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PUBLIC SPENDING AND REAL EXCHANGE RATE INSTABILITIES AND GROWTH IN AFRICA: EVIDENCE FROM PANEL DATA

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The paper investigates the causes of Africa's poor growth performance. It therefore focuses on the strand of literature that highlights the role of policy instability and uses the dependent economy model as the main theoretical framework. Results from the empirical work indicate that public spending instability increases real exchange rate instability, which in turn exerts a negative impact on both investment and total factor productivity. Further, the empirical investigation suggests partially that real exchange rate appreciation contributes to the decline of sectors with important positive externalities, thereby leading to persistent productivity losses and weak economic growth.

Keywords: Africa, Economic Growth, Macroeconomic Policy, Panel Data
JEL classification: C23, E6, O4, O55

1. INTRODUCTION

African economic performance has been very uneven over time and across countries, but appeared to be generally disappointing. GDP growth was relatively robust until the 1973 oil shock, averaging 5.2 percent during 1966-1973. Growth then decelerated significantly, with an annual average rate of 1.6 percent during 1974-1993. Finally, growth recovered from 1994 to 1997, averaging 4.1 percent during this period. These regional patterns are very much similar to country level record on growth. Indeed, the vast majority of countries in the continent have experienced many short-lived growth episodes, which seem to be closely associated with positive exogenous shocks such as terms of trade improvements, large capital inflows, and favourable weather conditions.

Boom periods have been characterised by accommodative fiscal and monetary

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policies in many countries. Booms often resulted in relatively higher government spending and exchange rate overvaluation. Prolonged unfavourable times, on the other hand, forced countries to adjust by tightening monetary and fiscal policies, and depreciating real exchange rate. This alternation of boom and bust cycles triggered severe instabilities in public spending and real exchange rate,[1] which, in turn, have hampered capital accumulation, productivity, and consequently economic growth. There are two schools of thoughts in the literature that offer explanations for the poor economic performance of African countries. The first emphasises deep-rooted institutional and structural constraints in explaining Africa's poor performance. Those constraints are typically geographical, demographical, political, and social in nature. The second stresses inadequate policies, including the lack of openness and macroeconomic instability (high inflation, unsustainable fiscal and current deficits, and real exchange misalignments) as the key driving forces behind slow growth in Africa. Some of the extensions of this strand of literature highlight the potential impact of policy instabilities on economic growth.[2] For instance, Guillaumont *et al.* (1999) uncover a negative relationship between economic growth and investment and real exchange rate instabilities and presents evidence that these policy-related instabilities[3] are ignited by exogenous shocks or "primary instabilities" such as terms of trade instability, political disturbances, and climate shock. While building on Guillaumont *et al.*, this paper differs from them in two respects. First, it focuses on real exchange rate and public spending, the two key variables of the dependent economy model. Second, the analysis and conclusions in this paper rely on dynamic panel data rather than the commonly use of cross-country data. While acknowledging the critical role played by institutional and structural factors in Africa's poor performance,[4] this paper assesses how instabilities in public spending and real exchange rate played a determinant role in the dismal performance of African economies.

The paper is organised as follows. Section 2 sets the context by providing an overview of descriptive statistics comparing African countries to other developing countries. The variables of interest in this analysis are average growth rate, real investment rate, and instabilities in real exchange rate and government spending. Section 3 presents the models that are used in the discussion, notably the neoclassical growth model and the endogenous growth framework. The latter helps capture dynamics such as

[1] Heavily inspired by the conclusions of the dependent economy model, policy makers in developing countries tend to focus on the level of absorption and the real exchange rate.

[2] The work of Ramey and Ramey (1995), Hnatkovska and Loayza (2003), which focuses mostly on output volatility, can be considered part of this literature too.

[3] Real exchange rate can not entirely be considered a policy variable because it could be influenced by exogenous factors.

[4] To some extent, the delimitation policy versus structural and institutional factors can be considered as artificial because of the intertwining between these two set of factors.

the role of policies. Section 4 reviews the existing econometric methodologies and identifies the best suited approach for the estimation strategy. Section 5 presents the empirical results. Section 6 concludes with policy implications based on the results of the empirical work.

2. DATA: AFRICA VERSUS OTHER DEVELOPING REGIONS

The comparison of the African and non-African data on the variables used in the study yields interesting preliminary lessons. Although sounding arbitrary, these preliminary results provide useful guidance regarding the structure of the theoretical model as well as the empirical investigation.

The comparison is based on a sample that covers 147 countries, including 45 Sub-Saharan African countries. The period under consideration spans three decades, from 1966 to 1997. This data set is structured as a panel with observations for each country consisting of four-year averages or standard deviations.[5] Indicators of instability are captured by standard deviations while level indicators are represented by four-year averages. Each country has eight observations: 1966-1969, 1970-1973, 1974-1977, 1978-1981, 1982-1985, 1986-1989, 1990-1993 and 1994-1997. The panel is, however, not balanced because some observations are missing for a number of countries.

Africa is compared to other regions, using the median.[6] A Wilcoxon/Mann-Whitney test[7] is used to that effect.

[5] We apply Levin, Lin and Chu (2002), Im, Peseran and Shin (2003), and Fisher-type (Madala and Wu, (1999), Choi (2001)) panel-based unit root tests on real effective exchange rate, total government expenditure, and government consumption, and find these series to be stationary around a constant. That implies that standard deviation is a perfect measurement of instability for tels series.

[6] The use of median rather than the mean is justified on practical ground. Most of the observations are geometric averages and standard deviations. This means that the "mean comparison" has to be based on the mean of geometric average or standard deviations, which is very hard to interpret.

[7] The Wilcoxon Mann-Whitney test is viewed as one of the most powerful non-parametric tests. It tests the null hypothesis that two samples have identical distribution functions against the alternative hypothesis that the two distribution functions differ with respect to the median.

Table 1. The Median of Some Key Indicators in Sub-Saharan Africa and in Other Developing Countries

	1966-1997	
	Africa	Other Developing Countries
Growth Rate	0.668*	2.25
	{321}	{670}
Real Investment Rate	8.252*	14.187
	{337}	{506}
REER Instability	11.312*	5.379
	{231}	{360}
Total Government Expenditure Instability	2.211*	1.623
	{162}	{377}
Government Consumption Instability	1.315*	0.849
	{304}	{574}

Notes: * denotes statistically significant at one per cent level using Wilcoxon/ Mann-Whitney Test. Figures in brackets indicate the number of observations.

The first observation is that the median per capita GDP growth in Africa is significantly lower than that of other developing regions during the period 1966-1997. Considering only the classical determinants of economic growth, the differences in GDP growth between these two groups reflect slower capital accumulation in Africa: the median real investment rate in this region is almost half of that of other developing regions. The values of the median real exchange rate instability, the median government expenditure instability, and the median government consumption instability are also statistically much higher in Africa, suggesting that African countries generally experienced more pronounced policy instabilities than other developing countries during the three decades considered here (1966-1997). It might be interesting to look at the evolution of these instabilities in periods of high growth and in times of crisis. This would certainly help understand potential interactions between these instabilities and economic growth.

The 1974-1993 period is arguably the most disappointing era of Africa post-independence economic history while 1994-1997 can be viewed as one of the most promising. The differences in terms of capital accumulation and the instability of the real exchange rate between Africa and other developing countries remain significant during these two periods. However, the fundamental changes that occurred during 1994-1997 had to do with government expenditure and real government consumption. More specifically, the instabilities of these two policy variables in Africa decreased to the point that their levels become roughly identical to those of other developing regions. Consequently, one can conjecture that a more stable public spending in Africa might have led to stronger growth performance in this region.

Table 2. Comparison of the Median of Some Key Indicators in Sub-Saharan Africa and in Other Developing Countries in 1994-1997 and 1974-1993

	1994-1997		1974-1993	
	Africa	Other Developing Countries	Africa	Other Developing Countries
Growth Rate	1.826	2.214	0.211*	1.980
	{45}	{107}	{208}	{440}
Real Investment Rate	7.930*	13.087	8.356*	14.656
	{45}	{95}	{210}	{310}
REER Instability	8.490*	4.409	12.568*	5.662
	{32}	{47}	{152}	{227}
Total Government	1.622	1.441	2.308*	1.786
Expenditure Instability	{16}	{71}	{129}	{273}
Government	1.299	0.846	1.367*	0.911
Consumption Instability	{44}	{95}	{195}	{380}

Notes: * denotes statistically significant at one per cent level using Wilcoxon/ Mann-Whitney Test. Figures in brackets indicate the number of observations.

3. THEORETICAL CONSIDERATIONS

3.1. Solow Model

This paper uses the Mankiw, Romer and Weil (1992)'s version of the Solow model as the main framework to investigate the determinants of growth. This model is based on a Cobb-Douglas production function with Harrod-neutral, i.e., labour-augmenting, technological progress and constant returns of scale features. The model takes the following form:

$$\ln y_{i,t} = \phi_0 \ln y_{i,t-1} + \phi_1 \ln(m_{i,t} + p + d) + \phi_2 \ln s_{i,t} + \omega W_{i,t} + u_i + n_t + \varepsilon_{i,t}, \quad (1)$$

or if human capital is augmented:

$$\ln y_{i,t} = \phi_0^* \ln y_{i,t-1} + \phi_1^* \ln(m_{i,t} + p + d) + \phi_2^* \ln s_{i,t} + \phi_3^* \ln h_{i,t} + \omega^* W_{i,t} + u_i + n_t + \varepsilon_{i,t}, \quad (1')$$

where *i* denotes country, *t* the period, u_i the country-specific effect, n_t the time effects, and $\varepsilon_{i,t}$ the error term. Also, $\ln y_{i,t}$ captures per-capita output, $\ln y_{i,t-1}$ the lagged per-capita output, $m_{i,t}$ the growth rate of the population, *p* the rate of technological progress, *d* the depreciation rate, $s_{i,t}$ and $h_{i,t}$ the measures of physical and human capital accumulation, respectively, and $W_{i,t}$ other determinants of economic growth.

3.2. Criticisms

It is asserted that the neoclassical growth model[8] has two major limitations: the model's conclusion that no growth takes place when the economy reaches the steady state, i.e., in the long-term, unless supported by exogenous technological progress and changes in the population growth rate, and the prediction that per capita income differences among countries should narrow down as time goes on.

Endogenous models have emerged especially as viable alternatives to explain steady-state growth. Romer, Lucas, Robelo, for instance, built models in which long term growth can be sustained endogenously at rates that may be tributary to policy choices, preferences, and technologies. Endogenous growth models are very often classified into two major groups: AK models and R&D models (Jones (1995)). AK growth models such as those of Romer (1986, 1987), Lucas (1988) and Robelo (1991) posit that physical and human capital accumulation can generate sustained economic growth, even in the absence of exogenous technological progress and population growth. The R&D-style growth models of Romer (1990) and Aghion and Howitt (1992) highlight technological progress as the means to perpetuate growth at the steady-state. In these models, technological change is driven by the activities of economic agents in perpetual quest of innovation.

In some of the AK-styled growth models, especially those involving positive externalities, private returns to investment differ from social returns to investment. This implies that an entirely market-based solution leads to sub-optimal solutions both in terms of growth and capital accumulation. These models therefore implicitly recognised the role of government intervention in eliminating distortions and ensuring ongoing per-capita growth. The beneficial impact of government intervention is also acknowledged when public services are considered as an input to private production (Aschauer (1988), Barro (1990)). Public spending, therefore, matters for growth.

3.3. The Role of Economic Policies: Importance of Stability

A close look at the patterns of government expenditures in most African countries suggests a procyclical nature. Commodity price booms and/or large capital inflows encourage many countries to initiate large expenditure programs. These programs are cut back in periods of lower prices and more often in times when external capital flows dry up.[9] Public spending, therefore, tends to be very volatile. Similarly, real exchange rate tends to follow the same patterns as public spending. Substantial inflows of export earnings generated by rising commodity prices or/and large foreign capital inflows result

[8] Use interchangeably The Solow Model and neoclassical growth model

[9] Some categories of public programs, say public consumption, initiated during boom times tend to be sustained even when bust times follow.

in the appreciation of the real exchange rate.[10] This is followed by serious internal and external imbalances, which are addressed by depreciating the real exchange rate. This clearly suggests some swings in the real exchange rate as well. Public spending and real exchange rate instabilities have the potential to hamper economic growth. In fact, they have a detrimental impact on capital (human and physical) accumulation while at the same time undermining the total factor productivity: the efficiency with which capital and labour are combined.

3.3.1. Public Spending Instability and Growth

Public spending instability might incur both direct and indirect costs for economic growth. Public spending instability may influence economic growth "directly" through the efficiency channel or/and "indirectly" through its effect on the accumulation of factors of production, namely capital.

The Productivity Channel

Two lines of arguments are typically put forth to justify a potential negative impact of public spending instability on productivity. On the one hand, intense fluctuations in government spending give rise to erratic provision of public services, such as infrastructure facilities, which leads to weak productivity (Calderòn and Servén (2003)). On the other hand, public spending instability, which is very often associated with boom-bust cycles, produces ratchet effects on public spending, notably on public consumption (Guillaumont (2006)).[11] Ratchet effects eventually result in an upward trend in public spending in the long run. If one assumes a heavy fiscal reliance on monetary financing, higher government spending leads to high and volatile inflation, the blurring of market signals, and ultimately a misallocation of resources and weak productivity.

The Factor Accumulation Channel

As mentioned earlier, public sector expands very often in boom periods. The expansion turns out not be to be sustainable, especially in bad times or/and when external financing dries up. Public spending is then cut in bust periods. This fiscal adjustment is achieved mainly through the reduction of some categories of public investment, such as investment in infrastructural facilities, or some specific current

[10] If the appreciation of the real exchange rate endures for some time, it leads to a Dutch disease phenomenon: a contraction of the non-commodity economy.

[11] Public wages and other current expenditures increase significantly in good times and do not adjust or partially adjust in bad times.

expenditures, including maintenance expenditure, which are complementary to private investment. Such policies affect private investment and constraint economic growth as suggested in endogenous growth models. Moreover, cuts in public spending often lead to protracted recession, which can have long-lasting effects. Firms, in situation of prolonged recession, may experience irreversible losses of material and immaterial assets, which include, among others, the social capital built as well as the institutional and technological settings built within the firms. There may also be irreparable damages caused by recessions to human capital, as the skills acquired by unemployed or underemployed depreciate or vanish.

Finally, public spending instability may represent an important source of real exchange instability, which in turn could constraint growth through direct and indirect channels (Ghura and Greenes (1993), Soderling (2002)).

3.3.2. Real Exchange Rate Instability and Growth

Again, we identify two sorts of mediating channels from real exchange rate instability to disappointing economic growth: the "direct" or total productivity channel and the "indirect" channels through the impact on factor accumulation.

The Productivity Channel

The alternation of real exchange appreciations and depreciations can modify the structure of the economy and generate enduring effects on productivity and economic growth. The "Dutch Disease" analysis captures very well these dynamics (Corden (1982), Corden and Neary (1984), Gylafason *et al.* (1999)). The analysis considers three sectors, namely a booming export sector, a lagging export sector (or traditional export sector), and a nontradable sector. A natural resource boom results in the increase of export earnings and higher domestic spending. If some of the windfalls are spent on nontradable a goods, which is very often the case, higher domestic demand drives up the relative price of nontradables and leads to real exchange rate appreciation.[12] The appreciation of the real exchange rate undermines the competitiveness of exports and causes the contraction of the traditional export sector. This effect is termed "the spending effect". A resource movement effect also takes place, with labour and capital moving from the traditional export sector to the nontradable sector, to meet the rise in domestic demand, and to the booming export sector. In sum, booms[13] can potentially bring about important changes in the structure of economies where they occur. Some

[12] This basically reflects instances where exchange rate is fixed. If exchange rate is flexible, nominal appreciation could be the main cause of real exchange rate appreciation.

[13] The analysis was initially formulated in the context of natural resource boom but could also well describe situations of impressive aid flows (Rajan and Subramanian (2005)).

sectors, such as the manufacturing sector, with significant productivity spillovers to the rest of the economy, might face severe contractions, which could eventually lead to their disappearance. Real exchange rate appreciation might generate "inertia effects" in the sense that the end of booms and subsequent deprecations in real exchange rate may turn not to be sufficient for the recovery of the manufactory sector. Given potential positive externalities of the manufacturing sector, a persistent decline of this sector lowers productivity and long-term growth.

Apart from its sector-specific effects on growth, real exchange rate instability can be detrimental to productivity in the economy in general. Real exchange rate fluctuations distort market signals and lead to an ineffective and inefficient allocation of investment. This argument has been largely supported in the literature (Aizenmann and Marion (1999), Ghura and Greennes (1993), Guillaumont (1999), Serven (1997)).

The Factor Accumulation Channel

The instability of real exchange rate can also impact negatively the level of investment because of the uncertainty it creates (Guillaumont *et al.* (1999)). Uncertainty may well be perceived by economic agents as a loss of credibility in government policies, which can ultimately diminish the expected return on private investment and therefore depress growth. Additionally, it is generally argued that under conditions of uncertainty, risk-adverse economic agents predict greater instability in expected returns, and may cut back in their investments, while risk-neutral agents may adopt a "wait and see" attitude in terms of investment strategy (Azam *et al.* (2002)). In any case, the outcome of greater uncertainty is a decline in investment rates and lower growth.

4. ECONOMETRIC METHODOLOGY

The empirical growth literature has until recently relied, to a large degree, on Ordinary Least Squares, henceforth OLS, to investigate the determinants of economic expansion. This technique has been severely criticised on the ground that it does not properly address the problems of measurement error, omitted variables, and endogeneity, which are common to growth regressions.

4.1. Ineffective OLS

To make easy the discussion on how ineffective is OLS in the presence of those problems, we rewrite Equation (1) and (1′) as

$$\ln y_{i,t} = \phi_0 \ln y_{i,t-1} + \xi Z_{i,t} + u_i + \varepsilon_{i,t}\,, \tag{2}$$

where $Z_{i,t}$ represents the vector of all the explanatory variables of economic growth, except the natural logarithm of lagged per capita income, and ξ the associated vector of coefficients. The issue of measurement error can be illustrated by the following: assume that $y^*_{i,t}$ and $Z^*_{i,t}$ capture $y_{i,t}$ and $Z_{i,t}$, with $w_{i,t}$ and $n_{i,t}$ their respective measurement errors:

$$\ln y^*_{i,t} = \ln y_{i,t} + n_{i,t}\,, \tag{3}$$

$$Z^*_{i,t} = Z_{i,t} + w_{i,t}\,. \tag{4}$$

Combining (2), (3) and (4) yields

$$\ln y^*_{i,t} = \phi_0 \ln y^*_{i,t-1} + \xi Z^*_{i,t} + u_i + \psi_{i,t}\,, \text{ with } \psi_{i,t} = \varepsilon_{i,t} + n_{i,t} - \phi_0 n_{i,t-1} - \xi w_{i,t}\,. \tag{5}$$

One of the key assumptions underlying the use of OLS technique is the absence of correlation between the regressors, $Z^*_{i,t}$ and $y^*_{i,t-1}$, and the disturbance $u_i + \psi_{i,t}$. That hypothesis does not hold, as

$$E\left[(Z_{i,t} + w_{i,t})(u_i + \varepsilon_{i,t} + n_{i,t} - \phi_0 n_{i,t-1} - \xi w_{i,t})\right] \neq 0 \text{ more specifically because}$$
$$E(w^2_{i,t}) \neq 0\,, \text{ and} \tag{6}$$

$$E\left[(\ln y_{i,t} + n_{i,t})(u_i + \varepsilon_{i,t} + n_{i,t} - \phi_0 n_{i,t-1} - \xi w_{i,t})\right] \neq 0 \quad \text{because} \quad E(n^2_{i,t}) \neq 0\,. \tag{7}$$

Further, the omission of some pertinent explanatory variables can also make OLS estimates biased and inconsistent. In fact, omitted variable, for instance time-invariant country-specific characteristics such as the initial level of technology, will be absorbed by the disturbance $u_i + \psi_{i,t}$ in Equation (5), making therefore $E\left[(Z_{i,t}(u_i + w_{i,t})\right] \neq 0$.

Finally, the endogeneity of some of the regressors leads to results that are similar to those reported in the case of omitted variable. For instance, $y_{i,t-1}$ is mechanically correlated with ε_{is} in (2) for $s < t$, $E\left[(y_{i,t-1})(\varepsilon_{is})\right] \neq 0$, violating therefore the assumption that all the explanatory variables are exogenous.

4.2. Instrumental Variable Estimator of Anderson and Hsiao (1982)

One way of addressing both the endogeneity and omitted variable is to use the methodology suggested by Anderson and Hsiao (1982). This consists in eliminating country-specific effects, u_i, by time differencing Equation (2):

$$\Delta(\ln y_{i,t}) = \phi_0 \Delta(\ln y_{i,t-1}) + \xi \Delta(Z_{i,t}) + \Delta(\varepsilon_{i,t}) . \quad (8)$$

By construction, $\Delta(\ln y_{i,t-1})$ becomes correlated with $\Delta(\varepsilon_{i,t})$, thus indicating the need to instrument suspected endogenous variables. Assuming no serial correlation in $\varepsilon_{i,t}$, $\ln y_{i,t-2}$ is not correlated with $\Delta(\varepsilon_{i,t})$ and can serve as instrument for $\Delta(\ln y_{i,t-1})$. The Anderson and Hsiao's instrumental methodology guarantees therefore consistent estimates.

4.3. First-Differenced Generalised Method-of-Moments Estimator (GMM) and System Generalised Method-of-Moments Estimator (SYS-GMM)

Although providing consistent estimates, the Anderson Hsiao's instrumental variable estimator is not efficient because additional lagged values of the dependent variable, $\ln y_{i,t-3}$, $\ln y_{i,t-4}, \ldots \ln y_{i,t-k}$ and $Z_{i,t-1}$, $Z_{i,t-2}, \ldots Z_{i,t-k}$ [14] are also good instruments under the assumption of no further serial correlation in $\varepsilon_{i,t}$.

$$E(\ln y_{i,t-p} \Delta\varepsilon_{i,t}) = 0 \quad \text{for} \quad p = 2,3,...,(T-1) , \quad (9)$$

$$E(Z_{i,t-r} \Delta\varepsilon_{i,t}) = 0 \quad \text{for} \quad r = 1,2,3,...,(T-1) . \quad (10)$$

On that basis, Arrelano and Bond (1991) suggest a Generalised Method of Moments Estimator (GMM), well-known by "first-differenced GMM estimator" that combines the suggested instruments efficiently. However, Blundell and Bond (1998) demonstrate that first-differenced GMM have poor finite sample properties, especially when lagged levels of the variables are not strongly correlated with subsequent first-differences. To address the problem associated with persistent panel data, Blundell and Bond (1998) develop a system GMM estimator that is based on a simultaneous system of two equations, which are Equations (2) and (8). Lagged levels of $\ln y_{i,t}$ and $Z_{i,t}$ serve as instruments for the differenced Equation (10) while their lagged first-differences are the instruments for the Equation in level (2):

$$E(\Delta \ln y_{i,t-p} \varepsilon_{i,t}) = 0 \quad \text{and} \quad E(\Delta Z_{i,t-r} \varepsilon_{i,t}) = 0 \quad \text{for } p \text{ and } \quad r = 2,...,(T-1) , \quad (11)$$

$$E(\ln y_{i,t-p} \Delta\varepsilon_{i,t}) = 0 \quad \text{and} \quad E(\ln Z_{i,t-r} \Delta\varepsilon_{i,t}) = 0 \quad \text{for } p \text{ and } \quad r = 2,...,(T-1) . \quad (12)$$

The validity of the system GMM as a consistent estimator can be ascertained by showing that the error term is not serially correlated, and the instruments used are the

[14] Assuming that some of regressors in $Z_{i,t}$ are endogenous.

adequate ones. The first condition is gauged by Arrelano and Bond (1991) test for autocorrelation, which determines whether the first-differenced error term has second-order. The second condition is verified by a test of over-identifying restrictions, which could be either the Sargan (1958) test or Hansen (1982) test.

5. EMPIRICAL RESULTS

The sample used in the empirical analysis includes 45 African countries but the sample size in each regression varies and is determined solely by data availability. The period covered is from 1966 to 1997. This data set is structured as a panel with observations for each country consisting of four-year averages, standard deviations or data in levels provided quadrennially. Real exchange rate and public spending instabilities are captured by standard deviations estimated on a four year period. The investment to GDP ratio is built by taking four-year non-overlapping averages. Real per capita GDP is obtained quadrennially, starting from 1966 and ending in 1997. Each country has eight observations: 1966-1969, 1970-1973, 1974-1977, 1978-1981, 1982-1985, 1986-1989, 1990-1993 and 1994-1997. The panel is, however, not balanced because some observations are missing for a number of countries.

5.1. Core Model

We investigate the potential impact of policy-related instabilities on economic growth by adding public spending and real exchange rate instabilities to the Augmented Solow construct.[15] To ensure that the analysis is robust, we use two measures of public spending, especially government consumption and total government expenditure.[16]

[15] The Solow model and its augmented version are rejected either because the sum of the coefficients on investment and population growth rate turns to be significantly different from 0 at the 5 percent level in the regression or because the implied share of physical capital is well above the usual one-third found in the literature.

[16] We try to go further in the breakdown in an attempt to identify current and capital expenditures but could not get enough observations to be used in the empirical investigation.

Table 3. SYS-GMM Estimates of the Model of Growth and Instabilities of Real Exchange Rate and Public Spending

(Dependent variable: growth rate of log of per capita GDP)

Variables	(1)	(2)
Ln (GDP_{it-1})	-0.0570*	-0.1112***
	(0.0324)	(0.0333)
Ln (Investment Rate)	0.1671***	0.1933***
	(0.0268)	(0.0333)
Ln ($n_{i,t} + g + d$)	-0.0915	-0.2206**
	(0.0833)	(0.1039)
Ln (Primary)	-00161	-0.0050
	(0.0301)	(0.0335)
Ln (Instability of REER)	-0.0301***	-0.0405***
	(0.0075)	(0.0129)
Ln (Instability of GOVEXP Ratio)	-0.0226	
	(0.0229)	
Ln (Instability of GC Ratio)		0.0025
		(0.0226)
Number of Observations	74	105
Number of Countries	27	30
Chi-Square (Hansen over-id test)	1.00	1.00
AR(2) (Test for Serial Autocorrelation)	0.267	0.211
Variables that are instrumented	All the explanatory variables	

Notes: Robust standard errors in parentheses. *** denotes significance of the estimates at 1 percent critical level, ** denotes significance of the estimates at 5 percent critical level, * denotes significance of the estimates at 10 percent critical level. REER stands for real exchange rate while GOVEXP and GC stand for total government expenditure and government consumption, respectively. Nakamura-Nakamura test indicates that both real exchange rate and public spending volatilities are endogenous. Time dummies are included and they turn not to be significant.

This exercise[17] is summarised in regressions (1) and (2). There is a significantly negative coefficient on initial GDP and a robust positive coefficient on investment. Population growth rate displays a negative coefficient, which turns to be statistically robust in regression (2) and not in regression (1). Human capital, captured by primary education, is statistically insignificant. Further, the results support the prediction that real exchange rate instability exerts a direct negative impact on growth while at the same

[17] A constant was added in all the regressions presented in the paper but the main results remain roughly unchanged.

time indicating a lack of a direct statistically strong effect of public spending instability on economic growth.[18] This leads us to investigate the mediating channels though which government spending instability potentially hampers economic growth.

5.2. The Potential Channels from Public Spending Instability to Poor Economic Growth

5.2.1. The Productivity Channel

In line with the ratchet effect argument developed in the theoretical construct, we introduce the level of public spending in the core regression. The purpose of such an exercise is to see if public spending instability leads to higher public spending, which in turn might lower economic growth through the productivity channel. The results are reported in table 4.

Table 4. SYS-GMM Estimates of the Model of Growth, with a Focus on Potential Ratchet Effects

(Dependent variable: growth rate of log of per capita GDP)

Variables	(3)	(4)
Ln (GDP_{it-1})	-0.0343	-0.1084***
	(0.0487)	(0.0301)
Ln (Investment Rate)	0.1361***	0.1877***
	(0.0285)	(0.0379)
Ln ($n_{i,t} + g + d$)	-0.0958	-0.2014**
	(0.0999)	(0.0841)
Ln (Primary)	-0.0150	-0.0108
	(0.0359)	(0.0336)
Ln (Instability of REER)	-0.0262***	-0.0348**
	(0.0065)	(0.0150)
Ln (GOVEXP Ratio)	-0.0395	
	(0.0627)	
Ln (Instability of GOVEXP Ratio)	-0.0173	
	(0.0213)	
Ln (GC Ratio)		0.0193
		(0.0448)
Ln (Instability of GC Ratio)		-0.0029
		(0.0185)

[18] We find similar results when instability measure is measured on an eight-year sub-period instead of the four-year period.

Number of Observations	74	105
Number of Countries	27	30
Chi-Square (Hansen over-id test)	1.00	1.00
AR(2) (Test for Serial Autocorrelation)	0.266	0.2222
Variables that are instrumented	All the explanatory variables	

Notes: Robust standard errors in parentheses. *** denotes significance of the estimates at 1 percent critical level, ** denotes significance of the estimates at 5 percent critical level. REER stands for real exchange rate while GOVEXP and GC stand for total government expenditure and government consumption, respectively. Nakamura-Nakamura test indicates that both real exchange rate and public spending volatilities are endogenous. Time dummies are included and they turn not to be significant.

Most of the previous significant controls continue to have a predictive content over per capita GDP while both levels and instabilities of government total expenditure and consumption turn not to have an explanatory power. The lack of statistical significance of public spending instability and non-significance of its level when included in the same regression do not support a ratchet effect argument.[19]

Table 5. SYS-GMM Estimates of the Model of Growth and Instabilities of Real Exchange Rate and Public Spending

(Dependent variable: growth rate of log of per capita GDP)

Variables	(5)	(6)	(7)	(8)
Ln (GDP_{it-1})	-0.0570*	-0.0683**	-0.1112***	-0.0871**
	(0.0324)	(0.0304)	(0.0333)	(0.0399)
Ln (Investment Rate)	0.1671***	0.2097***	0.1933***	0.1873***
	(0.0268)	(0.0345)	(0.0333)	(0.0399)
Ln ($n_{i,t} + g + d$)	-0.0915	-0.0503	-0.2206**	-0.1764**
	(0.0833)	(0.0851)	(0.1039)	(0.0822)
Ln (Primary)	-00161	-0.0096	-0.0050	-0.0399
	(0.0301)	(0.0312)	(0.0335)	(0.0326)
Ln (Instability of REER)	-0.0301***		-0.0405***	
	(0.0075)		(0.0129)	
Ln (Instability of GOVEXP Ratio)	-0.0226	-0.0387*		
	(0.0229)	(0.0209)		
Ln (Instability of GC Ratio)			0.0025	-0.0402**
			(0.0226)	(0.0194)

[19] This result is not surprising insofar as we previously found both government total expenditure and government consumption ratios to be stationary around a drift. In other words, public spending to GDP ratios are not following an upward trend.

Number of Observations	74	93	105	145
Number of Countries	27	33	30	40
Chi-Square(Hansen over-id test)	1.00	1.00	1.00	1.00
AR(2) (Test for Serial Autocorrelation)	0.267	0.283	0.211	0.521
Variables that are instrumented	All the explanatory variables			

Notes: Robust standard errors in parentheses. *** denotes significance of the estimates at 1 percent critical level, ** denotes significance of the estimates at 5 percent critical level, * denotes significance of the estimates at 10 percent critical level. REER stands for real exchange rate while GOVEXP and GC stand for government total expenditure and government consumption, respectively. Nakamura-Nakamura test indicates that both real exchange rate and public spending volatilities are endogenous. Time dummies are included and they turn not to be significant.

We explore another potential productivity channel, that is, the channel via real exchange rate instability. Strong evidence from the literature supports the view that fluctuations in public spending explain real exchange rate instability and real exchange rate appreciation (Ghura and Greenes (1993), Soderling (2002)). The most straightforward approach to uncover this channel is to compare two set of regressions: one that includes both public spending and real exchange rate instabilities and the other that accounts for public spending only. Results are presented in Table 5. Public spending, either captured by government total expenditure or government consumption, turns negative and significant when real exchange rate fluctuations are not factored in (regressions 6 and 8). However, the same variables appear statistically insignificant once real exchange rate instability is introduced in regressions 5 and 7. These results lend a strong support to the contention that government spending fluctuations amplify real exchange rate instability, which in turn depresses total factor productivity and ultimately economic expansion.

5.2.2. The Factor Accumulation Channel

A more systematic way to explore a potential investment channel is to look at the determinants of investment. We therefore regress real investment rate on all the explanatory variables of the core growth regression and a new control, namely, the lagged investment rate. Table 6 displays results that do not support any evidence of an investment channel.[20] Public spending instability seems not to influence directly the level of investment.[21]

[20] We also got the evidence of the absence of an investment channel by comparing a growth regression that includes investment to a regression that does not. In both regressions, public spending instability turns not to be statistically significant.

[21] Evidence of an indirect channel through real exchange rate instability is also found by putting side by side

Table 6. SYS-GMM Estimates of the Determinants of Real Investment

(Dependent variable: real investment rate)

Variables	(9)	(10)
Ln (Investment $Rate_{it-1}$)	0.6664***	0.6719**
	(0.0448)	(0.0739)
Ln (GDP_{it-1})	0.1240	0.1384*
	(0.0844)	(0.0752)
Ln ($n_{i,t} + g + d$)	-0.0069	0.0262
	(0.2541)	(0.2141)
Ln (Primary)	0.00326	-0.0155
	(0.0652)	(0.0571)
Ln (Instability of REER)	-0.044*	-0.0615*
	(0.0262)	(0.0350)
Ln (Instability of GOVEXP Ratio)	0.0280	
	(0.0220)	
Ln (Instability of GC Ratio)		0.0286
		(0.0381)
Number of Observations	74	105
Number of Countries	27	30
Chi-Square (Hansen over-id test)	1.00	1.00
AR(2) (Test for Serial Autocorrelation)	0.433	0.279
Variables that are instrumented	All the explanatory variables	

Notes: Robust standard errors in parentheses. *** denotes significance of the estimates at 1 percent critical level, ** denotes significance of the estimates at 5 percent critical level, * denotes significance of the estimates at 10 percent critical level. REER stands for real exchange rate while GOVEXP and GC stand for government total expenditure and government consumption, respectively. Nakamura-Nakamura test indicates that both real exchange rate and public spending volatilities are endogenous. Time dummies are included and they turn not to be significant.

an investment rate regression that contains both real exchange rate and public spending instabilities and an investment regression that contains public spending instability only. Public spending instability appears significant only in the second regression.

5.3. The Potential Channels from Real Exchange Rate Instability to Poor Economic Growth

5.3.1. The Productivity Channel

Results from Table 3 clearly indicate a direct negative impact of real exchange rate fluctuations on growth. As mentioned before, this "direct effect" indicates that real exchange instability has a negative impact on growth and that impact is felt through meagre total productivity factor growth. The finding is quite close and broadly consistent with what was uncovered by Aizenman and Marion (1999), Ghura and Greenes (1993), Guillaumont *et al.* (1999) and Serven (1997).

Having found that real exchange rate instability depresses total factor productivity and therefore economic growth, we then investigate potential asymmetric effects of real exchange rate instability and inertia effects of real exchange appreciation.

Asymmetric Effects of Real Exchange Instability

Referring to real exchange instability implies accounting for both real exchange rate appreciation and real exchange rate depreciation. Therefore, it will be interesting to find out which of these two components of real exchange instability drives the result. This exercise amounts to exploring potential asymmetric effects. We introduce a multiplicative variable *APPREER* and *DEPREER* in the core regressions to account for these effects. *APPREER* is a multiplicative variable equal to 1 times real exchange rate instability if there is an appreciation in real exchange rate and 0 otherwise. Similarly, *DEPREER* is equal to 1 times real exchange rate instability if there is depreciation in real exchange rate and 0 otherwise. Regressions 11 and 12 in Table 7 indicate that among the newly included variables only *APPREER* turns to have a significant predictive content over per-capita growth, which suggest that the detrimental effect of real exchange rate instability on growth is mostly driven by real exchange rate appreciation.

Table 7. SYS-GMM Estimates of the Model of Growth, with a Focus on Potential Asymmetric Effects and Inertia Effects

(Dependent variable: growth rate of log of per capita GDP)

Variables	(11)	(12)	(13)	(14)
Ln (GDP_{it-1})	-0.0663**	-0.1170***	-0.0570*	-0.0811**
	(0.0304)	(0.0296)	(0.0353)	
Ln (Investment Rate)	0.1755***	0.1985***	0.1545***	0.1473***
	(0.0306)	(0.0297)	(0.0323)	(0.0431)
Ln ($n_{i,t} + g + d$)	-0.1006	-0.2188**	-0.0996	-0.1772*
	(0.0819)	(0.0973)	(0.1035)	(0.0943)
Ln (Primary)	-0.0128	0.0026	-0.0138	-0.0049
	(0.0263)	(0.0296)	(0.0299)	(0.0286)
APPREER	-0.0309***	-0.0375***		
	(0.0059)	(0.0126)		
DEPRREER	-0.0133	-0.0363		
	(0.0118)	(0.0223)		
Ln (Instability of GOVEXP	-0.0172		-0.0253	
Ratio)	(0.0193)		(0.0164)	
Ln (Instability of GC Ratio)		0.0047		-0.0027
		(0.0208)		(0.0222)
Ln (Instability of REER)			-0.0297***	-0.0456**
			(0.0078)	(0.0189)
$APPR_{t-1}$ * $DEPR_t$			-0.0145	-0.0991*
			(0.0310)	(0.0514)
Number of Observations	74	105	69	98
Number of Countries	27	30	27	30
Chi-Square (Hansen over-id test)	1.00	1.00	1.00	1.00
AR(2) (Test for Serial Autocorrelation)	0.279	0.211	0.264	0.181
Variables that are instrumented	All the explanatory variables			

Notes: Robust standard errors in parentheses. *** denotes significance of the estimates at 1 percent critical level, ** denotes significance of the estimates at 5 percent critical level. REER stands for real exchange rate while GOVEXP and GC stand for government total expenditure and government consumption, respectively. APPREER is equal to 1 times Ln (Instability of REER) if there is an appreciation in real exchange rate and 0 otherwise. Similarly, DEPREER is equal to 1 times Ln (Instability of REER) if there is a depreciation in real exchange rate and 0 otherwise. APPR and DEPR are dummy variables that capture real exchange rate appreciation and real exchange depreciation, respectively. Time dummies are included and they turn not to be significant.

Inertia Effects of Real Exchange Rate Appreciation

In line with the theoretical argument developed in section 3.3, we explore further potential inertia effects of real exchange rate appreciation on total productivity factor and growth. We introduce a multiplicative variable $APPR_{t-1} * DEPR_t$ in the core regressions. That variable is a combination of the lagged of a dummy variable *APPR*, which captures real exchange rate appreciation, and a dummy variable *DEPR*, which stands for real exchange depreciation. The idea being captured here is that initial real exchange rate appreciation has an enduring impact in subsequent period even if that subsequent period is characterised by real exchange depreciation. The multiplicative variable $APPR_{t-1} * DEPR_t$ turns with the expected sign both in regressions 13 and 14. However, the coefficient on this multiplicative variable is statistically significant only in regression 14. These results tend to support partially the contention that real exchange rate appreciation exerts an enduring impact on per capita growth.

5.3.2. The Factor Accumulation Channel

The regressions presented in Table 6 show a significant negative relationship between real exchange rate instability and investment, suggesting real exchange rate instability also affects growth in a significant and negative way through the investment channel. This result is in line with what was found by Guillaumont *et al.* (1999).

To recap, instabilities of public spending and real exchange rate exert detrimental impact on growth through a variety of channels. On the one hand, the effects of real exchange rate instability work through both meagre total factor productivity and lower investment. On the other hand, government spending instability seems to have indirect effects only. It amplifies real exchange rate instability, which in turn depresses total productivity factor and investment.

6. SUMMARY AND CONCLUSIONS

Recent economic research on Africa has extensively explored possible reasons for the continent's dismal growth performance. This debate has been dominated by two lines of argument: those who attribute Africa's poor performance to poor policies and those who explain it by structural and institutional impediments. That classification appears simplistic, as both factors are interrelated. While acknowledging the critical role played by institutional and structural factors in Africa's poor performance, this paper revisits the policy argument along the lines of the arguments developed by Guillaumont *et al.* (1999) and explores the role played by policy instabilities. However, the approach adopted in this paper differs from earlier work on two counts. First, it relies entirely on the key variables underscored in the dependent economy model, namely the real exchange rate and the absorption. Second, the analysis is based on dynamic panel data

instead of cross-country data. Using the system GMM, the most appropriate econometric technique for our model, we find only real exchange instability to have a direct significant effect on economic growth. The combination of a statistical significance of real exchange instabilities and the non-significance of public spending instability, when incorporated in the same regression, indicates that both are not two distinct factors regarding their impact on per capita growth. Public spending instability has a significant positive predictive content over real exchange rate instability, which in turn hampers growth both through investment and productivity channels. Also, real exchange rate instability has asymmetric effects on economic growth, as the relationship between these two variables is driven by real exchange rate appreciation. Finally, partial evidence supports the view that real exchange rate appreciation contributes to the decline of sectors with important positive externalities, thereby leading to persistent productivity losses and weak economic growth. Overall, we interpret the above findings as suggesting that the stability of public spending and real exchange rate are keys to Africa's long-term economic growth.

That said, the question arises as to how to achieve those objectives. Avoiding large swings in public spending requires having some control over government revenue sources, both internal and external. In many African countries, with a narrow production bases, domestic revenues are closely synchronized with developments in commodity markets. The long-term solution for government revenue and expenditure instability is to broaden the revenue base through economic diversification. However, achieving a stability of government domestic revenues in the short-run may be facilitated by the adoption of the use of contingent financial instruments and some institutional arrangements, such as the establishment of a stabilisation fund. The use of contingent financial instruments, such as futures, swaps, and options, has the potential to transfer commodity price instability to international markets and guarantee more stable public revenue and expenditure. However, the use of such instruments critically depends on the existence of a sophisticated domestic financial sector, which does not exist in many African countries. Contrary to the contingent financial tools, stabilisation seems to be a feasible solution.[22] The stabilisation fund serves as a buffer mechanism whereby some part of windfall revenues are transferred from the budget to the stabilisation fund during times of increasing commodity prices and the other way round when prices are declining, ensuring therefore the stability of public spending. The other source of uncertainty for government revenue is the flows of resources coming from abroad and financing government deficit. Most African countries rely on aid flows in that respect, which means a more predictable aid, could also be beneficial. Having a more stable public spending could take care of an important source of real exchange rate instability.

[22] Transparency and fiscal restraint are just as important in ensuring the well-functioning of a stabilisation fund.

ANNEX 1. Sample

Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Republic of Congo, Cote-d'Ivoire, Djibouti, Eritrea, Ethiopia, Gabon, the Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe

ANNEX 2. Data, Definitions and Sources

Variables	*Sources*
Dependent	
Ln (GDP_{it})	Natural Logarithm of per capita GDP (1996 international prices) Source: Penn Word Table Version 6.1
Explanatory	
Ln (GDP_{it-1})	Lagged of Natural Logarithm of per capita GDP Source: Penn Word Table Version 6.1
Ln (Investment Rate)	Natural Logarithm of real investment as ratio to GDP (1996 international prices) Source: Penn Word Table Version 6.1
Ln ($n_{i,t} + g + d$)	Natural Logarithm of population annual growth rate plus 0.05 Source: World Development Indicators 2004
Ln (Primary)	Natural Logarithm of primary enrolment ratio Source: World Development Indicators 2004
Ln (Secondary)	Natural Logarithm of secondary enrolment ratio Source: World Development Indicators 2004
Ln (REER)	Natural Logarithm of Real Effective Exchange Rate. The real effective exchange rate is the ratio of prices in the rest of the world adjusted for variations in nominal effective exchange rate to price in the country. The weighting scheme used in the calculation of prices in the rest of the world and nominal effective exchange rate is based on the shares of the country's exports to the main five largest trade partners. An increase means a depreciation while a decrease means an appreciation. Source: Calculated based on data from International Financial Statistics (2004), World Development Indicators (2004) and COMTRADE (2004).
Ln (Instability of GC Ratio)	Natural Logarithm of the instability of general government final consumption expenditure as ratio GDP Source: World Development Indicators 2004

Ln (Instability of GOVEXP Ratio)	Natural Logarithm of the instability of government total expenditure as ratio to GDP Source: World Development Indicators 2004

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