the slower average rate of growth in Africa (about 0.2% in the eighties).

6 - Conclusion

The aim of this paper was to stress that different kinds of instability prevailing in Africa during the last two decades are a part of the explanation of the lower growth of African countries. These instabilities are due either to world markets or to climatic conditions or, and increasingly so, to political troubles. These different forms of "primary" instability were significantly higher in Africa than in other developing countries, particularly during the seventies[17].

We have shown that terms of trade instability and political instability are a part of the explanation of a growth rate in Africa that is lower than in other developing countries between 1970 and 1990. These instabilities contributed to induce bad policies which partly resulted in strong instabilities of the rate of investment and of the real exchange rate. These instabilities appear to lower the rate of growth, mainly by their effect on the growth residual.

A policy implication of this argument is that the acceleration of growth in Africa involves not only an increase of the rate of investment (which is, in Africa, lower than in other developing countries) but also economic policies leading to a more stable rate of investment and to smoother relative price changes.

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[16] This is consistent with the fact it has no significant effect on the rate of investment.

[17] Indeed, the difference is higher between countries refered to in Table I than in the sample used in the regressions, which is smaller, due to the lack of other data for some countries (often among the more unstable, and the slowest growers, see *supra*).

Table VI and Table VII (in annex)

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Table I - Average level of instability indices in Africa South of Sahara and in other developing countries

	1970 - 1980		1980 - 1990	
	Africa	Other DCs	Africa	Other DCs
Primary instabilities a)				
Agricultural value added (w)	1.97* (1.70) [32]	0.69 (0.53) [38]	1,63* (1.27) [37]	0,66 (0.52) [51]
Terms of trade (w)	2.38 (2.29) [29]	2.04 (1.38) [31]	1.75 (1.38) [30]	1,66 (0.99) [40]
Income terms of trade (w)	3.28 (2.13) [32]	3.05 (3.12) [42]	2.82 (2.01) [35]	2.49 (2.57) [45]
Import volume (w)	3.74* (2.70) [32]	2.53 (1.69) [40]	4.42* (3.07) [34]	3.11 (2.25) [42]
Socio-political instability				
"Coups"	0.91* (22) [45]	0.46 (20) [70]	0.87* (21) [45]	0.26 (15) [70]
"Coups", foreign and civil wars (ISP)	2.38 (31) [45]	1.99 (40) [70]	3.29 (36) [45]	2.67 (48) [70]
Intermediate instabilities a)				
Investment GDP ratio	12.85* (6.53) [43]	9.13 (7.59) [51]	13.76* (7.11) [43]	8.27 (8.75) [59]
Real effective exchange rate	3.40 (1.75) [37]	3.55 (2.42) [53]	6.82 (5.99) [41]	5.51 (3.31) [61]

Notes for Table I :
a) Quadratic deviation from the trend in % of the trend value.
The figure between brackets indicates the standard deviation.
The figure between hooks indicates the number of observations.

b) Average number of events by country. The figure between brackets indicates the number of countries concerned and the figure between square brackets the number of observations.
w = weighted
* Wilcoxon test = significant at 5% level

Table II – Primary instabilities and GDP per capita growth rate : regressions on two pooled periods (1970-1980 and 1980-1990)

Eq. Independent Variables	1	2	3	4	5	6
Investment Rate		0.12 (2.90)		0.15 (3.76)		0.13 (3.05)
Population Growth Rate	-0.41 (1.25)	-0.59 (1.69)	-0.58 (1.62)	-0.67 (1.92)	-0.58 (1.57)	-0.65 (1.76)
Log of Initial GDP Per Capita	-0.71 (1.60)	-1.00 (2.17)	-0.84 (1.57)	-1.05 (2.04)	-0.80 (1.49)	-0.95 (1.84)
Log of Initial Secondary School Enrolment Ratio	0.54 (1.54)	0.40 (1.19)	0.39 (1.05)	0.49 (1.37)	0.33 (0.94)	0.35 (0.99)
Weighted Terms of Trade Linear Trend	0.78 (4.55)	0.72 (4.38)	0.74 (3.43)	0.69 (3.43)	0.75 (3.68)	0.72 (3.87)
Weighted Instability of Terms Of Trade			-0.32 (1.33)	-0.66 (2.88)		
Weighted Instability of Income Terms of trade					-0.12 (2.45)	-0.19 (2.26)
Weighted Instability of Agricultural Value Added			-0.01 (0.06)	0.02 (0.10)	-0.01 (0.05)	0.02 (0.09)
Political Instability			-0.21 (3.01)	-0.17 (2.54)	-0.19 (2.83)	-0.14 (2.13)
Dummy Africa	-1.59 (2.20)	-1.03 (1.41)	-1.79 (2.23)	-0.70 (0.88)	-1.77 (2.23)	-0.90 (1.12)
Dummy 1970's	2.17 (4.51)	1.85 (3.85)	1.97 (3.83)	1.94 (4.09)	1.84 (3.69)	1.67 (3.45)
Intercept	5.45 (1.60)	6.70 (1.94)	8.50 (1.95)	7.83 (1.88)	8.18 (1.88)	7.41 (1.77)
R²	0.33	0.39	0.39	0.46	0.38	0.44
AdjR²	0.29	0.35	0.33	0.41	0.33	0.39
F-stat	9.07	10.00	7.34	8.90	7.29	8.27
Chow test (F)			1,92	1,31		
Nb obs Of which African	118 49	118 49	115 48	115 48	115 48	115 48

Table III – Instabilities and the rate of investment:
regressions on two pooled periods (1970-1980 and 1980-1990)

Eq. Independent Variables	1	2
Population Growth Rate	0.57 (0.90)	1.73 (2.28)
Log of Initial GDP Per Capita	1.35 (1.32)	2.41 (2.00)
Log of Initial Secondary School Enrolment Ratio	-0.66 (0.69)	1.26 (1.35)
Weighted Terms of Trade Linear Trend	0.34 (0.67)	0.49 (0.62)
Weighted Instability of Terms of Trade	2.24 (3.98)	
Weighted Instability of Agricultural Value Added	-0.15 (0.30)	
Political Instability	-0.28 (2.34)	
Instability of Real Effective Exchange Rate		-0.23 (2.39)
Real Effective Exchange Rate Linear Trend		-0.09 (1.10)
Dunmmy 1970's	0.37 (0.31)	2.53 (2.07)
Dummy Africa	-7.34 (5.09)	-4.52 (2.77)
Intercept	4.21 (0.56)	-10.73 (1.15)
R²	0.49	0.38
Adj R²	0.44	0.33
F-stat	11.27	8.24
Nb obs Of which African	117 50	116 44

White heteroskedasticity-consistent t-tests between brackets

Table IV – Primary and Intermediate Instabilities: Regressions on two pooled periods (1970-1980 and 1980-1990)

	Investment rate Instability	Real effective exchange rate Instability
Eq.	1	2
Independent Variables		
Log of Initial GDP Per Capita	-0.43 (0.48)	-0.43 (0.70)
Weighted Terms of Trade Linear Trend	-0.96 (1.87)	
Weighted Instability of Terms of Trade	0.67 (1.96)	
Terms of Trade Linear Trend		-0.17 (2.06)
Instability of Terms of Trade		0.35 (2.35)
Weighted Instability of Agricultural Value Added	0.41 (0.41)	1.09 (2.06)
Political Instability	0.81 (2.33)	0.18 (1.56)
Dummy Africa	4.77 (2.81)	-0.82 (0.81)
Dummy 1970's	0.15 (0.11)	-3.64 (4.34)
Intercept	8.02 (1.04)	6.23 (1.19)
R²	0.25	0.25
Adj R²	0.21	0.20
F-stat	5.64	5.31
Nb obs	124	122
Of which african	56	55
White heteroskedasticity-consistent t-tests between brackets		

Table V – Intermediate instabilities and GDP per capita growth rate : regressions on two pooled periods (1970-1980 and 1980-1990)

Eq. / Independent Variables	1	2
Investment Rate		0.10 (2.42)
Population Growth Rate	-0.34 (1.27)	-0.50 (1.67)
Log of Initial GDP Per Capita	-0.61 (1.40)	-0.84 (1.87)
Log of Initial Secondary School Enrolment Ratio	0.47 (1.61)	0.35 (1.23)
Weighted Terms of Trade LinearTrend	0.71 (4.73)	0.66 (4.58)
Instability of Investment Rate	-0.13 (3.81)	-0.14 (4.11)
Instability of Real Effective Exchange Rate	-0.13 (2.94)	-0.11 (2.57)
Real Effective Exchange Rate Linear Trend	-0.07 (1.89)	-0.06 (1.70)
Dummy 1970's	1.95 (4.46)	1.71 (3.85)
Dummy Africa	-0.87 (1.30)	-0.43 (0.65)
Intercept	6.47 (2.02)	7.51 (2.29)
R^2	0.52	0.55
adj R^2	0.48	0.51
F-stat	12.46	12.88
Chow test (F)	1,21	1,01
Nb obs	115	115

of which African	48	48
White heteroskedasticity-consistent t-tests between brackets		

Table VI - Average level of some non-instability variables for Africa South of Sahara and other developing countries

	1970 - 1980		1980 - 1990	
	Africa	Other DCs	Africa	Other DCs
Investment to GDP ratio				
Penn World Tables	11.05* (7.85) [43]	17.25 (7.14) [55]	9.86* (6.34) [43]	17.48 (8.08) [64]
Terms of trade trend (w)	-0.08 (1.86) [29]	-0.26 (1.38) [31]	-0.41 (0.96) [30]	-0.56 (0.60) [40]
Real effective exchange rate trend	-0.53* (4.91) [36]	-2.42 (5.65) [47]	-3.60 (4.46) [40]	-1.46 (6.65) [60]
Rate of population growth	2.69* (1.28) [44]	1.96 (0.99) [67]	2.92* (0.91) [45]	1.87 (1.03) [67]
GDP per capita growth rate World Bank Data	1.36* (2.97) [37]	2.85 (2.31) [48]	-0.16* (2.50) [39]	1.56 (2.99) [53]

Notes for Table VI:
The figure between brackets indicates the standard deviation.
The figure between square brackets indicates the standard deviation.
w = weighted (by the export to GDP ratio)
*Wilcoxon test = significant at 5% level

Table VII – Sources of variables

Variables	Sources
Dependent	
GDP per capita growth rate	World Bank Development Indicators (WDI)
Explanatory	
Agricultural value added	WDI
Terms of trade	UNCTAD
Purchasing power of exports (or Income terms of trade)	Exports valued at import prices, exports and import prices are from WDI
Import volume	WDI
Investment GDP ratio	Penn World Tables Mark 5.6 serie CI
Real effective exchange rate	Ratio of prices in the country to prices in the main import partners adjusted for variations in nominal effective exchange rate. The index is calculated from geometric average of relative prices and bilateral nominal exchange rates. Base 100 in 1980. The weight is given by the ten first import partners for the period 1980-1986.
Coups	Successfull or unsuccessfull coups (number of events), CERDI
«Coups», foreign and civil wars	Coups plus foreign and civil wars and others violent events (number of events), CERDI
Initial GDP per capita	Penn World Tables Mark 5.6 serie RGDPL
Secondary school enrolment ratio	WDI
Population	WDI
Export ratio	WDI, used as weights for liner trend of terms of trade, instability of terms of trade, instability of income terms of trade.
Share of agricultural value added in total value added	WDI, used as weight for instability of agricultural value added