

# IMF Working Paper

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## **Drivers of Growth: Evidence from Sub-Saharan African Countries**

*Prepared by Manuk Ghazanchyan and Janet G. Stotsky*

**IMF Working Paper**

Office of Budget and Planning

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**Abstract**

This study examines the drivers of growth in Sub-Saharan African countries, using aggregate data, from the past decade. We correlate recent growth experience to key determinants of growth, including private and public investment, government consumption, the exchange regime and real exchange rate, and current account liberalization, using various econometric methodologies, including fixed and random effects models, with cluster-robust standard errors. We find that, depending on the specification, higher private and public investments boost growth. Some evidence is found that government consumption exerts a drag on growth and that more flexible exchange regimes are beneficial to growth. The real exchange rate and liberalization variables are not significant.

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## I. DRIVERS OF AFRICAN ECONOMIC GROWTH

### A. INTRODUCTION

The analysis of growth is central to assessing macroeconomic performance. Most Sub-Saharan African countries have notably improved their macroeconomic performance in recent years, as reflected in higher average growth, generally moderate and stable inflation, and the accumulation of ample international reserve coverage. For developing countries, investment is a critical component of growth, and other important drivers may include characteristics of the foreign exchange regime and the real exchange rate as well as institutional and political variables. In Africa, a key contributing factor to this improved macroeconomic performance were the reforms that these countries undertook to strengthen macroeconomic stability, and in doing so to liberalize their foreign exchange regimes. In the past, the foreign exchange regimes of many of these countries shared features of illiberal regimes once found commonly in Latin America and elsewhere, and were characterized by administrative controls over foreign exchange allocation and current account transactions. Persistently weak external accounts and overvalued exchange rates led to extensive foreign exchange rationing and sizeable black market premiums.

This study focuses on assessing the drivers of growth in Sub-Saharan Africa, using aggregate cross-section and time-series data, for the past decade, over the entire continent. Growth analysis using aggregate data has its weaknesses, especially when dealing with a very diverse set of countries, and any such analysis needs to be supplemented with that derived from more micro-based data. Nonetheless, the striking improvement in growth rates in Africa over the past decade suggest that some analysis of aggregate relationships might yield clues as to what factors were most directly responsible for the improved performance. The value added of this study is thus twofold: it makes use of a panel data set, with recent data on all African countries and checks robustness of the results against model specification; and it specifically investigates the relationship of indicators of the exchange rate regime and current account liberalization to growth.

We find that, depending on the specification, higher private and public investments boost growth. The lack of a robust relationship in all samples and variants may reflect a lack of quality investments or an inability to measure growth and investment well in these countries.<sup>1</sup> Some evidence is found that government consumption exerts a drag on growth and that more flexible exchange regimes may be beneficial to growth. These results are generally in accordance with our expectations. The real exchange rate and liberalization variables are not significant. The absence of a robust relationship between the choice of the foreign exchange regime and growth is not unusual and has been obtained in other studies on developing

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<sup>1</sup> Devarajan (2013) and Jerven (2013) discuss the limitations of aggregate African data in a special issue of the *Review of Income and Wealth*.

countries, using aggregate data; this finding suggests that the entire macroeconomic policy mix and not just the foreign exchange regime is critical to providing an environment conducive to growth. The absence of a clear relationship between the real exchange rate and growth may reflect in part the difficulty in constructing an accurate measure of our CPI-based real exchange rates in these countries, especially in view of the poor quality of inflation data.

Section B reviews the literature. Section C describes the data and presents a descriptive analysis. Sections D and E present our results and Section F concludes.

## **B. Literature Review**

Aghion and Howitt (2009), the Commission on Growth and Development (2008), and Barro and Sala-i-Martin (2004) survey the extensive literature on the determinants of growth.<sup>2</sup> In Empirical modeling has found a robust relationship between investment (both human and nonhuman) and growth. Drawing upon an augmented Solow model of growth, Mankiw, Romer, and Weil (1992) find that investment, education, and population growth play a significant role in explaining cross-country growth. Levine and Renelt (1992) find that investment share in GDP is the most robust determinant of growth. Real exchange rates and institutional features also figure prominently as empirical determinants of growth.

A growing body of literature tries to explain the recent growth experience of low income countries and more specifically, African countries. Some recent studies include Guerguil and others (2011), IMF (2012), IMF (2013), Jaunky (2013), Johnson, Ostry, and Subramanian (2007), Mijiyawa (2013), Patillo, Gupta, and Carey (2006), and Stotsky and others (2012). This research shows that Sub-Saharan African countries have made progress in sustaining macroeconomic stability and liberalizing foreign exchange regimes but still face challenges to improve institutions, reduce regulatory barriers, strengthen human capital and health, and avoid overvalued exchange rates. Natural resource exporters have enjoyed robust growth, in the face of significant foreign direct investments while the experience of the non-resource based economies has been more varied. So far, no clear consensus has emerged on exactly what factors have been most responsible for driving the African growth pick-up and for sustaining growth. And it appears that there is a combination of factors, which are to some extent idiosyncratic to each country. The poor quality of African institutions was once thought to be a key hindrance to growth (Collier and Gunning, 1999). However, with the improvement over the past few decades of the institutions specifically responsible for macroeconomic management and the increasing autonomy of central banks, which have underpinned greater macroeconomic stability and stable inflation, other factors are beginning to emerge as key drivers of and hindrances to growth. Economic factors include investment

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<sup>2</sup> Agenor and Montiel (1996) bring in an explicit development macroeconomics dimension.

in human and physical capital, greater trade openness, avoidance of overvalued exchange rates, and greater financial development or availability of credit; institutional and cultural factors include democratization, reduction of ethnic friction, and greater gender equality.

We bring focus in our analysis to the relationship of foreign exchange regimes to growth. Rose (2011), Klein and Shambaugh (2010), and Ghosh, Gulde, and Wolf (2002) survey key ideas that form the background to a study of foreign exchange regimes. Monetary neutrality suggests that the nominal exchange rate regime should have no bearing on long-run economic growth. On the other hand, the exchange rate regime influences how countries adjust to real and nominal shocks and hence it may have some bearing on growth. It is generally considered advantageous for countries that experience significant real shocks to use floating exchange rates, which allows relative price adjustment to take place through adjustments of the nominal exchange rate, whereas it is considered advantageous for countries experiencing significant nominal shocks to adopt fixed exchange regimes. A range of other considerations are relevant to this discussion, including the transparency and credibility of the central bank, the incentives of different regimes for fiscal discipline, and various microeconomic arguments related to the workings of the foreign exchange market.

Theoretically, the choice of regime may influence growth through its indirect effect on investment, productivity, and international trade. Uncertainty is a key consideration in this indirect chain. A pegged exchange rate regime may increase confidence and reduce uncertainty and transaction costs, thus boosting investment, productivity, and trade, while uncertainty about exchange rates, under floating regimes, may create a damper to investment. However, if a peg is not credible or leads to overvaluation and black market premiums, as was observed in many African countries in the past, then it may lead to lower investment, productivity, and trade, and hence weaken growth and competitiveness. Countries with more developed financial markets may be better able to contain exchange rate volatility associated with a flexible exchange rate, and thus are able to achieve the benefits of flexible rates in terms of enhancing the ability to adjust to real shocks without sacrificing the stability that a credible peg may entail.

Rose, Kyaw and de Vita (2011), Klein and Shambaugh, Ghosh Ostry, and Tsangarides (2010), and Harms and Kreschmann (2009) add to empirical work on the relationship between foreign exchange regime and growth.<sup>3</sup> De Vita and Kyaw use a panel of developing countries, over the 1981–2004 period, to study this relationship. They distinguish *de facto* and *de jure* regimes. They find that after controlling for the monetary policy framework, the regime has no significant effect on growth. Similarly, Rose, Klein and Shambaugh, and Ghosh, Ostry, and Tsangarides reach the same conclusion, with respect to developing countries (see also Husain, Mody, and Rogoff, 2005, Rogoff and others, 2004; and Ghosh and others, 1997). Harms and Kreschmann, using a sample of developing countries, find

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<sup>3</sup> Petreski (2009) surveys the literature as well.

some benefit from less flexible regimes, but this result disappears after high inflation periods are eliminated from the sample. In contrast, Levy-Yeyati and Sturzenegger (2003) come to the conclusion that less flexible regimes are associated with slower growth, as well as greater output volatility. Miles (2006) introduces a measure of the black market premium, into the standard regression setup, and finds that this eliminates the effect of the exchange regime. In sum, the preponderance of empirical work suggests that the regime does not have a significant effect on growth, once other relevant variables are taken into account, in developing countries, but this finding is not uniform and some studies have found that more flexible regimes are better for growth.

These studies have not explored another important dimension of the foreign exchange regime, the degree to which the country has liberalized its current account. Liberalization may on its own exert an effect on growth by creating an atmosphere that is more conducive to development of trade and export-oriented industry. It may sometimes be difficult to ascertain whether a country has liberalized its current account, because there are many aspects to this determination and there may also be substantial gaps between the laws and regulations and practices, as with the exchange rate regime. The best measure of liberalization on a de jure basis is whether the country has accepted Article VIII status of the IMF's Articles of Agreement and the de facto adherence is something that IMF country teams assess in conjunction with the relevant authorities.

Finally, the real effective exchange rate is a key component of macroeconomic policy. There is evidence that overvaluation is bad for growth and some more limited evidence that undervaluation may be beneficial for growth. Johnson, Ostry, and Subramanian (2007), Rodrik (2008), and Berg and Miao (2010) cover these issues in depth, in the developing country and specifically African context.

### **C. Data and Descriptive Analysis**

#### **Data**

The sample for our study covers annual observations for 42 African countries over the period 1999–2011.<sup>4</sup> The sample excludes the Democratic Republic of Congo and Zimbabwe owing to their historically high inflation episodes and freely falling currencies. We group the countries into three samples: a full sample, a sample excluding oil exporters, and a sample that includes only middle and low income countries. The sample includes the countries in the regional unions of the West African Economic and Monetary Union (WAEMU), the Economic Community of Central African States (CEMAC), and the Common Monetary Area (CMA).

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<sup>4</sup> See Appendix A for a description of the data and summary statistics.

In constructing our measure of foreign exchange regime, this study distinguishes between de jure and de facto foreign exchange regimes, as indicated in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The de jure classification reflects the officially announced exchange rate regime and the de facto classification, the actual policies in place at that time. We map the IMF classifications into three regimes (i.e., pegged, intermediate, and floating).<sup>5</sup> The de jure and de facto classifications are positively correlated, in our sample, with a correlation coefficient of 0.85. Several other approaches rely on economic outcome data to distinguish de jure from de facto regimes. Levy-Yeyati and Sturzenegger (2005) use data on changes in nominal exchange rates, the volatility of these changes, and the volatility of international reserves, with cluster techniques, to group countries into de facto regimes. Reinhart and Rogoff (2004) rely on exchange rate movements and black market data, which were not available for our sample. In view of the difficulty in classifying intermediate regimes, we also conduct robustness checks on the regime classifications, following Eichengreen and Razo-Garcia (2011). We find no substantive difference in our results with these variants. Another approach is to substitute an index that increments by one for each type of regime, ordered from least to most flexible, in place of the dummy variables for the types of regimes. We use both linear and quadratic forms and again find results consistent with our baseline findings. For current account liberalization, we use the IMF's AREAER de facto classification to characterize current accounts as liberalized or not.

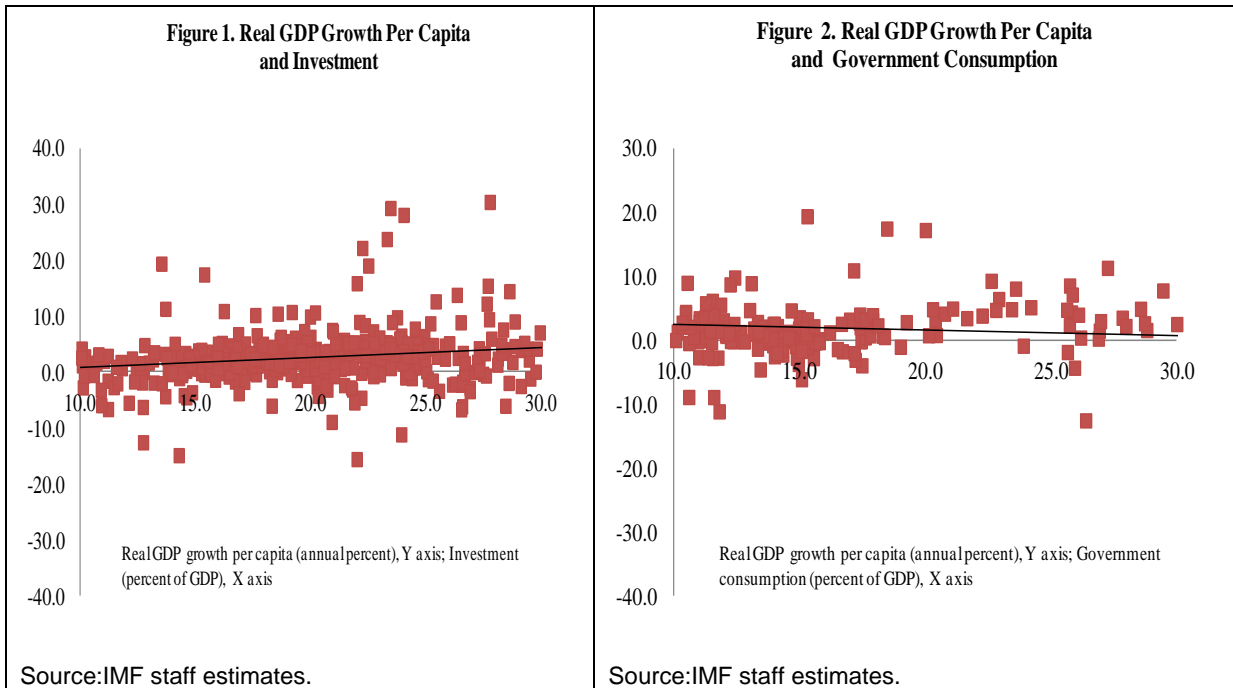
### **Descriptive analysis**

We present some simple scatter plots to examine the relationship between our variables of interest and growth. Figure 1 plots investment share in GDP against real GDP per capita while Figure 2 plots government consumption share. We find a direct association between investment and growth, and an inverse association between government consumption and growth, though in both cases the correlations appear weak.

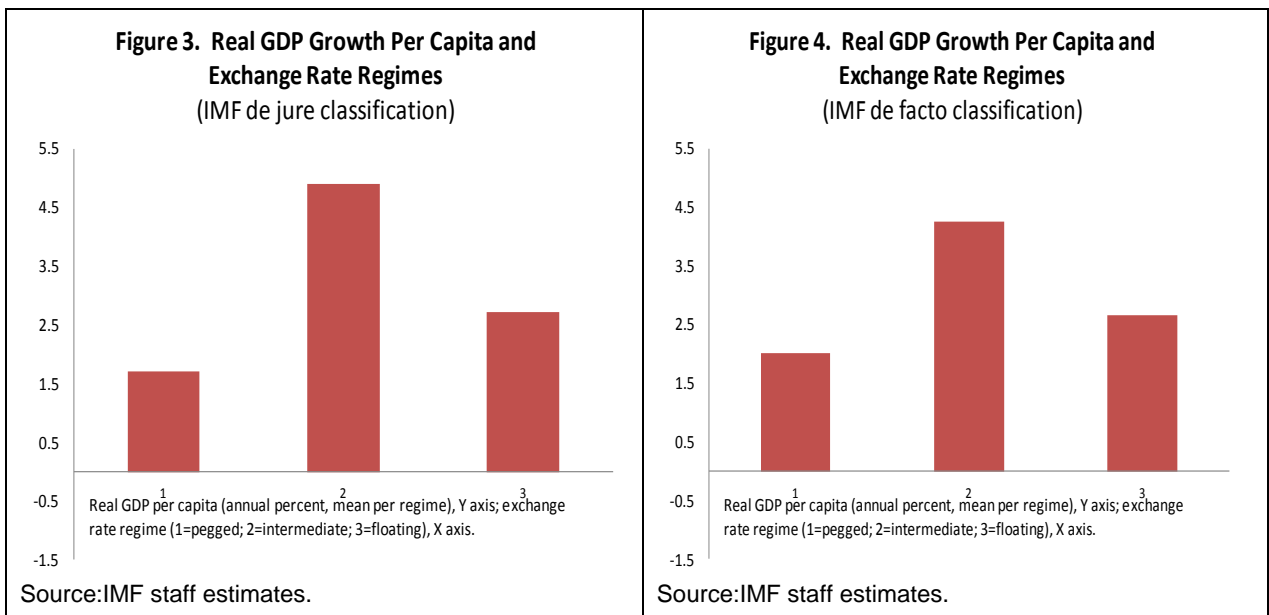
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<sup>5</sup> See Appendix B for the methodology of exchange regime classifications.





We also plot the mean real GDP growth per capita against the different exchange rate regimes, in both the de jure and de facto settings (Figures 3 and 4), where we find a positive relationship between the more flexible exchange rate regimes and growth. Intermediate regimes are associated with higher growth than either of the other regimes.



## D. Empirical Specification

### The set-up

Our econometric results are based on estimating the following equation:<sup>6</sup>

$$\text{Growth}_{i,t} = \alpha X_{i,t} + \beta R_{i,t} + \sigma_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

In equation (1),  $\text{Growth}_{i,t}$  is the growth rate of real GDP per capita or the growth rate of non-agricultural real GDP per capita of country  $i$  in year  $t$ ;  $X_{i,t}$  is a vector of explanatory variables, described below;  $R_{i,t}$  is a vector of foreign exchange regime dummies, where the coefficients represent the performance of flexible foreign exchange regimes relative to a pegged regime, which is the omitted category;  $\sigma_i$  are country specific effects;  $\gamma_t$  are time specific effects;  $\varepsilon_{i,t}$  are error terms; and  $\alpha$  and  $\beta$  are parameters to be estimated. We run our estimations for pooled ordinary least squares (OLS), cross-sectional fixed effects, time-and cross-sectional fixed effects and random effects models.<sup>7</sup>

For the explanatory variables, we draw upon the rich empirical literature in this field, keeping in mind the limitations of the data from these countries, especially regarding the investment variables. We use private and public investment in GDP as measures of factor inputs, where we would expect a higher share of investment should lead to higher growth. We use lagged investment in our analysis, following some previous studies, to capture supply side effects. We also use government consumption in GDP as an explanatory variable, which we expect would have an ambiguous effect on growth for the following reasons. From a demand perspective, higher government spending may stimulate growth, but if excessive, may lead to higher inflation rather than growth. From a supply perspective, public investment spending, on either physical or human capital, may induce higher growth. However, wasteful spending, such as on excessive compensation to civil servants or unproductive state enterprises, might lead to lower growth.

Following the open economy variants of the literature, the real exchange rate is expected to be a determinant of growth; hence in this analysis, we use the change in the real effective exchange rate as an explanatory variable, though its effect is uncertain. Countries that are growing more rapidly tend to experience exchange rate appreciation. Hence an appreciating real exchange rate may not necessarily reduce competitiveness. Unfortunately, we have no

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<sup>6</sup> We use annual data because data with a higher frequency are not available for key variables.

<sup>7</sup> We used STATA programming language in our research, and the following program codes: OLS (regress, robust); cross-sectional, fixed effects (xtivreg2, fe bw (5)), time and cross-sectional, fixed effects (xtivreg2...dum\* (year), fe bw (5)), both corrected for arbitrary autocorrelation up to the 4<sup>th</sup> order, with the assumption of homoskedasticity, and random effects (xtreg, re).

good measures of productivity in most of these African countries. In some analyses, relative per capita income is used as a measure of productivity, but we have some doubts about its value in the African context, where a large part of activity is smallholder farming. Hence, we simply use the change in the real exchange rate. We would expect an appreciating real effective exchange rate to have a negative effect on growth and a depreciating, a positive effect. With regard to the variables characterizing the foreign exchange regime, we would expect that a liberalized current account would raise growth, if it leads to greater trade and more certain access to foreign currency, thus improving business conditions. Our priors are that a more flexible exchange rate regime should be beneficial for countries that are buffeted by real shocks, which tends to be characteristic of African economies that heavily dependent on subsistence agriculture. Nonetheless, there are arguments in favor of a fixed exchange rate for those countries with weak central bank credibility or with close trade or financial relations to one dominant hard currency (e.g., the Francophone countries in Central and West Africa, which retain close economic links to France).

For the independent variables, private and public investment (Private Inv and Public Inv) and government consumption (Govc), the shares in GDP are taken from national accounts data. The change in the real effective exchange rate (cREER) is measured with the exchange rate expressed as US dollars per national currency (hence an increase means an appreciation of the national currency). Current account liberalization (Liberalization) is taken from AREAER data, where 1 indicates a liberalized current account, on a de facto basis, and the constrained regimes are the omitted category. The exchange rate regime dummies for intermediate and floating de facto (Intdefacto and Flexdefacto) and de jure regimes (Intdejure and Flexdejure) are used to measure the impact of the regime on growth, with the pegged exchange rate regime treated as the omitted regime.

It would be interesting to assess the effect on growth of distortions in the foreign exchange regime distortion as opposed to just the regime, itself, because of the profound macroeconomic imbalances that distorted regimes produced in these countries. However, given the data deficiencies, we could only construct measures that would have a sizeable measurement error. For instance, we could not devise an accurate and consistent way to measure the black market premium, without collecting for each country detailed informal exchange rate information that are not available in published sources. Similarly, observations where the de jure and de facto exchange regime classification differ might only reflect a gap between the law and practice but not necessarily a distortion, such as would result in rationing of foreign exchange or a black market premium. We thus do not draw any conclusions from our empirical work about the effect of distortions, as opposed to regimes.

Over the period of the sample, there are only a relatively modest number of foreign exchange regime changes (i.e., there are nine instances of countries experiencing a regime change out of 42 countries in the de jure setting and 21 in the de facto setting). Having said this, we do not find that the panel data display any problems of multicollinearity and hence we include both regime and country fixed effects in the final specification.

## Results

We present our results below for the two dependent variables, overall real GDP and non-agricultural real GDP growth per capita and for the full, non-oil, and middle- and low-income samples of countries. Within each table, we present two columns for each of the various econometric specifications (i.e., pooled OLS, cross-section fixed effects, time- and cross-section fixed effects, and random effects). The first column uses dummy variables derived from the IMF de jure foreign exchange regime classification and the second column the IMF de facto regime classification.

Our preferred model is the time-and cross-section, fixed effects estimator.<sup>8,9</sup> We assume that errors are homoskedastic and correct for autocorrelation. We do not correct for possible heteroskedasticity owing to the small number of cross-sectional units. However, the dependent variable is already scaled by size, thus reducing the possibility of serious bias. We explored variations on the exchange regime classification scheme and also, using an index variable rather than dummy variables for regimes, but found the results were similar.<sup>10</sup>

### *Overall real GDP growth per capita*

Table 1a presents the results for the full sample of African countries for the dependent variable, overall real GDP growth per capita. We concentrate our discussion columns 5 and 6, which refer to the time- and cross-section fixed effects results and columns 7 and 8, which refer to the random effects results. The signs of the control variables are broadly as expected, though the lack of significance is noteworthy. Lagged private investment has a positive and significant effect on growth. An increase of private investment share in nominal GDP by 1 percentage point (say, from 26 percent of GDP to 27 percent of GDP), increases the rate of growth per capita by a little over one-tenth of a percentage point. IMF (2013, p. 110) also finds that growth takeoffs in today's low-income countries have been achieved with lower investment than in the past, not inconsistent with our finding that the relationship between investment and growth is weaker than anticipated. In the de jure specification, we find that government consumption has a significantly negative effect and the coefficient implies that an increase of government consumption share in GDP by 1 percentage point decreases the

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<sup>8</sup> Our robustness checks showed that the fixed effects model is preferred to the pooled OLS regression model. The F-statistic (Durbin-Wu-Hausman) strongly rejects the null of consistency and full efficiency of OLS results compared to the fixed effects model. We also rejected the appropriateness of the random effects estimator with the standard Hausman test, and by also observing higher correlation of country level individual effects with the independent variables after running the fixed effects model. Nonetheless, we report the results of the random effects model.

<sup>9</sup> Our robustness tests soundly rejected the time invariance of our models, which means that the two-way, fixed effects model is the preferred one.

<sup>10</sup> The results are available from the authors upon request.

rate of growth per capita by about one-fifth of a percentage point. The change in the real effective exchange rate and the liberalization and regime dummies are not significant. The random effects specifications present the same positive effect of private investment, though the marginal effect is greater. Government consumption is negative and significant, but in contrast to the fixed effects results, only in the de facto specification. In the de jure specification, the intermediate regime dummy is positive and significant and the marginal effect is sizeable. Correction for endogeneity of investment and the use of a longer lag length produce similar results.<sup>11</sup>

We tried several variants on this basic specification to incorporate institutional or other economic features of the countries. The inclusion of population growth, education, country size, openness and political risk as explanatory variables did not change the key results. Although we did find that initial income was strongly negative and significant, suggestive of some degree of convergence of income over time, this variable is time invariant and hence would need to be dropped in the specification that included country fixed effects, our preferred specification.

Table 1b presents the results for overall real GDP growth per capita for the non-oil country sample, where the coefficients for private investment are no longer significant in explaining growth in the fixed effect specifications (columns 5 and 6), though they remain marginally significant in the random effects specifications (columns 7 and 8). These results may reflect a combination of genuine economic differences as well as the significantly loss of sample size and perhaps an overall poorer quality of data in the non-oil countries. Interestingly, in contrast to the full sample, we find that public investment is positive and significant, but only in the random effects specifications. This may suggest that the quality of public investment is better in non-oil countries, hence leading to a stronger linkage between public investment and growth, in this sample. In addition, in the low-income countries, the private sector may not yet have the confidence to lead large investment projects and hence the government remains a key investor for capital projects. Government consumption is negative and significant in the de facto specifications (columns 6 and 8). The exchange regime variables are not significant in the fixed effects specification though both of the flexible regime dummy variables are positive and significant in the random effects de jure specifications (column 7).

Table 1c presents the results for the sample for middle- and low-income African countries. We observe that private investment is no longer statistically significant while public investment is again positive and significant in the random effects specifications. Government consumption is negative and significant only in the fixed effects de jure specification. The foreign exchange and liberalization variables are not significant.

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<sup>11</sup> Rose (2011) in his survey finds few systematic differences between the higher income countries (measured by real GDP per capita) and their exchange rate regimes. Hence we do not formally assess endogeneity of the exchange rate regime.

**Table 1a. Growth and the Exchange Rate Regime, 1999–2011**

Dependent variable: growth in real GDP per capita

	OLS		Cross-section fixed effects <sup>1</sup>		Time- and cross-section fixed effects <sup>1</sup>		Random effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private Inv(-1)	0.190** (0.070)	0.178* (0.070)	0.120** (0.044)	0.126** (0.043)	0.132** (0.044)	0.137** (0.044)	0.162*** (0.038)	0.156*** (0.038)
Public Inv(-1)	0.161 (0.091)	0.163 (0.094)	-0.083 (0.079)	-0.086 (0.078)	-0.060 (0.082)	-0.065 (0.082)	0.043 (0.069)	0.041 (0.070)
Govc	-0.081** (0.029)	-0.091** (0.028)	-0.206* (0.104)	-0.183 (0.104)	-0.218* (0.103)	-0.200 (0.104)	-0.088 (0.047)	-0.107* (0.047)
cREER	0.063* (0.030)	0.069* (0.031)	0.031 (0.030)	0.030 (0.030)	0.031 (0.030)	0.029 (0.030)	0.041 (0.030)	0.042 (0.031)
Liberalization	-2.102* (0.899)	-1.800* (0.875)	0.395 (0.678)	0.453 (0.683)	0.345 (0.665)	0.295 (0.675)	-0.352 (0.648)	-0.229 (0.660)
Flexdejure	1.446** (0.523)		2.124 (1.820)		2.218 (1.799)		1.692 (1.049)	
Intdejure	3.811*** (0.870)		2.271 (1.834)		2.207 (1.817)		2.871** (1.053)	
Flexdefacto		0.824 (0.580)		-2.751* (1.182)		-1.913 (1.241)		0.023 (0.964)
Intdefacto		2.794*** (0.823)		-1.505 (1.143)		-1.617 (1.148)		0.485 (0.902)
_cons	0.259 (1.112)	0.672 (1.129)					0.106 (1.531)	1.128 (1.549)
Observations	441	441	441	441	441	441	441	441
r2	0.171	0.146	0.043	0.052	0.115	0.117		
rmse	5.809	5.898	4.843	4.820	4.723	4.718	4.845	4.891

Source: IMF staff estimates.

Standard errors in parentheses

\*Significant at 10% level

\*\*Significant at 5% level

\*\*\*Significant at 1% level

<sup>1</sup> Cross sectional and time series dummy variables are not presented but the full set of results is available from the authors.

**Table 1b. Growth and the Exchange Rate Regime, Non-Oil Sample, 1999–2011**

Dependent variable: growth in real GDP per capita

	OLS		Cross-section fixed effects <sup>1</sup>		Time- and cross-section fixed effects <sup>1</sup>		Random effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private inv (-1)	0.082** (0.028)	0.078** (0.029)	0.039 (0.034)	0.039 (0.034)	0.015 (0.035)	0.019 (0.035)	0.058* (0.027)	0.059* (0.027)
Public inv (-1)	0.130** (0.045)	0.139** (0.048)	0.085 (0.061)	0.075 (0.061)	0.073 (0.060)	0.069 (0.060)	0.111* (0.045)	0.118** (0.045)
Govc	-0.027 (0.017)	-0.037* (0.017)	-0.129 (0.069)	-0.125 (0.069)	-0.127 (0.066)	-0.133* (0.067)	-0.036 (0.023)	-0.047* (0.022)
cREER	-0.015 (0.020)	-0.017 (0.020)	0.008 (0.019)	0.007 (0.019)	0.004 (0.019)	0.002 (0.019)	-0.004 (0.019)	-0.006 (0.019)
Liberalization	-0.226 (0.452)	-0.142 (0.460)	-0.134 (0.469)	-0.205 (0.474)	-0.225 (0.448)	-0.347 (0.456)	-0.192 (0.436)	-0.167 (0.440)
Flexdejure	1.859*** (0.414)		0.406 (1.198)		0.845 (1.150)		1.796*** (0.538)	
Intdejure	1.522*** (0.431)		-0.365 (1.266)		-0.334 (1.220)		1.223* (0.576)	
Flexdefacto		1.363** (0.499)		-0.629 (0.765)		0.015 (0.770)		1.095* (0.532)
Intdefacto		1.095** (0.389)		-0.618 (0.739)		-0.477 (0.720)		0.700 (0.512)
_cons	-1.092 (1.069)	-0.757 (1.104)					0.503 (0.902)	0.691 (0.912)
Observations	360	360	360	360	360	360	360	360
r2	0.200	0.173	0.019	0.019	0.131	0.127		
rmse	3.150	3.203	2.900	2.901	2.778	2.785	2.891	2.940

Source: IMF staff estimates.

Standard errors in parentheses

\*Significant at 10% level

\*\*Significant at 5% level

\*\*\*Significant at 1% level

<sup>1</sup>Cross sectional and time series dummy variables are not presented but the full set of results is available from the authors.

**Table 1c. Growth and the Exchange Rate Regime,  
Middle and Low Income Sample, 1999–2011**

Dependent variable: growth in real GDP per capita

	OLS		Cross-section fixed effects <sup>1</sup>		Time- and cross-section fixed effects <sup>1</sup>		Random effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private inv (-1)	0.021 (0.034)	0.020 (0.035)	0.040 (0.044)	0.041 (0.043)	0.027 (0.044)	0.032 (0.044)	0.020 (0.039)	0.022 (0.037)
Public inv (-1)	0.182*** (0.054)	0.195*** (0.056)	0.090 (0.078)	0.077 (0.078)	0.102 (0.075)	0.102 (0.076)	0.154* (0.065)	0.171** (0.065)
Govc	-0.003 (0.018)	-0.017 (0.017)	-0.264 (0.141)	-0.250 (0.143)	-0.272* (0.134)	-0.250 (0.137)	-0.009 (0.031)	-0.021 (0.026)
cREER	-0.014 (0.024)	-0.014 (0.024)	0.008 (0.023)	0.005 (0.023)	-0.000 (0.023)	-0.002 (0.023)	-0.006 (0.022)	-0.008 (0.022)
Liberalization	-0.271 (0.508)	-0.285 (0.518)	0.073 (0.557)	-0.005 (0.566)	-0.105 (0.531)	-0.325 (0.553)	-0.229 (0.512)	-0.308 (0.517)
Flexdejure	1.289* (0.504)		0.528 (1.254)		0.825 (1.195)		1.208 (0.676)	
Intdejure	0.857 (0.512)		-0.600 (1.343)		-0.479 (1.296)		0.529 (0.712)	
Flexdefacto		0.744 (0.580)		-0.725 (0.857)		0.371 (0.865)		0.649 (0.610)
Intdefacto		0.418 (0.496)		-0.486 (0.836)		-0.378 (0.821)		0.091 (0.588)
_cons	1.504 (1.110)	1.873 (1.134)					1.398 (1.254)	1.509 (1.243)
Observations	263	263	263	263	263	263	263	263
r2	0.158	0.141	0.029	0.026	0.160	0.156		
rmse	3.074	3.105	3.035	3.040	2.893	2.900	2.889	2.947

Source: IMF staff estimates.

Standard errors in parentheses

\*Significant at 10% level

\*\*Significant at 5% level

\*\*\*Significant at 1% level

<sup>1</sup> Cross sectional and time series dummy variables are not presented but the full set of results is available from the authors.



*Non-agricultural real GDP growth per capita*

We now turn to the results for non-agricultural real GDP growth per capita. Table 2a presents the results for the full sample. Similar to the results for overall real GDP, we find that lagged private investment is positive and significant, with somewhat higher marginal effects. This holds true across both the fixed and random effects specifications (columns 5–8). It is intuitively plausible that private investment has a larger marginal effect on growth excluding agriculture, because much of the growth in the oil exporters as well in some other rapidly growing African countries is in sectors other than agriculture. Government consumption and the liberalization and change in the real exchange rate variables are not significant. The flexible regime variables are positive and significant in the random effects de jure specification (column 7), similar to the earlier results as well.

Table 2b presents the results for non-agricultural real GDP growth per capita for the non-oil country sample, where again we find, as with overall GDP, a diminished significance of private investment. The random effects specification indicates a marginal positive and significant effect of this investment. The only other significant variables are the flexible regime dummies in the random effects de jure specification and the most flexible regime dummy in the de facto specification. In Table 2c, which shows the results for the middle- and low-income sample, no variable is statistically significant except the most flexible regime dummy in the random effects de jure specification.

**Table 2a. Non-Agricultural Growth and the Exchange Rate Regime, 1999–2011**

Dependent variable: growth in real GDP (non agricultural) per capita

	OLS		Cross-section fixed effects <sup>1</sup>		Time- and cross-section fixed effects <sup>1</sup>		Random effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private inv (-1)	0.286** (0.088)	0.267** (0.088)	0.229*** (0.065)	0.221*** (0.065)	0.241*** (0.065)	0.238*** (0.065)	0.281*** (0.047)	0.266*** (0.047)
Public inv (-1)	0.024 (0.081)	0.025 (0.083)	-0.054 (0.140)	-0.083 (0.142)	-0.040 (0.145)	-0.053 (0.148)	0.022 (0.093)	0.026 (0.093)
Govc	-0.017 (0.028)	-0.040 (0.028)	-0.181 (0.151)	-0.177 (0.154)	-0.182 (0.151)	-0.193 (0.153)	-0.023 (0.047)	-0.040 (0.045)
cREER	0.036 (0.040)	0.034 (0.041)	0.020 (0.043)	0.012 (0.043)	0.033 (0.043)	0.029 (0.043)	0.045 (0.042)	0.044 (0.042)
Liberalization	-0.500 (1.028)	-0.334 (1.059)	-0.088 (1.065)	-0.259 (1.083)	-0.216 (1.060)	-0.452 (1.077)	-0.412 (0.947)	-0.399 (0.956)
Flexdejure	2.697** (0.919)		1.173 (4.445)		3.475 (4.447)		3.033** (1.177)	
Intdejure	2.766** (0.859)		-2.788 (4.312)		-0.557 (4.330)		2.456* (1.140)	
Flexdefacto		1.115 (1.003)		-1.773 (1.829)		0.062 (1.962)		1.816 (1.171)
Intdefacto		2.064** (0.786)		-1.197 (1.753)		-1.099 (1.758)		1.218 (1.070)
_cons	-1.345 (1.691)	-0.356 (1.678)					-0.737 (2.422)	0.007 (2.473)
Observations	356	356	356	356	356	356	356	356
r2	0.125	0.107	0.058	0.048	0.136	0.126		
rmse	6.963	7.033	6.593	6.626	6.426	6.464	6.509	6.588

Source: IMF staff estimates.

Standard errors in parentheses

\*Significant at 10% level

\*\*Significant at 5% level

\*\*\*Significant at 1% level

<sup>1</sup> Cross sectional and time series dummy variables are not presented but the full set of results is available from the authors.

**Table 2b. Non-Agricultural Growth and the Exchange Rate Regime,  
Non-Oil Sample, 1999–2011**

Dependent variable: growth in real GDP (non agricultural) per capita								
	OLS		Cross-section fixed effects <sup>1</sup>		Time- and cross-section fixed effects <sup>1</sup>		Random effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private inv (-1)	0.119*	0.102*	0.030	0.019	-0.006	-0.001	0.119*	0.102*
	(0.050)	(0.050)	(0.072)	(0.073)	(0.075)	(0.076)	(0.047)	(0.047)
Public inv (-1)	0.047	0.061	0.032	0.006	-0.008	-0.006	0.047	0.061
	(0.069)	(0.070)	(0.123)	(0.126)	(0.125)	(0.128)	(0.072)	(0.075)
Govc	0.008	0.000	0.018	0.009	0.052	0.023	0.008	0.000
	(0.026)	(0.026)	(0.136)	(0.139)	(0.133)	(0.136)	(0.032)	(0.032)
cREER	-0.016	-0.019	0.001	-0.006	0.005	0.002	-0.016	-0.019
	(0.039)	(0.039)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
Liberalization	-0.606	-0.526	-1.025	-1.306	-0.976	-1.214	-0.606	-0.526
	(1.225)	(1.239)	(1.042)	(1.059)	(1.035)	(1.049)	(0.921)	(0.921)
Flexdejure	3.069***		1.721		3.309		3.069***	
	(0.845)		(3.654)		(3.618)		(0.828)	
Intdejure	2.296**		-2.022		-0.541		2.296**	
	(0.773)		(3.542)		(3.518)		(0.858)	
Flexdefacto		2.725*		-0.444		1.422		2.725**
		(1.063)		(1.608)		(1.682)		(0.915)
Intdefacto		1.279		-0.719		-0.329		1.279
		(0.675)		(1.558)		(1.537)		(0.857)
_cons	1.070	1.576					1.419	1.601
	(1.889)	(1.936)					(2.114)	(2.176)
Observations	291	291	291	291	291	291	291	291
r2	0.155	0.137	0.026	0.007	0.125	0.110		
rmse	5.504	5.562	5.476	5.530	5.307	5.350	5.504	5.562

Source: IMF staff estimates.

Standard errors in parentheses

\*Significant at 10% level

\*\*Significant at 5% level

\*\*\*Significant at 1% level

<sup>1</sup> Cross sectional and time series dummy variables are not presented but the full set of results is available from the authors.

**Table 2c. Non-Agricultural Growth and the Exchange Rate Regime,  
Middle and Low Income Sample, 1999–2011**

Dependent variable: growth in real GDP (non agricultural) per capita

	OLS		Cross-section fixed effects <sup>1</sup>		Time- and cross-section fixed effects <sup>1</sup>		Random effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private inv (-1)	0.048 (0.061)	0.034 (0.065)	0.034 (0.090)	0.015 (0.091)	0.063 (0.094)	0.059 (0.097)	0.048 (0.067)	0.034 (0.067)
Public inv (-1)	0.064 (0.101)	0.090 (0.095)	0.035 (0.145)	-0.010 (0.149)	0.043 (0.146)	0.031 (0.152)	0.064 (0.101)	0.090 (0.105)
Govc	0.036 (0.029)	0.014 (0.029)	-0.278 (0.249)	-0.240 (0.259)	-0.218 (0.242)	-0.186 (0.252)	0.036 (0.040)	0.014 (0.038)
cREER	0.007 (0.040)	0.007 (0.040)	0.020 (0.041)	0.012 (0.042)	0.027 (0.040)	0.023 (0.041)	0.007 (0.041)	0.007 (0.041)
Liberalization	-1.430 (1.189)	-1.610 (1.257)	-1.314 (1.101)	-1.666 (1.131)	-1.214 (1.091)	-1.648 (1.127)	-1.430 (1.016)	-1.610 (1.013)
Flexdejure	2.580** (0.946)		2.331 (3.583)		4.454 (3.548)		2.580** (0.980)	
Intdejure	1.773* (0.816)		-2.444 (3.448)		-0.100 (3.446)		1.773 (0.972)	
Flexdefacto		1.706 (1.164)		-1.152 (1.700)		1.411 (1.822)		1.706 (1.026)
Intdefacto		0.524 (0.724)		-0.840 (1.682)		-0.230 (1.679)		0.524 (0.981)
_cons	3.153 (2.154)	4.153 (2.264)					3.797 (2.492)	4.473 (2.584)
Observations	222	222	222	222	222	222	222	222
r2	0.151	0.133	0.053	0.021	0.167	0.142		
rmse	5.285	5.342	5.310	5.400	5.129	5.205	5.285	5.342

Source: IMF staff estimates.

Standard errors in parentheses

\*Significant at 10% level

\*\*Significant at 5% level

\*\*\*Significant at 1% level

<sup>1</sup> Cross sectional and time series dummy variables are not presented but the full set of results is available from the authors.

## **E. Conclusions and Policy Implications**

This paper examines the relationship between economic growth and various determinants of growth, using panel data on 42 countries in Sub-Saharan Africa, during 1999–2011. We find no robust evidence that the exchange rate regime or current account liberalization affects growth performance, after controlling for other variables, though in some specifications more flexible regimes are correlated with stronger growth. Private investment share in GDP is an important determinant for growth when oil-exporting African countries are included in the sample, perhaps reflecting a willingness of the private sector to step in when reserves and fiscal balances are buffered by large oil revenues. When oil exporters are excluded, we find more limited evidence for a positive effect of private investment on growth but instead some evidence of a positive effect of public investment on growth. With regard to government consumption, we find some evidence that higher spending as share of GDP exerts a drag on growth, suggesting that this spending may be unproductive when it leads to padding a public work force or subsidizing loss-making state enterprises. In some specifications, the more flexible regime dummy variables are linked to stronger growth. In general, our results are consistent with our expectations regarding sign and magnitude of effects.

Overall, our results suggest that the recent African growth experience has been varied and that capital accumulation has boosted growth but that the relationship is not as strong or clear as might be expected. Evidence for the positive effect of private investment is largely limited to oil exporters, where its main impulse may be on the demand side. Some evidence is found for a positive effect of public investment in the non-oil countries. The implications for policy are that African countries should ensure that they not only invest in capital but also put in place a framework that ensures high-quality growth-enhancing investment. Government spending should be directed to critical priorities. Some limited evidence is found for a positive impact of more flexible foreign exchange regimes. The change in the real effective exchange rate and current account liberalization do not appear to be strong determinants of growth or their effect does not clearly emerge at this aggregate level of data. However, like investment and growth, the measure of the real effective exchange rate, relying on flawed inflation data, may limit our ability to assess the relationship.

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## Appendix A. African Countries in the Sample

**Table A1. African Countries in the Sample**

	Country Profile	Oil Exporter/importer	Commodity Exporter	
1	Angola	Middle income	Exporter	Oil
2	Benin	Low income	Importer	Cotton and textiles
3	Botswana	Middle income	Importer	Gold and diamonds and other precious stones
4	Burkina Faso	Low income	Importer	Cotton and gold
5	Burundi	Fragile	Importer	Coffee
6	Cameroon	Low income	Exporter	Oil
7	Cape Verde	Middle income	Importer	Re-export of fuel for boats and spare parts
8	Central African Republic	Fragile	Importer	Gold and diamonds and other precious stones
9	Chad	Low income	exporter	Oil
10	Comoros	Fragile	Importer	Vanilla, cloves, ylang ylang
11	Congo, Democratic Republic	Fragile	Importer	Cobalt and copper
12	Congo, Republic of	Low income	Exporter	Oil
13	Cote d'Ivoire	Fragile	Importer	Cocoa, coffee
14	Equatorial Guinea	Low income	Exporter	Oil
15	Eritrea	Fragile	Importer	Food and live animals
16	Ethiopia	Low income	Importer	Coffee
17	Gabon	Low income	Exporter	Oil
18	Gambia	Low income	Importer	Groundnut products
19	Ghana	Middle income	Importer	Gold and diamonds and other precious stones
20	Guinea	Fragile	Importer	Other
21	Guinea-Bissau	Fragile	Importer	Cashew nuts
22	Kenya	Low income	Importer	tea, horticulture
23	Lesotho	Middle income	Importer	Garments
24	Liberia	Fragile	Importer	Rubber
25	Madagascar	Low income	Importer	From export processing zones
26	Malawi	Low income	Importer	Tobacco
27	Mali	Low income	Importer	Gold and diamonds and other precious stones
28	Mauritius	Middle income	Importer	Sugar, textile
29	Mozambique	Low income	Importer	Aluminum
30	Namibia	Middle income	Importer	Gold and diamonds and other precious stones
31	Niger	Low income	Importer	Base metals and uranium
32	Nigeria	Middle income	exporter	Oil
33	Rwanda	Low income	Importer	Tea, coffee
34	Sao Tome and Principe	Fragile	Importer	Cocoa
35	Senegal	Middle income	Importer	Fish
36	Seychelles	Middle income	Importer	Tuna
37	Sierra Leone	Low income	Importer	Gold and diamonds and other precious stones
38	South Africa	Middle income	Importer	Gold and diamonds and other precious stones
39	Swaziland	Middle income	Importer	Sugar, textile
40	Tanzania	Low income	Importer	Gold and diamonds and other precious stones
41	Togo	Fragile	Importer	Cotton and phosphate
42	Uganda	Low income	Importer	Cobalt and copper
43	Zambia	Middle income	Importer	Base metals and uranium
44	Zimbabwe	Fragile	Importer	Gold and diamonds and other precious stones

Source: IMF country database.

1/ We remove the Democratic Republic of Congo and Zimbabwe from our sample data.

The African countries are divided into subsamples for our analysis. The first sample consists of all countries, minus Democratic Republic of Congo and Zimbabwe owing to their experience with hyperinflation during the sample period. The second sample consists of all countries, minus Zimbabwe and Democratic Republic of Congo as well as oil exporters, Angola, Cameroon, Chad, Republic of Congo, Equatorial Guinea, Gabon, and Nigeria. The third sample consists of only middle and low income countries, which excludes the oil exporters and the fragile countries (no countries are considered high income).

Cameroon, Central African Republic, Chad, Republic of the Congo, Equatorial Guinea, and Gabon form the CEMAC group, each using the CFA franc, which is pegged to the euro. Benin, Burkina Faso, Ivory Coast, Guinea-Bissau, Mali, Niger, Senegal, and Togo form the WAEMU group, also using the CFA franc pegged to the euro. The Common Monetary Area (CMA) consists of the Republic of South Africa, Lesotho, Namibia, and Swaziland, which have their currencies tied to the South African rand.

Figures A1 and A2 show some interesting data on growth and exchange regimes, broken down by country groups. Growth is higher among countries with a floating regime for middle income and low income countries, classified on either the de jure or de facto basis. However, higher growth is achieved by the intermediate regime countries for oil exporters.

**Table A2. Definition of Variables and Sources**

<b>Variable</b>	<b>Description</b>	<b>Source</b>
<b>Dependent variables</b>		
Rgdppcg	Real GDP growth per capita (percent)	International Monetary Fund, WEO
Rgdppcg_nagr	Nonagricultural Real GDP growth per capita (percent)	World Bank, World Development Indicators, IMF staff estimates
<b>Independent variables</b>		
Govc	Government consumption (percent of GDP).	International Monetary Fund, WEO
Private Inv (-1)	Lagged investment, gross fixed capital formation (percent of GDP)	International Monetary Fund, WEO
Public Inv (-1)	Lagged investment, gross fixed capital formation (percent of GDP)	International Monetary Fund, WEO
Real GDP	Real GDP growth	International Monetary Fund, WEO
Creer	Change in reer (average yearly).	International Monetary Fund, Information Notice System
<b>Dummy variables</b>		
Intdejure	Intermediate exchange rate regime dummy, de jure regime classification	International Monetary Fund, <i>Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)</i> .
Flexdejure	Flexible exchange regime dummy, de jure regime classification	International Monetary Fund, AREAER
Intdefacto	Intermediate exchange regime dummy, de facto regime classification	International Monetary Fund AREAER and Bubula and Ötker-Robe (2002).
Flexdefacto	Flexible exchange regime dummy, de facto regime classification	International Monetary Fund, AREAER and Bubula and Ötker-Robe (2002).
Liberalization	Liberalization dummy constructed based on controls for current account transactions; a country is considered to have a liberalized regime (the dummy variable taking a value of 1 and 0 otherwise) if it has a liberalized current account.	International Monetary Fund, AREAER

Source: IMF staff estimates.

**Table A3. Descriptive Statistics for the Full Sample, 1999-2011**

Variable	Mean	Standard Deviation	Min	Max
Real GDP per capita growth (percent change)	2.6	6.2	-32.2	64.5
Investment (percent of GDP)	21.37	10.22	1.37	76.44
Government consumption (percent of GDP)	16.10	8.29	2.29	54.80
Real effective exchange rate (percent change)	0.62	6.60	-8.39	18.97
Real GDP growth (percent change)	4.7	5.5	-31.3	63.4

Source: IMF staff estimates.

**Table A4. Selected Variable Means by Type of Exchange Rate Regime, 1999-2011**  
(de jure classification)

Regime classification	Pegged (286)	Intermediate (112)	Floating (148)
Real GDP per capita growth (percent change)	1.8	4.9	3.0
Investment (percent of GDP)	22.05	19.00	19.99
Government consumption (percent of GDP)	16.93	14.78	13.67
Real effective exchange rate (percent change)	1.08	1.17	-0.91
Real GDP growth (percent change)	4.2	5.8	5.2

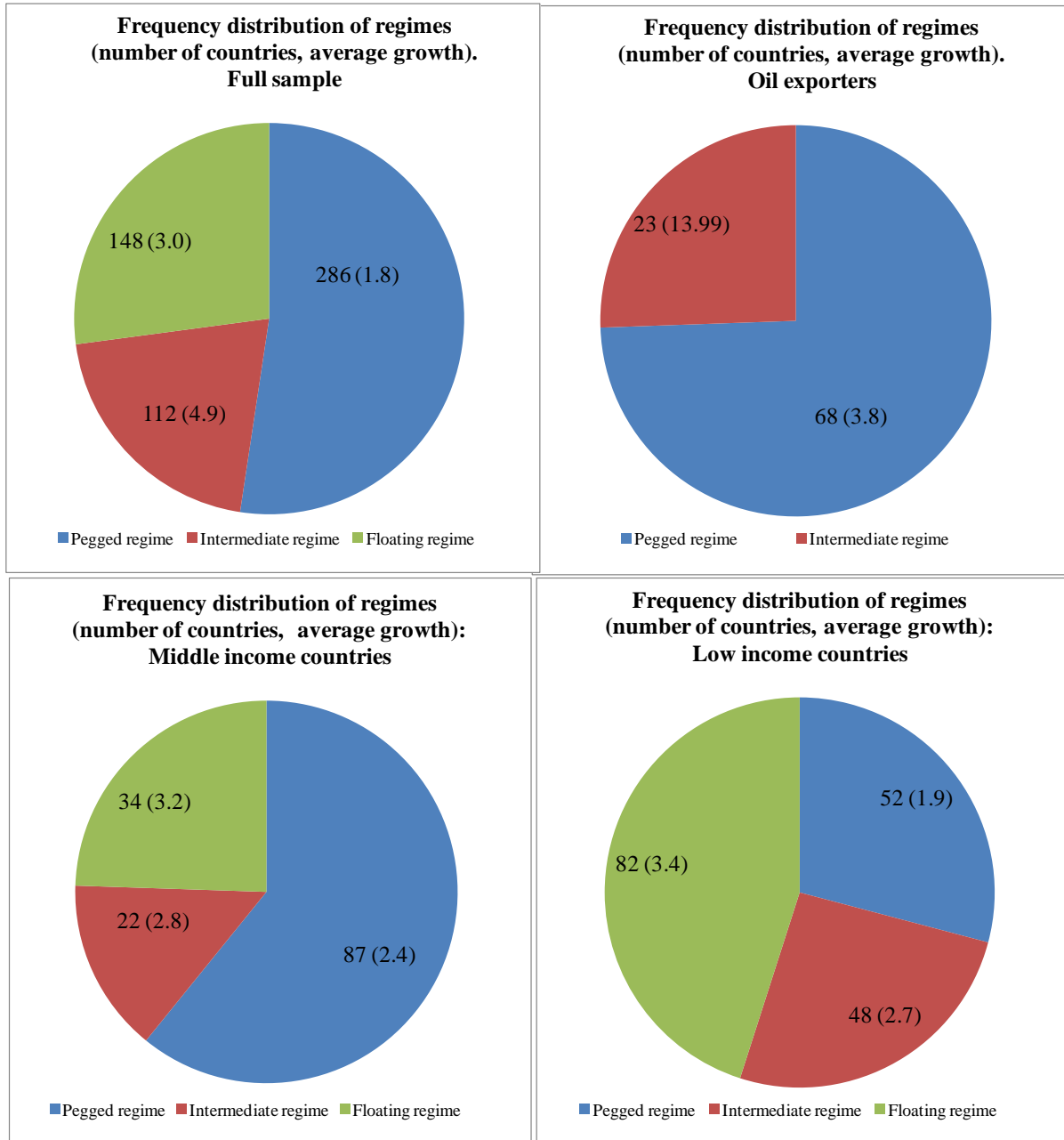
Source: IMF staff estimates.

**Table A5. Selected Variable Means by Type of Exchange Rate Regime, 1999-2011**  
(de facto classification)

Regime classification	Pegged (304)	Intermediate (120)	Floating (122)
Real GDP per capita growth (percent change)	2.0	4.2	2.6
Investment (percent of GDP)	21.89	19.89	18.89
Government consumption (percent of GDP)	16.40	19.89	14.64
Real effective exchange rate (percent change)	1.10	0.57	-0.74
Real GDP growth (percent change)	4.5	5.3	4.8

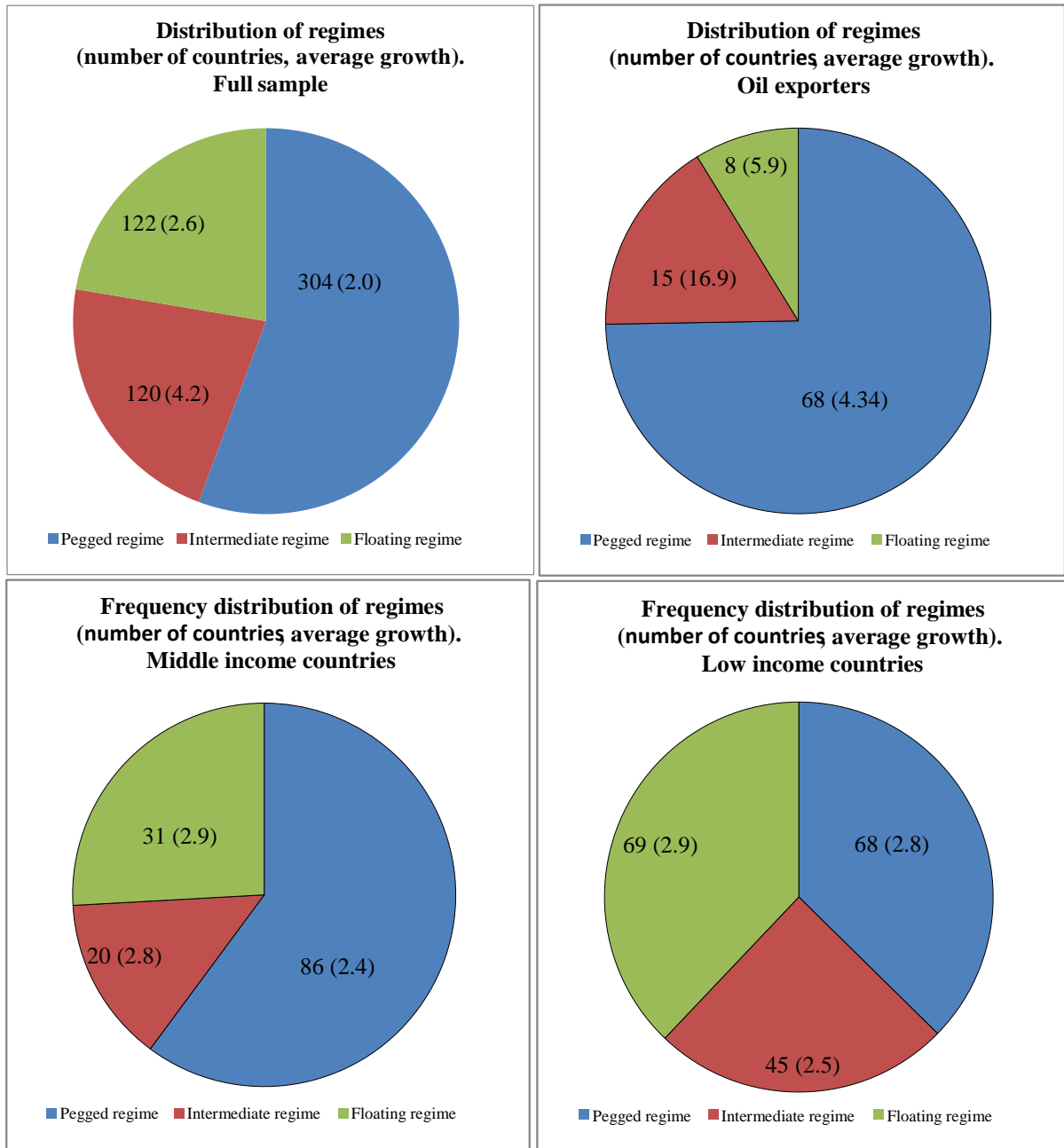
Source: IMF staff estimates.

**Figure A1. Selected Country Groups and Average Growth, 1999–2011.**  
(de jure classification)



Sources: IMF AREAER and staff estimates.

**Figure A2. Selected Country Groups and Average Growth, 1999–2011.**  
(de facto classification)



Sources: IMF AREAER and staff estimates.

## Appendix B. De Jure and De Facto Classification

Characterizing accurately the exchange rate regime is critical in assessing the relationship between exchange rate regimes and economic growth. In our empirical study we adopted two classification schemes:<sup>1</sup> The IMF de jure regime classification, based on the regime that governments claim to have in place, published by the IMF in its *Annual Report on Exchange Rate Agreements and Exchange Restrictions* (various issues) and the IMF de facto classification scheme also published in the IMF's *Annual Report on Exchange Rate Agreements and Exchange Restrictions (AREAER)*. Thus, we complement the IMF de jure classification scheme with the de facto scheme for comparison.

### *The IMF de jure classification<sup>2</sup>*

The IMF de jure classification is reported in either the issues of the AREAER or in the *International Financial Statistics*. For the countries in our study, this original IMF de jure classification scheme is presented in Table B1 and Figure B1. As can be seen, we further mapped the original classification into three (floating, intermediate, and pegged) regime categories. This is done to draw a line in a continuum of different intermediate regimes ranging from fixed rates, hard and soft pegs, crawling or other stabilized arrangements, heavily or lightly managed floats, to free floating regimes.

**Table B1. The IMF de Jure Regime Classifications and Our Reclassification Strategy**

	IMF	Reclassified 1/
No self-determined monetary policy	-1	-1
Information not available	0	0
Exchange arrangement with no separate legal tender	1	0
Currency board arrangement	2	1
Conventional pegged arrangement	3	1
Pegged exchange rate within horizontal bands	4	1
Crawling peg	5	1
Crawling band	6	1
Managed floating	7	2
Independently floating	8	3

1/ 1-pegged; 2-intermediate; 3-

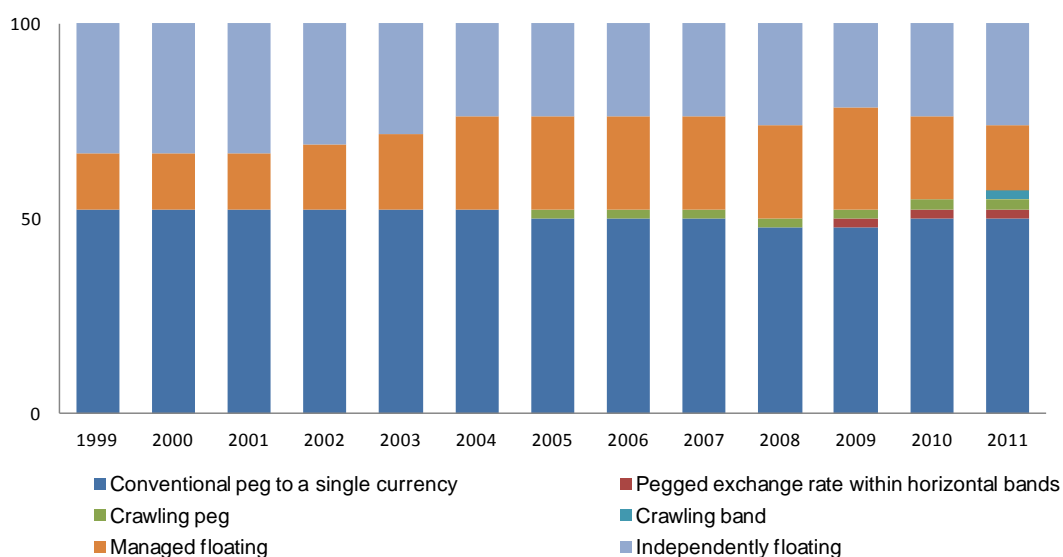
Sources: IMF AREAER and staff estimates.

<sup>1</sup> We examined other statistically-based regime classification approaches proposed in the literature, (for example, Levy-Yeyati and Sturzenegger, 2002, 2003, Reinhart and Rogoff (2004) and Shambaugh (2004), but focused on the IMF and Bubula and Ötoker-Robe (2002) classifications. We did not use the Reinhart and Rogoff regime classification scheme, whose distinguishing feature is its use of black market premium data, which are not consistently available for our set of countries.

<sup>2</sup> All classifications are at end of year.



**Figure B1. Exchange Rate Regime Classifications,  
1999–2011**  
(De jure classification)

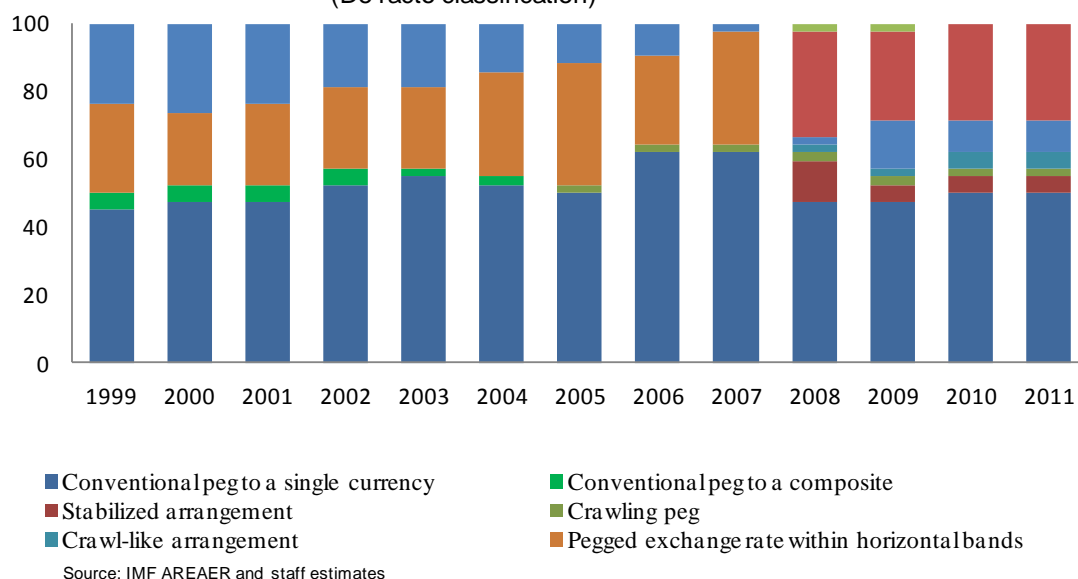


Source: IMF AREAER and staff

### *The IMF de facto classification*

Regarding the IMF de facto classification, since 1999 the IMF moved from a purely de jure classification to a hybrid one, which combines information obtained through bilateral discussions with or provision of technical assistance to the country authorities and also from the IMF's judicial assumptions over the countries de facto policies and the observed behavior of the exchange rate within the existing exchange rate regime framework. This new methodology was applied by the IMF to the years after 1999 up to 2011, and the data is available through the yearly issues of AREAER. For the countries in our study, this original IMF de facto classification scheme is presented in Figure B2. Furthermore, in Table B2, we present the IMF de facto regime classifications and our regrouping strategy.

**Figure B2. Exchange Rate Regime Classifications, 1999–2011**  
(De facto classification)



**Table B2. The IMF de Facto Regime Classifications and Our Reclassification Strategy**

	IMF	Reclassified 1/
No separate legal tender	1	0
Currency board	2	1
Conventional peg to a single currency	3	1
Conventional peg to a composite	3.5	1
Stabilized arrangement	4	2
Crawling peg	5	1
Crawl-like arrangement	6	1
Pegged exchange rate within horizontal bands	7	1
Other managed arrangement	8	2
Floating	9	3
Free floating	10	3

1/ 1-pegged; 2-intermediate; 3-floating

Sources: IMF AREAER and staff estimates.

Table B3 shows the regime distributions of both de jure and de facto observations. According to the official IMF de jure classification floating regimes constitute about one third of all the observations, while pegged regimes more than half of the observations owing mainly to the inclusion of CFA franc zone countries. Under the de facto categorization, there are even fewer floating regimes, about 22 percent of total observations but more pegged regimes,

about 56 percent of total observations. The share of intermediate regimes stays at a steady level of about 22 percent of total observations under both classifications.

**Table B3. Distribution of Regimes**

Regime	IMF (de Jure)	Percent (in total)	IMF (de facto)	Percent (in total)
Floating regime	148	27	122	22
Immediate regime	112	21	120	22
Pegged	286	52	304	56
<b>Total</b>	<b>546</b>	<b>100</b>	<b>546</b>	<b>100</b>

Sources: IMF AREAER and staff estimates.

Among the countries in our sample presented in Tables B4 and B5, Burundi, Gambia, Madagascar, Mozambique, South Africa, Tanzania, Uganda, and Zambia had most of the floating time periods under the de jure exchange rate regime but with the de facto classification, Burundi is no longer among the floaters and Liberia and Sierra Leone are added to this group. Other than the CFA franc zone countries, only Botswana, Ethiopia and Namibia had no experience in having a floating regime. De facto, Burundi, Ethiopia, Ghana, Kenya, Mauritius, Nigeria, Rwanda, Sao Tome and Principe, and Zambia had most of the experience in running managed arrangements. Overall, countries who had mixed regimes from floating to intermediate are Gambia, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mauritius, Mozambique, and Zambia.

**Table B4. Distribution of de Jure Regimes by Country**

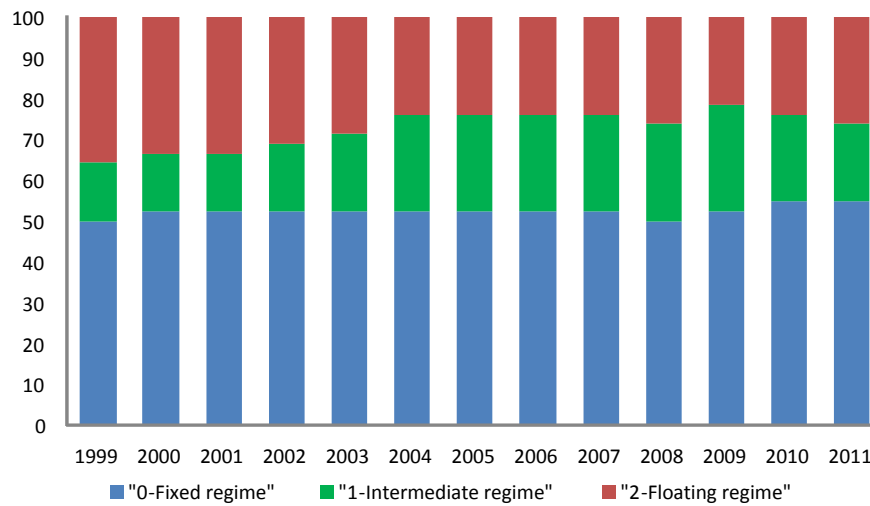
	Floating	Intermediate	Pegged	Percent of Floats	Percent of Total
Angola	0	13	0	0	0
Benin	0	0	13	0	0
Botswana	0	0	13	0	0
Burkina Faso	0	0	13	0	0
Burundi	13	0	0	100	9
Cameroon	0	0	13	0	0
Cape Verde	0	0	13	0	0
Central African Republic	0	0	13	0	0
Chad	0	0	13	0	0
Comoros	0	0	13	0	0
Congo, Republic of	0	0	13	0	0
Cote d'Ivoire	0	0	13	0	0
Equatorial Guinea	0	0	13	0	0
Eritrea	1	0	12	8	1
Ethiopia	0	13	0	0	0
Gabon	0	0	13	0	0
Gambia	13	0	0	100	9
Ghana	4	9	0	31	3
Guinea	3	10	0	23	2
Guinea-Bissau	0	0	13	0	0
Kenya	0	13	0	0	0
Lesotho	0	0	13	0	0
Liberia	5	8	0	38	3
Madagascar	13	0	0	100	9
Malawi	0	13	0	0	0
Mali	0	0	13	0	0
Mauritius	4	9	0	31	3
Mozambique	13	0	0	100	9
Namibia	0	0	13	0	0
Niger	0	0	13	0	0
Nigeria	0	10	3	0	0
Rwanda	12	1	0	92	8
Sao Tome and Principe	10	1	2	77	7
Senegal	0	0	13	0	0
Seychelles	0	4	9	0	0
Sierra Leone	5	8	0	38	3
South Africa	13	0	0	100	9
Swaziland	0	0	13	0	0
Tanzania	13	0	0	100	9
Togo	0	0	13	0	0
Uganda	13	0	0	100	9
Zambia	13	0	0	100	9
<b>Total</b>	<b>148</b>	<b>112</b>	<b>286</b>		<b>100</b>

Source: IMF country information.

Figures B3 and B4 depict the evolution of the exchange rate regimes in our sample of 42 countries ranging from 1999 to 2011 using both classification schemes. As shown in the top chart, the de jure classification shows a slight increase in the prevalence of intermediate regimes with the popularity of floating regimes fluctuating over time. In the bottom chart with de facto regimes, intermediate regimes are less common and the move towards floating regimes is more prevalent in the recent years.

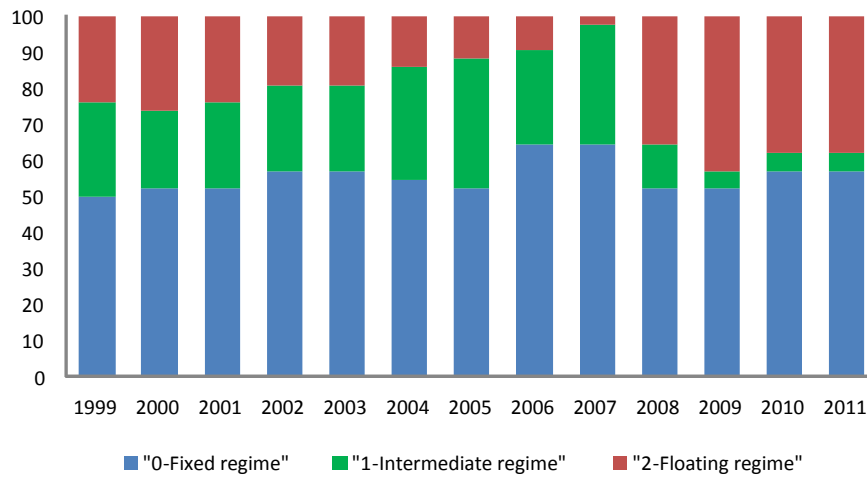
Having said this, overall, there is not much difference between the two classification schemes and our calculated correlation coefficient between the IMF de facto and de jure regime classification's is 0.81. The slight divergence that exists is in the gap between de jure floating and de facto intermediate regimes early and in mid 2000-s. Interestingly, the proportion of de facto floating regimes that are de jure intermediate regimes has increased in the very recent years. The proportion of pegged regimes compared in the de jure and de facto classifications has been stable.

**Figure B3. Frequency Distribution of Exchange Rate Regimes, 1999–2011**  
(De jure classification)



Sources: IMF AREAER and staff estimates.

**Figure B4. Frequency Distribution of Exchange Rate Regimes, 1999–2011**  
(De facto classification)



Sources: IMF AREAER and staff estimates.