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Economic Freedom, Real Exchange Rates and Economic Growth in Emerging Markets and Developing Countries

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ABSTRACT

This paper examines the contingency effects of economic freedom on the growth effect of the exchange rate in a panel of 83 emerging markets and developing countries over the period 1976-2010. Based on the generalized method of moments system estimators (SGMM) that control for the weakness and proliferation of instruments, we uncover positive and significant contingency effects of economic freedom on the growth effect of the real exchange rate undervaluation. The marginal growth effects of the real exchange rate undervaluation are enhanced as countries improve the qualities of their economic institutions. The findings are robust with the exclusion of outliers and oil-exporting countries, alternative measures of real exchange rate undervaluation, additional control variables, sub-components of economic freedom, and multicollinearity between the interaction term and the original variables.

Keywords: Economic freedom; Institutions; Real exchange rate; Economic growth; Developing countries.

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INTRODUCTION

The role of macroeconomic policies in steering the development process has always been central to economic analysis. In this regard, exchange rate policy has been viewed as an important vehicle in the global economy and thereby for international transactions. The exchange rate which is defined as a relative price of non-tradable goods to tradable goods acts as a key indicator of the international competitiveness of a country vis-à-vis the rest of the world. Thus, exchange rate movements are an important factor that influences trade and financial flows across countries and hence the balance of payments. It is therefore likely that a sound exchange rate policy is a crucial condition in influencing not only the stability of the international market but more essentially the domestic economy at large. Along these lines, however, there is a significant debate among scholars and policymakers about the impact of the exchange rate on economic growth. Bhalla (2008) stressed that instead of focusing on exchange rate regimes one should rather emphasise on the direction of the exchange rate (i.e. undervaluation or overvaluation) for the better achievement of a country's economic growth and macroeconomic balance. Along these lines, Naseem and Hamizah (2013) highlighted that the presence of a protracted real exchange rate (RER) overvaluation is well-established, which leads to a non-optimum allocation of resources, inconsistency of macroeconomic policies, rent-seeking and corruption, lower economic growth, an unsustainable current account deficit as well as currency crashes.

Although a consensus seems to emerge on the detrimental effects of a RER overvaluation, the parallel theoretical and analytical issues concerning a RER undervaluation remain unresolved at both the theoretical and empirical levels. On one hand, some scholars argue that exchange rate undervaluation i.e. at a highly competitive, below-market value is believed to provide a favourable atmosphere to spur economic growth (Rodrik 2008). On the other hand, others are sceptical that the relative prices between currencies would act as a fundamental driver for long-run economic growth. This is because nominal exchange rates, like any other nominal variables, seem to be immaterial to growth while the real exchange rate appears to be an endogenous variable that is out of the control of policymakers. This poses several questions and challenges among researchers trying to determine the effects of real exchange rate undervaluation on growth. This is also coupled with the inconclusive evidence that has been accumulated. For instance, previous studies that contributed to this unsettled debate found conflicting results, for example, Bresser-Pereira (2002), Polterovich and Popov (2004), Dooley *et al*., (2005), Hausmann *et al*. (2005), Rodrik (2008), Eichengreen (2008) and Macdonal and Vieira (2010) showed that exchange rate undervaluation increases economic growth, while Kahn (1994), Johnson *et al*. (2006), and Haddad and Pancaro (2010) discovered adverse effects of RER undervaluation on economic growth. Furthermore, Razin and Collins (1997) and Aguirre and Calderon (2005) emphasised that a large undervaluation hurt growth, while a modest undervaluation enhanced growth. Added to these opposing findings, there are also studies that failed to establish a significant relationship between RER undervaluation and economic growth (Nouira and Sekkat, 2012).

A recent related line of research argued that a RER undervaluation policy can get around structural deficiencies in promoting economic growth. For instance, Rodrik (2008) argued

that an undervalued RER would lead to stronger growth particularly for developing countries because their tradable sectors usually suffer more disproportionately from institutional weakness and market failures. Therefore, sustained currency real depreciation raises the relative profitability of investing in tradable sectors and hence acts as a second-best fashion to alleviate the economic costs of these distortions (i.e. weak institutions). This conjecture was further supported by Steinberg (2011) who found that financial development as a channel through which undervaluation constructively affects growth by lessening the symptoms of frictions, specifically in financially under-developed countries. These studies implied that government policies that intentionally undervalue the RER to promote growth may get around the weak institutional environment and low level of financial development (second best view).

Other studies have also shown the different channels that the RER provides towards growth. For instance, Di Nino *et al*. (2011) showed that there was a positive relationship between undervaluation and economic growth by increasing exports, especially from high-productivity sectors, in Italy between 1861-2011. Aizenman and Lee (2010), McLeod and Mileva (2011) and Benigno *et al*. (2015) argued that RER undervaluation acts like a subsidy to the (more efficient) tradable sector, where a weak exchange rate supports production in the tradable sector.[1] From a different viewpoint, Gluzmann *et al*. (2012) found that there was an insignificant response to undervaluation from export and import flows. Instead, Gluzmann *et al*. (2012) found that savings, investment and employment are more important than the tradable sector for the undervaluation-growth effect. Specifically, their study demonstrated that a weak exchange rate led to higher saving and investment through lower labour costs and income re-distribution. Through shifting resources, real devaluation would further boost savings and investment in financially-constrained firms relative to financially developed ones.

However, most recent studies that have looked at the various intervening/facilitating factors on the growth effect of exchange rate undervaluation have largely ignored the fundamental role of the institutional setting in influencing policy outcomes and growth despite strong theoretical and empirical consensus on the importance of institutions in the growth process (North, 1990; Acemoglu *et al*., 2001, 2003, 2005, Rodrik *et al*., 2004; Justesen, 2008).[2] Acemoglu *et al*. (2003) argued that the emergence and persistence of bad macroeconomic policy outcomes were due to a weak institutional setting. Thus, the effects of policy on growth may depend on the institutional setting. Similarly, Easterly and Levine (2003) found that macroeconomic policies (inflation, trade, and real exchange rate overvaluation) lost power in explaining economic growth once institutional variables were controlled for. These led Easterly (2005) and Acemoglu *et al*. (2003) to speculate that adverse macroeconomic policy may be the proxy for weak institutions. More recently, Fatas and Mihov (2013) also showed that strong institutions explained better fiscal policy outcomes and that institutions enhanced (lowered) the growth effect of policy

[1]Undervaluation of exchange rate is believed to enhance a country's international competitiveness level that encourages exports and investment, and thereby allows the reaping of more benefits from cheaper local currency and hence economic growth (Ahmad *et al*., 2010; Naseem *et al*., 2010).

[2] Literature focusing on the role of economic freedom (EF) also shows that EF and some of its components promote growth as summarised in a meta-analysis by Doucouliagos and Ulubasoglu (2006). Though some criticism remains as to the two-way or feedback relationship between institutions or governance and growth (Jomo and Chowdhury, 2012), other scholars for example Justesen (2008) shows that composite EF and its components especially government size (fiscal institutions) and regulatory institutions cause growth while Compton *et al*. (2014) showed that the effects differ across income quartiles in the case of the U.S. In this study we contribute to the debate focusing not on the direct effect of institutions (EF) on growth but instead the complementary role it plays on the growth effect of policy (EF) within the dynamic panel data framework that controls for endogeneity of the right-hand side variables.

outcome (fiscal policy volatility). Thus, the role of institutions embedded in the country may influence not only policy outcomes but also the growth effect of policy outcomes. Slesman (2014), for instance, showed that better quality market-supporting institutions lowered the growth effects of inflation and inflation volatility in developing countries while Emara (2012) also showed that better quality regulatory institutions lowered the growth effect of inflation volatility. However, there seems to be a lack of direct empirical evidence on the interaction effects between institutions along economic freedom and real exchange rate undervaluation on economic growth within the context of emerging markets and developing countries.

In this study, we provide new empirical evidence on the facilitating/mediating role plays by the institutional setting in the relationship between RER undervaluation and growth in developing countries. Specifically, we investigate the complementary roles play by economic freedom (i.e. economic institutions) on the marginal growth effects of RER undervaluation in developing countries. Given the above-mentioned view that institutional arrangements determine the policy outcome and policy volatilities, our main contribution in this paper is our attempt to shed additional light on the importance of the institutional channel through which undervaluation affects the growth process. Particularly, we contribute to the literature by emphasising the important role that economic freedom (i.e. economic institutions) may play in mediating the marginal effects of relative price changes on economic development, focusing specifically on a relatively more homogenous panel of developing countries which possess relatively more variation in their institutional qualities. Another contribution, discussed in further detail below, is that we have addressed this issue more carefully within the dynamic panel data framework of system GMM, controlling for weakness and proliferation of instruments. This is important in the context of institution-policy complementarities and growth because weakness and proliferation of instruments problems may result in a type I error and fragility of the results, i.e. showing significant growth effects of the interaction between the RER and economic freedom which is in fact not correlated (see Slesman *et al*., 2015; Vieira *et al*., 2012).

We estimated the RER undervaluation using the framework proposed by Rodrik (2008) that adjusted for the Balassa-Samuelson effect. Based on a panel dynamic growth model for 83 emerging markets and developing countries during the period 1976-2010 that controlled for the endogeneity of all regressors, weakness and proliferation of instruments, the results reveal that the marginal growth effects of RER undervaluation are enhanced as the level of economic freedom is improved. The results further reveal that the most important dimensions of economic freedom are indicators that reflect government size (fiscal institutions), freedom to trade internationally, and regulatory institutions. In addition, these findings are robust with the exclusion of outliers, oil-exporting countries, additional control of policy variables and democracy. The clear policy implication is that improvements in economic freedom can yield growth benefits from a macroeconomic policy of RER undervaluation. Furthermore, our findings suggest that policymakers should be pragmatic in institutional reform by targeting the most binding institutional constraints along fiscal and regulatory institutions and advocate institutional arrangements that promote free trade.

The remainder of this paper is organised as follows. The next section describes the model specification and method used in the analysis. Section 3 reports and discusses the empirical results and finally, the last section concludes with the key findings and policy implications of the study.

EMPIRICAL SPECIFICATION, METHODOLOGY AND DATA

Empirical Specification

We assess the interaction effect of economic institutions and the exchange rate on economic growth based on earlier works (Islam, 1998; Rodrik, 2008) using the following dynamic growth model specification.

$$y_{it} - y_{i,t-1} = \alpha y_{i,t-1} + \beta_1 UNDERVAL_{it} + \beta_2 EF_{it} + \beta_3 (UNDERVAL_{it} \, x \, EF_{it}) + \theta' X_{it} + \eta_i + \mu_{it}$$

or

$$y_{it} = \beta y_{i,t-1} + \beta_1 UNDERVAL_{it} + \beta_2 EF_{it} + \beta_3 (UNDERVAL_{it} \, x \, EF_{it}) + \theta' X_{it} + \eta_i + \mu_{it} \quad \text{Eq. (1)}$$

Subscript *i* and *t* indicate, respectively, the country and time index; *y* is the logarithmic value of real GDP per capita; UNDERVAL is the Balassa-Samuelson adjusted real exchange undervaluation[3]; *EF* is economic freedom that captures the quality of economic institutions; *X* is a vector of other control variables; η_i is a time-invariant unobserved country-specific effect term; and μ_{it} is the usual error term. Eq. (1) predicts the coefficient on $y_{i,t-1}$ to be positive for conditional convergence, and negative for divergence (Islam, 1995; Slesman *et al*., 2015). We expect a positive sign to indicate that laggard countries grow faster and catch up with rich countries. One major weakness in the empirical literature is that it does not provide a clear guidance on the set of control variables to be included in the growth equation. This is due to the fact that there exist as many potential growth determinants as the number of countries under analysis (Durlauf *et al*., 2005). To avoid this problem, we follow recent studies (Levine and Renelt, 1992; Islam, 1995; Azman-Saini *et al*., 2010; Slesman *et al*., 2015) to opt for the Solow growth theoretical driven vector of control variables, *X*, which encompass the log of initial income, population growth, the investment ratio, and Barro and Lee's (2013) secondary schooling to proxy for human capital. Nevertheless, we also control for a set of additional policy and institutional variables reflecting the size of the government, trade openness, inflation and political institutions.

Before we discuss the contingency effect of economic institutions on the growth effects of exchange rate undervaluation, we should make clear how the measure of *UNDERVAL* is computed. We follow Rodrik (2008) in computing the time-varying index of *UNDERVAL* that adjusts for the Balassa-Samuelson effect.[4] The procedure is as follows. First, the real exchange rate is computed as $\ln RER_{it} = \ln(XRAT_{it}/PPP_{it})$ where *XRAT* and *PPP* are exchange rates and purchasing power parity conversion factors, respectively, and are each expressed in terms of national currency units per U.S. dollar. Both *XRAT* and *PPP* are from the Penn World Table version 7.1. *RER* can take values of more than one to indicate that the value of the currency is lower (more depreciated) than indicated by *PPP*. Rodrik (2008) argued that through the Balassa-Samuelson effect nontradable goods are cheaper than tradable goods in poor countries, therefore, an adjustment should be made. The second step, then, is to isolate the income and

[3] Detail on its construction is provided below. As an alternative measure, we also used real exchange rate that is unadjusted for the Balassa-Samuelson effects. The results are reported in Table 3A.

[4] UNDERVAL is adjusted for relative price of tradables to nontradables, i.e. the Balassa-Samuelson effect, in the sense that as countries get richer, the relative prices of non-tradable goods and services tend to rise because of higher productivity in the tradables (see Rodrik, 2008).

intrinsic time specific effects from the portion reflecting *RER* through regressing , $\ln RER_{it} = \alpha + \lambda \ln RGDPC_{it} + \mu_i + v_t$, where $\ln RGDPC_{it}$ is the log of the non-overlapping five-year average of real income per capita, μ_t is a time fixed effect. The result (not reported) shows the coefficient λ to be -0.044 and is significant at 5% (*t* statistic = 2). This is much smaller than the coefficient of -0.24 found by Rodrik (2008) in a mixed sample of developed and developing countries. This suggests that the extent of the Balassa-Samuelson effect is small among the developing countries sample: when income increases by 10 percent, the real exchange rate would fall by about 0.44 percent. Lastly, ln*UNDERVAL* is computed as the difference between the actual $\ln RER_{it}$ and the predicted $\ln \overline{RER}_{it}$, i.e. $\ln UNDERVAL_{it} = \ln RER_{it} - \ln \overline{RER}_{it}$. We take anti-log of ln*UNDERVAL* to convert it into a level form, *UNDERVAL*, which has a base of one. As pointed out by Rodrik (2008) when *UNDERVAL* exceeds one it means that the exchange rate is undervalued: goods produced at home are relatively cheaper in dollar terms. Similarly, when UNDERVAL is less than one, the exchange rate is overvalued.

We now turn to our main interest on how economic institutions mediate the marginal effects of exchange rate undervaluation on growth. We evaluate the marginal and statistically significant effects of *UNDERVAL* on growth at various levels of quality of economic institutions, using an interaction model and the associated computed standard errors proposed by Brambor *et al*. (2006).[5] The marginal effect of *UNDERVAL* can be calculated by taking a partial derivative of Eq. (1) as follows:

Furthermore, naturally, there would be a high correlation between the interaction term

$$\frac{\partial y_{it}}{\partial UNDERVAL_{it}} \approx \beta_1 + \beta_3 EF_{it}$$

$UNDERVAL_{it}$ x EF_{it} and its components used to construct it, i.e. $UNDERVAL_{it}$ and EF_{it}. Burrill (2007) and Azman-Saini *et al*. (2010) suggested that we mitigate this problem of multicollinearity between the original variables and the interaction term by orthogonalizing the interaction terms in the following manner: $UNDERVAL_{it}$ x EF_{it} is regressed on $UNDERVAL_{it}$ and EF_{it} to generate residuals. These residual terms would be used as the representation of the interaction term. Finally, using the procedure provided by Brambor *et al*. (2006) we evaluate the statistical significance of the marginal effects of UNDERVAL on growth at three levels of economic freedom (EF) namely the minimum, mean and maximum scores on EF and its five sub-components.

METHODOLOGY

In order to estimate Eq. (1), we employ the generalized method-of-moments (GMM) panel estimator (Arellano and Bond, 1991; Arellano and Bover, 1995, Blundell and Bond, 1998) to provide consistent estimates of the interaction effects of economic institutions and real exchange

[5] Based on interaction model: $Y=\beta_0+\beta_1 X+\beta_2 Z+\beta_3 XZ$, the marginal effects of *X* on *Y* is computed as $\frac{\partial Y}{\partial X} = \beta_1 + \beta_3 Z$ with the standard error calculated using covariance matrix with the formula: $\hat{\sigma}_{\frac{\partial Y}{\partial X}} = \sqrt{var(\hat{\beta}_1) + Z^2 var(\hat{\beta}_3) + 2Z cov(\hat{\beta}_1 \hat{\beta}_3)}$. Computation is conducted using Stata code provided by Brambor *et al*. (2006).

rate undervaluation on output growth.[6] This estimator has a number of advantages over cross-sectional techniques and traditional panel estimators, especially its abilities to control for the endogeneity of all explanatory variables, account for unobserved country-specific effects and allowing the inclusion of lagged dependent variables as regressors. Endogeneities of *UNDERVAL* and *EF* are a major concern when estimating their effects on growth (see Acemoglu *et al*., 2001; and Habib *et al*., 2017; respectively). First, Arellano and Bond (1991) proposed a differenced-GMM (DGMM) estimator in which we eliminate country-specific effects by transforming Equation (1) into a first-difference form, and dealing with the endogeneity problem of the right-hand side variables including the lag-dependent variable through instrumenting the first differenced-series of the right-hand side variables using their lagged levels (Arellano and Bond, 1991). Although DGMM can mitigate problems due to country-specific effects and simultaneity bias, one major limitation remains. Blundell and Bond (1998) showed that the lagged levels of the regressors convey little information about their future changes when the regressors are persistent, e.g. economic institutions, i.e. EF, making lagged levels to be a weak instrument for their differenced-series and this may lead to biased parameter estimates in small samples and larger variance asymptotically.

Blundell and Bond (1998) and Arellano and Bover (1995) proposed that we simultaneously estimate Eq. (1) as a system of regressions in difference and levels forms: estimating regression in difference using lagged levels of the regressors as instruments and regression in levels using lagged values of their differenced series as instruments. This strategy is known as system-GMM estimation (SGMM) and is shown to be able to overcome the weak instrument problems associated with the DGMM estimator. In this paper, we tackle the weak instrument problem by employing SGMM. To evaluate the validity of SGMM, three specification tests are employed. The first test examines the hypothesis that the error terms in the difference-equation (i.e. $\Delta\mu_{it}$) are not second-order serially correlated. The second test is the Hansen's (1982) *J* test for overidentification restrictions used to test the null that instruments are not correlated with the error terms. Finally, we apply the difference-in-Hansen test to examine the validity of additional instruments used in the regression in levels, i.e. the lagged values of differenced series. Failure to reject the null for these tests indicates that the model is adequately specified.

Furthermore, we follow Roodman's (2009) strategy by reducing the dimensionality of the instrumental variables (through collapsing the instrument) matrix to mitigate the instrument proliferation problems that can weaken above specification tests as well as increase the tendency to commit type I errors (see Roodman, 2009). This happens when the instrument ratio $r = i/N$ is larger than one (i.e. the number of instruments, i, is larger than the number of countries *N*). We ensure that *r* would always be less than one.[7] Therefore, unlike previous studies including Rodrik (2008), one additional contribution that our study makes to the growth literature is to account for weak instruments and the proliferation of instruments and their consequences for the contingency effects of economic institutions on the effect of exchange rate undervaluation on economic growth in developing countries.

[6] See Azman-Saini *et al.* (2010) for detailed discussion on this estimator in the context of the growth equation while Slesman *et al*. (2015) add on the importance of dealing with the proliferation of instruments problem.
[7] Vieira *et al.* (2012) showed recently that in the context of panel data, correction for the proliferation of instruments in SGMM makes the institutions-growth nexus become fragile statistically. Thus, it is important to correct for this problem to ensure that our results are robust.

Table 1. Summary Statistics

	LRGDPC	*INV*	*SCHOOL*	*UNDERVAL*	*EF*	*GOVSIZ*	*LEGAL*	*SM*	*TRADE*	*REGCRED*
Mean	8.167	23.029	1.328	1.071	5.580	5.822	4.706	6.257	5.729	5.342
Minimum	4.764	-1.537	0.032	0.138	2.995	0.940	1.193	0.058	1.750	2.476
Maximum	11.822	71.764	4.687	7.077	8.818	10	9.475	9.793	9.989	8.789
St. Deviation	1.211	10.353	0.946	0.457	1.032	1.648	1.540	2.066	1.468	1.104
Observation	572	572	572	572	572	572	570	572	565	572
N	83	83	83	83	83	83	83	83	82	83
T	6.89	6.89	6.89	6.89	6.89	6.89	6.86	6.89	6.89	6.89
LRGDPC	1.000									
INV	0.260	1.000								
SCHOOL	0.650	0.147	1.000							
UNDERVAL	0.010	–0.044	-0.140	1.000						
EF	0.477	0.213	0.448	-0.122	1.000					
GOVSIZ	0.118	–0.082	0.149	0.048	0.529	1.000				
LEGAL	0.412	0.176	0.336	-0.143	0.529	–0.026	1.000			
SM	0.297	0.162	0.252	-0.015	0.716	0.239	0.210	1.000		
TRADE	0.409	0.255	0.446	-0.197	0.733	0.224	0.367	0.372	1.000	
REGCRED	0.420	0.115	0.382	-0.057	0.743	0.386	0.342	0.363	0.536	1.000

Note: Authors calculation. N is number of countries; T is number of five-year non-overlapping time period.

DATA

We estimate Eq. (1) using the SGMM estimator on a panel of 83 developing and emerging economies over the period 1976–2010. The list of the countries included in this study is available upon request. The sample period is divided into seven non-overlapping five-year periods (1976–1980, 1981–1985 …, 2006–2010), T=7. Although we are dealing with an unbalanced panel due to missing data for some countries, we ensure that those few countries must have at least at the minimum T = 4 to meet the SGMM requirement. Data for the variables used in the analysis were taken from the Penn World Tables (PWT, version 7.1) and the World Bank's World Development Indicators (WDI). The dependent variable is the log of per capita real (weighted chained series) GDP (*LRGDPC*), as reported in the PWT. We follow the literature (Islam, 1995; Azman-Saini *et al*., 2010; Slesman *et al*., 2015) to classify the regressors into stock and flow variables. Stock variables are measured at the beginning of each nonoverlapping five-year period, while flow variables are measured as the average over each five-year period. Stock variables consist of logged initial income (measured in 1975, 1980 ... , 2005, if the dependent variable is measured in 1980, 1985 ... , 2010), Barro and Lee's (2013) average year of secondary schooling (as a proxy for human capital) (*SCHOOL*), and, our focal variables, the Fraser-Institute's measures of economic freedom and its five components namely government size (i.e., expenditures, taxes, and enterprises) (*GOVSIZ*); legal structure and security of property rights (*LEGAL*)[8]; access to sound money (*SM*); freedom to trade internationally (*TRADE*); and regulation of credit, labor, and business (*REGCRED*). Flow variables consist of real investment shares of real GDP (*INV*) (PWT), population growth (*WDI*), inflation (*INF*) measured as the annual change in the consumer price index (CPI) (WDI), government size measured as the share of government consumption relative to GDP (*GOV*) (PWT), degree of trade openness measured as exports plus imports over GDP (*OPEN*) (WDI), and Freedom House's political rights index as a measure of political institutions in the form of democracy (*DEMOC*)[9]. Table 1 provides a summary of the main variables used in this paper.

EMPIRICAL FINDINGS AND DISCUSSION

Table 2. The interaction effects of real exchange rate undervaluation and EF on growth

	Coeff.	S.e.
Constant	0.4141	(0.1354)[a]
Initial Income (log)	0.9003	(0.0207)[a]
Population growth	–0.0446	(0.0149)[a]
Investment ratio	0.0030	(0.0015)[c]
Schooling	0.0916	(0.0215)[a]
Real exchange rate undervaluation (UNDERVAL)	0.1038	(0.0289)[b]

[8] LEGAL captures the degree of general observance of rule of law, security of the private property rights, independent judiciary and impartial court. Rent-seeking would be expected to be prevalent if weak/low quality of LEGAL exists in the country.

[9] The scale of this index is 1 to 7, in which 1 means "there are competitive parties or other political groupings, the opposition plays an important role and has actual power," while 7 indicates that political rights are absent. This index is rescaled from 0 to 10 to indicate that a high score means better-quality democratic institution.

Table 2 (Cont.)

Economic freedom (EF)	0.0683	(0.0167) [a]
UNDERVAL × EF	0.0856	(0.0300) [a]
Marginal effects of UNDERVAL at minimum EF	0.3604	(0.1125) [a]
Marginal effects of UNDERVAL at mean EF	0.5817	(0.1893) [a]
Marginal effects of UNDERVAL at max EF	0.8590	(0.2861) [a]
Time dummies	Yes	
AR(2) Test (*p*-value)	0.689	
Hansen *J*-test (*p*-value)	0.111	
Difference-in-Hansen Test (*p*-value)	0.297	
Number of Instruments	49	
Country/Observation	83/572	

Note: S.e. indicates heteroskedasticity-robust standard errors. *AR(2)* test is on the null of no second-order residual serial correlation. Hansen *J*-test reports p-value for null hypothesis of instrument validity. Difference-in-Hansen test reports *p*-values for the null of validity of the additional moment restrictions necessary for system GMM. Following Roodman (2009b), the instrument columns are collapsed. [a, b] and [c] indicate significance level at 1%, 5% and 10% respectively.

Table 2 reports the main empirical results on the medium- to long-run contingent effects of EF on the growth effect of real exchange rate undervaluation for 83 emerging markets and developing countries over the period 1976-2010. Model specification tests on SGMM suggest that the model is well specified including for instrument proliferation: it passes the AR (2) test that error terms exhibit no second-order serial correlation; it fails to reject the null hypothesis of the Hansen J test that the instruments used are valid (p-value = 0.111) and that the null of validity of additional instruments (lagged difference-series) used to estimate level equations is also confirmed as suggested by the difference-in-Hansen test (p-value = 0.297), and the instrument ratio is less than 1. The coefficient assessments on all core control variables included in the growth equation suggest that they all carry the expected sign and highly significant confirming literature (Islam, 1995; Azman-Saini *et al*., 2010; Slesman *et al*., 2015). The positive signed and statistically significant coefficient on the logged initial income confirms the neoclassical growth theoretical prediction of conditional convergence with the speed of convergence (λ) of about 2.1% that is closer to 1.74% found by Azman-Saini *et al*. (2010) who also controlled for economic freedom but for a mixed sample of developed and developing countries.[10] The magnitude and statistically significant effects of other core controlled variables are well in line with recent existing growth studies (e.g., Azman-Saini *et al*., 2010).

Turning to our focal variables on the interaction term between UNDERVAL and EF (i.e. UNDERVAL×EF). The results in Table 2 show that the estimated coefficients of UNDERVAL, EF and UNDERVAL×EF are all positive and significant at the 1% significance level. This confirms that UNDERVAL and EF jointly affect growth directly by themselves as well as indirectly through the interaction term, UNDERVAL×EF. First of all, this result suggests that both exchange rate undervaluation policy and economic freedom have a crucial direct positive effect on the economic growth process in developing countries.[11] This confirms conventional

[10] Using Eq. (1), the speed of convergence (λ) is given by solving $1+\alpha = \widetilde{\beta} = \exp^{-\lambda t}$ where t is the time gap between current and lagged income (= 5 years).
[11] The model without UNDERVAL×EF also reports positive and significant results at 1 % on coefficients for UNDERVAL and EF. The result is available upon request from the author.

wisdom that better quality of economic institutions promotes long-run economic prosperity (Gwartney *et al*., 1999; Acemoglu *et al*., 2001; Rodrik *et al*., 2004; Azman-Saini *et al*., 2010) and that an undervaluing exchange rate policy promotes growth by reducing the economic cost associated with market failures through its increasing the relative profitability of tradables (Rodrik, 2008; Gluzmann *et al*., 2012; Béreau *et al*., 2012; Habib *et al*., 2017). It may also promote growth through the increase in the competitiveness of exports which is crucial for many export-led growth developing countries in the sampling countries. Secondly, and our main focus, is the positive and statistical significance of UNDERVAL×EF which shows that the marginal growth effect of UNDERVAL is enhanced indirectly through the improvements in EF. Further examination on the positive coefficients evaluated at the minimum, mean and maximum levels of EF show that they are positive and statistically significant at the 1% level. Further detailed evaluation shows that the marginal growth effect of a one-standard-deviation increase in UNDERVAL is associated with an increase in the annual growth rate of about 3.297% when the EF is at the minimum level and that the effects jump to 5.322% and then 7.858% as the EF score increases from the mean level to the maximum level, respectively.[12] These effects are indeed large magnitude effects and should not be ignored by developing countries. This paper further lends formal support to Rodrik's (2008, p. 393-396) view that a better institutional environment enhances the growth effect of exchange rate undervaluation since such an environment imposes relatively lower transaction costs on tradables (which relatively exhibit more complex production processes compare to nontradables) by lower contractual incompleteness, fewer hold-up problems, lower corruption, better protection of private property rights and stronger enforcement of contracts. Thus, institutional reforms to improve the quality of economic institutions are crucial to promote the effectiveness of exchange rate policy on the long-run economic growth in developing countries.

Robustness Checks

Although we have ensured that not only our main results but all the findings reported in this paper are robust to weakness and proliferation of instruments through the use of SGMM and collapsing the instrument matrix, we further conduct robustness checks on our main findings as follows. We use an alternative measure of real exchange rate undervaluation (without adjusting for the Balassa-Samuelson effect); remove outliers, which could blur our main findings, by using the so-called DFITS test (Belsley *et al*., 1980) to flag and remove countries that have a high combination of leverage and residuals[13]; and follow Mankiw *et al*., (1992) to remove oil-exporting countries where a large proportion of their GDP is from oil/natural resource extraction rather than productive economic activities; control for additional policy variables to see whether our main results held up; and finally, we take a closer look at the disaggregate effect of each of the five sub-components of *EF* namely *GOVSIZ, LEGAL, SM, TRADE* and *REGCRED*.

[12] Obtained by multiplying the marginal effects at the three level of EF reported in Table 2 by the standard deviation of UNDERVAL (=0.4574) and divided by 5, the time gap in our panel estimate.

[13] $DFITS = r_j\sqrt{h_j/(1-h_j)}$ where r_j is a studentised residual given by $r_j = e_j/(s_{(j)}\sqrt{1-h_j})$ with $s_{(j)}$ and s are the root mean square error(s) of the regression equation with jth observation removed, and h is the leverage statistic (Belsley *et al*., 1980; Azman-Saini *et al*., 2010; Naseem *et al*., 2015). The test flags any observation as outliers when the DFITS statistic is greater than $2\sqrt{(k/n)}$, with k, the number of independent variables, and n is the number of countries.

Table 3A. Robust analysis: Sub-sample analysis and alternative measure

	Model 1 Alternative measure: real exchange rate (unadjusted for Balassa-Samuelson effect)	Model 2 Excluding Outliers	Model 3 Excluding Oil-exporting Countries
Constant	1.1291 [a]	0.0461 [a]	0.0910
	(0.2014)	(0.2724)	(0.1730)
Initial Income (log)	0.8032 [a]	0.9524 [a]	0.9523 [a]
	(0.0214)	(0.0316)	(0.0207)
Population growth	–0.0459 [a]	–0.0501 [b]	–0.0160
	(0.0139)	(0.0159)	(0.0182)
Investment ratio	0.0060 [a]	0.0020	0.0024
	(0.0013)	(0.0015)	(0.0015)
Schooling	0.1317 [a]	0.0596 [b]	0.0813 [a]
	(0.0270)	(0.0258)	(0.0205)
Real exchange rate undervaluation (UNDERVAL)	–0.1257	0.1536 [a]	0.0914 [a]
	(0.1015)	(0.0477)	(0.0305)
Economic Freedom (EF)	0.0575 [c]	0.0605 [a]	0.0440 [a]
	(0.0299)	(0.0165)	(0.0156)
UNDERVAL × EF	0.0469 [b]	0.1348 [a]	0.1601 [a]
	(0.0216)	(0.0357)	(0.0334)
Time dummies	Yes	Yes	Yes
AR(2) Test (*p*-value)	0.724	0.858	0.400
Hansen *J*-test (*p*-value)	0.245	0.105	0.110
Difference-in-Hansen Test (*p*-value)	0.524	0.318	0.105
Number of Instruments	49	49	49
Country/Observation	83/572	80/553	78/539

Note: See Table 2. [a] , [b] and [c] indicate significance level at 1%, 5% and 10% respectively.

Table 3B. Robust analysis: Additional controls

	Model 4	Model 5	Model 6	Model 7
Constant	0.2518 [b]	–0.0367 [a]	–0.0446 [a]	0.4287 [a]
	(0.1161)	(0.1162)	(0.0924)	(0.096)
Initial Income (log)	0.9242 [a]	0.9355 [a]	0.9348 [a]	0.9013 [a]
	(0.0177)	(0.0176)	(0.0172)	(0.0146)
Population growth	–0.0429 [a]	–0.0223 [b]	–0.0171 [b]	–0.0275 [a]
	(0.0127)	(0.0097)	(0.0077)	(0.007)
Investment ratio	0.0028 [c]	0.0053 [a]	0.0049 [a]	0.0036 [a]
	(0.0014)	(0.0014)	(0.0012)	(0.0007)
Schooling	0.0758 [a]	0.0763 [a]	0.0848 [a]	0.0887 [a]
	(0.0185)	(0.0181)	(0.0165)	(0.0136)

Table 3B (Cont.)

UNDERVAL	0.1026 [a]	0.1046 [a]	0.1031 [a]	0.0691 [a]
	(0.0219)	(0.0184)	(0.0187)	(0.0108)
EF	0.0674 [a]	0.0654 [a]	0.0716 [a]	0.0422[a]
	(0.0152)	(0.0138)	(0.0136)	(0.0092)
UNDERVAL × EF	0.1185 [a]	0.1081 [a]	0.1052 [a]	0.0762 [a]
	(0.0216)	(0.0193)	(0.0187)	(0.0153)
Inflation	–0.0002 [a]	–0.00011 [a]	–0.00009 [a]	–0.00008 [a]
	(0.00002)	(0.00001)	(0.00001)	(0.00001)
Government expenditure ratio (GOV)		0.0086 [a]	0.0079 [a]	0.0021
		(0.0025)	(0.002)	(0.0017)
Trade openness (OPEN)			–0.0003	–0.00006
			(0.0004)	(0.0002)
Democracy				0.0140 [a]
				(0.003)
Time dummies	Yes	Yes	Yes	Yes
AR(2) Test (p-value)	0.322	0.285	0.287	0.824
Hansen *J*-test (*p*-value)	0.238	0.403	0.469	0.261
Difference-in-Hansen Test (*p*-value)	0.172	0.217	0.412	0.917
Number of Instruments	55	61	67	73
Country/Observation	83/572	83/572	83/572	77/533

Note: See Table 2. UNDERVAL: Real exchange rate undervaluation; EF: Economic Freedom. [a], [b] and [c] indicate significance level at 1%, 5% and 10% respectively.

Firstly, Table 3A reports the results using the alternative measure of UNDERVAL, and with outliers and oil-exporting countries removed.[14] All of the specifications appear to be well-specified. Clearly, the sign and significance of the coefficients on UNDERVAL, EF and their interaction terms remain intact when the alternative measure of UNDERVAL is used (Model 1), outlier countries are removed (Model 2) and oil-exporting countries are removed (Model 3). Thus, these results appear to replicate our main finding. Next, we further control for additional covariates. Table 3B reports the results. Again, all the models are well-specified and the sign and significance of the coefficients on the main variables remain intact (Model 4-7). When inflation is added (Model 4-7) it is negative and highly significant and highly robust supporting recent studies (e.g. Baharumshah *et al*., 2016) that found low and stable inflation to be a crucial ingredient supporting long-run economic growth. Other control variables such as government expenditure and trade openness are not robustly influencing growth while democracy promotes growth.

[14] The DFIT test suggests El Salvador, United Arab Emirate (UAE), and Democratic Republic of Congo, as outliers which were excluded from the sample. For oil-exporting countries, we excluded Bahrain, Gabon, Iran, Kuwait, and the United Arab Emirates (UAE), see Mankiw *et al*. (1992).

Table 3C. Sub-components of EF

	EF: Government Size (GOVSIZ)	EF: Legal structure and security of property rights (LEGAL)	EF: Access to sound money (SM)	EF: Freedom to trade internationally (TRADE)	EF: Regulation of credit, labor, and business (REGCRED)
Constant	0.4428 [b]	0.4522 [a]	0.5240 [a]	0.5097 [a]	1.1291 [a]
	(0.1749)	(0.1399)	(0.1903)	(0.1331)	(0.2014)
Initial Income (log)	0.9801 [a]	0.9232 [a]	0.9119 [a]	0.9797 [a]	0.8032 [a]
	(0.0237)	(0.0187)	(0.0206)	(0.0189)	(0.0214)
Population growth	−0.0336 [b]	−0.0570 [a]	−0.0687 [a]	−0.0111	−0.0459 [a]
	(0.0134)	(0.0181)	(0.0144)	(0.0092)	(0.0139)
Investment ratio	0.0076 [a]	0.0074 [a]	0.0064 [a]	0.0036 [c]	0.0060 [a]
	(0.0015)	(0.0013)	(0.0015)	(0.0021)	(0.0013)
Schooling	0.028	0.0361 [c]	0.0513 [b]	0.0714 [a]	0.1317 [a]
	(0.0231)	(0.0181)	(0.0221)	(0.0184)	(0.027)
Real exchange rate undervaluation (UNDERVAL)	−0.0426	0.107	0.1664 [c]	−0.4840 [a]	−0.1257
	(0.0593)	(0.0311)	(0.0957)	(0.08)	(0.1015)
Economic freedom (EF)	−0.0622 [a]	0.0412 [a]	0.0314 [c]	−0.1013 [a]	0.0575 [c]
	(0.0146)	(0.0152)	(0.0174)	(0.0239)	(0.0299)
UNDERVAL × EF	0.0153 [c]	−0.0193 [b]	−0.0175	0.1297 [a]	0.0469 [b]
	(0.0085)	(0.0096)	(0.0162)	(0.0174)	(0.0216)
Marginal effects of UNDERVAL at minimum EF	−0.0283	0.0839 [a]	-	−0.2570 [a]	−0 0.0093
	(0.0516)	(0.0217)		(0.0515)	(0.0512)
Marginal effects of UNDERVAL at mean EF	0.0462 [b]	0 0.0159	-	0.2590 [a]	0.1252 [a]
	(0.0178)	(0 0.0231)		(0.0328)	(0.0298)
Marginal effects of UNDERVAL at max EF	0.1100 [a]	−0.0763	-	0.8116 [a]	0.2871 [a]
	(0.0326)	(0.0654)		(0.1006)	(0.0947)
Time dummies	Yes	Yes	Yes	Yes	Yes
AR(2) Test (*p*-value)	0.542	0.846	0.584	0.834	0.724
Hansen *J*-test (*p*-value)	0.116	0.101	0.203	0.469	0.245
Difference-in-Hansen Test (*p*-value)	0.379	0.452	0.126	0.237	0.524
Number of Instruments	49	49	49	49	49
Country/ Observation	83/572	83/570	83/572	82/565	83/570

Note: See Table 2. [a], [b] and [c] indicate significance level at 1%, 5% and 10% respectively.

Finally, we further examine the contingency roles of each component of EF on the growth effects of real exchange rate undervaluation. The results are reported in Table 3C. First and foremost, all of the five specifications pass all of the tests making them well-specified. The results show that the interaction terms between UNDERVAL and the sound money index (SM) are not significant (column 3) while the interaction with LEGAL is negative and statistically significant (column 2). Further evaluation on the later finding at the three levels of LEGAL reveals that the marginal effect of UNDERVAL is positive and significant at the 1% level at the minimum level of LEGAL but disappear when LEGAL is improved towards the mean and maximum levels. Thus, the (aggregate) main results are robust in three out of five components of EF reflecting government size (GOVSIZ), column 1, freedom to trade internally (TRADE), column 4, and regulation of credit, labour, and business (REGCRED), column 5, since their interaction terms with each component of EF are positive and significant at the conventional levels. These show that the marginal growth effects of exchange rate undervaluation are enhanced along with the improvements in the quality of fiscal institutions, institutions that function to promote international trade, and regulatory institutions that promote productive private economic activities. These findings indeed extend further support to the 'embedded' institutional framework advocated by North (1990), Acemoglu *et al*. (2001, 2003, 2005), Rodrik *et al*. (2004) and Rodrik (2008), among others, that the underlying institutional setting embedded in developing countries is fundamental not only directly to influence growth but also, and perhaps more importantly as we show here in this paper, to translating policy variables including exchange rate undervaluation into higher growth in developing countries that are usually embedded with weak institutions.

CONCLUDING REMARK

The effects of the misalignment of currencies on growth are hotly debated with conflicting views: 'the bad' and 'the good' views for growth. Much empirical evidence points towards overvaluation hurting growth while undervaluation helps growth (Rodrik, 2008). While "the bad" view argues toward 'getting policy right', recent "the good" views argue that embedded institutional infrastructure plays a crucial role in making macroeconomic policy effective in promoting growth in the long-run (Acemoglu *et al*., 2003; Easterly and Levine, 2003; Easterly, 2005; Rodrik, 2008), i.e. 'getting policy right' should be complemented with 'getting institutions right' (see also Rodrik, 2006, p. 978; IMF, 2003, p. 107-108). This view relies on the statistical evidence that shows that policy variables (inflation, trade policies, and real exchange rate overvaluation) lose statistical power in explaining growth when institutions are also controlled for. However, the literature seems to be silent on whether the data supports institutions-policy complementarities (Slesman, 2014; Emara, 2012). In this study, we have provided new evidence to complement the literature on the complementarities (interaction) between institutions and the RER in influencing economic growth in the context of developing countries.

Thus, this paper fills the gap by examining the contingency effect of economic freedom on the nexus of the exchange rate and economic growth in a relatively homogenous panel of 83 emerging markets and developing countries during the period 1976-2010. Based on

system GMM that controls for the endogeneity of exchange rate undervaluation, economic freedom as well as their interaction terms and all other control variables; and weakness and proliferation of instruments, the results reveal that the institutions-policy complementarities view is supported by the data for developing countries. Particularly, the marginal growth effects of exchange rate undervaluation are enhanced when there is an improvement in the level of economic freedom (quality of market-supporting institutions) from the lowest to the highest level. This finding sheds additional light on the importance of institutions in facilitating the growth effects of exchange rate policy. The policy implications that can be derived are that policymakers in developing countries should be pragmatic in seeking for institutional reforms to increase the level of economic freedom because such effort can increase growth dividends from exchange rate undervaluation policy. For example, the higher the level of economic freedom (through better protection of property rights, law enforcement and good quality of regulatory institutions) would provide an environment that promotes incentive structures for economic agents to undertake productive economic activities, such as accumulating physical and human capital and to pursue technologically upgrading innovation (North, 1990). Such an environment would consequently lower the transaction costs, minimise market failures and improve the profitability of the tradable sectors which in turn further boosts the effectiveness of real exchange rate undervaluation policy, hence accelerating growth in the long-run. Our results further suggest some key areas for reforms namely fiscal and regulatory institutions as well as institutional arrangements promoting trade. For instance, a lower tax rate system to promote private incentives for investment and productive effort, less burdensome regulatory arrangements on business, labour and credit and other institutional arrangements (e.g. a lower tariff system) that promote international commerce (see Justesen, 2008) would complement and enhance the growth benefit of an exchange rate undervaluation policy that seeks to relatively promote profitability in the tradable sectors in developing countries.

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