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Market-Supporting Institutions, Institutional Complementarities and Economic Growth: New Evidence on the Nonlinear Relationship

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Abstract

Recent existing literature overwhelmingly focuses on direct effects of "cluster" institutions on growth largely ignoring the indirect or indexing role of institutions and the interaction effects between different dimensions of institutional matrix in influencing long-run growth process. One contention suggests different domains of institutions are inter-related in equilibrium whole, with any changes in one domain may influence the rest of domains—the so-called "institutional complementarity hypothesis". This study aims to empirically examine this hypothesis based on the sample of 93 developed, emerging market and developing countries over 1980-2010 periods using novel threshold regression framework. Using Rodrik's (2000, 2005) conceptualization to unbundle market-supporting institutions (MSI) into market-creating (MCI), market-regulating (MREGI), market-stabilizing (MSTABI) and market-legitimizing (MLEGI) institutions, this paper investigates whether countries belong to regime with high MCI quality have efficiently transformed Solow-Mankiw-Romer-Weil (Solow-MRW) growth determinants, MREGI, MSTABI, and MLEGI into higher growth compare with low quality MCI regime. The finding reveals that countries obtaining MCI quality above an estimated optimum threshold value (i.e. high-MCI regime) can transform Solow-MRW growth determinants and MREGI into higher growth than those falls below (i.e. low-MCI group). It finds weak support for MSTABI and no support for MLEGI that they each matter differently in low- and high-MCI regime. These findings are invariant to extensive robust tests. One important policy implication is that poor countries can have high productivity gains from factor inputs and efficient functioning of regulatory institutions from sufficient improvement in the quality of MCI.

Keywords: Market-creating institutions, market-regulating institutions, market-stabilizing intuitions, market-legitimizing institutions, economic growth, nonlinearity, threshold model

1. INTRODUCTION

This study aims at addressing direct and indirect channels through which institutions influence economic growth. Particularly, it deals with the possibility of the existence of multiple institutional regimes conditioning the growth process. North (1990) observes that strong institutional countries involve a relatively different organization of productions than countries with weak institutions. For instance, countries having weak institutions, among others, are usually associated with weak protection of property rights and contract enforcement, short term contracts, high corruption and rent-seeking activities, low investments, and obsolete and backward technologies.

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Furthermore, recent growth models predict that institutions can trap economies in less optimum equilibria, i.e. institutional non-convergence traps, by blocking their transition towards a better, new equilibrium characterized by advance technology and high growth path. In addition, institutions are multidimensional, implying that a weak core institutional dimension that traps economies in low growth path will also influence the *functions* of other lower order institutional dimensions within the trap, through institutional complementarities. For instance, weak institutions protecting property rights and enforcing contracts imply low-constraints (as an intervening factor) leading to weak regulatory institutions. In contrary to these observations and theoretical postulations, overwhelming empirical studies usually treat institutions directly in their influence on economic growth. The literature largely ignores the possibility of different institutions-induced growth regimes. The natural question arises here whether productivity of growth determinants differs in countries with low and high quality institutional settings. In other words, can different institutional infrastructures produce different growth equilibria characterizing various groups of countries?

Few empirical studies have documented the indirect linkages (e.g., Acemoglu et al., 2005; Aidt et al., 2008) and shows that growth process is far from linear (Flachaire et al., 2014). Therefore, it is highly imperative to examine the indirect channels by allowing institutions to index growth process in order to better capture the dynamics of institutions-growth linkages. This study argues that institutions work dynamically in a more indirect manner towards growth, functioning as a kind of the underlying third factor, conditioning the productivity of the growth determinants. This line of argument is based on a recent model of appropriate growth institutions by Acemoglu et al. (2006) and Aghion and Howitt (2009), based on distance to technological frontier, predicts that weak institutional quality can block and trap countries' transiting from one inappropriate growth arrangement (i.e. investment-based growth strategy) to a better equilibrium (i.e. innovation-based growth strategy) in the long run as the economy moves closer to the technological frontier. The so-called institutional non-convergence trap, associated with backward technologies and low growth path, can arise when investment-based strategy enriches and creates its own followers and when their economic power (*de facto* power) buys political power (*de jure* power), making it more difficult to reverse the institutional arrangement that has an economically and politically powerful constituency (Acemoglu et al., 2006). Thus, different institutional regimes generate different growth paths for the economy.

In this study, we investigate on the institutional induced growth regimes mediating growth effects of conventional human-capital-augmented-Solow growth determinants (see Mankiw et al., 1992) and complements the other dimensions of institutions supporting market economy in its influence on growth (i.e. parameter heterogeneity). Although, the existence of different growth regimes (e.g. parameter heterogeneity) based on various indexing factors such as stages of development, education, level of financial market development, and trade have been empirically documented in the growth literature (Azariadis and Drazen, 1990; Durlauf and Johnson, 1995; Papageorgiou, 2002; Masanjala and Papageorgiou, 2004; Alfaro et al., 2004, 2010; Durham, 2004; Azaman-Saini et al., 2010b). It appears that institutions have not been given their rightful role as a leveraging variable despite the facts that institutions are deep-rooted factors underlying the socio-political and economic fabric of a country.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

One crucial issue is that institutions are multi-dimensional but the literature has not paid much attention to the relative important of different dimensions of embedded 'cluster' institutional matrix supporting the economy (see a recent survey by Lloyd and Lee, 2016). We rely on Rodrik (2000, 2005) to conceptually unbundled broad cluster institutions into four component market-supporting institutions (MSI) that *function* to create a market (market-creating institutions, MCI), regulate the market (market-regulating institutions, MREGI), stabilize the market (market-stabilizing institutions, MSTABI) and legitimize the existence of market (market-legitimizing institutions, MLEGI).

In this study we argue that MCI is a core component of MSI because without markets either do not exist or poorly function (Rodrik, 2005; Bhattacharyya, 2009). MCI are the institutions that function to protect property rights and ensures contract enforcement. The property rights component is for regulating the relationship between ordinary citizens or owners of private properties and government and/or powerful elites (i.e. vertical relationships) while contracting enforcement component regulates the transactions between private parties such as creditors and debtors (i.e. horizontal relationship) (see Acemoglu and Johnson (2005) on this further classification). Thus, the rule of law (written law and/or social customs and norms that define how property can be legally acquired) and its enforcement, constraints on executive powers, independent judiciary, for instance, are measures devised to protect ownership of private properties from public or private predatory behaviors (Asoni, 2008). These are a cluster of property rights and contract institutions (Acemoglu and Johnson, 2005; Acemoglu et al., 2005). Market-

creating institutions are the underlying core institutions since without them markets either do not exist or perform very poorly (Rodrik, 2005; Bhattacharyya, 2009).

Furthermore, Rodrik (2005) noted that economic growth and development are dynamically complicated processes; therefore institutions that support such process also need to better reflect more than just institutions that protect property rights and enforce contracts, i.e. market-creating institutions. Although such institutions are a necessity for the existence and better functioning of the market economy, they are insufficient to sustain it. In this regard, it is also crucial to consider other complementary dimensions of market supporting institutions in promoting long-run economic growth by sustaining better and efficient functioning of the markets. Market-regulating institutions is one of such institutions that function to provide regulatory frameworks, such as for goods, services, labor, assets and financial markets, in order to prevent various market failures and to sustain the growth momentum in the long-run (Rodrik, 2000; Bhattacharyya, 2009). Market-stabilizing institutions manage and insulate various macroeconomic shocks that inevitably hit the economy, for instance financial crisis, macroeconomic volatility and other cyclical fluctuations. And finally, market-legitimizing institutions function to deal with social conflicts, provide social protection and redistribution to those negatively affected by various economic backdrops.

Well-functioning markets are always embedded within broader mechanisms of collective governance (Rodrik, 2011). Thus, it is intuitively expected that various institutional dimensions interact with one another in influencing economic growth. Aoki (2001), Amble (2000) and Boyer (2005) argue that there are strategic linkages and complementarities across different domain of institutions which together form part and parcel of the inter-related equilibrium whole, as any change in one domain will influence others. Furthermore, in essence, the Acemoglu's et al. (2005) and Acemoglu-Robinson's (2000) theoretical framework on the emergence and persistence of economic institutions rests on *constraints* that emerge to check and balance the power structure of elites and powerful interest groups so that institutions that protect private property rights across a broad section of people may prevail and persist.

Building on this theoretical argument and connecting it to other dimensions of market-supporting institutions, it is clear that unconstrained authoritative powers whether *de jure* or *de facto* imply that Rodrik's market-regulating, market-stabilizing and market-legitimizing institutions may also be unable to function effectively in promoting growth. Thus, the existence of institutional non-convergence trap predicted by Aghion and Howitt (2009) and Acemoglu et al. (2006) and observed by North (1990) would also imply that those countries trapped in low growth path, defined by weak constraints (i.e. market-creating institutions) are also likely to have experienced weak qualities of market-regulating, market-stabilizing and market-legitimizing institutions, therefore, reinforcing the existence of low growth equilibrium.

3. BRIEF REVIEW OF THE LITERATURE

There is a huge empirical literature on *direct* effects of institutions on growth (Knack and Keefer, 1995; Hall and Jones, 1999; Rodrik et al., 2004; Acemoglu and Johnson, 2005; Bhattacharyya, 2009, among many others). Various proxies thought to reflect cluster or different dimensions of institutions were employed and found significantly related with income per capita growth. However, relatively less attention has been paid to the indirect effects of institutions on economic growth. A recent study by Aidt et al. (2008) showed that the corruption and growth linkages depend on political institutional regimes. Their empirical analysis revealed results confirming their theoretical prediction that corruption-growth links is nonlinear in the sense that the links depend on political institution regimes (level of political accountability). Using political institutions as instruments for economic institutions, Eicher and Leukert (2009) found institutions matter significantly for non-OECD countries than for OECD countries; the effect on the latter was just about one-third of the effect on that of the former. Thus, improvement in institutions may have mattered more for growth in emerging and developing countries than that of developed countries. Owen et al. (2009) using a finite mixture model found strong evidence that institutions (measured by ICRG's rule of law and order) indirectly affect growth process in defining the membership of countries into distinct growth process and productivity of growth determinants.

With this scarce empirical evidence the present study seeks to contribute to the existing literature by examining the indirect effects institutions influence growth process. Empirical studies overwhelmingly focus only on direct effects of institutions on economic performance despite theoretical predictions of mainly indirect growth-effects through growth determinants, including other *'second-order'* institutional dimensions. Though accumulated evidences suggest strong robust positive direct institution-growth linkages, we are still far from understanding the dynamic interaction process between institutions and growth determinants in producing particular economic outcomes we observe, e.g. despite starting with similar initials, some economies are trapped in low growth and

stagnation while others take-off in higher sustained growth and become resilient towards various socio-economic shocks. There are also others who takeoff for a while to only stagnate or collapse later when the shocks hit. This study is an attempt to fill this gap.

4. MODEL SPECIFICATION AND METHODOLOGY

Consider the following nonlinear growth equation specification:

$$\ln y_{i,t} - \ln y_{i0} = \begin{cases} a - \tau_{low}\ln y_{i0} + \omega_{0low}\ln OMSI_i + \omega_{1low}\ln s_{ki} + \omega_{2low}\ln s_{hi} \\ \quad - \omega_{3low}\ln(\delta + g + n_i) + \varepsilon_i \; MCI_i \leq \gamma \\ a - \tau_{high}\ln y_{i0} + \omega_{0high}\ln OMSI_i + \omega_{1high}\ln s_{ki} + \omega_{2high}\ln s_{hi} \\ \quad - \omega_{3high}\ln(\delta + g + n_i) + \varepsilon_i \; MCI_i > \gamma \end{cases} \qquad \text{Eq. (1)}$$

Eq. (1) is estimated using the threshold estimation technique developed by Hansen (2000) for the cross-sectional data to capture threshold effects of market-creating institutions (MCI) on the growth-effects of human-capital-augmented-Solow growth determinants and other market-supporting institutions (OMSI) dimensions, i.e. MREGI, MSTABI, and MLEGI. This estimation method is more flexible in that it allows the data to endogenously search for the optimum threshold levels so as to be able to split the countries into high- and low-MCI induced growth regimes rather than assume a priori by grouping countries into both MCI groups. In addition, the splits are based on statistical inference with the validities and properties established in Hansen (1996).

Other variables are physical capital, $\ln s_{ki}$; human capital, $\ln s_{hi}$. ε_i is error term, independently and identically distributed with mean zero and finite variant, σ^2. The countries forming the sample are split into two regimes depending on whether market-creating institutions (MCI_i) fall below or surpass the threshold value γ, which is to be estimated. TR model of Eq. (1) allows the effects of growth determinants and MREGI on long-run growth to be distinguished, based on differing regression slopes ω_{low} and ω_{high} for countries in low and high *MCI* regimes respectively. The major objective here is to determine the threshold level $\hat{\gamma}$ and then estimate the slope coefficients ω_{low} and ω_{high} . All of these are carried out step by step.

First, since γ is unknown, to determine it, Hansen (2000) suggests that Eq. (1) be experimented with all possible values of γ through the grid search approach, and the estimated $\hat{\gamma}$ is the one that minimizes residual sum of squares computed across all of its possible values. Next, after $\hat{\gamma}$ has been identified, the estimated slope parameters are obtained simply as $\hat{\omega}(\hat{\gamma})$. Next, for inference purposes, there is a need to test the significance of threshold parameter γ on the null that $\omega_{low} = \omega_{high}$ (i.e. no MCI-induced regime specific or no threshold effects). But γ is not identified under the null within standard distribution, thus a model-based bootstrap is used instead, with validities and properties established as in Hansen (1996), to simulate the asymptotic distribution of the likelihood ratio test, i.e. the *F* or *LM* test. It is given as:

$$F_1 = \frac{(S_0 - S_1(\hat{\gamma}))}{\hat{\sigma}^2}$$

where S_0 is the residual sum of square (RSS) obtained from estimating modified Eq. (1) under the null of no threshold; S_1 is the RSS obtained from estimating modified Eq. (1) under the null of existing of (all possible) threshold values, and $\hat{\sigma}^2$ is the residual variance of *TR* model of Eq. (1). If the bootstrap estimate of the asymptotic *p*-value for F_1 test under the null of $\omega_{low} = \omega_{high}$ is smaller than the desirable critical value, the null of no threshold effect is rejected.

When the existence of a threshold effect ($\omega_{low} \neq \omega_{high}$) has been identified, Hansen (2000) proposes that we proceed to construct the confidence interval of $\hat{\gamma}$ using the likelihood ratio test given as:

$$LR_1(\gamma_0) = \frac{(S_1(\gamma_0) - S_1(\hat{\gamma}))}{\hat{\sigma}^2}$$

But the standard LR test statistic is not applicable as it does not have a standard χ^2 distribution. Hansen (2000) has derived the correct distribution function and tabulated the appropriate asymptotic critical values, e.g. 5.94 (at 10%), 7.35 (at 5%) and 10.59 (at 1%). The no-rejection region of confidence interval $(1 - \alpha)$ for γ is formed with the set of values of γ such that $LR_1(\gamma) \leq$ critical value.

4.1 Measurement and Data

This study employed a sample of 93 advanced economies, emerging markets and developing countries over the period 1980 to 2010. The sample is restricted by the data on quality of market supporting institutions and control

variables (Appendix D provides detailed definitions and sources of data for each variable). The focus of this study is on medium- and long-run economic growth rather than the business cycle and other short-term fluctuations. Thus, the data were averaged over the 1980-2010 period. Except the dependent variable, which was measured as the log difference of real GDP per capita (weighted chained series, measured in PPP constant 2005 international dollars) between 1980 and 2010, and the corresponding initial income per capita would be the log of real GDP per capita in 1980. These real GDP per capita data are taken from the Penn World Table 7.1 (PWT). The following independent variables are averaged over the entire period, namely population growth rate which was extracted from the World Development Indicator (WDI); real investment ratio was taken from PWT; secondary schooling was taken from Barro and Lee (2013) as proxy for human capital; and the measures of qualities of MSI, MCI, MREGI, MSTABI and MLEGI were drawn from various sources.

This study adopted Rodrik's (2000, 2005) MSI conceptualization that distinguishes four distinct components: the core MCI, MREGI, MSTABI and MLEGI, and to proxy for each of these components, this study follows Bhattacharyya (2009). The fundamental market-creating institutions (MCI) is proxy by the index of rule of law and order provided by international country risk guide (ICRG) of political risk service groups; market-regulating institutions (MREGI) is proxy by index of regulation of credit, labor and business of the Fraser Institute's economic freedom index (EF); market-stabilizing institutions (MSTABI) is proxy by sound money index of EF; and finally, following Rodrik (1999) and Bhattacharyya (2009), market-legitimizing institutions is proxy by democracy index of Polity IV of the Centre for International Development and Conflict Managements, University of Maryland. All these institutional measures are scaled from 0 to 10; lower score means lower quality. All variables are converted into natural logarithmic value except the measure of MCI. The summary statistics is reported in Table 1.

Table 1. Summary statistics

	DLY	*LY80*	*LNGD*	LS_k	LS_h	*LMREGI*	*LMSTABI*	*LMLEGI*	*MCI*
Mean	0.453	8.582	1.880	3.093	0.544	1.803	2.023	1.555	6.307
Minimum	–0.598	6.295	0.157	2.042	–1.781	1.324	1.549	–1.642	1.65
Maximum	2.396	10.597	1.503	3.873	1.670	2.109	2.269	2.303	10
Std. Deviation	0.447	1.146	2.222	0.316	0.706	0.150	0174	0.871	2.236
Observation	93	93	93	93	93	93	93	93	93

Note: All the variables are in natural logarithm, except MCI.

Table 2. Threshold regression: *MCI* regimes and role of institutional complementarities

	Dependent Variable: Log Different Real GDP per Capita 1980–2010					
	Equation 1a		Equation 1b		Equation 1c	
	Low-*MCI* ($MCI \leq \gamma$)	High-*MCI* ($MCI > \gamma$)	Low-*MCI* ($MCI \leq \gamma$)	High-*MCI* ($MCI > \gamma$)	Low-*MCI* ($MCI \leq \gamma$)	High-*MCI* ($MCI > \gamma$)
Constant	3.872***	2.810*	4.224***	2.354	4.796***	3.047**
	(1.561)	(1.448)	(1.270)	(1.714)	(1.459)	(1.484)
ln $y80$	−0.216***	−0.421**	−0.223***	−0.419***	−0.228***	−0.380***
	(0.072)	(0.111)	(0.072)	(0.114)	(0.063)	(0.118)
ln $(n+g+\delta)$	−1.675***	−0.622**	−1.795***	−0.537**	−1.693***	−0.583**
	(0.479)	(0.256)	(0.503)	(0.256)	(0.564)	(0.281)
ln (s_k)	0.166	0.479**	0.181	0.443**	0.165	0.549***
	(0.183)	(0.190)	(0.166)	(0.205)	(0.180)	(0.193)
ln (s_h)	0.087	0.355***	0.085	0.322**	0.112	0.348**
	(0.131)	(0.130)	(0.127)	(0.125)	(0.121)	(0.137)
ln $(MREGI)$	0.484	0.542**				
	(0.450)	(0.245)				
ln $(MSTABI)$			0.382	0.681		
			(0.313)	(0.531)		
ln $(MLEGI)$					0.037	0.053
					(0.090)	(0.082)
Implied λ	0.00812	0.0182	0.00842	0.01812	0.00862	0.01593
R^2	0.3370	0.555	0.3402	0.5555	0.3276	0.5279
Countries	44	49	44	49	44	49
Threshold estimate $\hat{\gamma}$	5.83056		5.83056		5.83056	
95% confidence interval	[5.2667, 6.4611]		[5.2667, 6.5444]		[4.4833, 6.5444]	
LM-test for no threshold	37.3182		33.2755		34.9501	
Bootstrapped *p*-value	0.0030		0.0100		0.0040	

Note: *p*-value was bootstrapped with 1000 replications and 10% trimming percentage. Standard errors (s.e) are White corrected for heteroskedasticity. *, **, *** indicate significance at the 10%, 5%, 1% level respectively.

5. EMPIRICAL RESULTS AND DISCUSSION

Table 2 reports the main results on the institutional indexing nonlinear effects of human-capital-augmented-Solow type growth determinants, MREGI, MSTABI and MLEGI on economic growth. With the indicator of MCI qualities, i.e. ICRG's rule of law and order, acting as a regime-switcher threshold variable, results show that the null of no threshold effect can easily be rejected at 5% level or better as indicated by bootstrapped *p*-value with 1000 replications and a 10% trimming percentage. The model endogenously determine the threshold level of MCI at 5.83056 (the level of Ecuador), which is slightly below the sample mean of 6.3067. Countries scoring MCI qualities below these estimated threshold scores would be categorized as low-MCI regime while those who surpass this threshold value are characterized as high-MCI regime. Thus, there exist two growth regimes define by the level of core institutional infrastructure, i.e. MCI, confirming both theoretical and empirical arguments put forward by North (1990), Acemoglu et al. (2006) and Aghion and Howard (2009). This also confirms the work of Owen et al. (2009) who show that MCI is the most important variable in predicting countries' different classes of growth process.

Overall, all the variables in both MCI regimes have the correct sign and the magnitude effects, especially those of the high-MCI regime, are well in line with standard results reported in the literature (MRW, 1992; Islam, 1995; Masanjala and Papageorgiou, 2004; Ishise and Sawada, 2009, Aidt et al., 2008; Owen et al., 2009). Furthermore, in terms of overall fit, generally the institution-augmented empirical model specified in Eq.1a-1c can explain more than 50 percent of the variation in growth rate in high-MCI countries but can only account for slightly above 30 percent of the variation in low-MCI countries.

Furthermore, the results reveal that there exist differential growth effects between low-MCI and high-MCI regime with respect to human-capital-augmented-Solow growth determinants, MREGI, MSTABI, and MLEGI. Firstly, from Eq.1a to 1c, the results generally show that the coefficient on log of initial income per capita in 1980 is highly significant at 5% or better with bigger negative magnitude recorded in high-MCI compared to low-MCI regime. These imply that conditional convergent speed (λ) in high-MCI (λ ranges from 1.593% to 1.822%) is faster than those experienced in low-MCI regime (λ ranges from 0.812% and 0.862%). This speed of convergence especially for high-MCI regime is similar to the one obtained by MRW (1992) and Ishise and Sawada (2009). Thus, countries with MCI surpassing an optimum score converge faster to their group steady state income than those which fall below the threshold score. Furthermore, the negative growth effect due to population growth was also found to be lower in high-MCI relative to low-MCI regimes. In addition, the results show that physical and human capitals are statistically significant at the 5% level or better only in countries belonging to high-MCI regime while those recorded in low-MCI regime are not statistically significant different from zero. Further, the magnitude effects in high-MCI are double (for physical capital) and triple (human capital) the ones reported in low-MCI regimes.

Turning to the outer-layer MSI-components, the results show some evidences of complementarity effect between MCI and MREGI on economic growth. Though coefficient assessments on MREGI (Eq. 1a), MSTABI (Eq. 1b) and MLEGI (Eq. 1c) in both regimes reveal that high-MCI regimes tend to record higher positive magnitude growth effects of these institutions relative to low-MCI regimes, results only show that MREGI, in high-MCI regime, is significant at 5%. This implies that countries' score on the qualities of MCI above the threshold score is better or that there exists adequate checks and balance constraining powerful elites (*de jure* power holders) and interest groups (*de facto* power holders) from expropriation and opportunistic behaviors which translate into better functioning of institutions regulating markets (MREGI) and hence growth. However, this is not the case in low-MCI regime. Thus, this finding confirms "institutional complementarities hypothesis" that various market supporting institutions are not independent but complement one another. This is precisely the case here in which low-MCI regime breeds dysfunctional MREGI such as being a tool for expropriation or to stifle competitions, thus dampening its influence on long-run economic growth. This confirms recent studies such as that of Aidt et al. (2008) who theoretically and empirically show that there are two distinct political institution regimes, low-political accountability and high-political accountability regimes, defining the effect of corruption on growth. Furthermore, our finding also extend Owen et al. (2009) that core MCI not only leverages the effects of accumulated factors of production but also influences the functioning of other dimensions of deep institution variables in the growth process.

A more intuitive explanation can be made from the following experiments. Take for instance the case of Argentina, one of the countries in the high-MCI regime with lowest MREGI quality (5.85). If it were to improve its MREGI quality to that of Netherland or Denmark, the highest scorers on MREGI quality (10), its growth rate would have been 2.84% instead of 0.59% during the period 1980-2010. This is indeed quite a substantial effect. However, such effects are absent in low-MCI regime which implies that even as the Congo, Rep., the lowest scorer on

quality MREGI in this regime, or Ghana were to improve its MREGI to the level of Ecuador, the highest scorer on MREGI quality in the group, it would not make any difference on its long-term growth.

Aidt et al. (2008) found similar increase in growth effect of lowering corruption, within a high-quality political institution regime, in that if the worst corrupt country in the regime (Brazil) were to reduce corruption to the level of the least corrupt country (Denmark). This intuitive underscores the importance of institutional complementarities with which core institutions need to pass above a minimum critical threshold level before other institutional dimensions can have a desirable and beneficial function in promoting long-run growth.

Thus weak institutions appear to be critical bottlenecks that trap countries in low-growth paths. This finding indeed accords with the "institutions induced non-convergence trap" theoretical prediction: older institutional arrangements supporting *investment-based growth strategy*, which were appropriate at the earlier stage of development become costly as economy moves closer to technological frontiers, entrenching its own followers and making it difficult to change or reverse (see Acemoglu and Robinson, 2000). There is a "threshold distance to the technological frontiers" that economies need to switch into a new strategy, i.e. *innovation-based growth strategy*, which exploits innovation opportunities to drive growth. Failure to reverse institutional and policy arrangements into the ones supporting this new strategy when reaching the threshold, would trap the economy in a non-convergence trap with "inappropriate institutions" characterized by backward technology and low-growth path (see Acemoglu et al., 2006; Aghion and Howard, 2009).

Lee and Kim (2009) argued that institutions is one of the bottlenecks responsible for the so-called "middle income trap" facing emerging market economies especially that of East Asian economies. These results square well with their interpretation. For example, despite similar initial conditions, e.g. income per capita, some East Asian economies such as Indonesia, Philippines and other emerging economies (which are found to belong to low-MCI regime) fail to move into the high-income group while their peers like South Korea and Singapore (which belong to the high-MCI regime) successfully move into high-income status.

In sum, this study observes that there exists two-MCI regime-induced growth process: For countries in the high-MCI regime, the investments in physical and human capitals and the improvement in the quality of MREGI have contributed to higher long-run growth but such effects seem to be absent in countries belonging to low-MCI regimes. Are these findings robust? Among other problems, one major concern in the institutions-growth literature is the endogeneity problems. This and other problems are taken up in the Robust Checks sub-section below.

5.1 Robust Checks

Table 3. Robust checks: Instrumental variable threshold regression

	Dependent Variable: Log Different Real GDP per Capita 1980–2010					
	Equation 2a		Equation 2b		Equation 2c	
	Low-*MCI* ($MCI \leq \gamma$)	High-*MCI* ($MCI > \gamma$)	Low-*MCI* ($MCI \leq \gamma$)	High-*MCI* ($MCI > \gamma$)	Low-*MCI* ($MCI \leq \gamma$)	High-*MCI* ($MCI > \gamma$)
ln $y80$	−0.0827	−0.3176***	−0.1406*	−0.3271***	−0.0773	−0.2458***
	(0.0841)	(0.0704)	(0.0729)	(0.1073)	(0.0668)	(0.0670)
ln $(n+g+\delta)$	−0.2697	−0.4874***	−0.4742	−0.4133**	−0.1926	−0.2580
	(0.4027)	(0.2283)	(0.4136)	(0.2076)	(0.2772)	(0.2463)
ln (s_k)	0.4562***	0.5621***	0.2356	0.6092***	0.3627**	0.8493***
	(0.1534)	(0.1887)	(0.1424)	(0.1675)	(0.1549)	(0.1219)
ln (s_h)	0.0953	0.3599***	0.1217	0.1822**	0.0761	0.0676
	(0.1205)	(0.1293)	(0.1113)	(0.0863)	(0.1173)	(0.0974)
ln $(MREGI)$	0.0512	1.3802***				
	(0.5772)	(0.3819)				
ln $(MSTABI)$			0.8182	1.0948*		
			(0.5959)	(0.5744)		
ln $(MLEGI)$					0.1238	0.3237
					(0.0934)	(0.2013)
Implied λ	0.00288	0.01274	0.00505	0.01321	0.00268	0.00940
Countries	39	54	44	49	48	45
Threshold estimate $\hat{\gamma}$	5.27778		5.83056		6.09444	
90% confidence interval	[4.8083, 6.8056]		[4.2944, 8.8389]		[5.8278, 6.8056]	

Note: The standard errors are in parenthesis. Log of population density in 1500s, absolute latitude, legal origin (British and France legal origin), and ethnic, religious, and language fragmentation were used as instruments in each respective regression. *, **, *** indicate significance at the 10%, 5%, 1% level respectively.

A number of robust checks on the main findings were conducted. First, the main results may be influenced by outliers that potentially blur the true relationships between the included variables. To check for this, we relied on DFITS test statistics from Belsley et al. (1980) to identify countries having high combination of leverage and residual. The test results (not reported) show China as the potential extreme outlier. The empirical results remained intact when China was removed from the sample (results available upon request). Furthermore, the results become even stronger when all potential outliers namely China, Guyana, Malawi, Jordan, Bahrain, Singapore, Syria, Togo and Uganda are removed (results available upon request).

Second, whether the significant threshold effects of MCI is sensitive to different trimming percentage and bootstrapped *p*-value was also checked with various replications. To do so, bootstrapped *p*-value with various replications (1000, 5000, and 10000) at various trimming percentage (10%, 15%, 20%, 25% and 30%) were recalculated. The resulting bootstrapped *p*-value strongly confirms that the null of no threshold is still rejected at 5% or better for the three equations (results available upon request).

Third and perhaps the most important concern is the endogeneity issue regarding the relationship between institutions (MREGI, MSTABI and MLEGI) and growth. Since one of the assumptions of Hansen's (2000) threshold regression methodology is that all the right-hand side variables are exogenous, and that we cannot rule out the possibility that better growth performance leads to the demand for reform on the quality of MREGI, MSTABI and MLEGI, in which case endogeneity issues may arise (see Acemoglu et al., 2001, 2002, 2005). To check for this, the present study relies on instrumental variable threshold regression (IVTR) developed by Caner and Hansen (2004) which allows for the right-hand side variables specifically MREGI, MSTABI, and MLEGI to be endogenous. The main aim is to remove endogeneity bias through the use of instrumental variables.

Table 3 above summarizes the result from the application of the Caner and Hansen's (2004) IVTR. Overall results on both magnitude effects and statistically significant coefficients, especially the high-MCI regime, remain virtually unchanged, albeit the threshold value of MCI is found to be marginally lower. One of the noticeable results that stand out for high-MCI regime when the endogeneity was corrected is that MREGI becomes highly significant and the magnitude effects more than double, and that MSTABI is now significant at 10% level while MLEGI remains insignificant. Similar as the main results for low-MCI regime, the effects of MREGI, MSTABI and MLEGI are found to be absent, while the share of physical capital in some cases becomes significant but the magnitude effects are much lower than the ones reported for high-MCI regime. All these attest well for the main results reported in Table 2.

Furthermore, we also adopted a dynamic panel data model on high- and low-MCI samples found in Table 2. Using generalized method of moments system (S-GMM) estimators which, besides controlling for country specific effects, are capable of correcting simultaneity bias on all right-hand side variables. The results also confirm that countries that score their way into high-MCI regime do indeed transform human-capital-augmented-Solow growth determinants and MREGI into higher growth compared with low-MCI ones (results available upon request). Finally, market supporting institutions (MSI) was allowed to be a regime switcher and address the overall role of MSI in inducing the differential growth effects of human-capital-augmented-Solow growth determinants. The results, both without and with an extreme outlier (China) removed and regardless of MSI being measured as first principle component or simple average, also are strongly in favor of an overall finding that countries possessing quality of MSI above a certain threshold transform human-capital-augmented-Solow growth determinants into high positive long-run growth while those falling below such threshold either record smaller or insignificant effects (results available upon request).

6. CONCLUDING REMARKS AND POLICY IMPLICATION

The shift of focus from mechanical to root causes of economic development and the triumph of institutions over integration and geography in development debate suggest that getting institutions right is a more fundamental solution for long-term economic growth and development. This study extends the notion that "institutions matter" to that of "*how* institutions matter" by demonstrating that institutions matter fundamentally more indirectly through their influence on growth determinants. Empirical findings in this paper consistently show that market-creating institutions MCI create the market and supporting market economic activities are fundamental mediating factors in the growth process. They mediate the influence of not only domestic physical and human capitals but also complement other dimensions of market-supporting institutions on long-run economic growth. Particularly, the finding shows that countries obtaining the MCI quality above an estimated optimum threshold value (i.e. high-MCI regime) can transform standard human-capital-augmented-Solow growth determinants (i.e. physical and human capitals) and MREGI into higher growth while those falling below (i.e. low-MCI regime) have seen such effects statistically insignificant. This finding signifies the indexing role of institutions on the entire growth

process affecting the productivity and accumulation of not only the "proximate" but also the functioning of other "deep" growth determinants.

Thus, institutional reforms are crucial for the development process. The finding implies that reform efforts, especially in emerging markets and developing countries, should aim particularly at devising strong institutional constraints to check and balance (the *de jure* and *de facto*) power structure of the elite and powerful interest groups. This includes, for instance, strengthening the rule of law and its popular observance, constraints on executive powers, efficiency of the judiciary system and ensuring its independence from the executive, and the check-balance mechanism between legislative and executive branches of state governance. These would minimize institutional risks such as weakening predatory and expropriation behaviors, and contract repudiations, among power-holders. The reform that bring about these strong check-balance constraints can spill over into *efficient functioning* of regulatory institutions that control corruption and rent-seeking activities, ensure fair competition, reduce uncertainty and other market failures.

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