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The effect of real exchange rate misalignment on economic growth: Evidence from emerging markets

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Abstract

Purpose — This study investigates the effect of real exchange rate (RER) misalignment on economic growth performance for 21 emerging markets from 1980 through 2016.

Methods — The study measures the RER misalignment series for 21 emerging markets relying on the single-equation approach. It estimates the effect of RER misalignment, undervaluation, and overvaluation on economic growth performance using a dynamic panel system generalized method of moments approach.

Findings — The study finds that the RER of emerging markets is significantly misaligned. The study also argues that any deviation of the RER from its equilibrium value impairs economic growth. The view that overvaluation erodes growth was accepted, while a real undervaluation is found to be a deteriorating growth fact.

Implication — From the policy perspective, policymakers should advocate appropriate exchange rate policies to check its sustained misalignments over time to enrich the ability of concerned authorities to attain the growth target by using it as a policy instrument.

Originality — Apart from the lack of a unique analytical framework for determining RER misalignment, most studies on the impact of RER misalignment in emerging markets largely ignore its growth effects. The study is an attempt to address these gaps.

Keywords — economic growth, RER misalignment, single-equation approach, system GMM, emerging markets

Introduction

The real exchange rate (RER), as a summary measure of crucial economic information, has gained recognition in theoretical discussion among economists and policymakers. Despite their unanimity, the ways RER misalignment affects the macroeconomic performance of open economies are construed differently. The RER conducive to a country's internal and external equilibrium is referred to as equilibrium RER. Deviation in RER from its equilibrium value, that is, overvaluation or undervaluation in RER, also called RER misalignment, exerts a considerable impact on the macroeconomic performance of open economies. Overvaluation of RER is generally viewed as the unpredictability of the choices of macroeconomic policies that may result in an unsustainable current account deficit, a significant rise in external debt, and the risk of possible speculative attacks. However, an undervaluation in RER promotes investment and exports, strengthening

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economies' competitive position, which causes the current account position to improve and thereby stimulates output growth of the economies (Razin & Collins, 1997; Schröder, 2013).

Misalignment in RER brings about a change in trade balance through changing the competitive position of an economy at least in three possible ways, by changing the relative prices of exports and imports, by altering the relative prices of tradable and non-tradable goods, and by reallocating resources between tradable and non-tradable sectors due to the change in the relative wage rate. The price uncertainty resulting from RER misalignment also affects the aggregate level of domestic consumption and domestic investment. As they all together determine the level of the national output of an economy, RER misalignment is one of the crucial factors that describe the growth of open economies.

The consistently faster growth performance of emerging markets (EMs) as compared to the developed economies has made them the key driver of global growth over the last few decades. EMs have maintained a fairly greater growth rate than the developed economies since the 1970s. EMs experienced a higher growth around almost last five decades against the declining trend in the growth of developed economies, of which the 2000s was remarkable, as average gross domestic product (GDP) growth in these economies picked at just over 5.9 percent against the average of 1.6 percent in developed economies over the same period. The average growth rate of developed economies was around 1.9 percent in the 2010s, which was around 5.1 percent for EMs.

A relatively stable RER is a fundamental factor of economic stability as viewed by many authors (Edwards, 1989; Schröder, 2017), and hence, with the increase in the alternative exchange rate policy opportunities, the effects of the choice of exchange rate regime on macroeconomic conditions of EMs bear a great deal of attention particularly because of their divergence in exchange rate management. In this context, researchers and policymakers have a strong interest in RER misalignment, particularly because of its influence in causing instability and effects on the macroeconomic performance of economies. While emerging Asian economies have been able to achieve miraculous growth following deliberate management of their exchange rate policies, emerging Latin American economies endured persistent currency crises owing to poor manipulation of the exchange rate regime over the second half of the twentieth century (Nouira & Sekkat, 2012). However, Latin American economies were stable in the last decades and even after the great recession of 2008-09 as they took lessons from the past and actively intervened in the foreign exchange market (Damill & Frenkel, 2017). Therefore, an appropriate exchange rate regime that allows maintaining the RER adjacent to its equilibrium value results in instability in the macroeconomic performance of open economies.

Realizing the enormous significance of the conjugation of equilibrium RER and RER misalignment on macroeconomic performance, plenty of research effort has been devoted to examining RER movements and their impact on the macroeconomic performance of open economies. However, although the EMs are the major contributor to global growth, no recognized study has been found in recent years evaluating their macroeconomic performance in response to RER misalignment, particularly after the East Asian financial crisis, following which both the crisis-affected emerging Asian economies and the emerging Latin American economies passing through frequent currency crisis over the last half of the twentieth century have been able to recover through appropriate management of their exchange rate policies (Damill & Frenkel, 2017). Earlier studies relying on the country level and panel data greatly differ in terms of their analytical framework, leading to diverse findings on RER misalignment and its implication on the macroeconomic performance of EMs as well as developing economies. This current research is an attempt to bridge these voids. It is in response to the need for an analytical framework for examining misalignment in RER to make a more inclusive decision relating to its effects on the growth performance of EMs.

There is extensive empirical literature on RER misalignment and economic growth linkage, but much of the recent studies on the growth impact of misaligned exchange rates can be perceived in the context of the Washington Consensus view. This view regards both sorts of RER misalignments. That is, deviations of RER from its equilibrium values in any direction are detrimental from a long-term growth perspective, which has been supported by several empirical

studies (Aguirre & Calderon, 2005; Mazorodze, 2021; Sallenave, 2010; Schröder, 2013, 2017; Toulaboe, 2006).

Edwards (1989) was the first pioneer to estimate the impact of RER misalignment on economic growth for 12 developing countries over the period 1962-1984. The study finds misallocation of resources due to the distortions in relative prices of tradable and non-tradable sectors caused by RER misalignment, which damages economic growth. Aguirre and Calderon (2005) used the fundamentals of Edwards's (1989) model to estimate the impact of RER misalignment on the economic growth of 60 countries during 1965-2003, applying the System Generalized method of moments (SGMM) estimation approach. The results show that misalignments impact growth in a nonlinear fashion. That is, a larger size of misalignment leads to a larger decline in economic growth. Sallenave (2010) measures RER misalignments employing the behavioral approach and evaluates its growth effects for the G-20 countries over the period 1980-2006. The findings differ largely from developed to emerging economies- while it marks misalignment is relatively pronounced in Ems. Moreover, a relatively sluggish speed of convergence towards the estimated equilibrium exchange rate is evident for developed economies. However, the overall growth effects of misalignment are found to be negative. Toulaboe (2006) investigates the relationship between the mean growth rate of per capita GDP and RER misalignment for 33 developing countries from Sub-Saharan Africa, Asia, and Latin America. The results indicate that average RER misalignments are negatively correlated with economic growth. Schröder (2013, 2017) suggests that not equilibrium RER but its misalignments do affect economic growth in 63 developing countries over 1970–2007. In a most recent study, Mazorodze (2021) investigates whether currency misalignment and state fragility have a role in the sluggish growth of sub-Saharan Africa between 2009 and 2018 applying the SGMM. It suggests that RER misalignment has a significantly negative impact on growth that increases with state fragility.

However, the decomposition of misalignment indicators is focused much in recent studies to illustrate the growth effect of deviations of RER from its equilibrium values which results in a rising agreement amongst researchers to reject the view that RER misalignments are harmful from the long-term growth perspective as they have found RER overvaluation has a negative impact on economic growth, while undervaluation stimulates it. Though a depreciated RER fosters economic growth of developing and emerging economies, it may bring about a contractionary effect beyond a certain limit. Considering data for a large sample of countries over the period 1980-2009, Couharde and Sallenave (2013) identify the threshold value of devaluation for Asian and non-Asian emerging economies beyond which it harms growth. Ribeiro, McCombie, and Lima (2020) focus on one direction of RER change, the undervaluation, to examine its impact on economic growth for a panel of 54 developing countries covering the period 1990–2010 and identifies that it has an indirect impact on the growth of the selected developing countries.

Methods

The study will consider economies following floating, free-floating, or other managed exchange rate arrangements under monetary aggregate target or inflation targeting framework. EMs from all major regions of the globe have been covered in undertaking the research. Annual frequency data for the period 1980-2016 have been used for the 21 EMs, namely Argentina, Bangladesh, Brazil, Chile, China, Colombia, Egypt, Greece, Indonesia, India, Republic of Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, South Africa, Thailand, Turkey, and United Arab Emirates.

The RER is a multilateral exchange rate to measure the relative price of domestic goods and services in terms of a basket of goods and services of other major trading partners, which is the weighted-average of bilateral RER where the trade share of a trading partner in a country's total trade constitutes the weight. RER indices are based on the consumer price index (CPI). The base year is kept fixed across the economies. Terms of trade data were retrieved from the data center of the United Nations Conference on Trade and Development (UNCTAD) and International Financial Statistics (IFS) of the International Monetary Fund (IMF). The net financial assets position (NFA) and net official development assistance (ODA) are taken as the ratio to GDP and compiled from World Development Indicators (WDI) of the World Bank (WB).

The explanatory variables have to be proxied by appropriate alternatives to estimate equilibrium RER. Investment spending (INV) data is proxied by gross capital formation as a percent of GDP. Government expenditure (GOV) broadly falls into two categories: expenditure on tradable (GT) and non-tradable (GN) goods. However, the share of government expenditure in these two categories is not distinctly attainable and therefore replaced by the share of total government expenditure in GDP. The direct measure of trade policy is not available. Empirical studies substantially use the sum of exports and imports over GDP to proxy this variable. Productivity differentials have been proxied by the relative productivity between EMs and Group of Seven (G-7) countries, which is constructed as a percent of the home country's GDP per capita to the G-7 average GDP per capita for each of the EMs. Data on these variables are piled up from Penn World Table (PWT), WDI of WB, IFS of IMF, and UNCTAD

Concerning growth regression, the data on the growth rate of real GDP per capita and inflation rate (CPI-based) are collected from the WDI of the WB. Government consumption, investment spending, terms of trade, openness, and net foreign asset – all these are important fundamentals of equilibrium RER that are included in the growth regression to purge omitted variable bias. The study also considers human capital proxied by average years of total schooling and institutional quality proxied by polity variable. Data for the variables are sourced from the Barro-Lee (2020) database on educational attainment and the Center for Systemic Peace database, respectively. Finally, in $\ln(n_{i,t}+g+\delta)$, which measures the growth rate of effective labor units and the rate of depreciation, the population growth rate ($n_{i,t}$) is extracted from WDI of WB. In contrast, the rate of advancement in technology (g) and the rate of depreciation (δ) are assumed to be fixed at 0.05 following Mankiw et al. (1992).

For growth regression, the sample period is divided into non-intersecting 5-year intervals over which the data of the variables are averaged. This averaging is required to check non-seasonal components of time series variables similar to cyclical variation to embody the long-run data perspective. Consequently, it produces eight non-intersecting 5-year intervals over the sample period 1980-2016, apart from the last one that covers only two years. Outliers are identified for all of the series and excluded from the analysis to avoid any inconsistency.

The main purpose of the study is to examine the impact of RER misalignments on the macroeconomic performance of the EMs. Therefore, the first order of business is to determine the misalignment series of RER. Equilibrium RER is an unobservable entity, and therefore, its estimation is inevitable to produce the misalignment series.

Deriving RER misalignment series

The study is concerned with the long-run equilibrium RER, and based on Koukouritakis' (2013) comparative analysis, it decides to employ the single-equation approach (SEA) offered by Baffes, Elbadawi, and O'connell (1999), Edwards (1989), and Elbadawi, (1994) to determine the equilibrium RER and corresponding misalignment. The SEA estimates the long-run equilibrium RER directly drawing a vector of sustainable values for the fundamentals that include terms of trade (TOT), government spending on non-tradable goods (GN), government spending on tradable goods (GT), investment (INV), trade openness (OPEN). However, the theory underlying this approach offers a relatively wide range of fundamentals to choose from in developing the model. Consider with literature from developing and emerging economies (for instance, Schröder, 2013; Toulaboe, 2006), the study identifies NFA, the relative productivity in the tradable sector to non-tradable sector (PROD) to incorporate the Balassa-Samuelson effect, and official development assistance (ODA) apart from the aforesaid fundamentals in modeling equilibrium RER. Hence, the theoretical model of equilibrium RER (q*) determination takes the following form:

$$q^* = q(TOT, G_N, G_T, INV, OPEN, NFA, PROD, ODA) \quad (1)$$

The empirical model for estimating the relationship between RER and its fundamentals can, therefore, be given as:

$$lnq_{it}^* = \beta' F_{it}^s \quad (2)$$

Where q^*_{it} is the equilibrium RER of country i at time t, β' is the vector of coefficients of the long-run parameters to be estimated, F_{it}^{s} is the vector of permanent or sustainable values for the set of fundamentals of country i at time t. The empirical model presented below is nothing but the replication of equation 2:

$$lnq_t^* = \beta_0 + \beta_1 lnTOT_t + \beta_2 G_{Nt} + \beta_3 G_{Tt} + \beta_4 INV_t + \beta_5 OPEN_t + \beta_6 NFA_t + \beta_7 lnPROD_t + \beta_8 ODA_t + \varepsilon_t \quad (3)$$

This current study expects that government spending on non-tradable goods, net financial assets position, relative productivity in the tradable sector to non-tradable sector, and official development assistance have a positive impact on RER while it is inversely related to government spending on tradable goods and trade openness. However, the impact of terms of trade and investment can either be positive or negative.

In order to estimate the equilibrium RER empirically as modeled in equation 3 for each of the countries separately, the study proceeds in three steps: firstly, it examines the stationarity of the variables. Then it estimates the long-run co-integration relationship among the variables that are integrated at order 1. As a unique combination of fundamentals may not always form a long-run co-integration relationship with RER irrespective of countries, the study considers their alternative combinations, and the final choice is based on criteria proposed by Montiel (2007): Specification for which there exists a long-run co-integration relationship among the variables must comply with all necessary diagnostic checks, the estimated parameters must be stable, signed according to economic theory, and statistically significant. For more than one such specification, preference will be given to the one that minimizes the information criteria. Once the long-run co-integrating relationship is confirmed, the sustainable values of the fundamentals derived by detrending the fundamentals using Hodrick & Prescott (1997) filtering is used to arrive at the long-run equilibrium values of RER (Schröder, 2013). Finally, the misalignment series can be derived by simply taking the difference between the actual and long-term equilibrium values of RER in terms of percent.

Empirical model for growth regression

A critical issue in investigating the impact of misalignment on macroeconomic performance is the potential endogeneity. The endogeneity problem is encountered when some regressors are expected to be explained by unobserved common factors and must be checked to eliminate prospective bias in the estimated parameters. This current study employs the dynamic panel Generalized method of moments (GMM) estimation approach to address endogeneity and to estimate the dynamic relationship between growth and misalignment (Nouira & Sekkat, 2012; Sallenave, 2010; Schröder, 2017). The general form of the dynamic model is much as follows:

$$y_{i,t} = \alpha + \beta y_{i,t-1} + \gamma X_{i,t} + \theta m_{i,t} + \varepsilon_{it} \quad (4)$$
$$\varepsilon_{it} = \mu_i + \lambda_t$$

Where $y_{i,t}$ is the economic growth, the performance of which will be evaluated in response to RER misalignment $m_{i,t}$, $y_{i,t-1}$ refers to the value of y at the initial period, $X_{i,t}$ is a set of control variables that explain $y_{i,t}$. The error term $\varepsilon_{i,t}$ is composed of two different orthogonal elements, the country fixed effects μ_i and the idiosyncratic time effects λ_t. The dynamic panel model also provides superior results compared to the static models like random and fixed effect models as these models are sensitive to the existence of a correlation between lagged dependent variable and error term and therefore contain deep econometric bias.

The standard GMM estimator proposed by Arellano and Bond (1991) ponders the first-difference transformation of all variables while explanatory variables are used at lagged levels as instrumental variables:

$$\Delta y_{i,t} = \alpha + \beta \Delta y_{i,t-1} + \gamma \Delta X_{i,t} + \theta \Delta m_{i,t} + \Delta \varepsilon_{it} \quad (5)$$

This model eliminates the country-fixed effect as it is time-invariant, but this instrumenting process works poorly in the presence of autocorrelation among errors due to which the resulting

estimators could be imprecise or even biased. This swayed Arellano and Bond (1991)and Blundell and Bond (1998) to develop an SGMM estimator. They extend the Arellano-Bond estimator based on the assumption of no correlation between instrumenting variables at first differences and fixed effects which allow them to introduce more instruments that boosts the efficiency of estimators sharply. Arellano and Bover (1995) propose to take forward orthogonal deviation transforming the regressors to obliterate fixed effects which improve control over the instrument matrix minimizing data losses and thereby results in a better GMM estimator from that of the first difference model. To have a more precise estimator, Blundell & Bond (1998) resort to the approach drawn by Arellano and Bover (1995) just by reverting the instrumentation, instrumenting regressors in levels with differences so that the instrumenting variables become uncorrelated (exogenous) to the fixed effects. The study, therefore, decides to rely on Blundell and Bond's (1998) estimation approach to investigate the macroeconomic performance of the EMs while RER misalignment is present.

Similar to the specifications of Razin and Collins (1997) and Couharde and Sallenave (2013), the empirical specification of the growth equation can be given as:

$$g_{i,t} = \alpha + \beta g_{i,t-1} + \gamma X_{i,t} + \theta m_{i,t} + \mu_i + \lambda_t + v_{it} \quad (6)$$

Here, $g_{i,t}$ is the real GDP per capita growth rate, $g_{i,t-1}$ is the per capita growth rate of real GDP at the initial period, $X_{i,t}$ is a set of variables that explain economic growth, misalignment in RER is shown by $m_{i,t}$, μ_i is to represent country fixed effects, λ_t shows time-specific effects and v_{it} is an error term. The model is designed in a dynamic fashion, confirmed by the inclusion of lagged dependent variable as a regressor.

However, Schröder (2013) identifies some perceptible drawbacks of models stipulated in this manner. Most importantly, the model specified in this way ignores the corresponding growth effects of undervaluation and overvaluation. Therefore, to identify the respective impact of undervaluation and overvaluation of RER on growth, the study develops undervaluation and overvaluation indices and incorporates them together in the growth equation. The growth equation becomes:

$$g_{i,t} = \alpha + \beta g_{i,t-1} + \gamma X_{i,t} + \theta_1 UNDER_{i,t} + \theta_2 OVER_{i,t} + \mu_i + \lambda_t + v_{it} \quad (7)$$

where $under$ and $over$ represent undervaluation and overvaluation, respectively. The undervaluation and overvaluation series are constructed, decomposing the misalignment series of RER into its two counterparts- one incorporating the negative values or zero otherwise for the former, and another is incorporating the positive values or zero otherwise for the later series.

The selection of growth determinants is substantially influenced by the evolution of exogenous growth theories following the work of Barro and Lee (1994). The initial value of per capita real GDP growth rate, that is, $g_{i,t-1}$ is taken to account the initial position of the economy following the neoclassical growth theory to control for conditional convergence. Among the voluminous literature on cross-country growth regression, the study consults with the studies conducted by Schröder (2013, 2017), and the factors found to have a significant influence on economic growth are inflation rate, government spending, human capital, institutional quality, investment, terms of trade, trade openness, and net foreign asset position. The study also considers the growth rate of effective labor units and the rate of depreciation by taking ($n_{i,t}+g+\delta$) into account where n is the growth rate of labor, g is the advancement in technology ($n_{i,t}+g$ defines the effective labor growth rate) and δ is the rate of depreciation. Among these factors, terms of trade, openness, net foreign assets position, and government spending are equilibrium RER determining fundamentals, and their inclusion in the growth regression will help remove the omitted variable bias (Schröder, 2013). Along with these determinants, the study comprises the undervaluation and overvaluation series into the model to examine their growth effects. The empirical model for growth regression can therefore be given as:

$$\begin{aligned} g_{i,t} = {} & \alpha + \beta g_{i,t-1} + \gamma_1 INF_{it} + \gamma_2 GOV_{it} + \gamma_3 INV_{it} + \gamma_4 lnHC_{it} + \gamma_5 INST_{it} + \\ & \gamma_6 \ln\left(n_{i,t} + g + \delta\right) + \gamma_7 lnTOT_{it} + \gamma_8 OPEN_{it} + \gamma_9 NFA_{it} + \theta_1 UNDER_{i,t} + \theta_2 OVER_{i,t} + \\ & \mu_i + \lambda_t + v_{it} \end{aligned} \quad (8)$$

where INF stands for the inflation rate, GOV is for government expenditure, INV represents investment, HC is the human capital, INST is a proxy of institutional quality, TOT stands for terms of trade, OPEN refers to trade openness, NFA is the net foreign assets position.

This current study then considers the following regression comprising the RER misalignment ($m_{i,t}$) into the model to examine its growth effect:

$$g_{i,t} = \alpha + \beta g_{i,t-1} + \gamma_1 INF_{it} + \gamma_2 GOV_{it} + \gamma_3 INV_{it} + \gamma_4 lnHC_{it} + \gamma_5 INST_{it} + \gamma_6 \ln(n_{i,t} + g + \delta) + \gamma_7 lnTOT_{it} + \gamma_8 OPEN_{it} + \gamma_9 NFA_{it} + \theta m_{i,t} + \mu_i + \lambda_t + v_{it} \quad (9)$$

The coefficients of both undervaluation and overvaluation have to be negative to support the view that undervaluation fosters economic growth while overvaluation weakens economic growth (Razin & Collins, 1997; Rodrik, 2008; Schröder, 2013). Inflation, government final consumption expenditure, the growth rate of effective labor units, rate of depreciation, and net foreign asset are expected to deter economic growth Barro, 1997; Devarajan, Swaroop, and Zou, 1996 and Fischer (1993). On the other hand, investment, human capital, and institutional quality are expected to have a favorable contribution to economic growth and, therefore, should be accompanied by positive signed coefficients (Barro & Lee, 1994; Lim, 1994). However, the impact of trade openness and terms of trade are left undetermined both in theory and empirical literature, and hence their coefficients can take on both signs (Blattman, Hwang, & Williamson, 2003; Cooke, 2010; Stiglitz, 1996).

Results and Discussion

Misalignment Series

The key macroeconomic fundamentals that are found to cause equilibrium RER include terms of trade, government expenditure, productivity differentials, investment spending, trade openness, net foreign assets position, and official development assistance.[1] The estimated coefficients of the long-run co-integration equation bear appropriate signs and are also statistically significant. In other words, fundamentals bearing theoretically expected and statistically significant signs are considered to model the equilibrium RER. The estimated models pass all necessary robustness checks. They are structurally stable and correctly specified. The study suggests that RERs for each of the EMs were substantially misaligned throughout the sample period.

Among the underlying factors that determine equilibrium RER, TOT is common for all economies. The next most common fundamentals in terms of their inclusion in the normalized co-integration equation are government expenditure (17), PROD (16), INV (12), OPEN (11), NFA (9), and ODA (8), respectively, where figures in brackets show the number of countries.

Specifications for which estimated parameters are signed in line with economic theory and significance are considered for estimating long-run equilibrium RER. Hence, negative productivity differentials coefficients for all countries approve the Balassa-Samuelson effect, which states that productivity growth appreciates RER. Productivity growth in emerging economies is expected to be more intense in the tradable sectors, which increases the demand for labor in these sectors and thereby persuades the wage rate to rise in the non-tradable sectors (Jongwanich, 2009). Such an increase in wage rate in the non-tradable sectors of the selected emerging economies appreciates RER causing inflation. The positive signs associated with coefficients of openness variable for eleven emerging economies approve that greater liberalization depreciates RER by increasing demand for foreign currency through reducing prices of importable goods nationally.

An increase in the rest of the fundamentals can influence RER in either direction. Following inferences can be drawn based on the number of times the fundamentals are included in the normalized cointegration equation. For about half of the countries, the RER depreciating income effect due to terms of trade improvement appears to be more powerful than its corresponding RER appreciating substitution effect. For the rest of the countries, the substitution effect dominates over the income effect. For about two-thirds of the economies, domestic investment and government

[1] Co-integration results and RER misalignment series are not reported here for brevity reasons.

expenditure markedly flow into tradable goods. Theory anticipates that an increase in net foreign asset depreciates RER, which is found true for two-third of the economies under study. The study finds that the way official development assistance affects RER is consistent with theory. An increase in official development assistance depreciates RER of most of the economies except China and hence supports the existence of Dutch Disease phenomena for China.

What is common for most of the EMs under investigation is that the RER was overvalued in the wake of the national and regional financial crisis, and the shift in exchange rate regime from fixed to floating depreciates the RER of the concerned economy. These observations stand to mean that misalignment in RER belongs to the key indicators of an economy's susceptibility to the financial crisis. As misalignment of RER is fairly evident in EMs, therefore, its impact on the economic growth of these economies could be a matter of interest to researchers, which will be dealt with in the next section.

Growth Regressions

Equation 8 examines the impact of overvaluation and undervaluation on growth (Table 1). The study deals with a variant of specifications to examine the consistency of results. It gradually augments the baseline model in columns 1 and 2 with human capital in columns 3 and 4 and then with institutional quality in columns 5 and 6. The standard fixed effect (FE) estimators are reported in columns 1, 3, and 5, and SGMM estimators are in columns 2, 4, and 6 for alternative specifications together with the pre and post-diagnostic test results of the SGMM estimations. The Wooldridge test accepts the null hypothesis of 'no autocorrelation' at a 1 percent level of significance for all possible specifications, and therefore the models are free from the autocorrelation problem. However, the Breusch-Pagan test and Wu-Hausman test show that the regression specifications are subject to heteroscedasticity and endogeneity between GDP growth rate per capita and regressors, which justifies the application of SGMM in examining the impact of over and undervaluation on growth.

Concerning the post-diagnostic checks, the significant AR (1) test statistic implies that residuals are correlated at first order. However, insignificant AR (2) test statistic confirms no autocorrelation among the residuals at second order, which is desirable for the validity of the internal instrumentation structure SGMM uses. The study uses lagged per capita GDP growth rate as endogenous, human capital and intuitional quality as predetermined, and the other regressors as extremely exogenous. The Hansen test statistic accepts the null hypothesis of over-identifying restrictions and hence approves the overall validity of instruments. Besides, with additional instruments (compared to the numbers of cross-sections), the augmented model in column 6 bears the over-fitting bias problem, which is efficiently addressed by the other two SGMM models with sufficiently low numbers of instruments.

A negative and significant undervaluation coefficient confirms that undervaluation enhances growth. The result obtained in this study is quite contrasting, as, in Table 1, the undervaluation coefficient is positive for all cases and significant for five specifications, meaning that undervaluation decreases economic growth in EMs. Undervaluation, stimulating technological progress and knowledge spillovers, can promote economic growth. However, undervaluation deters the economic growth of EMs, impacting the functional distribution of income negatively, which has recently been approved by Ribeiro et al. (2020) and hence supports the findings of this study. The growth deteriorating impact of overvaluation is approved by the negative sign of the overvaluation coefficients, though the coefficients are found to be significant only for SGMM specification. Thus, both undervaluation and overvaluation have a negative association with the growth of EMs.

Inflation is found to bear expected negative signs for all cases, but it is significant only for SGMM specifications of the baseline model and the model that includes human capital and institutional quality. Government expenditure maintains a negative but insignificant coefficient for all variants of regression specifications. Investment spending has to bear expected positive coefficients that are insignificant for standard fixed effect estimation but significant for all cases of SGMM. The impact of terms of trade on economic growth is theoretically undetermined. It can

either foster or tone down economic growth. The coefficient of the trade openness variable is negative and significant for all estimations except for SGMM. Therefore, the more outward orientation of EMs causes lower economic growth. The results of net foreign assets accumulation differ across estimates. From standard fixed effect estimation, net foreign asset accumulation is statistically significant, showing that net foreign asset accumulation deters growth. However, the SGMM estimates, though significant, turn out to be the opposite.

Table 1. Growth regression: with undervaluation & overvaluation

Regressors	FE (1)	SGMM (2)	FE (3)	SGMM (4)	FE (5)	SGMM (6)
Growth(-1)	-0.097	-0.033	-0.091	0.013	-0.089	0.211*
	(0.95)	(0.48)	(0.88)	(0.18)	(0.85)	(1.82)
Inflation	-0.033	-0.024**	-0.035	-0.018	-0.035	-0.066***
	(1.46)	(2.09)	(1.50)	(1.5)	(1.50)	(2.89)
Government Expenditure	-0.056	-0.121	-0.058	-0.154	-0.060	0.265
	(0.60)	(1.15)	(0.62)	(1.43)	(0.63)	(1.39)
Human Capital			-0.530	-1.541	-0.488	-4.044***
			(0.37)	(1.59)	(0.34)	(2.88)
Institutional Quality					-0.010	0.115
					(0.16)	(1.24)
ln (n+g+d)	-2.632***	-1.178**	-2.689***	-2.191**	-2.680***	-1.178*
	(3.44)	(2.81)	(3.43)	(2.72)	(3.39)	(2.01)
Investment	0.058	0.132***	0.056	0.106***	0.056	0.106**
	(1.35)	(4.94)	(1.30)	(3.04)	(1.28)	(2.25)
Terms of Trade	-0.233	0.140	-0.195	-0.163	-0.183	-6.196*
	(0.24)	(0.25)	(0.20)	(0.25)	(0.19)	(1.98)
Openness	-0.033**	-0.013***	-0.031**	-0.011**	-0.031**	-0.001
	(2.45)	(3.43)	(2.17)	(2.69)	(2.14)	(0.14)
Net Foreign Assets	-0.050**	0.013**	-0.048**	0.028***	-0.048**	0.029**
	(2.53)	(2.15)	(2.29)	(2.89)	(2.28)	(2.61)
Undervaluation	0.057*	0.053*	0.058*	0.035	0.057*	0.048*
	(1.72)	(1.81)	(1.72)	(1.08)	(1.71)	(1.93)
Overvaluation	-0.021	-0.019**	-0.022	-0.017*	-0.023	-0.036**
	(1.00)	(2.3)	(1.06)	(1.97)	(1.06)	(2.30)
Hausman Test	62.270***		59.730***		58.250***	
(p-value)	(0.000)		(0.000)		(0.000)	
Observations	136	136	136	136	136	136
Cross Section	21	21	21	21	21	21
Adj R-Square	0.547		0.543		0.539	
AR(1) p-value		0.098		0.084		0.047
AR(2) p-value		0.835		0.903		0.13
Hansen Test		9.85		8.81		8.14
(p-value)		(0.363)		(0.359)		(0.615)
Instrument		20		20		23
Wooldridge Test		1.125		1.163		1.359
(p-value)		(0.301)		(0.294)		(0.257)
Breusch-Pagan Test		108.57***		104.98***		104.20***
(p-value)		(0.000)		(0.000)		(0.000)
Wu-Hausman Test		16.00***		14.99***		15.03***
(p-value)		(0.001)		(0.002)		(0.002)

Notes: entries in ***, **, * are statistically significant at 1%, 5% and 10% significance levels, respectively. Figures below the coefficients in parentheses are t-ratios.

The polity variable used to proxy the institutional quality is included only in the most augmented case. Its coefficient varies from standard fixed effect to SGMM estimates but is insignificant for both situations. The study finds that human capital harms economic growth, which is significant only in one case of SGMM. However, the result is not surprising as studies performed

by Razin and Collins (1997), Sallenave (2010), and Toulaboe (2006) also drew similar conclusions. The negative association between per capita GDP growth rate and the growth rate of effective labor units and the rate of depreciation together suggested by Mankiw, Romer, and Weil (1992) is approved.

Table 2. Growth regression with misalignment

Regressors	FE (1)	SGMM (2)	FE (3)	SGMM (4)	FE (5)	SGMM (6)
Growth(-1)	-3.852***	0.305***	-4.221***	0.358***	-4.218***	0.384***
	(6.73)	(3.42)	(6.95)	(3.70)	(6.91)	(3.85)
Inflation	-0.036*	-0.016	-0.030	-0.024**	-0.030	-0.023**
	(1.93)	(1.39)	(1.60)	(2.42)	(1.60)	(2.32)
Government	-0.134*	-0.175**	-0.134*	-0.124	-0.135*	-0.101
Expenditure	(1.68)	(2.78)	(1.70)	(1.62)	(1.69)	(1.34)
Human Capital			2.105*	-2.589***	2.132*	-2.849***
			(1.70)	(3.46)	(1.68)	(4.38)
Institutional Quality					-0.006	0.012
					(0.11)	(0.30)
Ln (n+g+d)	-2.734***	-1.735***	-2.523***	-1.798***	-2.517***	-1.764***
	(4.26)	(7.47)	(3.90)	(3.97)	(3.86)	(3.50)
Investment	0.105***	0.072***	0.113***	0.057*	0.112***	0.053
	(3.08)	(2.83)	(3.30)	(1.81)	(3.27)	(1.41)
Terms of Trade	0.589	-0.129	0.505	-0.455	0.512	-0.472
	(0.73)	(0.33)	(0.63)	(0.84)	(0.64)	(0.79)
Openness	0.002	-0.015***	-0.002	-0.003	-0.002	-0.001
	(0.17)	(5.96)	(0.17)	(0.55)	(0.16)	(0.12)
Net Foreign Assets	-0.010	0.019**	-0.016	0.023**	-0.016	0.027**
	(0.58)	(2.10)	(0.89)	(2.57)	(0.88)	(2.80)
RER misalignment	-0.030**	-0.017**	-0.025*	-0.029***	-0.025*	-0.030***
	(1.99)	(2.27)	(1.67)	(3.30)	(1.66)	(3.29)
Hausman Test	48.887***		56.021***		52.271***	
(p-value)	(0.000)		(0.000)		(0.000)	
Observations	137	137	137	137	137	137
Cross Section	21	21	21	21	21	21
Adj R-Square	0.676		0.682		0.679	
AR(1) p-value		0.099		0.085		0.077
AR(2) p-value		0.655		0.722		0.735
Hansen Test		12.2		10.35		11.75
(p-value)		(0.272)		(0.323)		(0.228)
Instrument		20		20		21
Wooldridge Test		1.159		1.229		1.336
(p-value)		(0.294)		(0.281)		(0.261)
Breusch-Pagan Test		109.18***		105.84***		105.16***
(p-value)		(0.000)		(0.000)		(0.000)
Wu-Hausman Test		15.83***		14.97***		15.03***
(p-value)		(0.001)		(0.002)		(0.002)

Notes: entries in ***, **, * are statistically significant at 1%, 5% and 10% significance levels, respectively. Figures below the coefficients in parentheses are t-ratios.

Equation 9 examines the impact of RER misalignment on economic growth and the results presented in Table 2. This study takes alternative specifications to look at the consistency of findings. Pre and post-diagnostic checks for SGMM estimations are given at the bottom of table 2. The Wooldridge test fails to reject the null hypothesis of non-autocorrelation, and therefore, there is no autocorrelation problem in the models. The Breusch-Pagan test and Wu-Hausman test imply that the regression specifications suffer from heteroskedasticity and endogeneity between GDP growth rate per capita and regressors.

It is worth mentioning that the non-episodic absolute RER misalignment is used for the study because of its superior performance over episodic measures of RER misalignment in explaining its growth effects. The conventional post-diagnostic econometric test finds that the residuals are correlated at first order but not at second order, which is necessary for the cogency of internal instrumentation of the SGMM estimation technique. The insignificant Hansen test statistic points to the overall validity of instruments by accepting the null hypothesis of over-identifying restrictions. Finally, the numbers of instruments in all SGMM cases are low enough to handle the 'over-fitting bias' problem.

A negative misalignment coefficient infers that distortion in RER from its equilibrium value erodes growth. The misalignment coefficients are unanimously negative and statistically significant irrespective of specifications and estimation. Therefore misalignment in RER undermines the growth of EMs, and hence it confirms the findings obtained by Mazorodze (2021), Nouira and Sekkat (2012), and Schröder (2017). Therefore, we conclude that any kind of distortions in RER exerts an adverse impact on economic growth, which is further warranted by the growth deteriorating effects of undervaluation and overvaluation.

Concerning other growth determinants, inflation allows the expected coefficient in all cases, which is negative, but the coefficient is significant for standard fixed effect estimation and extended SGMM cases. The government expenditure is significant for all standard fixed effect and baseline SGMM estimations. It predicts that growth is dismayed by an increase in government expenditure, which justifies the growing agreement among policymakers. So that the private sector can serve better for economic growth and increased government expenditure, particularly borrowing from the domestic financial institutions squeezes opportunity for the private entrepreneurs and of thereby hampering the economic growth. On the same ground, the investment variable is expected to support economic growth. As for this current study, the investment coefficient is also positive for all regression specifications and significant for five of them. The sign of the coefficient of terms of trade variable varies across estimation methods, and hence its impact on economic growth is inconclusive. However, none of the coefficients are significant, which is exactly what Toulaboe (2011) obtains in his study. The negative coefficient of the trade openness variable except for the baseline standard fixed effect estimate indicates that the outward orientation of EMs hampers their growth.

The coefficient of net foreign assets is negative but insignificant for standard fixed effect estimators, while the SGMM estimator is positive and significant. The coefficient of the institutional quality differs from the fixed effect model to SGMM estimation but is insignificant for both cases. Human capital coefficients show a negative significance in SGMM regression specifications, where this result is confirmed by the previous study (Razin & Collins, 1997; Sallenave, 2010; Toulaboe, 2006). As for the effect of the growth rate of effective labor units and the depreciation rate on economic growth, the results confirm Mankiw et al.'s (1992) suggestion. Negative and significant coefficients of the variable for all variants of regression specification confirm its anti-growth effect for EMs.

Conclusion

Misalignment of RER and its role in open economies is one of the widely researched topics in open economy macroeconomics, and its impacts on different macroeconomic variables are well documented in the literature. But there are few studies found in recent years evaluating the growth performance of EMs in response to misaligned RER. However, these economies have been able to raise their contribution to global growth in the last few decades dealing with frequent currency crises by managing their exchange rate policies appropriately following the macroeconomic challenges they faced. Most of the contemporary studies on the impact of RER misalignment in EMs are limited to the export performance that has diverse findings owing to several reasons- the disparity in fundamentals they accept, dissimilarity of the period they cover, and disagreement on the methodology they use to determine the equilibrium RER. These help the researchers of the present study to be precautious in delineating the misalignment series to produce the most representational results. Among the different approaches of equilibrium RER determination, the

study chooses to employ the SEA that estimates the long-run equilibrium RER directly drawing a vector of sustainable values for the fundamentals.

The study finds that the RER of EMs is significantly misaligned, which allows proceeding for evaluating its impact on the growth performance of the economies. To this end, the study adopts the dynamic panel SGMM estimation approach to estimate the dynamic relationship between the economic growth and RER misalignment of EMs. In line with the traditional view, the present study argues that any deviation of RER from its equilibrium value impairs economic growth. The view that overvaluation erodes growth is accepted. While a good number of recent empirical researches identify the beneficial effects of a real undervaluation on economic growth, the study stands against those as no such evidence is observed for EMs. Rather a real undervaluation hampers the growth of EMs. Literature suggests that undervaluation may hurt economic growth, exerting an adverse impact on domestic consumption by creating income inequality. Hence, the study opens for future research on income distributional consequences of undervaluation along with misalignment for the selected emerging economies. From the policy perspective, policymakers should advocate appropriate exchange rate policies to make sure that its sustained misalignments over time so that it can enrich the ability of concerned authorities to attain the growth target by using it as a policy instrument.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Aguirre, A., & Calderon, C. (2005). *Real exchange rate misalignments and economic performance.* (Central Bank of Chile Working Papers No. 315).

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, *58*(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error components models. *Journal of Econometrics*, *68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Baffes, J., Elbadawi, I., & O'connell, S. (1999). Single-equation estimation of the equilibrium real exchange rate. In L. E. Hinkle & P. J. Montiel (Eds.), *Exchange Rate Misalignment: Concept and Measurement for Developing Countries* (pp. 405–475). New York: Oxford University Press. https://doi.org/10.1596/1813-9450-1800

Barro, R. J. (1997). *Determinants of economic growth: A cross-country empirical study* (NBER Working Paper No. 5698). https://doi.org/10.3386/w5698

Barro, R. J., & Lee, J. (1994). Sources of economic growth. *Carnegie-Rochester Conference Series on Public Policy*, *40*, 1–46. https://doi.org/https://doi.org/10.1016/0167-2231(94)90002-7

Blattman, C., Hwang, J., & Williamson, J. G. (2003). *The terms of trade and economic growth in the periphery 1870-1938* (NBER Working Paper No. 9940). Cambrigde. https://doi.org/10.3386/w9940

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Cooke, D. (2010). Openness and inflation. *Journal of Money, Credit and Banking*, *42*(2–3), 267–287. https://doi.org/10.1111/j.1538-4616.2009.00287.x

Couharde, C., & Sallenave, A. (2013). How do currency misalignments' threshold affect economic growth? *Journal of Macroeconomics*, *36*, 106–120. https://doi.org/10.1016/j.jmacro.2012.11.002

Damill, M., & Frenkel, R. (2017). Symposium: Dilemmas of exchange rate and monetary policies in Latin America. *Journal of Post Keynesian Economics*, *40*(1), 1–8. https://doi.org/10.1080/01603477.2017.1343079

Devarajan, S., Swaroop, V., & Zou, H. (1996). The composition of public expenditure and economic growth. *Journal of Monetary Economics*, *37*(2–3), 313–344. https://doi.org/10.1016/0304-3932(96)01249-4

Edwards, S. (1989). Exchange rate misalignment in developing countries. *The World Bank Research Observer*, *4*(1), 3–21. https://doi.org/10.1093/wbro/4.1.3

Elbadawi, I. A. (1994). Estimating long-run equilibrium real exchange rates. In J. Williamson (Ed.), *Estimating equilibrium exchange rates* (pp. 93–131). Washington, D.C.: Institute for International Economics.

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics*, *32*(3), 485–512. https://doi.org/10.1016/0304-3932(93)90027-D

Hodrick, R., & Prescott, E. (1997). Postwar U.S. business cycles: An empirical investigation. *Journal of Money, Credit and Banking*, *29*(1), 1–16. https://doi.org/10.2307/2953682

Jongwanich, J. (2009). *Equilibrium real exchange rate, misalignment, and export performance in developing Asia* (Asian Development Bank Economics Research Paper Series No. 151). https://doi.org/10.2139/ssrn.1604839

Koukouritakis, M. (2013). Capital-enhanced equilibrium exchange rate in the presence of structural breaks: Evidence from the Visegard countries. *The Manchester School*, *81*(1), 58–79. https://doi.org/10.1111/j.1467-9957.2011.02258.x

Lim, D. (1994). Explaining the growth performances of Asian developing economies. *Economic Development and Cultural Change*, *42*(4), 829–844. https://doi.org/10.1086/452123

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The Quarterly Journal of Economics*, *107*, 407–437. https://doi.org/10.3386/w3541

Mazorodze, B. T. (2021). Exchange rate misalignment, state fragility, and economic growth in sub-Saharan Africa. *Cogent Economics & Finance*, *9*(1), 1898113. https://doi.org/10.1080/23322039.2021.1898113

Montiel, P. J. (2007). Equilibrium real exchange rates, misalignment and competitiveness in the Southern Cone. Santiago, Chile: CEPAL, Economic Development Division, United Nations Publications.

Nouira, R., & Sekkat, K. (2012). Desperately seeking the positive impact of undervaluation on growth. *Journal of Macroeconomics*, *34*(2), 537–552. https://doi.org/10.1016/j.jmacro.2011.12.002

Razin, O., & Collins, S. M. (1997). *Real exchange rate misalignments and growth* (NBER Working Paper Series No. w6174). Cambridge, MA.

Ribeiro, R. S. M., McCombie, J. S. L., & Lima, G. T. (2020). Does real exchange rate undervaluation really promote economic growth? *Structural Change and Economic Dynamics*, *52*, 408–417. https://doi.org/10.1016/j.strueco.2019.02.005

Rodrik, D. (2008). *The real exchange rate and economic growth* (Brookings Papers on Economic Activity, Fall 2008). Retrieved from https://www.brookings.edu/wp-content/uploads/2008/09/2008b_bpea_rodrik.pdf

Sallenave, A. (2010). Real exchange rate misalignments and economic performance for the G20 countries. *International Economics*, *121*, 59–80. https://doi.org/10.1016/S2110-7017(13)60008-6

Schröder, M. (2013). Should developing countries undervalue their currencies? *Journal of*

Development Economics, *105*, 140–151. https://doi.org/10.1016/j.jdeveco.2013.07.015

Schröder, M. (2017). The equilibrium real exchange rate and macroeconomic performance in developing countries. *Applied Economics Letters*, *24*(7), 506–509. https://doi.org/10.1080/13504851.2016.1205718

Stiglitz, J. E. (1996). Some lessons from the East Asian miracle. *The World Bank Research Observer*, *11*(2), 151–177. https://doi.org/10.1093/wbro/11.2.151

Toulaboe, D. (2006). Real exchange rate misalignment and economic growth in developing countries. *Southwestern Economic Review*, *33*(1), 57–72.