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Financial Development, Exchange Rate Regimes, and Growth Dynamics

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Abstract

This paper utilizes data for African countries to analyze the extent to which financial development affects the dynamics of the relationship between exchange rate flexibility and economic growth. The findings indicate that financial development exerts a positive influence on the relationship between exchange rate flexibility and GDP growth as well as total factor productivity growth. The paper also documents a positive impact of trade openness on the relationship between exchange rate flexibility and growth. Moreover, the results show a strong and positive association between exchange rate flexibility and financial development. The findings, therefore, suggest that discussions and decisions on exchange rate policy should be undertaken with consideration for structural policies that address the development of the financial sector. In addition, the paper asserts that policy makers should adopt a stance that facilitates some flexibility in exchange rates to foster development of the financial infrastructure in these economies.

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Financial Development, Exchange Rate Regimes, and Growth Dynamics *

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1 Introduction

Evidence on the effect of exchange rate regimes on productivity and growth is copious. Yet, the findings have been mixed and seemingly inconsistent. The policy recommendations emanating from these studies are particularly important for countries that have adopted various stances on exchange rate policy along the flexibility spectrum. In developing economies, the choice of exchange rate regime can have a considerable impact on a number of macroeconomic variables including growth, inflation, global competitiveness, the trade balance and overall macroeconomic stability (Bailliu et al., 2003; Bleaney et al., 2007; Gervais et al., 2016; Calvo and Reinhart, 2002; Aghion et al., 2009; Edwards and Yeyati, 2005). Exchange rate regimes, thus, have significant implications for developing economies in terms of economic performance whereas the link between exchange rate flexibility and economc growth is often found to be weaker for advanced economies (Levy-Yeyati and Sturzenegger, 2003).

The lack of consensus and consistency in the evidence, often considered an empirical challenge, is driven by a lack of clarity in the conceptual frameworks underlying the relationship between exchange rate regimes and various macroeconomic outcomes, mainly economic growth. Arguably, the relationship between exchange rate regime and economic growth would be influenced by salient characteristics of an economy. This study follows a strand of the literature that examines heterogeneity in the relationship between exchange rate regimes and growth through underlying macroeconomic fundamentals such as the degree of financial development (Aghion et al., 2009; Slavtcheva, 2015), financial openness and international financial integration (Rodriguez, 2016). In particular, we focus on identifying the heterogeneity that underlies the relationship between exchange rate regimes and economic growth in Africa across levels of financial development and degrees of trade openness.

In developing countries, the perennial debate on which type of exchange rate regime is favorable to economic growth is still ongoing. A major argument, among several, that has been advanced in favor of flexible exchange rate regimes is that they enhance economic growth by facilitating adjustments in an economy, particularly in response to unfavorable domestic and

foreign shocks in the presence of nominal rigidities. This, in effect, suggests that exchange rate pegs make an economy susceptible to greater macroeconomic volatility and should have adverse impact on growth. Furthermore, exchange rate pegs tend to culminate in overvaluation of currencies with potentially dire consequences for exports as well as capital flight and current account reversals, as was the case during the financial crises in Southeast Asia. On the contrary, an argument against flexible regimes is that they are a source of macroeconomic volatility, as they allow the transmission of negative external shocks, and hence dampen growth. Moreover, flexible regimes tend to be associated with uncertainty and potentially negative effects on trade, investment and economic performance in general. A fixed regime is, therefore, favored to provide an environment that enhances growth through a decline in risk and uncertainty associated with cross-border trade and investment.

The empirical evidence on the dynamics between exchange rate flexibility and growth in developing economies is mixed. On one hand, the findings from some studies suggest that there is no systematic relationship between exchange rate regimes and growth (Ghosh et al., 1997, 2002). On the other hand, other studies show contradictory evidence. For example Levy-Yeyati and Sturzenegger (2003) find that in developing economies, floating exchange rate regimes are associated with higher economic growth. In contrast, Husain et al. (2005) find that for emerging and developing economies, there is no growth benefit from a floating exchange rate regime but instead, countries seem to benefit from increasingly flexible exchange rate systems as they become richer and their financial systems develop. Using data for 10 major Asian economies, Coudert and Dubert (2005) also show that fixed regimes or pegs are associated with weaker growth than floating exchange rate regimes. On the contrary, Bleaney et al. (2007) indicate that some of the preceding results are not robust and find a negative correlation between flexible regimes and growth performance for a sample of 91 developing countries. Thus, the debate on the impact of exchange rate regimes on productivity and growth forges ahead.

It is arguable that the variation in findings across countries is not necessarily implausible. In fact, the existing literature has identified several channels through which exchange rate regimes could indirectly affect growth, such as investment, international trade, and the level of financial

development. Bailliu et al. (2003) find a positive relationship between a fixed regime and growth, a negative relationship between growth and an intermediate regime without an anchor, and no relationship between other regime types and economic growth; where the growth effects are based on the uncertainty or lack thereof created by the exchange rate regime, and the impact of that on trade and investment. Aghion et al. (2009) provide evidence to suggest that a flexible exchange rate regime is more favorable to growth in countries with more developed financial systems. They also observe a negative relationship between productivity growth and flexible regimes in countries with less developed financial systems. The main idea is that firms in countries with higher levels of financial development are able to survive liquidity shocks that accompany exchange rate fluctuations, and contribute to innovation and long-run growth. Such exchange rate volatility tends to have negative effects on long-run growth in less financially developed countries as they discourage investments.

There is, hence, an emerging understanding that the relationship between exchange rate flexibility and the growth of gross domestic product (GDP), or that between exchange rate flexibility and productivity, depends on some underlying characteristics of an economy. Existing studies with seemingly contradictory empirical results may have, potentially, failed to uncover the heterogeneity in these underlying characteristics. In this study, we attempt to identify some sources of heterogeneous impact of exchange rate flexibility on economic growth. Following the conceptual framework in Aghion et al. (2009), we examine the relationship between exchange rate regimes and economic growth in Africa across the distribution of the level of financial development.

The focus on Africa is against the backdrop of the many development challenges that the region faces including, among others, deficient infrastructure and credit constraints, which are critical to the growth and development of the private sector. The region has experienced some progress as pertains to the development of the financial sector, yet it remains relatively underdeveloped in comparison to other developing regions. Given that access to finance is a major impediment to operations of small and medium scale enterprises in the region, the potential implication of the dynamics between exchange rate policy, financial development and economic growth is worth investigating. This study could, hence, serve to inform the extent to which exchange rate

policy could facilitate the growth impact of some structural policies, such as those aimed at the development of the financial sector in Africa.

Moreover, limiting the analysis to Africa minimizes the extent of heterogeneity in coefficient estimates, as well as unobserved heterogeneity across countries, thereby providing more reliable estimates of the relationships we investigate, in comparison to studies that examine a set of countries that are at significantly different levels of development. The focus on a group of countries with similar underlying features is more amenable to the assumption that the fundamental structural relationships between financial development, exchange rate regimes and growth are homogenous across countries. Furthermore, not only does the focus on Africa represent a point of departure from Aghion et al. (2009), but we also contribute to the literature by analyzing the extent to which the relationship between exchange rate flexibility and growth varies by the degree of trade openness. The underlying hypothesis is that the benefits accruing to a country operating a flexible exchange rate should increase as it takes measures to facilitate trade. Lastly, we present an assessment of the extent to which financial development is linked to the choice of exchange rate policy.

The remainder of the paper is organized as follows. Section 2 presents the theoretical framework that underpins the specification of the empirical model and section 3 presents the empirical analysis. Section 4 examines the relationship between financial development and exchange regimes and concluding remarks are provided in section 5.

2 Theoretical Framework

Aghion et al. (2009) provides the theoretical foundation for the main empirical investigation conducted in this paper, and this section presents an exposition of the framework, where exchange rate flexibility leads to volatility of earnings and profits, which in turn affects firms' capacity to borrow and invest in innovations resulting in reduced levels of productivity and growth, particularly at low levels of financial development.[1] In what follows, we present essential features

[1] Slavtcheva (2015) also develops a small open economy model that focuses on the steady state to analyze long-run effects of exchange rate regimes on growth. Financial development is modeled as monitoring costs via a costly state

of the model to describe how the level of financial development affects the relationship between exchange rate flexibility and productivity growth.

2.1 Features of the economy

The small open economy produces one good and is characterized by overlapping generations of entrepreneurs and workers who live in two periods. Domestic firms are price -takers, such that the foreign price of the good at time t, P_t^* is given. Under the assumption that purchasing power parity holds, the value of a unit of good sold is given by,

$$P_t = S_t P_t^*, \tag{1}$$

where P_t is the domestic price level, and S_t is the nominal exchange rate. P_t^* is assumed to be constant and normalized to 1, hence, $P_t = S_t$. Nominal wages are rigid for one period and determined before the realization of the nominal exchange rate. In consequence, fluctuations in the nominal exchange exposes firms to the risk of fluctuations in their earnings and profits with adverse effects on innovation and productivity growth. S_t is constant in a fixed exchange rate regime, whereas it is random and fluctuates around its mean value, $E(S_t) = \overline{S}$, under a flexible exchange rate regime.

Real wage at the beginning of period t is some reservation wage, kA_t where $k < 1$ represents the workers' productivity-adjusted reservation utility and A_t is current aggregate productivity level. It follows then, that

$$\frac{W_t}{E(P_t)} = kA_t,$$

where W_t is the nominal wage rate which is preset at the beginning of period t, and $E(P_t)$ is the expected price level. Since $E(P) = E(S) \equiv \overline{S}$, it implies that

$$W_t = k\overline{S}A_t \tag{2}$$

verification framework which is necessitated by information asymmetry. In the set-up, a fixed exchange rate regime is associated with low inflation whereas flexible exchange rate regime is prone to higher inflation via money growth, which raises the cost of borrowing and discourages entrepreneurial activity, thereby decreasing productivity. With financial development, however, inflation is minimized, financial constraints are relaxed, and productivity rises as entrepreneurial activity rises.

2.2 Production and profit

Entrepreneurs make two decisions. Foremost, at the beginning of the first period, they decide how much labor to hire at the preset nominal wage. A crucial feature is that this decision occurs after realization of aggregate shocks. Secondly, at the end of the first period, they face a liquidity shock and decide whether to cover it where possible, in order to survive and innovate in the second period. A proportion ρ_t of entrepreneurs innovate and determine the growth rate of the economy.

An entrepreneur's production function during the first period is given by

$$y_t = A_t \sqrt{l_t}, \tag{3}$$

where l_t is the firm's labor input at time t. Given the nominal wage, nominal profit at the end of the first period is,

$$\Pi_t = P_t y_t - W_t l_t = A_t S_t \sqrt{l_t} - k A_t \overline{S} l_t. \tag{4}$$

The entrepreneur innovates and realizes the value of innovation, v_{t+1}, in the second period with probability ρ_t, which depends on the ability to cover liquidity costs at the end of the first period; and chooses employment in the first period to maximize the net present value of profit,

$$max A_t P_t \sqrt{l_t} - k A_t \overline{S} l_t + \beta \rho_t E_t v_{t+1}, \tag{5}$$

where β denotes the entrepreneur's discount rate.

2.3 Innovation, credit constraints and liquidity shocks

Innovation is expected to upgrade the firm's technology by a factor $\gamma > 1$, such that an entrepreneur who successfully innovates has productivity level $A_{t+1} = \gamma A_t$. The value of innovation is assumed to be proportional to the productivity level achieved by a successful innovator, $v_{t+1} = v P_{t+1} A_{t+1}$, where $v > 0$. The liquidity cost of innovation is assumed to be proportional to productivity; $C_t^i = c^i P_t A_t$, where c^i has a uniform distribution over the interval between 0 and c, and is independently and identically distributed across all firms in the domestic economy. Ex ante all firms face the same probability distribution over c_i, but ex post the realization of c_i

varies across firms. The net productivity gain from innovating is sufficiently high enough such that it is profitable for entrepreneurs to make an effort to overcome the liquidity shock. This is dependent, however, on domestic credit constraints which prevent a firm from borrowing more than a multiple $\mu - 1$ of current cash flow Π_t where μ_t is a measure of financial development. At very high levels of μ, the credit constraint is no longer binding. The total value of funds available for innovative investment at the end of the first period could reach a high of $\mu\Pi_t$ and the entrepreneur will invest in innovation if $\mu\Pi_t > C_t^i$. The probability of innovation is, therefore, expressed as

$$\rho_t = min(\frac{\mu\Pi_t}{cS_tA_t}, 1). \tag{6}$$

Substituting the probability of innovation, ρ_t, in the profit maximization problem, Equation 5, yields the optimal choice of employment and profit respectively, as

$$l_t = (\frac{S_t}{2k\overline{S}})^2 \quad and \quad \Pi_t = \psi A_t S_t^2, \tag{7}$$

where $\psi = 1/(4k\overline{S})$. Using Equation 6, the probability of innovation can thus be expressed as,

$$\rho_t = min(\frac{\mu\psi}{c}S_t, 1). \tag{8}$$

The expected productivity at time $t+1$ is $E(A_{t+1}) = E(\rho_t)A_t + (1 - E(\rho_{t+1}))A_t$, so that the expected rate of productivity growth is,

$$g_t = \frac{E(\rho_{t+1}) - A_t}{A_t} = (\gamma - 1)E(\rho_t). \tag{9}$$

It can be shown that moving from a fixed to flexible exchange rate regime reduces average growth.[2] When the level of financial development μ is not too small however, the growth gap between the two regimes decreases with the level of financial development. In essence, the model suggests that financial development ameliorates the negative investment effects of domestic market credit constraints under flexible exchange rate regimes.

[2]See Aghion et al. (2009) for details.

Table 1: Summary Statistics

Variables (N=245)	Mean	Std. Dev.	Min.	Max.
GDP per capita growth	1.63	4.56	-8.27	49.7
Total factor productivity (TFP)	0.58	0.34	0.12	2.05
GDP per capita	1447.46	2062.42	124.35	14241.83
Exchange rate regime coarse class	2.01	1.19	1	6
Exchange rate regime fine class	6.24	4.25	1	15
Domestic credit to private sector (% of GDP)	21.16	21.36	0.97	150.97
Private credit (% GDP)	19.78	20.46	0.003	145.39
Education	34.36	22.47	2.64	104.46
Trade Openness (% of GDP)	75.53	35.94	13.59	211.57
Inflation (annual %)	15.8	37.08	-3.42	302.12
Government expenditure (% of GDP)	15.07	6.02	2.89	37.32
Bank crisis	0.08	0.2	0	1

3 Empirical Analysis

3.1 Data

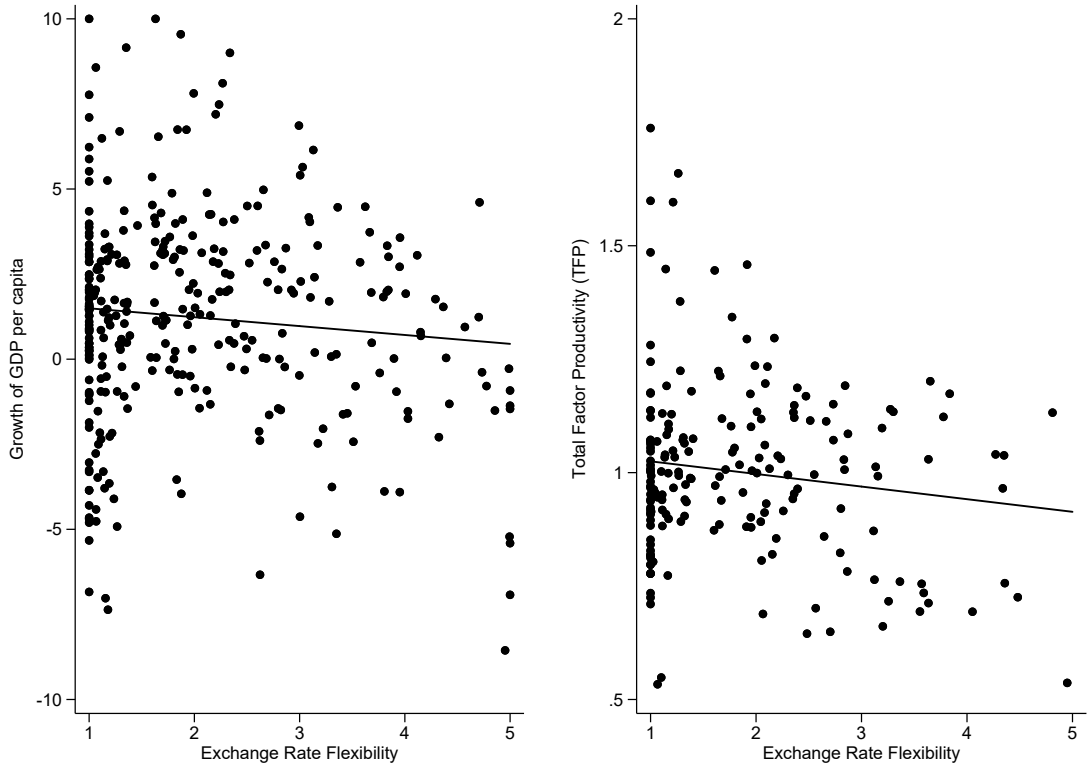
The data for the study covers a panel of 48 African countries, spans the period 1974-2015, and has been transformed into non-overlapping five year averages.[3] The data for most of the variables are obtained from the World Development Indicators and International Financial Statistics. Productivity measures are obtained from Penn World Tables Version 9.0 (Feenstra et al., 2015). The data for exchange rate regimes comes from Reinhart and Rogoff (2004, 2009), Levy-Yeyati and Sturzenegger (2016) and Ilzetzki et al. (2017). The classification of exchange rate regimes is based on 2 schemes: coarse classification with 6 categories and fine classification with 15 categories.[4] Table 1 presents some basic summary statistics for the variables.

Figure 1 presents preliminary evidence which suggests that, on average, there seems to be a negative association between exchange rate flexibility and GDP per capita growth, as well as between exchange rate flexibility and productivity. The relationship between exchange rate flexibility and per capita growth, however, varies across different levels of financial development as depicted in Figure 2. For countries in the upper quartile of the financial development distribution,

[3] Averaging over five year periods has become a standard approach in analyzing long run growth to filter out business cycle fluctuations and identify long term growth trends (Agenor and McDermott, 2000; Aguiar and Gopinath, 2007; Aghion et al., 2009). Unless a significant share of the data is missing, we include all 48 countries in the estimations.

[4] The classification is presented in Table A1 in the appendix. Figure A1 (in the appendix) also provides a representation of the evolution of exchange rate policy across Africa, and shows that in recent years, about half of the countries have operated some form of an exchange rate peg.

Figure 1: Exchange Rate Regimes and Growth



the basic relationship between per capita growth and exchange rate regime appears to be positive, whereas it is negative for those in the lower quartile.[5]

Similarly, Figure 3 shows that in countries with a higher degree of trade openness (in the top quartile) as represented by the level of trade flow (exports and imports) as a share of GDP, there appears to be a positive association between exchange rate flexibility and per capita growth. The relationship between exchange rate flexibility and growth, however, is negative in countries at very low levels of openness. This suggests that the benefits of operating flexible exchange rate in terms of the effect on growth increases with greater degree of trade openness. In other words, it may be less beneficial to operate a flexible exchange rate regime without addressing policies that limit trade. Still and all, the associations represented in the figures only capture binary relationships with no consideration of other critical factors that impact growth, which represents the focus of the analysis in the next section.

[5]It is noteworthy that that there is a significant variation in productivity and growth across countries operating a fixed exchange rate regime which potentially highlights differences in structural policies.

Figure 2: Exchange Rate Flexibility and Growth By Financial Development

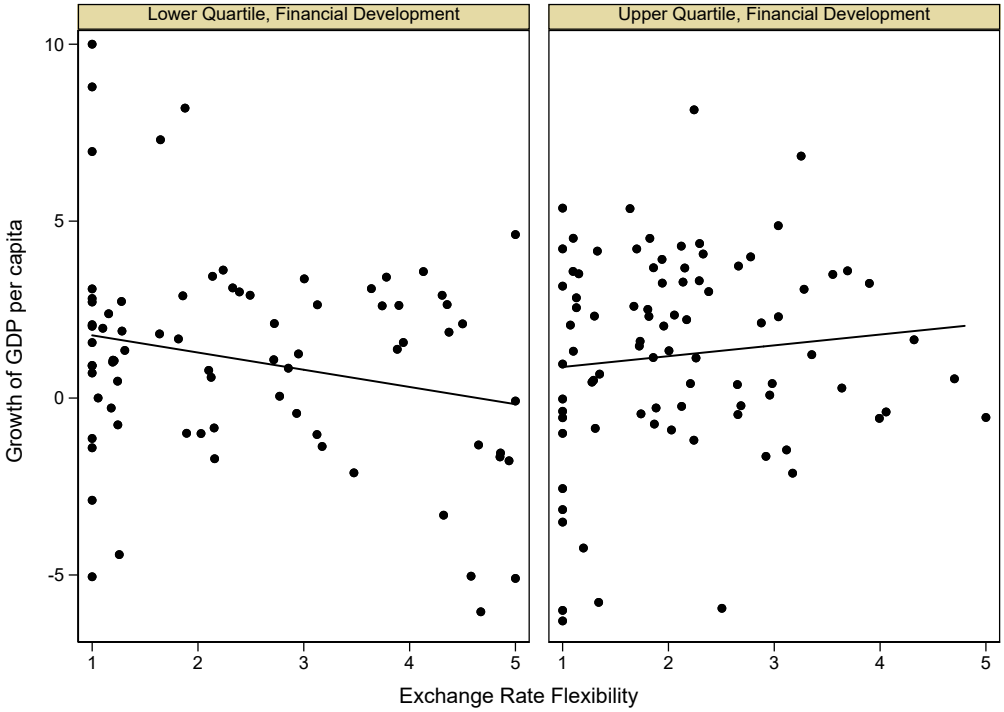
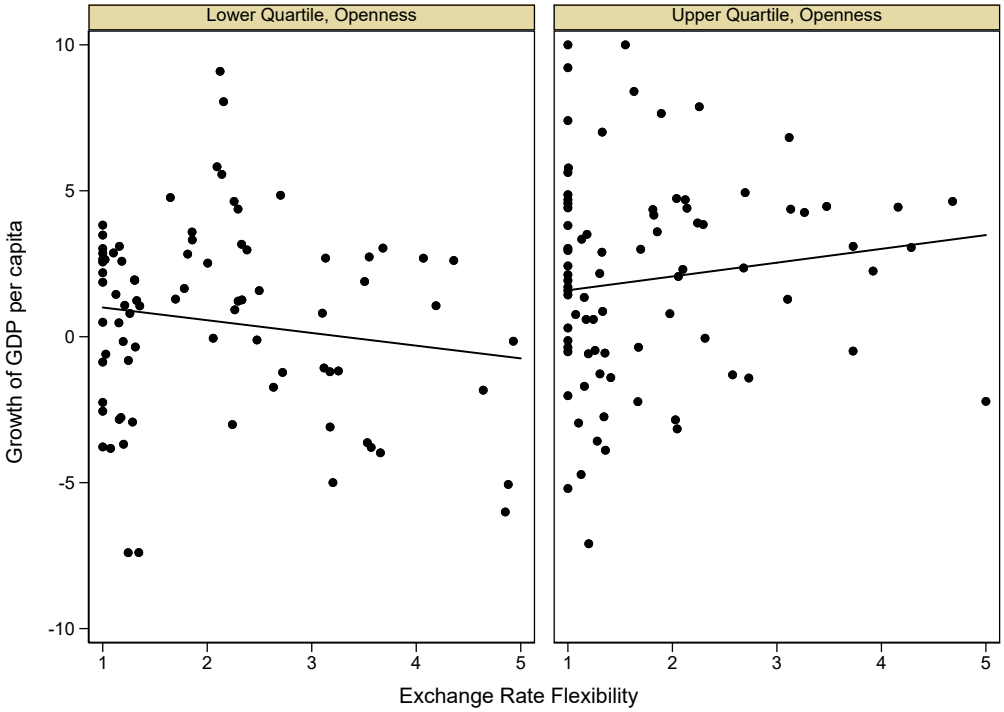


Figure 3: Exchange Rate Flexibility and Growth By Trade Openness



3.2 Methodology

In order to explore further, how financial development and trade openness affect the relationship between exchange rate flexibility and economic growth, we specify and estimate a dynamic model using the generalized method of moments (GMM) estimator proposed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998), which is designed to deal with potential endogeneity in all explanatory variables, but which accounts, particularly, for endogeneity due to the introduction of lags of the dependent variable as covariates. The estimator also addresses potential biases due to country-fixed effects, in addition to the possible existence of joint endogeneity of all explanatory variables. The dynamic equation is represented by a model of the form,

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \phi' X_{it} + \beta' Z_{it} + \mu_t + \eta_i + \varepsilon_{it}, \tag{10}$$

where y_{it} is output per worker or per capita income, X_{it} is a vector of key variables of interest including financial development, trade openness and interaction of these variables with exchange rate flexibility; Z_{it} is a vector of other explanatory variables, η_i is a country specific effect which is unobserved, μ_t is the period specific effect and ε_{it} is an error term. The dependent variable is either GDP per capita growth rate or the growth rate of total factor productivity, and the main explanatory variables include initial per capita income, exchange rate regime, financial development, trade openness, government spending, inflation and an interaction term of financial development and exchange rate regimes as well as an interaction of trade openness and exchange rate regime. The first interaction term is introduced to analyze the extent to which the level of financial development of a country influences the effect of exchange rate flexibility on economic growth whereas the latter term captures the extent to which trade openness affects the impact of exchange rate regime on growth.[6]

Equation (10) is estimated using the system GMM estimator which combines an estimator in first-differences with an estimator in levels. The inclusion of a levels equation allows the use of information on cross-country differences. This estimation technique generates internal instruments

[6]For all estimations, we use a logarithmic transformation of all variables, with the exception of the exchange rate regime index. Also, outliers are excluded from all regressions.

by using the lagged levels and lagged differences of the explanatory variables as instruments under two conditions: i) that there is no serial correlation in the errors and ii) the differences of the explanatory variable and the errors are uncorrelated. Two specification tests, Sargan test for over-identifying restrictions and Arellano-Bond test for second-order serial correlation are applied to assess the validity of the instruments and consistency of the estimates.[7] All estimates are based on the 2-step system GMM with Windmeijer's (2005) small sample correction.

3.3 Results

3.3.1 Interaction with financial development

Table 2 presents results that characterize the dynamics of the relationship between exchange rate regimes and the growth of GDP per capita, using the coarse classification for exchange rate regimes. Exchange rate flexibility has negative effect on growth, but the interaction variable which captures the impact of an increase in flexibility as level of financial development rises is positive. These results are robust to different indicators of financial development. The coefficient for the interaction term suggests that the effect of exchange rate flexibility on growth tends positive as the level of financial development increases. Moreover, the nonlinear combination of the standalone effect of exchange rate regimes and the interaction of financial development and exchange rate regime is negative and statistically significant, yet smaller in magnitude relative to the standalone effect of exchange rate flexibility on growth. Thus, at the average level of financial development, the negative effect of exchange rate flexibility is dampened.

To further assess the dynamics of the relationship between economic growth and the interaction of exchange rate flexibility and financial development, the nonlinear combination of the coefficients for exchange rate regimes and the interaction term is estimated at different thresholds along the distribution of financial development. The estimates are based on results in Table 2, columns (2), (3), (5) and (6), and presented in Table 3. The estimated nonlinear effects show that the negative impact of exchange rate flexibility on growth declines at higher levels of financial development. For instance, the negative impact of exchange rate flexibility declines from -1.326 at

[7] See Blundell and Bond (1998) for details on the system GMM estimators. These estimators have been widely applied and discussed in a number of studies (Aghion et al., 2009; Rodriguez, 2016).

the first quartile of financial development to -1.169 at the second quartile and to -0.953 at the third quartile. This suggests that the negative impact of flexible exchange rates declines at higher levels of financial development.

There are a couple of noteworthy observations for some of the control variables in Table 2: (i) the sign and statistical significance of trade openness suggests that policies that facilitate trade tend to foster growth in the region, and (ii) the estimated negative impact of financial development on growth is contrary to what is typically observed in the literature. Nevertheless, such an outcome is possible under certain conditions. For example, the development of the banking sector could lead to lower savings, decrease investment and consequently, adversely impact growth due to financial repression or where financial liberalization is too fast and characterized by a poor regulatory system (De Gregorio and Guidotti, 1995).

The specifications in Table 4 utilize the fine classification for exchange rate regimes to assess the robustness of the initial findings, and the estimates are in general, consistent with the results in Table 2, that an increase in the level of financial development mitigates the negative effect of flexible exchange rates on economic growth. Specifically, the coefficient for exchange rate regime is statistically significant and negative in all specifications, whereas the interaction variable is positive in each case.

Next, we follow to some degree, the analysis in Aghion et al. (2009) to address the impact of exchange rate variability on productivity growth. Table 5 presents results for estimates based on specifications that introduce total factor productivity (TFP) growth as the dependent variable. The estimates indicate that an increase in exchange rate flexibility has a negative impact on productivity growth. Moreover, as observed in the previously estimated models, the nonlinear combination of the estimates for exchange rate regime and the interaction term involving exchange rate regime and financial development is negative and significant, but smaller in magnitude in comparison to the standalone effect of exchange rate flexibility.[8] Thus the development of the

[8]It should be noted that the sample size drops significantly due to unavailability of data for TFP for some countries. As noted in Gadanecz and Mehrotra (2013), it is a challenge to capture the long-run impact of exchange rate flexibility on total factor productivity in developing economies due to lack of data.

financial sector of a country has a positive influence on the effect of exchange rate flexibility on productivity growth. This result is supported by the estimates of the nonlinear effects at different percentiles of financial development presented in Table 6, the negative effect being dampened, for example, from -0.078 at the 25th percentile of the financial development index, to -0.016 at the 90th percentile.[9]

3.3.2 Robustness analysis - financial development indicators

Arguably, the ideal financial development indicator should be one that incorporates access to financial services, particularly on account of the recent surge in mobile finance in some countries in Africa. Even then, not only is data lacking on financial development indicators that incorporate usage of mobile financial infrastructure, which is relevant to aspects of depth and access in several countries (Sahay et al., 2015), but only an estimated 34% of the adult population in sub-Saharan Africa, for instance, have an account at a formal financial institution (Demirguc-Kunt et al., 2015). This suggests that the impact of the surge in mobile finance on domestic savings mobilization has not been significant.

Indeed, the advances in financial innovation via the use of mobile phones has had an impact on financial inclusion and access to financing for households. Within the context of the interaction between exchange rate flexibility and financial development, however, the emphasis is on firms' access to finance and not on financial inclusion per se. Moreover, Sahay et al. (2015) show that credit to firms tends to have a greater growth impact than credit to households, as credit to firms eliminates financing constraints leading to greater investment and growth. Thus, to the extent that over 90% of the private sector in SSA constitute SMEs, majority of which face financing constraints, it is arguable that formal financial institutions remain the main source of finance for SMEs in Africa, and hence the indicators utilized in the estimations can be considered as representative of the general state of financial development with respect to firms' access to finance.[10]

[9] We provide additional estimates based on sub-Saharan African countries in Table A5 in the appendix, and for which, although the sample size is smaller, the results are consistent with the general observations pertaining to the influence of financial development on the impact of exchange rate regime on growth.

[10] Kuntchev et al. (2012) found that of the small businesses in sub-Saharan Africa that obtained external financing, 6.3% took the form of equity, 48.5% was formal external debt, 17.4% semi-formal financing and 27.8% informal financing.

Nevertheless, we perform additional robustness checks using the financial development index compiled by Sahay et al. (2015) which incorporates measures for depth, access and efficiency of financial institutions and markets. It is noteworthy that this composite index suggests that financial development in sub-Saharan Africa has been mediocre over the past three decades, and trails other regions, although there has been some modest improvement over the last 15 years (Mlachila et al., 2016). The results, which are presented in Table 7, show the interaction term for the exchange rate regime and financial development indexes bears a positive coefficient. Moreover, the effect of an increase in exchange rate flexibility estimated at the mean level of financial development is consistent with prior estimates; the coefficient for the nonlinear combination of the standalone effect of exchange rate regime and the interaction with financial development being positive and statistically significant in columns (3) and (6). These estimates substantiate the initial finding that an increase in financial development facilitates a positive impact of exchange rate flexibility on economic growth.

In general, the observed impact of financial development on the dynamics between exchange rate flexibity and growth is consistent with Aghion et al. (2009), yet there are some notable observations. Aghion et al. (2009) show that for a sample that includes both developed and developing economies, there is a threshold level of financial development beyond which exchange rate flexibility has a positive effect on productivity growth. In this study, the estimated nonlinear effect at the 75th percentile of financial development for instance, is negative but of a significantly smaller magnitude in comparison to the standalone effect of exchange rate flexibility. This suggests that for African countries, the level of financial development as captured by traditional measures is quite low, such that even in countries with the highest level of financial development in the region, the best outcome for a further deepening of the financial system would be to neutralize the negative effect of exchange rate flexibility on growth. Nevertheless, when financial development is measured using the indicator by Sahay et al. (2015), a positive impact of exchange rate flexibility is realized at the mean level of financial development for the countries in the sample.

3.3.3 Interaction with trade openness

Mundell (1961) suggests that trade openness, among other factors, should influence a country's exchange rate policy decision. Countries with greater external exposure and trade openness are less likely to suffer from the effects of overvaluation of currencies in the wake of terms of trade shocks if the exchange rate regime is flexible. On the contrary, fixed exchange rate regimes are exposed to increased risks of misalignment, because the real exchange rate tends to be overvalued under such circumstances. The subsequent loss in competitiveness may lead to a current account deficit and reduced growth. Economies with a relatively higher trade openness may be able to adjust more quickly to external shocks and minimize the risk of losses if they have flexible exchange rate regimes. Calderon and Kubal (2018) find that overall trade openness helps attenuate the effects of volatile fluctuations in real exchange rate fundamentals. To the extent that flexible nominal exchange rates are a source of such fluctuations in real exchange rate fundamentals, it is arguable that an increase in trade openness should exert a positive effect on the impact of exchange rate flexibility on growth. Thus, we also examine the extent to which trade openness matters for the impact of exchange rate regimes in the region.

Given the well-documented advantages of flexible exchange rates in terms of promoting exports and adjustments to external shocks, we hypothesize that the effect of an increase in exchange rate flexibility on growth should increase with a rise in the degree of trade openness. Table 8 presents estimates for specifications that incorporate an interaction of trade openness and exchange rate flexibility, which show that the standalone effect of exchange rate flexibility is negative and statistically significant across all specifications, whereas the interaction term for exchange rate regime and trade openness is positive. This suggests that trade openness dampens the negative effect of exchange rate flexibility on growth, as reflected by the estimates of the nonlinear combination of the standalone effect of exchange rate regime and the coefficient for the interaction variable at the mean level of trade openness, which turns out to be negative and smaller in magnitude in comparison to the standalone effect across all specifications.

Furthermore, we estimate the variation in the effect of exchange rate flexibility on growth

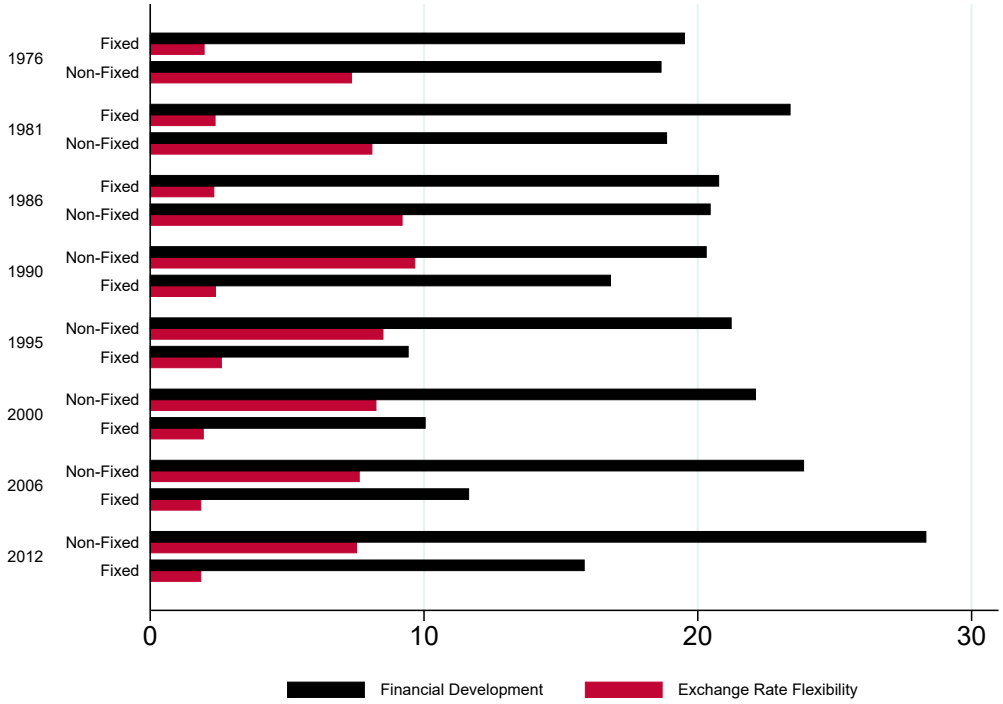
across various percentiles of the distribution of trade openness, using results from Table 8. The estimates, as shown in Table 9, show that the nonlinear effects are statistically significant, and suggest that the negative effect of exchange rate flexibility diminishes with an increase in trade openness.

4 Exchange rate regimes and financial development

The focus of this study has been on the interaction between financial development and exchange rate regimes and their impact on economic growth. However, the choice of exchange rate regime tends to be endogenous to the level of financial development especially in economies with less developed financial sector. Flexible exchange rates can be instrumental in minimizing incentives for foreign currency borrowing which helps to minimize currency mismatches, and deepen domestic financial markets particularly for local currency debt instruments and those for hedging against exchange rate risks (Gadanecz and Mehrotra, 2013). Thus, fixed exchange rate regimes may discourage the development of the financial system.

Bordo and Flandreau (2003) show that the level of financial development is higher in countries with a flexible exchange rate regime in the post-Bretton-Woods era, and further suggest that financial development is critical to the evolution of the international monetary system. On a different note, Lin and Ye (2011) address the question of whether financial development matters for the choice of exchange rate regime, and whether financial development plays a role in the decision to transition from a fixed exchange rate regime to a flexible one. Using data for 102 countries, and domestic credit to the private sector as share of GDP as the measure of financial development, they find that financial development has a statistically significant and negative impact on the probability of adopting a fixed exchange rate regime; the impact being quantitatively sizable. The study also finds that countries with a higher level of financial development are less likely to opt for a fixed exchange rate regime, and that conditional on having been under a fixed exchange rate regime, a country is more likely to exit under a higher level of financial development. The analysis, however, acknowledges that financial development may be endogenous, such that exchange rate regime choices may impact financial development outcomes.

Figure 4: Financial development under fixed and flexible exchange rate regimes



Note: Each year denotes a mid-point year for each five years period for 1973-2013

In this section, we provide a brief assessment of the link between financial development and exchange rate regimes. Figure 4 presents a plot of the relationship between an exchange rate regime index (fine classification) and a financial development indicator (private sector credit as a percentage of GDP), which shows that on average, countries operating flexible regimes have relatively more developed financial systems than countries with a fixed regime. This suggests that fixed exchange rate regimes are associated with a lower level of financial development, in general. We also estimate a model to assess the relationship between exchange rate regimes and financial development, and find that there is a strong and positive association between the two variables. The regression model specifies financial development as dependent on exchange rate regimes, controlling for variables like inflation, GDP per capita and year fixed-effects. For variant specifications using private sector credit as the indicator for financial development, the coefficient estimate for exchange rate regimes varies between 1.43 and 2.12 and is significant at the 1% level.[11]

[11]The results are available upon request.

We further estimate another set of regressions using the financial development index compiled by Sahay et al. (2015), and find positive and statistically significant coefficients for exchange rate regime ranging between 0.61 and 1.53 as reported in the appendix (Table A4). The estimates indicate there is a coexistence between higher level of financial development and more flexible exchange rate regimes, which suggests that the absence of flexibility in the exchange rate may not be conducive to the deepening of the financial system.

5 Concluding Remarks

This paper examines the impact of exchange rate regimes, and hence exchange rate policy on economic growth in Africa. We study the dynamics of this relationship along two dimensions: (i) the level of financial development, and (ii) the degree of trade openness. The main results suggest that the development of the financial system facilitates a positive relationship between exchange rate flexibility and both economic growth and total factor productivity growth. Moreover, the results show a positive impact of trade openness on the relationship between exchange rate flexibility and growth. In other words, an increase in trade openness enhances the potential benefits of flexible exchange rates on growth. Furthermore, the paper finds a positive and strong association between exchange rate flexibility and financial development.

A fixed exchange rate regime insulates an economy with an underdeveloped financial system from the risks associated with exchange rate variability and its negative consequences on growth. Yet, studies have shown that there is a threshold of financial development beyond which countries inevitably enjoy positive effects of financial development on economic growth, even under exchange rate variability. Thus, the potential negative effect of exchange rate flexibility is, perhaps, due to some structural features of developing economies, for example, an underdeveloped financial sector, as indicated by the findings. In essence, our paper suggests that exchange rate policy should be conducted with consideration for structural policies such as those that address the development of the financial sector.

Furthermore, given that financial systems are generally underdeveloped in the region, es-

pecially in sub-Saharan Africa, and that operating a flexible exchange rate regime could imply exposure to some of the risks associated with variability in the exchange rate, it is likely the case that the level of financial development may dictate exchange rate policy decisions, such that countries with a relatively less developed financial system would opt for limited to no flexibility in their exchange rates. The inherent policy dilemma, however, is that pegged exchange rates, in spite of minimizing exchange rate risks, may hinder the development of a country's financial system, per our findings. Policy makers would, therefore, have to adopt a stance that allows for some flexibility in exchange rates to foster development of the financial infrastructure in these economies to realize the positive effects that come with a well-functioning financial architecture.

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Table 2: Effect of Exchange Rate Regimes: Role of Financial Development (I)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Exchange Rate Regime (ERR)	-1.258**	-1.536***	-1.572***	-1.636***	-1.017***	-1.857***
	(0.033)	(0.002)	(0.000)	(0.002)	(0.005)	(0.000)
Financial Development (FD)	-0.909	-2.101	-1.533**	-0.247	-0.523	-0.756
	(0.488)	(0.127)	(0.027)	-0.247	-0.523	-0.756
ERR*Financial Development		0.024**	0.034*		0.031**	0.033**
		(0.016)	(0.055)		(0.027)	(0.017)
Initial GDP per capita	2.853	3.874	-3.212*	-2.845	2.801	0.672
	(0.470)	(0.200)	(0.079)	(0.316)	(0.254)	(0.691)
Education	-0.805	0.259	0.148	0.191	1.532**	-0.003
	(0.330)	(0.769)	(0.808)	(0.812)	(0.041)	(0.996)
Government Spending	-1.384	0.470	-3.759***	-3.312***	-4.130***	-4.618***
	(0.577)	(0.865)	(0.000)	(0.007)	(0.001)	(0.000)
Trade Openness	7.594***	5.528***	6.281***	6.109***	5.967***	9.616***
	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)
Inflation	-2.605***	-1.278**	-1.336*	-0.701	-1.728***	-2.004***
	(0.001)	(0.033)	(0.065)	(0.220)	(0.001)	(0.008)
Bank Crisis			-0.151			0.750
			(0.852)			(0.396)
$[ERR + ERR * FD]^1$		-1.055**	-0.888***		-0.434	-1.598***
		(0.014)	(0.000)		(0.254)	(0.000)
Observations	245	245	245	244	244	244
No. of countries	48	48	48	48	48	48
Hansen Test	(0.665)	(0.917)	(0.716)	(0.570)	(0.746)	(0.749)
Sargan Test	(0.259)	(0.980)	(0.268)	(0.160)	0.150	(0.372)
AR(2) Test	(0.116)	(0.176)	(0.104)	(0.112)	(0.128)	(0.108)

Notes: Dependent variable is GDP per capita growth rate; p-values are in paranthesis; *** significant at 1%, ** at 5% * at 10% levels. ERR is Exchange Rate Regime. FD is financial development. ERR is based on Reinhart and Roggoff coarse classification. (1)-(3) use credit to private sector (% GDP) while (4)-(6) use total credit (% GDP) as a measure of financial development. $^1[ERR + ERR * FD]$ represents the non-linear effect of ERR at the mean of financial development index. Estimates are based on a 2-step system GMM with Windmeijer (2005) small sample correction.

Table 3: Non-linear effects of ERR at various percentiles of financial development

	p25	p50	p75	p90
Table 2 (2)	-1.326**	-1.169**	-0.953**	-0.559
	(0.003)	(0.007)	(0.026)	(0.224)
Table 2 (3)	-1.273***	-1.051***	-0.742***	-0.182
	(0.000)	(0.000)	(0.000)	(0.673)
Table 2 (5)	-0.773**	-0.571*	-0.328	-0.236
	(0.023)	(0.100)	(0.418)	(0.683)
Table 2 (6)	-1.598***	-1.385***	-1.127***	-0.531
	(0.000)	(0.000)	(0.001)	(0.201)

Notes: p-values are in parenthesis; *** significant at 1%, ** at 5%, * at 10% levels. ERR is Exchange Rate Regime. Non-linear estimates are based on interaction of ERR*Financial Development from Table 2. p25, p50, p75 and p90 are percentiles of financial development index at $25^{th}, 50^{th}, 75^{th}$ and 90th percentile, respectively.

Table 4: Effect of Exchange Rate Regimes: Role of Financial Development (II)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Exchange Rate Regime	-0.683***	-0.352*	-0.571***	-0.470***	-1.165***	-1.088***
	(0.000)	(0.091)	(0.000)	(0.008)	(0.000)	(0.000)
Financial Development	-1.161	-1.420	-0.822	-0.261	-0.574	-0.461
	(0.231)	(0.323)	(0.299)	(0.650)	(0.204)	(0.201)
ERR*Financial Development		0.006**	0.009*		0.005**	0.002
		(0.037)	(0.076)		(0.029)	(0.304)
Initial GDP per capita	0.881	2.237	-0.844	-3.848	-0.889	-2.661
	(0.775)	(0.556)	(0.664)	(0.185)	(0.606)	(0.162)
Education	0.410	0.362	0.472	0.188	1.572***	0.594
	(0.533)	(0.680)	(0.445)	(0.823)	(0.002)	(0.367)
Government Spending	-0.337	-0.280	-3.252**	-2.599**	-0.629	-1.167
	(0.830)	(0.925)	(0.014)	(0.033)	(0.471)	(0.221)
Trade Openness	5.207***	5.662***	7.676***	4.316**	6.224***	5.933***
	(0.000)	(0.002)	(0.000)	(0.012)	(0.000)	(0.000)
Inflation	-1.573**	-1.340*	-2.216***	-0.807	-0.141	-0.631*
	(0.014)	(0.058)	(0.001)	(0.194)	(0.772)	(0.069)
Bank Crisis			0.897			-0.220
			(0.295)			(0.747)
$[ERR + ERR * FD]^1$		-0.203	-0.283**		-1.131***	-1.086***
		(0.194)	(0.012)		(0.000)	(0.000)
Observations	245	245	245	244	244	244
Number of Countries	48	48	48	48	48	48
Hansen Test	(0.363)	(0.870)	(0.619)	(0.691)	(0.419)	(0.643)
Sargan Test	(0.263)	(0.951)	(0.116)	(0.230)	(0.423)	(0.546)
AR(2) Test	(0.191	(0.180	(0.109	(0.127)	(0.253)	(0.115)

Notes: Dependent variable is GDP per capita growth rate; p-values are in paranthesis; *** significant at 1%, ** at 5%, * at 10% levels. ERR is Exchange Rate Regime. FD is financial development. ERR is based on Reinhart and Roggoff fine classification. (1)-(3) use credit to private sector (% GDP) while (4)-(6) use total credit (% GDP) as a measure of financial development. [1] $[ERR + ERR * FD]$ represents the non-linear effect of ERR at the mean of financial development index. Estimates are based on a 2-step system GMM with Windmeijer (2005) small sample correction.

Table 5: Effect of Exchange Rate Regimes: Role of Financial Development(III)

VARIABLES	(1)	(2)	(3)
Exchange Rate Regime	-0.035***	-0.098**	-0.088*
	(0.004)	(0.030)	(0.075)
Financial Development	-0.017	-0.120	-0.077
	(0.298)	(0.100)	(0.124)
ERR*Financial Development		0.002	0.003
		(0.296)	(0.205)
Initial TFP	0.073**	0.158*	0.095**
	(0.040)	(0.085)	(0.015)
Education	-0.034	0.078	0.004
	(0.173)	(0.373)	(0.919)
Government Spending	-0.023	-0.142	0.028
	(0.449)	(0.139)	(0.400)
Trade Openness	0.081**	0.024	0.088**
	(0.028)	(0.778)	(0.012)
Inflation	0.002	-0.035	-0.253**
	(0.968)	(0.856)	(0.011)
Bank Crisis			-0.001
			(0.973)
$[ERR + ERR * FD]^1$		-0.057***	-0.035*
		(0.007)	(0.087)
Observations	142	142	142
Number of ccode	26	26	26
Hansen Test	(0.689)	(0.243)	(0.644)
Sargan Test	(0.371	(0.570)	(0.501)
AR(2) Test	(0.468)	(0.163	(0.979)

Notes: Dependent variable is growth rate of of TFP; p-values are in paranthesis; *** significant at 1% level, ** at 5% level, * at 10% level. ERR is Exchange Rate Regime. FD is financial development. ERR is based on Reinhart and Roggoff coarse classification. Financial development is measured by credit to private sector (% GDP). [1] $[ERR + ERR * FD]$ represents the non-linear effect of ERR at the mean of financial development index. Estimates are based on a 2-step system GMM with Windmeijer (2005) small sample correction.

Table 6: Non-linear effects of ERR at various percentiles of financial development

	p25	p50	p75	p90
Table 5 (2)	-0.078***	-0.064***	-0.043*	-0.016
	(.005)	(.002)	(.082)	(.718)
Table 5 (3)	-0.063**	0-.045**	-0.019	0.015
	(.043)	(.045)	(.411)	(.707)

Notes: p-values are in parenthesis; *** significant at 1% level, ** at 5% level, * at 10% level. Non-linear estimates are based on interaction of ERR*Financial Development from Table 5. p25, p50, p75 and p90 are percentiles of financial development index at $25^{th}, 50^{th}, 75^{th}$ and 90th percentile, respectively.

Table 7: Exchange rate regime and growth using financial development index (Sahay et al., 2015)

	Coarse Classification			Fine Classification		
	(1)	(2)	(3)	(4)	(5)	(6)
Exchange Rate Regime (ERR)	-1.629***	-2.218**	-1.543**	-0.418**	-0.446*	-0.338*
	(0.000)	(0.016)	(0.023)	(0.011)	(0.071)	(0.050)
Financial Development (FD)	-1.667	-3.577*	-6.410***	-2.236	-4.317**	-6.065***
	(0.334)	(0.063)	(0.000)	(0.192)	(0.026)	(0.000)
ERR*Financial Development		0.105**	0.211***		0.019	0.050***
		(0.031)	(0.000)		(0.122)	(0.000)
Initial GDP per capita	-1.720	-0.156	-7.556***	-2.082	-1.235	-9.655***
	(0.514)	(0.945)	(0.000)	(0.365)	(0.533)	(0.000)
Education	0.291	1.810**	0.574	0.555	1.728**	0.985*
	(0.663)	(0.023)	(0.408)	(0.412)	(0.028)	(0.072)
Government Spending	-2.228**	-3.122***	-4.893***	-1.200	-2.393**	-4.737***
	(0.044)	(0.006)	(0.000)	(0.219)	(0.034)	(0.000)
Trade Openness	5.151***	5.691***	7.106***	4.782***	5.344***	7.203***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	0.126	-2.145	-12.936***	-3.565	-4.317	-13.130***
	(0.958)	(0.489)	(0.000)	(0.166)	(0.123)	(0.000)
Bank Crisis			-0.590			-0.245
			(0.681)			(0.856)
$[ERR + ERR * FD]^1$		-.9085*	1.091*		-.292*	.289*
		(0.075)	(0.033)		(0.087)	(0.051)
Observations	202	202	202	202	202	202
Number of countries	43	43	43	43	43	43
Hansen Test	0.692	0.366	0.700	0.423	0.409	0.623
Sargan Test	0.340	0.795	0.632	0.316	0.597	0.773
AR(2) Test	0.215	0.241	0.109	0.188	0.222	0.158

Note: Notes: Dependent variable is growth rate of GDP per capita; p-values are in paranthesis; *** significant at 1%, ** at 5%, * at 10% levels. ERR is Exchange Rate Regime. ERR is based on Reinhart and Roggoff classification where (1)-(2) use coarse classification and (4)-(6) use the fine classification. Financial development is from Sahay et al. (2015) financial development index which combines both access to credit and financial markets development. $^1[ERR + ERR * FD]$ represents the non-linear effect of ERR at the mean of the financial development index. Estimates are based on a 2-step system GMM with Windmeijer (2005) small sample correction.

Table 8: Effects of Exchange Rate Regimes: Role of Trade Openness

VARIABLES	(1)	(2)	(3)	(4)
Exchange Rate Regime	-1.966***	-2.106***	-2.116***	-1.794***
	(0.002)	(0.000)	(0.000)	(0.001)
Financial Development	-1.219	-2.168***	-1.010***	-0.473
	(0.143)	(0.000)	(0.005)	(0.204)
ERR*Trade Openness	0.011**	0.012**	0.007*	0.007
	(0.030)	(0.020)	(0.086)	(0.179)
Initial GDP per capita	4.018	1.915	1.453	-0.387
	(0.147)	(0.323)	(0.238)	(0.805)
Education	-0.150	0.353	0.367	0.235
	(0.831)	(0.502)	(0.575)	(0.609)
Government Spending	-2.581**	-0.951	-2.235***	-0.631
	(0.044)	(0.382)	(0.002)	(0.518)
Trade Openness	5.415***	3.952***	6.214***	4.819***
	(0.000)	(0.001)	(0.000)	(0.001)
Inflation	-2.207***	-1.317**	-1.309***	-0.010
	(0.004)	(0.015)	(0.000)	(0.991)
Bank Crisis		-1.946*		-2.978***
		(0.051)		(0.000)
$[ERR + Openness * ERR]^1$	-1.177**	-1.256***	-1.617***	-1.301***
	(0.003)	(0.000)	(0.000)	(0.000)
Observations	245	245	245	245
Number of countries	48	48	48	48
Hansen Test	(0.632)	(0.576)	(0.780)	(0.865)
Sargan Test	(0.215)	(0.233)	(0.192)	(0.144)
AR(2) Test	(0.101)	(0.0986)	(0.121)	(0.119)

Notes: Dependent variable is growth rate of GDP per capita; p-values are in paranthesis; *** significant at 1%, ** at 5%, * at 10% levels. ERR is Exchange Rate Regime. ERR is based on Reinhart and Roggoff coarse classification.(1)-(2) use credit to private sector (% GDP) while (3)-(4) use total credit (% GDP) as a measure of financial development. [1] $[ERR + Openness * ERR]$ represents the non-linear effect of ERR at the mean of trade openness index. Estimates are based on a 2-step system GMM with Windmeijer (2005) small sample correction.

Table 9: Non-linear effects of ERR at various percentiles of trade openness

	p25	p50	p75	p90
Table 8 (1)	-1.443***	-1.273**	-0.963**	-0.622
	(0.001)	(0.002)	(0.012)	(0.134)
Table 8 (2)	-1.543***	-1.360	-1.026***	-0.659*
	(0.000)	(0.000)	(0.000)	(0.056)
Table 8 (3)	-1.785***	-1.678***	-1.483***	-1.267***
	(0.000)	(0.000)	(0.000)	(0.000)
Table 8 (4)	-1.468***	-1.362***	-1.168***	-.955***
	(0.000)	(0.000)	(0.000)	(0.000)

Notes: p-values are in parenthesis; *** significant at 1% level, ** at 5% level, * at 10% level. ERR is Exchange Rate Regime. Estimates are based on interaction of ERR*Trade Openness from Table 8. p25, p50, p75 and p90 are percentiles of trade openness at 25th, 50th, 75th and 90th percentile, respectively.

Appendix

Table A1: Reinhart & Roggoff de facto Exchange Rate Classification

Regime Class	Coarse Classification Description
1	No separate legal tender
1	Pre announced peg or currency board arrangement
1	Pre announced horizontal band that is narrower than or equal to $+/-2\%$
1	De facto peg
2	Pre announced crawling peg
2	Pre announced crawling band that is narrower than or equal to $+/-2\%$
2	De factor crawling peg
2	De facto crawling band that is narrower than or equal to $+/-2\%$
3	Pre announced crawling band that is wider than or equal to $+/-2\%$
3	De facto crawling band that is narrower than or equal to $+/-5\%$ (i.e., allows for both appreciation and depreciation overtime)
3	Moving band that is narrower than or equal to $+/-2\%$
3	Managed floating
4	Freely floating
5	Freely falling
6	Dual market in which parallel market data is missing

Regime Class	Fine Classification Description
1	No separate legal tender or currency union
2	Pre announced peg or currency board arrangement
3	Pre announced horizontal band that is narrower than or equal to $+/-2\%$
4	De facto peg
5	Pre announced crawling peg; de facto moving band narrower than or equal to $+/-1\%$
6	Pre announced crawling band that is narrower than or equal to $+/-2\%$ or de facto horizontal band that is narrower than or equal to $+/-2\%$
7	De facto crawling peg
8	De facto crawling band that is narrower than or equal to $+/-2\%$
9	Pre announced crawling band that is wider than or equal to $+/-2\%$
10	De facto crawling band that is narrower than or equal to $+/-5\%$
11	Moving band that is narrower than or equal to $+/-2\%$ (i.e., allows for both appreciation and depreciation over time)
12	De facto moving band $+/-5\%$ Managed floating
13	Freely floating
14	Freely falling
15	Dual market in which parallel market data is missing.

Source: www.reinhartandrogoff.com

Figure A1: Countries per exchange rate regime - Reinhart-Rogoff coarse classification (Table A1)

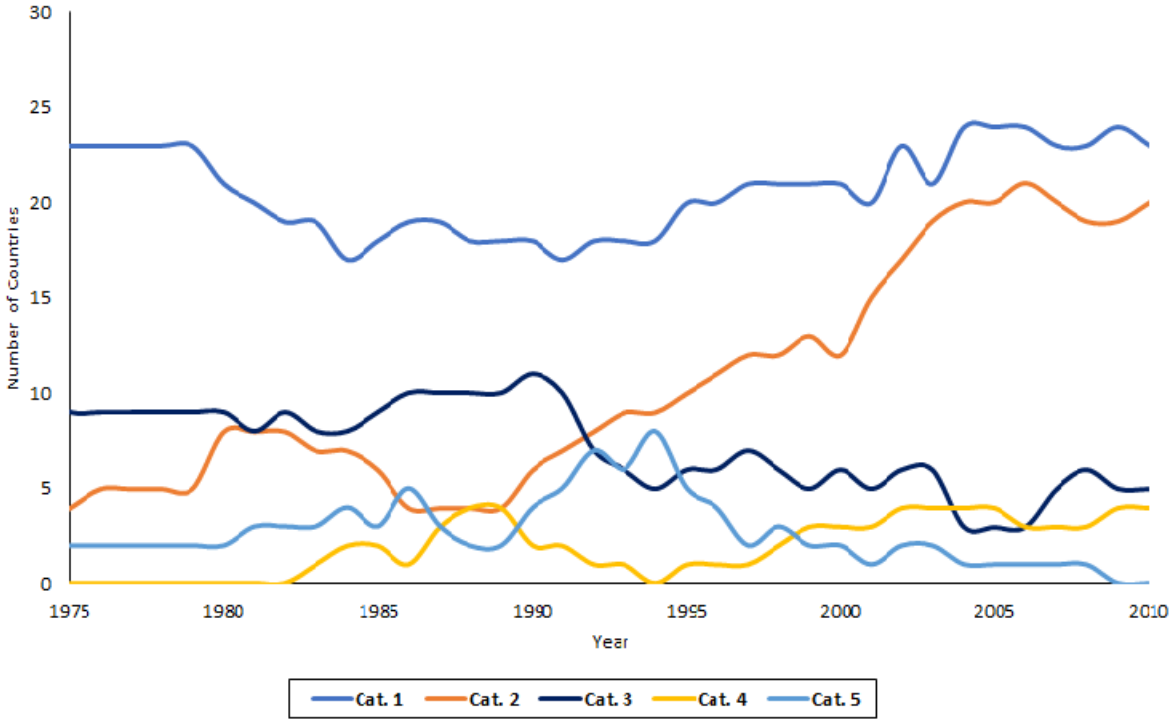

Table A2: Definitions and Data Sources

Variables	Definition	Source
GDP per capita growth	Growth rate of real GDP per capita	WDI[1]
Growth rate of TFP	Growth rate of total factor productivity	PWT[2]
TFP at current PPPs	Total factor productivity at current PPP	PWT
GDP per capita	GDP per capita	WDI
Exchange rate regime-coarse	Reinhart and Rogoff de-facto exchange rate regime, coarse classification	RR[3]
Exchange rate regime-fine	Reinhart and Rogoff de-facto exchange rate regime, fine classification	RR
Credit to private sector	Domestic credit to private sector (% of GDP)	WDI
Credit by banks & institutions	Private credit by deposit money banks and other financial institutions (% of GDP)	WDI
Education	Secondary enrollment ratio	WDI
Trade (Openness)	Total imports and exports (% of GDP)	WDI
Inflation (annual %)	log(100+inflation rate)	WDI
Government Expenditure	Total government expenditure (% of GDP)	WDI
Bank Crisis	= 1 if there was a crisis in that year, 0 otherwise	WDI

[1]WDI - World Development Indicators; [2]PWT - Penn World Tables from (Feenstra et al., 2015); [3]RR - Reinhart and Rogoff's exchange rate regimes index Reinhart and Rogoff (2004, 2009) and Ilzetzki et al. (2017)

Table A3: List of countries

Algeria	Congo, Rep.	Lesotho	Nigeria
Angola	Côte d'Ivoire	Liberia	Rwanda
Benin	Djibouti	Libya	Senegal
Botswana	Egypt	Madagascar	Sierra Leone
Burkina Faso	Equatorial Guinea	Malawi	South Africa
Burundi	Ethiopia	Mali	Swaziland
Cabo Verde	Gabon	Mauritania	Tanzania
Cameroon	Gambia, The	Mauritius	Togo
Central African Republic	Ghana	Morocco	Tunisia
Chad	Guinea	Mozambique	Uganda
Comoros	Guinea-Bissau	Namibia	Zambia
Congo, Dem. Rep.	Kenya	Niger	Zimbabwe

Table A4: Exchange rate regime and financial development

VARIABLES	(1)	(2)	(3)	(4)	(5)
Exchange Rate Regime	0.614*	0.785**	1.534***	1.407***	1.193***
	(0.087)	(0.026	(0.000)	(0.001)	(0.005)
GDP per capita	Yes	Yes	Yes	Yes	Yes
Inflation			Yes	Yes	Yes
Trade Openness					Yes
Year FE		Yes	Yes	Yes	Yes
Institutional quality				Yes	Yes
Constant	-11.17	-10.36	59.13***	56.96***	51.83***
	(0.000)	(0.000)	(0.002)	(0.003)	(0.006)
Observations	298	298	276	276	275
R-squared	0.217	0.282	0.316	0.327	0.343

Dependent variable is Sahay et al. (2015) financial development index; ERR is based on coarse classification; institutional quality indicator is index of legal structure and security of property rights from the Quality of Government database.

Table A5: Exchange rate regime and financial development - SSA countries

VARIABLES	(1)	(2)	(3)
Exchange Rate Regime	-1.537**	-1.507***	-1.288***
	(0.023)	(0.001)	(0.001)
Financial Development (FD)	-0.301	-2.256	-1.535**
	(0.813)	(0.121)	(0.014)
ERR*Financial Development		0.026***	0.021*
		(0.007)	(0.094)
Initial GDP per capita	4.622	3.753	-1.118
	(0.238)	(0.239)	(0.475)
Education	-0.937	0.638	0.675
	(0.336)	(0.449)	(0.224)
Government Spending	-0.941	-0.700	-3.428***
	(0.734)	(0.807)	(0.000)
Trade Openness	7.783***	5.285***	5.992***
	(0.000)	(0.003)	(0.000)
Inflation	-1.962**	-2.596***	-1.475***
	(0.013)	(0.008)	(0.002)
Bank Crisis			0.126
			(0.881)
$[ERR + ERR * FD]$		-0.970***	-0.860***
		(0.005)	(0.000)
Observations	240	240	240
Number of countries	45	45	45
Hansen Test	0.577	0.941	0.811
Sargan Test	0.323	0.958	0.170
AR(2) Test	0.111	0.125	0.109

Notes: Dependent variable is growth rate of GDP per capita; p-values are in paranthesis; *** significant at 1%, ** at 5%, * at 10% levels. ERR is Exchange Rate Regime. ERR is based on Reinhart and Roggoff coarse classification. Credit to private sector (% GDP) is the measure of financial development. $[ERR + ERR * FD]$ represents the non-linear effect of ERR at the mean of trade openness index. Estimates are based on a 2-step system GMM with Windmeijer (2005) small sample correction.