REAL EXCHANGE MISALIGNMENTS AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA: PANEL DATA EVIDENCE

By

Bernard Njindan Iyke[1]
Department of Economics
University of South Africa
P. O. Box 392, UNISA
0003, Pretoria
South Africa
Email: niykeb@unisa.ac.za / benitoflex@gmail.com

AND

Nicholas M. Odhiambo
Department of Economics
University of South Africa
P. O. Box 392, UNISA
0003, Pretoria
South Africa
Email: odhianm@unisa.ac.za / nmbaya99@yahoo.com

MAY, 2015

[CONFERENCE DRAFT: NOT TO BE CITED WITHOUT PERMISSION]

BIENNIAL CONFERENCE OF THE ECONOMIC SOCIETY OF SOUTH AFRICA 2-4

SEPTEMBER 2015, UNIVERSITY OF CAPE TOWN, CAPE TOWN, SOUTH AFRICA

[1]Corresponding Author [Economics Department, University of South Africa, Pretoria]

REAL EXCHANGE MISALIGNMENTS AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA: PANEL DATA EVIDENCE

ABSTRACT

In this paper, we investigate the impact of real exchange rate misalignments on economic growth in sub-Saharan Africa (SSA). Our dataset consists of fifteen (15) countries spanning the period 1970-2010. We examined this linkage in a piecewise fashion; using short panel data techniques (i.e. within-effects estimators and GMM estimators). Our results suggest that real undervaluations enhance economic growth; whereas real overvaluations mar economic growth in the selected SSA countries in our sample. In particular, we find a percentage change in real undervaluation to generate approximately 2.8 per cent change in economic growth. Our findings remain unaffected by endogeneity, serial correlation, heteroskedasticity and the choice of real exchange rate misalignments measure. The main policy implications stemming from these findings are that: (i) Authorities in these countries could deploy real undervaluations as policy tool to move idle resources from the less-productive non-traded goods sectors to the more-productive traded goods sectors; and (ii) authorities should setup policy frameworks that suppress real overvaluations to the barest minimum.

Keywords: Real Exchange Rates, Economic Growth, Undervaluation, Overvaluation, sub-Saharan Africa

JEL Classification: C23, F21, F31

1. INTRODUCTION

The impact of real exchange rate misalignments on economic growth has been examined extensively in the international economics literature with conflicting results. A careful review of the literature reveals two strands of conclusions. The first strand argues that real exchange rate misalignments hurt economic growth. Such a conclusion is documented in Fischer

(1993), Razin and Collins (1997), and Johnson *et al.* (2007). According to this view, real exchange rate misalignments, especially overvaluations hurt economies through activities such as corruption and rent-seeking, shortages of foreign currency, unsustainable current account deficits, and balance-of-payment crises (see Fischer, 1993). Emphasizing this conclusion, Calvo and Reinhart (2002) document evidence which shows that most countries have hesitated floating their currencies because they "fear" the consequences of misalignments.[2]

The second strand finds real exchange rate misalignments, especially undervaluations, to stimulate economic growth. This conclusion is well-documented in the recent literature. For example, Bhalla (2007), Gala (2008), Rodrik (2008), and Glüzmann *et al.* (2012) find strong evidence that real exchange rate misalignments in the form of undervaluations have enhanced economic growth in many developing countries. Substantiating this conclusion, Rodrik (2008) argues that the tradable sectors of low- and middle-income countries are distorted by institutional ineffectiveness and market failures which restrict these countries from developing. According to this author, real exchange rate misalignments in the form of undervaluations are second-best policies aimed at removing distortions; and hence, enable countries to achieve economic growth. This account is also evident in Dollar (1992), who attributes the rapid and sustained growth of most Eastern Asian countries (such as Japan, Taiwan, South Korea, Singapore, and China) to their undervalued exchange rates.

In this paper, we examine whether real exchange rate misalignments, especially undervaluations, are necessary ingredients for economic growth. We construct an index for real currency misalignments following the novel approach recently advanced by Rodrik (2008) and Glüzmann *et al.* (2012). Our index is constructed from a dataset of fifteen (15)

[2] For the familiar reader, this is the "fear-of-floating" syndrome documented in the exchange rate literature.

sub-Saharan African (SSA) countries spanning the period 1970-2010.[3] The index is based on data from the Penn World Tables which contains price levels for each country. The special characteristic of this index is that it adjusts for the Balassa-Samuelson (BS) effect. By adjusting for the BS effect, this index allows the study to efficiently control for reverse causality which can arise in the coefficient estimates. In doing so, we contribute to the literature in two ways. Firstly, we introduce into the African literature a novel index of real exchange rate misalignments which controls for reverse causality; and secondly, we shed a broad insight into an interesting economic relationship which can enhance policymaking.

The remainder of the paper is organised as follows. In section 2 we present the theoretical and empirical literature on the relationship between exchange misalignments and economic growth. In section 3, we outline our methodology and data. Then, we report our results in section 4. Finally, our concluding remarks are provided in section 5.

2. REVIEW OF THE RELEVANT LITERATURE

2.1 The Theory

The theoretical connection between the real exchange rate and economic growth is still developing. Traditional models of economic growth have considered the real exchange rate as an endogenous variable. Due to this, the real exchange rate has mostly been determined in the old literature within general equilibrium setups in which its values are affected by productivity, preferences and factor endowments, among other parameters (see Razmi *et al.*, 2012). The recent empirical findings suggest that the real exchange rate correlates with the nominal exchange rate, at least, majority of the time. Since the nominal exchange rate can be manipulated by policies to stimulate economic activities, it should be logical for us to expect the real exchange rate to work in a similar fashion. A very detailed theoretical insight into the

[3] These countries are Botswana, Congo DR, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Kenya, Ghana, Mali and Nigeria.

growth impact of real exchange rates was developed by Rodrik (2008). Since then, other theoretical papers have emerged. Beginning with Rodrik, we present the theoretical literature on the links between the real exchange rate misalignments and economic growth.

Rodrik (2008) investigates the effect of the real exchange rate misalignments on economic growth within a simple dynamic equilibrium framework. He sets up a small open economy model in which the tradable and non-tradable sectors are "taxed". These "taxes" create a significant wedge between private and social benefits. Rodrik (2008) demonstrates that when taxes in the tradable sector are larger than those in the non-tradable sector, resources in the economy will be misallocated. Moreover, the tradable sector will be small, resulting in suboptimal growth rate. According to Rodrik, an economic structure of this nature can experience growth if its real exchange rate depreciates mildly. His argument is that if the real exchange depreciates, tradable goods become lucrative. Rodrik, therefore, associates the taxes in such an economy to the existence of weak institutions and market failures.

Gala (2008), and Gala and Libanio (2010) extend Bhaduri and Marglin's (1990) model to evaluate the links between the real exchange rate and economic growth. They specify two functions: (i) an aggregate investment function which depends on capacity utilisation and profit margins; and (ii) a consumption function which depends on real wages. They derive two equations which relate savings and investment levels to real exchange rates, and real wages. They demonstrate that, if workers do not save, higher real wages and real appreciation will lower savings rates and consumption levels. Alternatively, lower real wages and real depreciation will stimulate profit growth and investment. Aggregate demand, capacity utilisation, and savings will also be stimulated, as a consequence. They conclude that competitive currencies might increase investment and savings, and stimulate capital accumulation and economic growth.

Aghion *et al.* (2009) investigate the interaction between exchange rate flexibility and financial development, and how this interaction impacts productivity growth. They examine this issue within a simple open economy which is populated by overlapping generations of two-period lived entrepreneurs and workers. In their model, productivity grows as a consequence of innovation by entrepreneurs who have sufficient funds to contain short-run liquidity shocks. In addition, nominal exchange rate movements influence macroeconomic volatility, given wage stickiness. They argue that unless exchange rates are pegged, risk premium shocks induce excess exchange rate volatility sufficient to offset real shocks. The authors conclude that higher levels of exchange rate volatility mar economic growth, especially in countries with small capital markets, where macroeconomic volatility is largely due to financial shocks.

Korinek and Serven (2010) evaluate the impact of real exchange rate intervention on welfare in a formal dynamic model of an economy characterised by learning-by-investing externalities. Their model is a small open economy model with two intermediate goods sectors – the tradable and the non-tradable goods sectors – which employ labour and capital. The tradable and the non-tradable goods are combined to produce a final good which is suitable for both consumption and investment. The capital account of this small open economy is closed for private agents but opened to the government which can trade financial assets with the rest of the world. They demonstrate that real undervaluation raises the relative price of tradable goods relative to non-tradable goods which distorts the economy. Also, given that the tradable goods sector is more capital-intensive, the returns on capital will be increased, leading to faster rate of capital accumulation, based on the Stolper-Samuelson theorem. In addition, given that learning-by-investing externalities are directly related to capital accumulation, there will be dynamic welfare gains. Thus, a devalued real exchange

rate via capital accumulation will be socially desired, if the learning-by-investing impact in the economy is strong.

Gente and Nourry (2011) develop a two-sector overlapping generations model. This model relates capital movements to economic growth and the real exchange rate. Gente and Nourry's model contains two production sectors: the tradable sector and the non-tradable sector. They assume a world of two countries which accumulates human capital and experiences endogenous growth. In addition, they normalise the price of tradables, so that the price of non-tradables represents the domestic real exchange rate. They demonstrate that trade openness and capital movements result in the divergence between countries' growth rates barring cross-border externalities in human capital accumulation. Also, that capital mobility can induce real exchange rate misalignments which reduce economic growth and promote divergence in income, in a less altruistic economy. Thus, in their 2x2x2 overlapping generations model, economic growth depends on real exchange rate through human capital accumulation.

Razmi *et al.* (2012) investigate the links between the real exchange rate and sustainable economic growth. They develop a stylised model for a small open economy with two sectors: a modern sector which produces tradable goods; and a traditional sector which produces non-tradable goods. The modern sector employs capital which is usually imported but the traditional sector does not. The crucial assumption of the model is that there is a substantial hidden unemployment in the economy. According to these authors, the real exchange rate determines the composition of employment in this economy. Thus, the real exchange rate can be employed to stimulate the accumulation of capital and economic growth in this economy. They argue that non-tradable output and employment are demand-led, and that an increase in investment can stimulate output and growth rate (i.e. growth is investment-led). However, the investment stimulus affects balance of payments. This means that suitable real exchange rate

policies must be pursued to ensure sustainability of the investment-led growth stimulus. Thus, the real exchange rate is crucial to successful economic development, according to these authors.

Lima and Porcile (2013) investigate the role of different preferences of government, capitalists and workers in influencing the dynamics of the real exchange rate. They build a dynamic open economy with a monetary authority that regulates the nominal exchange rate. This economy is populated by capitalists and workers who have different consumption patterns. They assume further that: (i) the economy produces a single good which can be consumed or invested; (ii) this good is produced through a combination of two domestic factors (labour and capital) or imported intermediate input; and (iii) that capitalist firms operate in an oligopolistic market and produce the domestic good. They demonstrate that economic growth and capacity utilisation move with the real exchange rate. They also demonstrate that the nominal exchange rate tends to move whenever the real exchange rate differs from the desired rate of the government and the capitalists. The authors argue that when government preoccupies itself with preserving workers' share of income by regulating the nominal exchange rate, the economy undergoes endogenous cyclical fluctuation in the real exchange rate and growth which appears to be experienced by developing countries. These authors shed light on the need to incorporate the real exchange rate and income distribution in future growth regressions.

Bussière *et al.* (2014) build a simple open economy model which links productivity and interest rate shocks to the real exchange rate, gross domestic product, and current account. Their model assumes that firms face idiosyncratic fixed costs; so that initial steady state gross profits cover the fixed costs of each marginal firm. The gross profits are affected by productivity and interest rate shocks. Thus, in the short run, firms which are unable to cover their fixed costs must shut down. Also, the model assumes that no firm can be created in the

short run due to the huge amount of time and capital required. The authors show that shocks which adversely affect gross profits in the tradable goods sector reduce the number of firms in that sector, but none is created in the non-tradable goods sector. Because they assume that each firm faces decreasing returns to scale, a lower number of firms results in lower output. They argue that shocks to world interest rate (in the form of increment) trigger a real appreciation, and reduce profits in the non-tradable goods sector. This results in the reduction of the number of firms, and output. Similarly, a reduction in world interest rate reduces profits in the tradable goods sector, and consequently, output. Therefore, either way, shocks to the interest rates reduce output. According to their study, appreciations due to capital inflows are associated with weak economic growth, while appreciations associated with productivity shocks lead to high economic growth. They argue that real appreciations due to capital flow shocks are accompanied by low growth because of frictions (externalities) in their model (see Bussière *et al.*, 2014).

2.2 The Empirical Literature

A number of studies have been conducted in order to empirically examine the impact of real exchange rate misalignments on economic growth. The attention has often been directed towards what constitute the right measure of real exchange rate misalignments. On the whole, there are two main strands based on the available literature. The first strand argues that real exchange rate misalignments harm economic growth. Such studies include Ghura and Grennes (1993), Razin and Collins (1997), Domac and Shabsigh (1999), Aguirre and Calderon (2005), Johnson *et al.* (2007), Gala (2008), Aghion *et al.* (2009), among others. The second strand argues that real exchange rate misalignments can stimulate economic growth. Such studies are Bleaney and Greenaway (2001), Duba *et al.* (2005), Hausmann *et al.* (2005), Gala and Lucinda (2006), Rodrik (2008), Béreau *et al.* (2009), Glüzmann *et al.* (2012),

Bussière *et al.* (2014), among others. A summary of the relevant empirical literature is presented in Table 1.

Table 1: Real Exchange Rate Misalignments and Economic Growth

Author(s)	Dependent Variable(s)	Independent Variable(s)	Method(s)	Sample Period (Number of Countries)	Conclusion(s)
Ghura and Grennes (1993)	Real GDP per capita growth; Trade openness; Saving and Investment ratios	Capital stock; Population growth; Measures of RER misalignments; TOT growth; Investment	Panel regression; OLS	1972—1987 (33 SSA countries)	RER misalignments affect economic performance negatively
Domac and Shabsigh (1999)	Real GDP per capita growth	RER variability; Investment/GDP; TOT growth; Population growth	Panel regression; 3SLS	1970—1995 (4 countries; Egypt, Jordan, Morocco and Tunisia)	RER misalignments affect economic performance negatively
Bleaney and Greenaway (2001)	Total investment/ GDP; GDP growth	TOT; TOT volatility; RER; RER volatility; Inflation and two lags of GDP	GARCH(1,1); Panel regression; OLS	1980—1995 (14 SSA countries)	Competitive RERs foster economic growth
Aguirre and Calderon (2005)	Real per capita GDP growth	Initial GDP per capita; Initial output gap; RER misalignment indexes; TOT shocks; Government consumption/GDP; Human capital; Financial depth; Trade openness; Inflation; Currency crises index; Time and country dummies	Panel regression; OLS; GMM	1965—2003 (60 countries)	RER misalignments affect economic performance negatively; the effect is nonlinear
Dubas *et al.* (2005)	GDP growth	Exchange rate regimes	Panel Data; Multinomial logit	1960—2002 (180 countries)	Stable currency value regimes promote economic growth
Hausmann *et al.* (2005)	Growth acceleration	TOT; Imports/GDP; Exports/GDP; Inflation; Investment/GDP; RER	Time series regression; OLS; Correlation Analysis	Varying periods between 1957 and 1992 (110 countries)	Positive correlation between growth accelerations and RER depreciations
Gala and Lucinda (2006)	GDP per capita growth	Initial GDP per capita; Schooling; Infrastructure; Institutions; Price Stability; RER index	Panel regression; OLS; Pooled OLS; GMM	1960—1999 (58 developing countries)	RER undervaluation has a positive and significant impact on economic growth
Freund and Pierola (2008)	Export growth	RER Misalignment; Country size; Trade liberalization; lagged GDP	Panel regression; OLS; Correlation Analysis	1980—2005 (130 countries)	Competitive currencies are essential for firm expansion and export surges in developing countries
Gala (2008)	GDP per capita	Initial GDP per capita; Initial output gap; Education; Public	OLS; Pooled OLS; GMM	1960—1999 (58 developing	RER misalignments affect economic

	growth	infrastructure; Governance; Lack of price stability; TOT shocks; Population; Year dummies		countries)	performance negatively
Rodrik (2008)	GDP per capita growth	RER undervaluation index; TOT; Lagged growth; Initial income; Time dummies	Panel regression; Fixed effect OLS; GMM	Eleven 5-year time periods from 1950-54 to 2000-04 (184 countries)	RER undervaluation positively affect economic growth, for developing countries; the effect is linear
Aghion *et al.* (2009)	Productivity growth	Exchange rate flexibility and volatility indexes; Level of financial development; Initial output per worker; Education; Trade openness; Government burden; Lack of price stability; Banking or currency crisis dummy	Panel regression; GMM	1960—2000 (83 countries)	RER Volatility negatively affects economic growth at low level of financial development; the effect is nonlinear
Béreau *et al.* (2009)	GDP per capita	RER misalignment; Inflation; Initial GDP per capita; Investment; Trade openness; TOT growth; Government burden	Panel smooth transition regressions (PSTR); GMM	1980—2007 (32 developed and developing countries)	RER overvaluation reduces economic growth; RER undervaluation enhances economic growth; the effect is nonlinear
Berg and Miao (2010)	Per capita GDP growth	Initial GDP per capita; RER misalignment indexes; TOT; Trade openness; Government consumption; Investment; Time and country dummies	Panel regressions; OLS; GMM	Eleven 5-year time periods from 1950–54 to 2000–04 (181 countries)	RER undervaluation enhances economic growth; the effect is linear
Sallenave (2010)	Per capita GDP growth	RER misalignments index; Human capital; Initial GDP per capita; Investment; Trade openness; TOT growth; Government burden;	Hodrick-Prescott filter; GARCH(1,1); Panel unit root; Panel cointegration; GMM	1980—2006 (G20 countries)	RER misalignments adversely impact on economic growth
Rapetti *et al.* (2011)	Real per capita GDP growth	Initial GDP per capita; RER under-valuation index; Government consumption; Inflation; Gross domestic saving; Trade openness; Human capital; TOT; Foreign debt; RER volatility; Rule of law index; Time and country dummies	Panel regressions; OLS; GMM	Eleven 5-year periods spanning 1950- 2004 (181 countries)	RER under-valuation enhances economic growth; the effect is nonlinear
Benhima (2012)	Growth in real output per worker	Exchange rate flexibility; Dollarization; The interaction of the two; Initial output per worker; Financial development; RER volatility; TOT volatility; Education; Trade openness; Inflation; Government burden; Institutional quality; Net external debt	Panel regression; GMM	From 1995-1999 to 2000-2004 (76 countries)	Flexible exchange rates negatively affect economic growth under higher levels of dollarization.
Bussière *et al.* (2012)	Output growth	Indexes of currency collapses; Inflation	Conditional probabilities; Event	1960—2006 (108 emerging and	Currency collapses are associated with permanent output

			analysis; Two-way fixed effects panel regression;	developing countries)	losses in the long-run
Elbadawi *et al.* (2012)	GDP per capita growth	Aid/GDP; RER misalignment index; Financial development index; Initial GDP per capita; Initial cyclical GDP component; Inflation; Government expenditure/GDP; Human capital investment; Rule of law index; Trade openness	ARDL; Panel regression; GMM	1970—2004 (77 countries, including 36 SSA countries)	RER overvaluation has a strong negative impact on economic growth, when the financial system is less-developed.
Glüzmann et al. (2012)	GDP per capita growth	RER undervaluation index;	Panel regression; OLS; GMM	N/A	RER under-valuation positively and contemporaneously affect economic growth
Razmi *et al.* (2012)	Average annual rate of investment growth	RER under-valuation index; RER volatility; Average years of education; Rule of law index; Lagged real GDP per capita; Trade openness; Government consumption/GDP; Gross domestic saving; TOT; Time and country dummies	Panel regressions; GMM;	1960—2004 (153 countries)	RER under-valuation has positive and significant effect on investment growth, especially in developing countries
Vieira and MacDonald (2012)	GDP per capita growth	Different Measures of RER misalignment; Education index; Rule of law index; Government consumption; Inflation	Panel regressions; Two-step System GMM; Difference GMM	1980—2004 (90 countries)	RER depreciation enhances economic growth
Levy-Yeyati *et al.* (2013)	Percentage change of the real gross domestic product; Real GDP per worker	Measures of exchange rate intervention; TOT; External demand shocks; Capital inflows; Initial GDP per capita; Population growth; Initial output gap; Country and time dummies	Panel regression; OLS	1974–2007 and 1993–2007 (179 countries)	Depreciated exchange rates promote economic growth through deepened domestic capital accumulation and savings
Bussière *et al.* (2014)	Productivity increase; Capital surge	Global uncertainty index; commodity price index; US interest rate; changes in real GDP; Private credit/GDP; Productivity; Interest rate differential; Reserves/GDP; Current account/GDP; Capital account openness; Exchange rate regime dummy	Propensity score matching (PSM); Logit estimations	1960—2011 (68 countries consisting of 30 advanced and 38 emerging economies)	Real appreciations linked with higher productivity have stronger effect on economic growth than real appreciations linked with inflow of capital

Notes: TOT=Terms of trade, RER=Real exchange rate, OLS=Ordinary least squares, 3SLS=Three stage least squares, GARCH=Generalised autoregressive conditional heteroskedasticity, GMM=Generalised method of moments, ARDL=Autoregressive distributed lags, PSM=Propensity score matching, N/A=Non-applicable.

As shown in Table 1, the measure of real exchange rate misalignments is still very debatable. Different studies have utilized different measures to proxy real exchange rate misalignments. However, in the most recent studies, the measure of real exchange rate misalignments proposed by Rodrik (2008) has been adopted. This measure has come under harsh criticisms by Woodford (2009), who contends that Rodrik's measure tends to exaggerate the association between real exchange rate misalignments and economic growth. The current study attempts to resolve this problem by comparing the performance of Rodrik's measure to the traditional measure recommended by Woodford (2009).

3. METHODOLOGY

3.1 The Empirical Models

3.1.1 The Balassa-Samuelson Hypothesis and the Misalignment Index

This paper relies on the recent insights of Rodrik (2008), and Woodford (2009) in specifying the empirical models. First we examine the validity of the Balassa-Samuelson Hypothesis (BSH). Then we construct the index of the real exchange rate misalignments which accounts for Balassa-Samuelson (BS) effect (see Rodrik, 2008). To do this, we extract the exchange rates (*XRAT*) and the purchasing power parity (*PPP*) conversion factors from the Penn World Tables, version 8.0, compiled by Feenstra *et al.* (2013). Then we construct an index of the real exchange rate as follows.

$$lnRER_{it} = ln(XRAT_{it}/PPP_{it}) \quad (1)$$

where i is the country under consideration, and t is a 5-year time period. A 5-year time period is chosen in order to eliminate noise effects which are often inherent in annual data, and also because real exchange rate effects could take more than a year to appear (see Freund and Pierola, 2008; Rodrik, 2008; Aghion *et al.*, 2009; and Rapetti *et al.*, 2011). As a robustness check for the five-year averaging, we construct a similar index of the real

exchange rate which is based on one-year annual data (i.e. we set *t=1* instead of *t=5*). *XRAT* and *PPP* are denoted in national currency units per US dollar. Constructed in this way, an *RER* more than unity indicates a more depreciated currency than implied by purchasing power parity (see Rodrik, 2008).

Non-traded goods are known to be cheaper in poorer countries than in richer countries – the so-called BS effect (see Harrod, 1933; Balassa, 1964; Samuelson, 1964; and Bhagwati, 1984). Hence, the real exchange rate index should take the BS effect into account (see Rodrik, 2008). In order to construct an index of real exchange rate misalignments which accounts for the BS effect, it is natural to ensure that our data support the BS effect. We, therefore, examine the validity of the BS effect by specifying and testing the coefficient of $lnGDP_{it}$ in the following model.

$$lnRER_{it} = \alpha + \beta lnGDP_{it} + f_t + \varepsilon_{it} \quad (2)$$

where: α and β are parameters of the model; GDP_{it} is real per capita GDP of country i in time period t; ln is the natural logarithm; f_t is a fixed effect for time period t; and ε_{it} is the error term for country i at time period t. β is expected to be negative and significant (see Rodrik, 2008; Rapetti *et al.*, 2011; Glüzmann *et al.*, 2012; and Vieira and MacDonald, 2012). As is the case of many other empirical studies (see, for instance, Ito *et al.*, 1999; Gala, 2008; Rodrik, 2008; Glüzmann et al., 2012; and Vieira and MacDonald, 2012), the BS effect is expected to be present in the estimate. We then construct a measure of real exchange rate misalignments using the difference between the actual real exchange rate in *Eq.* (2) and the adjusted BS rate as

$$lnMIS_{it} = lnRER_{it} - ln\widehat{RER}_{it} \quad (3)$$

where $\widehat{lnRER_{it}}$ represents the predicted values of the natural logarithm of the real exchange rate in *Eq.* (2); and $lnMIS_{it}$ is the index of real exchange rate misalignments.

According to Rodrik (2008), this real exchange rate misalignments index is a convenient indicator of real exchange rate misalignments due to its ease with comparability across time and space. A real exchange rate misalignments index (MIS) greater than unity implies that the home country's currency is undervalued; below unity implies that the home country's currency is overvalued. This approach, according to Rodrik, is fairly close to the approach employed in Johnson *et al.* (2007).

In the spirit of Rodrik (2008), our definition of real exchange rate misalignments is based on price comparisons. This definition contrasts with an alternative definition which is constructed by formulating a small-scale macro model and estimating the real exchange rate level required to yield balance-of-payments equilibrium. Such an alternative definition can be found in studies such as Elbadawi (1994), and Aguirre and Calderon (2005).

3.1.2 Real Exchange Rate Misalignments and Economic Growth

Next, we present a simple empirical model of real exchange rate misalignments and economic growth. This model provides a simple empirical way of assessing the impact of real exchange rate misalignments on economic growth in our study countries. This model is of the form

$$growth_{it} = \gamma + \theta lnGDP_{it-1} + \delta lnMIS_{it} + f_i + f_t + \mu_{it} \quad (4)$$

where $growth_{it}$ is the annual rate of growth in country *i's* per capita real GDP from the 5-year period, *t-1,* to the next 5-year period, *t. Eq.* (4) makes room for a convergence term (initial income level, GDP_{it-1}) and a set of country and time dummies, f_i and f_t, respectively. γ, θ, and δ are the parameters of the model; μ_{it} is the error term for country i in period t. δ

is the objective parameter which measures the effect of changes in real exchange rate misalignments on changes in economic growth rates within countries. This parameter is expected to be positive implying that increase in real exchange rate misalignments in the form of undervaluation enhances economic growth. The initial level of GDP per capita (GDP_{it-1}) is included as a determinant of economic growth in line with growth literature on conditional convergence hypothesis (see Barro, 1991; Mankiw *et al.*, 1992; and Romer, 2012). The conditional convergence hypothesis states that, given the same structural and macroeconomic features, countries with low GDP per capita should grow faster because of diminishing returns on the stock of capital (see Romer, 2012).

An alternative version of *Eq.* (4) is in order to verify the Woodford (2009) critique. Woodford (2009) argues that Rodrik's measure of real exchange rate misalignments tends to exaggerate the association between the real exchange rate misalignments and economic growth. Woodford proposes that the real exchange rate should be used, as is in conversional literature, instead of the Rodrik's index. He warns that when the real exchange rate is used, the definition of developing countries should be considered from different perspectives. So we specify the following simple competing model

$$growth_{it} = \rho + \sigma lnGDP_{it-1} + \tau lnRER_{it} + f_i + f_t + \mu_{it} \quad (5)$$

where the definition of variables are as before. ρ, σ and τ are the parameters to be estimated. The *a priori* sign of τ remains positive, and the interpretation remains as in *Eq.* (4). *Eq. (5)* allows the paper to assess whether the choice of the real exchange rate misalignments measure has a bearing on the effect of real exchange rate misalignments on economic growth.

Whereas *Eqs.* (4) and (5) provide the simplest specifications for examining the effect of the real exchange rate misalignments on economic growth, these equations suffer from variable omission bias. The theory suggests that economic growth is determined by certain basic

factors. The basic Solow Model, for example, emphasizes that the evolution of output over time depends on the growth rates of capital, labour, and technology (see Solow, 1956; Swan, 1956; Romer, 2012). On this basis alone, an extended model is required for reasonable coefficient estimates to be achieved. To formulate a fully-specified model, we motivate our paper by Barro (1991), Mankiw *et al.* (1992), Easterly (2001), Acemoglu *et al.* (2002), Fajnzylber *et al.* (2002), Levy-Yeyati and Sturzenegger (2003), Gala (2008), Aghion *et al.* (2009), and Glüzmann *et al.* (2012). Our fully-specified augmented-neoclassical growth model is of the form

$$growth_{it} = \alpha_0 + \alpha_1 lnRGDP_{it-1} + \alpha_2 lnMIS_{it} + \Psi X_{it} + f_i + f_t + \epsilon_{it} \quad (6)$$

Eq. (6) enables the paper to consider the real exchange rate misalignments measure advanced by Rodrik (2008). Similarly, the model which takes into account the Woodford critique is formulated as

$$growth_{it} = \alpha_0 + \alpha_1 lnRGDP_{it-1} + \alpha_2 lnRER_{it} + \Psi lnX_{it} + f_i + f_t + \epsilon_{it} \quad (7)$$

Eqs. (6) and (7) are the extended versions of *Eqs.* (4) and (5). All the variables except X, retain their definitions as before. X is a vector of *1xk* variables representing the standard determinants of economic growth considered in the neoclassical growth literature. Ψ is a vector of *kx1* parameters to be estimated. ϵ represents the white-noise error term. The vectors of variables are in two forms: (i) the fundamental determinants of growth, namely, the initial level of income, human capital and physical capital; (ii) the variables employed in recent studies, namely: terms of trade shocks, trade openness, and government debt burden.

Human capital has considerable impact on total factor productivity (see Barro, 1991; Levy-Yeyati and Sturzenegger, 2003; and Romer, 2012). However, its measure is quite debatable. Owing to the lack of data availability for some of the countries considered in this paper we proxy human capital by population growth. Population growth influences the growth rate of

per capita output *à la* Solow and Swan models. Other authors also include population growth in their studies (see Ghura and Grennes, 1993; Domac and Shabsigh, 1999; Levy-Yeyati and Sturzenegger, 2003; and Gala, 2008). We expect the coefficient on population growth to have a positive sign.

That aside, all growth models include physical capital as a fundamental determinant of growth (see Barro, 1991; Mankiw *et al.*, 1992; Ghura and Grennes, 1993; Domac and Shabsigh, 1999; Levy-Yeyati and Sturzenegger, 2003; and Glüzmann et al., 2012, among others). Countries which are growing faster (for instance, China, India, Brazil, and Turkey), today, have huge amounts of physical capital stock. This paper employs capital stock (*rkna*) to proxy physical capital following the tradition of the growth literature. High capital stock correlates with high economic growth rate in the literature (see Grossman and Helpman, 1991). Hence, physical capital is expected to exert positive influence on economic growth.

The other variables that are included in our empirical specifications are government burden, terms of trade shocks and trade openness. Government debt burden, in this paper, is measured as government consumption per GDP. This variable has been included in recent studies such as Levy-Yeyati and Sturzenegger (2003), Gala (2008), and Aghion *et al.* (2009). Terms of trade shocks has a favourable or deleterious consequence on growth (see Gala, 2008). Improved terms of trade enhance a country's ability to consolidate gains from trade for development purposes; poor and persistent terms of trade exert negative influence on a country's ability to gain from trade. We define terms of trade, in this paper, as the relative price of export to import.[4] The quantum of goods and services flowing into a country depends on the country's degree of openness. Various empirical studies have shown that trade openness is vital for economic growth. Following the recent literature (see Bleaney and

[4] See Ghura and Grennes (1993), Bleaney and Greenaway (2001), Levy-Yeyati and Surzenegger (2003), Aguirre and Calderon (2005), Berg and Miao (2010) among others for a similar definition.

Greenaway, 2001; Aguirre and Calderon, 2005; Aghion *et al.*, 2009; Berg and Miao, 2010 among others), we define this variable as the sum of export and import as a fraction of GDP.

3.2 Data and Estimation Techniques

We employ panel data for this paper. The main reason why we employ panel data is that we are able to pool together the time series and cross-sectional characteristics of the dataset; thus, improving the precision of the coefficient estimates. We extract the data from the Penn World Tables, version 8.0, compiled by Feenstra *et al.* (2013). In all, 15 countries from SSA are included in our sample. They are Botswana, Congo DR, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Kenya, Ghana, Mali and Nigeria. A sample period of 41 years (1970—2010), which is further divided into eight 5-year time periods is used for our empirical exercises.

We estimate *Eqs.* (4), (5), (6) and (7) using the within-effects estimation technique. To cater for any possible specification and endogeneity biases, we also estimate these equations in the form of dynamic panel regressions using generalized method of moments (GMM) due to Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). GMM system estimators may perform better than GMM difference estimators, in the presence of instruments with high degrees of persistence. For this reason, we provide results for both estimators and check for model adequacy using *Sargan Test* for orthogonality of the instruments and error terms.

4. RESULTS

4.1 Testing the Balassa-Samuelson Hypothesis

We estimate *Eq.* (2) using the within-effects estimator for the selected SSA countries in our sample. The results are reported in Table 1. As we have discussed earlier, there is evidence in

favour of the BS effect if the coefficient attached to real GDP per capita in *Eq.* (2) is negative. From Table 1, the estimated coefficient is negative for both time frames considered (i.e. the *t=1* and *t=5*). In addition, the estimated coefficient is statistically significant at 1 *per cent* level, for both cases. On this account, the BSH is well-established in our sample. These results are consistent with the results reported in some of the previous studies (see Ito *et al.*, 1999; Gala, 2008; Rodrik, 2008; Glüzmann et al., 2012; and Vieira and MacDonald, 2012).

Table 1: Testing the Balassa-Samuelson Hypothesis

	[1]	[2]
	All Countries [One-Year]	All Countries [Five-Year]
LNRER		
LNRGDP	-0.6844*** (-27.28)	-0.6882*** (-11.77)
Time dummy	yes	yes
Country dummy	yes	yes
Observations	765	150

Note: t-statistics are reported in the parentheses; *** denotes significance at 1%.

4.2 Baseline Regression for the Simple Measures of Misalignments

In Table 2, we report the within-effects results for the baseline regression with the two measures of real exchange rate misalignments. Panels [1a] and [1b] report the results for the BS adjusted real exchange rate misalignments index under *t=1* and *t=5*, whereas [2a] and [2b] report the results for the alternative index of real exchange rate misalignments. The coefficient for the BS adjusted real exchange rate misalignments index is positive and significant at 5 *per cent*. Indeed, the estimated coefficient shows that if real exchange rate misalignments increase by 1 *per cent*, economic growth improves by approximately 1.7 *per cent*. In the case where the alternative index of real exchange rate misalignments is included

in the baseline regression, the coefficient turns out positive but insignificant. The worrying issue is that the convergence term, although negative, is insignificant for the one-year time window. This works against the traditional literature on cross-country income differences which emphasises the role of initial income (see Barro, 1991). This may have resulted from the fact that some key determinants are omitted in this simple model. Besides, the potential presence of endogeneity issues may have contributed to this insignificance.

Table 2: The Simplified Model

	[1a]	[1b]	[2a]	[2b]
	LNMIS [One-Year]	*LNMIS* [Five-Year]	*LNRER* [One-Year]	*LNRER* [Five-Year]
Growth				
LNRGDP(-1)	-0.5228 (-1.56)	-1.3024** (-2.57)	-0.1722 (-0.36)	-1.1904* (-1.66)
MISALIGN	1.6501** (3.41)	1.6658** (2.27)	0.5154 (1.05)	0.1225 (0.16)
Time dummy	yes	yes	yes	yes
Country dummy	yes	yes	yes	yes
Observations	750	135	750	135

Note: t-statistics are reported in the parentheses; ** denotes significance at 5%.

4.3 The Fully-Specified Model with Key Control Variables

Table 3 shows the results which we obtained when the key determinants of economic growth are included in the baseline regression model. This is what we call the fully-specified model with key control variables. The key control variables include population growth, terms of trade, trade openness, and government consumption expenditure.[5] Panels [1a] and [1b] report the within-effects estimates for the BS adjusted real exchange rate misalignments index under *t=1* and *t=5*, whereas panels [2a] and [2b] report the within-effects estimates for the alternative real exchange rate misalignments index.

[5] A detailed discussion of the motivation for including these variables can be found in subsection 3.1.2.

The estimated coefficient for the BS adjusted real exchange rate misalignments index is highly significant at 1 *per cent*. The coefficient estimates suggest that 1 *per cent* change in the misalignments index generates roughly 2.8 *per cent* change in economic growth, given that the other growth determinants remain unchanged. The estimated convergence term is negative and statistically significant, so is the government consumption expenditure. Population growth, terms of trade, and trade openness all have positive signs; population growth and terms of trade are also significant. The model with alternative real exchange rate misalignments index shows slightly different estimates. The coefficient estimate for the misalignments term is positive under $t=1$ and $t=5$, but significant only under the former. This suggests that the alternative real exchange rate misalignments index may not be appropriate for our empirical exercises. Regardless, the alternative misalignments measure seems to fairly corroborate Woodford's (2009) contention that Rodrik's (2008) measure exaggerates the impact of undervaluation on economic growth.

Our findings support the existing findings but overall the magnitude of the impact seems high. The existing empirical studies document mild impact of real exchange rate misalignments on economic growth for developing countries. For example, Rodrik (2008) reports the magnitude of the impact to be approximately 0.026 for the developing countries considered in his paper. Similarly, Ghura and Grennes (1993) report the magnitude of the impact to be roughly -0.036 for the SSA countries considered in their paper. Nonetheless, it is worth noting that the studies cited herein employ larger cross-sectional units than we have in this paper. Future studies can consider expanding the dataset (i.e. in terms of time and cross-sectional dimensions) in order to carefully consider this issue.

Table 3: The Fully-Specified Model with Key Control Variables

	[1a]	[1b]	[2a]	[2b]
	LNMIS [One-Year]	*LNMIS* [Five-Year]	*LNRER* [One-Year]	*LNRER* [Five-Year]
Growth				
LNGDP(-1)	-3.6228*** (-5.78)	-4.5718*** (-5.73)	-2.0535** (-3.44)	-3.2884*** (-3.99)
MISALIGN	2.8026*** (5.15)	2.7804*** (3.77)	1.3796** (2.47)	1.3167 (1.60)
LNPOP	5.2091*** (4.85)	5.5439*** (4.10)	3.9094*** (3.57)	4.6412** (3.16)
LNTOT	3.5851** (3.19)	2.9283* (1.80)	3.8240** (3.36)	3.5630** (2.10)
LNOPEN	1.0146* (1.73)	1.1796 (1.39)	1.0475* 1.76)	1.2242 (1.38)
LNGDB	-1.2824** (-2.64)	-1.4736** (-2.18)	-1.4347** (-2.92)	-1.7464** (-2.47)
Time dummy	yes	yes	yes	yes
Country dummy	yes	yes	yes	yes
Observations	747	135	747	135

Note: t-statistics are reported in the parentheses; ***, **, and * denote significance at 1%, 5% and 10%, respectively. *MISALIGN* denotes the general measure of real exchange rate misalignments.

4.4 Controlling for Potential Endogeneity Problems

Endogeneity problems appear to pervade macroeconomic relationships. It can prove to be a policy hurdle, if uncontrolled for, in single equation modelling. In particular, if the covariates in our model correlate with the disturbance term, the coefficients estimated for these covariates are biased and inconsistent. Thus, the results we report in Table 3 can be misleading, if endogeneity is an issue in the fully-specified model. In principle, we overcome endogeneity bias by reporting results that are based on GMM estimators in Table 4.

In panels [1a] and [1b], we report estimates for the BS adjusted real exchange rate misalignments index using the difference and system GMM estimators. The results are quite

interesting. The estimated coefficient of the BS adjusted real exchange rate misalignments index remains positive but only significant under the difference GMM case. The explanation is purely econometric. The system GMM estimator does better than the difference GMM estimator only when instruments are highly persistent. We can adjudge the best model, in this case, by considering the *Sargan Test*. Clearly, the *p-values* of the *Sargan Test* reported at the base of panels [1a] and [1b] show that difference GMM estimator performs better under this circumstance. Hence, we can summarise that a percentage increase in real misalignments, given other growth determinants unchanged, generates roughly 2.2 *per cent* and 1.8 *per cent* growth, for $t=1$ and $t=5$, respectively.

Panels [2a] and [2b] report the results for the alternative measure of real exchange rate misalignments. Here, we find the coefficient of the misalignments term to be positive but insignificant, supporting the previous results. A brief comparison of the misalignments indexes is worthwhile. From Table 4, we can immediately notice that the coefficients for the alternative real exchange rate misalignments index are moderately estimated, when compared to those of the BS adjusted index. Thus, there is some evidence in favour of Woodford's argument that Rodrik's measure may have exaggerated the impact of real exchange rate misalignments on economic growth. Yet, of particular concern to this paper is how the BS adjusted real exchange rate misalignments index impact on economic growth. Our empirical investigation shows some elements of truth that real exchange rate misalignments influence economic growth in the SSA countries considered in this paper.

Finally, our empirical results reveal one other econometric issue that needs brief discussion. It is obvious that the impact of real exchange rate misalignments is stronger when we consider the one-year time window. A general consensus in the empirical literature is that certain macroeconomic variables including the real exchange rate can be very "noisy" when considered monthly, quarterly or annually. In other words, such variables exhibit undesirable

mean-reverting properties. The standard empirical procedure for eliminating such noise effects in series of this nature is through five-year averaging (see Freund and Pierola, 2008; Rodrik, 2008; Aghion *et al.*, 2009; and Rapetti *et al.*, 2011). Hence, the fact that the coefficients under *t=1* are overestimated is expected, and indeed, is the reason we maintain the one-year time window – to elaborate this issue!

Table 4: Controlling Endogeneity in the Fully-Specified Model

	[1a] *LNMIS* [One-Year]		[1b] *LNMIS* [Five-Year]		[2a] *LNRER* [One-Year]		[2b] *LNRER* [Five-Year]	
Growth	Diff-GMM	Sys-GMM	Diff-GMM	Sys-GMM	Diff-GMM	Sys-GMM	Diff-GMM	Sys-GMM
LNGDP(-1)	-5.150*** (-6.24)	-0.825** (-2.41)	-5.908*** (-6.70)	-2.017*** (-4.66)	-3.956*** (-5.12)	-0.801** (-2.34)	-5.139*** (-5.76)	-1.930*** (-4.42)
MISALIGN	2.158** (3.00)	0.197 (0.46)	1.838** (2.01)	0.779 (1.29)	0.629 (0.85)	0.111 (0.31)	0.437 (0.45)	0.792 (1.52)
LNPOP	8.127*** (5.15)	0.365 (0.73)	8.611*** (4.97)	1.620** (2.36)	6.402*** (3.95)	0.434 (0.88)	7.509*** (3.94)	1.926** (2.86)
LNTOT	3.849** (2.89)	1.859* (1.72)	4.626** (2.77)	4.041** (2.56)	4.322** (3.21)	.907* (1.77)	5.360** (3.12)	3.999** (2.51)
LNOPEN	2.809** (2.99)	1.920** (3.16)	4.442*** (3.63)	4.013** (5.24)	2.595** (2.71)	1.800** (3.02)	4.412** (3.42)	3.423*** (4.55)
LNGDB	-1.982** (-3.15)	-1.017** (-2.02)	-2.091** (-2.71)	-1.541** (-2.13)	-2.182** (-3.43)	-1.033** (-2.06)	-2.379** (-2.98)	-1.688** (-2.36)
Observations	389	397	64	72	389	397	64	72
Sargan Test (p-value)	0.111	0.013	0.138	0.044	0.140	0.011	0.193	0.062

Note: (i) t-statistics are reported in the parentheses. (ii) ***, **, and * denote significance at 1%, 5% and 10%, respectively. (iii) Diff-GMM and Sys-GMM denote, respectively, difference GMM and system GMM estimations. (iv) *MISALIGN* denotes the general measure of real exchange rate misalignments.

5. CONCLUDING REMARKS

The question of how real exchange rate misalignments affect economic growth has been investigated both theoretically and empirically in the recent past. Generally, the findings in the literature are inconclusive. Whereas some studies (see Fischer, 1993; Razin and Collins, 1997; Johnson *et al.*, 2007) find real exchange rate misalignments to exert negative effects on economic growth, others (see Bhalla, 2007; Gala, 2008; Rodrik, 2008; Glüzmann *et al.*, 2012) emphasize the positive effects of real exchange rate misalignments on economic growth. In this paper, we took sides with the latter strand by investing the impact of real exchange rate misalignments on economic growth in sub-Saharan Africa (SSA). Our dataset consists of fifteen (15) countries spanning the period 1970-2010. We examined this linkage in a piecewise fashion. Firstly, we verified the Balassa-Samuelson (BS) effect for these countries and found the BS effect to exist. Then, we constructed an index of real exchange rate misalignments, which takes into account the BS effect. Then, using short panel data techniques (i.e. within-effects estimators and GMM estimators), we estimated a standard simple and a fully-specified neoclassical panel regression model. As a robustness check, we also employed a conventional measure of real exchange rate misalignments. Our results suggest that real undervaluations enhance economic growth; whereas real overvaluations mar economic growth in the selected SSA countries in our sample. In particular, our results indicate that a percentage change in real undervaluation generates an approximately 2.8 *per cent* change economic growth. Our findings remain unaffected by endogeneity, serial correlation, heteroskedasticity and the choice of real exchange rate misalignment measure. Our findings are also broadly consistent with the findings of previous studies such as Ghura and Grennes (1993), Gala (2008), Rodrik (2008), Glüzmann *et al.* (2012), and Vieira and MacDonald (2012). The main policy implications stemming from these findings are that: (i) Authorities in these countries could deploy real undervaluations as policy tool to move idle

resources from the less-productive non-traded goods sectors to the more-productive traded goods sectors; and (ii) authorities should set up policy frameworks that suppress real overvaluations to the barest minimum.

REFERENCES

Acemoglu, D., Johnson, S., Thaicharoen, Y. and Robinson, J. (2002). 'Institutional Causes, Macroeconomic Symptoms: Volatility, Crisis and Growth', NBER Working Paper 9124

Aghion, P., Bacchetta, P., Ranciere, R., and Rogoff, K. (2009). Exchange Rate Volatility and Productivity Growth: The Role of Financial Development. Journal of Monetary Economics 56: 494—513.

Aguirre, A., and Calderon, C. (2005). Real Exchange Rate Misalignments and Economic Performance, Central Bank of Chile, Economic Research Division, April 2005.

Arellano, M., and Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. Review of Economic Studies 58: 277-97.

Arellano, M. and Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. Journal of Econometrics 68(1): 29—51.

Balassa, B. (1964). The Purchasing-Power Parity Doctrine: A Reappraisal, The Journal of Political Economy, 72 (6), pp. 584-96.

Barro, R. J. (1991). Economic Growth in a Cross Section of Countries. Quarterly Journal of Economics 106(2): 407—443.

Barro, R. J., and Sala-i-Martin, X. (1992). Convergence. Journal of Political Economy 100(2): 223—251.

Benhima, K. (2012). Exchange Rate Volatility and Productivity Growth: The Role of Liability Dollarization. Open Economies Review 23:501–529.

Berg, A. and Miao, Y. (2010). The Real Exchange Rate and Growth Revisited: The Washington Consensus Strikes Back? IMF Working Paper No. WP/10/58.

Béreau, S., Villavicencio, A. L., and Mignon, V. (2009). Currency Misalignments and Growth: A New Look using Nonlinear Panel Data Methods. CEPII Working Paper No. 2009–17 September, Centre D'études Prospectives et D'informations Internationales.

Bhaduri, A., and Marglin, S. (1990). Unemployment and the Real Wage: The Economic Basis for Contesting Political Ideologies. Cambridge Journal of Economics 14: 375–393.

Bhalla, S. S. (2007). Second Among Equals: The Middle Class Kingdoms of India and China, Peterson Institute of International Economics, Washington, DC, forthcoming (May 21, 2007 draft).

Bhagwati, J. N. (1984). Why Are Services Cheaper in The Poor Countries? The Economic Journal 94: 279–86.

Bleaney, M. and Greenaway, D. (2001). The Impact of Terms of Trade and Real Exchange Rate Volatility on Investment and Growth in Sub-Saharan Africa. Journal of Development Economics 65: 491–500.

Blundell, R., and Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. Journal of Econometrics 87: 11-143.

Bussière, M., Lopez, C., and Tille, C. (2014). Do Real Exchange Rate Appreciations Matter for Growth? Graduate Institute of International and Development Studies Working Paper No. 06/2014.

Bussière, M., Saxena, S. C. and Tovar, C. E. (2012). Chronicle of Currency Collapses: Re-Examining the Effects on Output. Journal of International Money and Finance 31: 680–708.

Calvo, G. A., and Reinhart, C. M. (2002). Fear of Floating. The Quarterly Journal of Economics CXVII(2): 379—408.

Dollar, D. (1992). Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCS, 1976–1985, Economic Development and Cultural Change (40): 523–44.

Domac, I. and Shabsigh, G. (1999). Real Exchange Rate Behaviour and Economic Growth: Evidence from Egypt, Jordan, Morocco, and Tunisia. IMF Working Paper. WP/99/40 pp. 3-21.

Dubas, J. M., Lee, B-J. and Mark, N. C. (2005). Effective Exchange Rate Classifications and Growth. NBER Working Paper Series, Working Paper No. 11272, National Bureau of Economic Research, Cambridge, MA 02138, Massachusetts.

Easterly, W. (2001). The Lost Decades: Developing Countries' Stagnation in spite of Policy Reform 1980–1998, Journal of Economic Growth 6(2): 135–57.

Elbadawi, I. (1994). Estimating Long-Run Equilibrium Real Exchange Rates, in Estimating Equilibrium Exchange Rates, ed. by J. Williamson (Washington: Institute for International Economics, 1994).

Elbadawi, I., Kaltani, L., and Soto, R. (2012). Aid, Real Exchange Rate Misalignment and Economic Growth in Sub-Saharan Africa. World Development. Vol.40, No.4, pp.681-700.

Fajnzylber, P., Loayza, N. and Calderon, C. (2002). Economic Growth in Latin America and the Caribbean, Washington, DC, The World Bank. Downloaded on 4/03/2014 at core.kmi.open.ac.uk/../6642260.pdf

Feenstra, R. C., Robert I. and Timmer, M. P. (2013). The Next Generation of the Penn World Table Available for Download at www.ggdc.net/pwt. Accessed: 11/01/2015.

Fischer, S. (1993). The Role of Macroeconomic Factors in Growth. Journal of Monetary Economics 32: 485-512.

Freund, C., and Pierola, M. D. (2008). Export Surges: The Power of a Competitive Currency, World Bank, August, 2008.

Gala, P. (2008). Real Exchange Rate Levels and Economic Development: Theoretical Analysis and Empirical Evidence. Cambridge Journal of Economics 32: 273–288.

Gala, P. and Libanio, G. (2010). Exchange Rate Policies, Patterns of Specialisation and Economic Development: Theory and Evidence from Developing Countries. Texto Para Discussion 211. Escola de Economia de Sao Paulo.

Gala, P. and Lucinda, C. R. (2006). Exchange Rate Misalignment and Growth: Old and New Econometric Evidence. Economia, ANPEC-Associação Nacional dos Centros de Pósgraduação em Economia, Brazilian Association of Graduate Programs in Economics 7(4): 165–187.

Ghura, D. and Grennes, T. J. (1993). The Real Exchange Rate and Macroeconomic Performance in Sub-Saharan African. Journal of Development Economics 32: 155--l 74.

Gente, K. and Nourry, C. (2011). Integration, Real Exchnage Rate, and Growth. <halsh-006430437

Glüzmann, P. A., Levy-Yeyati, E., and Sturzenegger, F. (2012). Exchange Rate Undervaluation and Economic Growth: Díaz Alejandro (1965) Revisited. Economics Letters 117(3): 666–672.

Grossman, G and Helpman, E. (1991). Innovation and Growth in the Global Economy (Cambridge, Mass: MIT Press).

Harrod, R. F. (1933). International Economics. James Nisbet and Co. Ltd. And the Cambridge University Press.

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

Ito, T., Isard, P., Symansky, S. (1999). Economic Growth and Real Exchange Rate: An Overview of the Balassa-Samuelson Hypothesis in Asia, pp. 109-132, NBER-EASE, University of Chicago Press, Vol. 7

Johnson, S. H., Ostry, J. and Subramanian, A. (2007). The Prospects for Sustained Growth in Africa: Benchmarking the Constraints" (March 2007). IMF Working Paper No. 07/52.

Korinek, A. and Serven, L. (2010). Undervaluation through Foreign Reserve Accumulation: Static Losses, Dynamic Gains. Policy Research Working Paper 5250, The World Bank, Washington DC.

Levy-Yeyati, E. and Sturzenegger, F. (2003). To Float or to Fix: Evidence on the Impact of Exchange Rate Regimes on Growth. American Economic Review 93(4): 1173—1193.

Levy-Yeyati, E., Sturzenegger, F. and Gluzmann, P. A. (2013). Fear of Appreciation. Journal of Development Economics 101: 233–247.

Lima, G. T., and Porcile, G. (2013). Economic Growth and Income Distribution with Heterogeneous Preferences on the Real Exchnage Rate. Journal of Post Keynesian Economics 35(4): 651—674.

Mankiw, N. G., Romer, D., and Weil, D. N. (1992). A Contribution to the Empirics of Economic Growth. The Quarterly Journal of Economics 107(2): 407—437.

Rapetti, M., Skott, P., and Razmi, A. (2011). The Real Exchange Rate and Economic Growth: Are Developing Countries Different? Working Paper No. 2011-07, Department of Economics, University of Massachusetts.

Razin, O., and Collins, S. M. (1997). Real Exchange Rate Misalignments and Growth, Georgetown University.

Razmi, A., Rapetti, M., and Skott, P. (2012). The Real Exchange Rate and Economic Development. Structural Change and Economic Dynamics 23: 151—169.

Rodrik, D. (2008). The Real Exchange Rate and Economic Growth, Working Paper, John F. Kennedy School of Government, Harvard University, Cambridge, MA 02138, Revised, September 2008.

Romer, D. (2012). Advanced Macroeconomics. Fourth Edition, McGraw-Hill Irwin.

Sallenave, A. (2010). Real Exchange Rate Misalignments and Economic Performance for the G20 Countries. Économie International 121: 59—80.

Samuelson, P. A. (1964). Theoretical Notes on Trade Problems, The Review of Economics and Statistics, 46 (2), pp. 145-154.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. Quarterly Journal of Economics 70 (1): 65–94.

Swan, T. W. (1956). Economic Growth and Capital Accumulation. Economic Record 32 (2): 334–361.

Vieira, F. V. and MacDonald, R. (2012). A Panel Data Investigation of Real Exchange Rate Misalignment and Growth Estudios de Economia 42(3): 433—456.

Woodford, M. (2009). Is an Undervalued Currency the Key to Economic Growth? Discussion Paper Series, Department of Economics, Columbia University, Discussion Paper No. 0809-13