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Article

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A note on national leadership and technology in moderating finance-growth nexus

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Abstract

This paper seeks to determine the factors energising economic growth using balanced panel data between 1997 and 2017 from 44 developing economies. The heterogeneous panel data estimator, namely the pool mean group (PMG) estimator is utilised to analyse the data. We find national leadership, telecommunication technology and finance significantly impact growth. Additionally, the effects of finance and telecommunication on growth are both contingents upon exemplary leadership.

Keywords: economic growth; financial development; ICT; national leadership; pooled mean group
JEL Classification Codes: C23, O11

1. Introduction

Sustainable economic growth is the primary goal of any economy. Hence, identifying potential growth engines is crucial to attain this goal. Financial development, leadership and telecommunication technology have often been cited critical growth catalysts. Financial development is vital for growth as it mobilises savings for productive investment. However, it can also truncate economic growth as evident by the Asian Financial Crisis of 1997/1998 and the Global Financial Crisis of 2007/2008. Numerous studies (e.g., Cechetti and Kharroubi, 2014; Law and Singh, 2014) have noted that excessive financial development can impede growth via competition and resource misallocation such as inducing talent movement from productive sectors to the financial sector. Such findings have compelled economists and policymakers the zeal to review the finance-growth nexus.

Despite the abundance of finance-growth studies, most studies neglected the role of leadership and telecommunication technology in facilitating the finance-growth nexus. Leaders are responsible for policymaking, charting national development and reshaping institutions to enable growth catalysts to play their roles effectively (Zolcsák, 2015; Jone and Olken, 2005). Hence,

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absence of exemplary leadership is the core of growth negative. Besides, telecommunication technology development helps to improve business and financial transaction efficiency which eventually expanding financial sector and energise economic growth (Alshubiri et al., 2019). Therefore, this paper proposes to address this important limitation by investigating the contribution of leadership and telecommunication technology in optimising the impact of finance on growth in 44 developing economies across 1997-2017 using the dynamic heterogeneous panel estimator introduced by Pesaran and Smith (1995). The findings of this study not only contribute to the literature, but also help policymakers to maximise the contribution of finance on growth in developing countries.

Section 2 will delineate the methodology used and the estimation results while Section 3 will conclude the discussion.

2. Methodology and results

In this study, an augmented Cobb-Douglas model, as outlined below, was utilised to examine the impact of leadership, telecommunication technology, and financial development on economic growth.

$$y_{it} = A_{it}^{1-\beta}(k_{it})^{\beta} \tag{1}$$

where y_{it} is the per capita real output, k_{it} is the per capita real capital stock, and A_{it} is the labour-augmenting factors representing progress in technology and economic efficiency. Assuming $A_{it} = A_0 e^{g_i t} W_{it}^{\theta_i}$ where g represents the exogenous growth rate of technology and W_{it} is a vector of explanatory factors affecting economic efficiency and technological advancement such as financial development (FD), quality of leadership (QL), and telecommunication technology (ICT), the production function with natural logarithm (ln) is rendered as:

$$\ln y_{it} = (1-\beta)\ln A_0 + (1-\beta)g_i t + (1-\beta)\theta_i \ln W_{it} + \beta \ln k_{it} \tag{2}$$

Given $\ln W_{it}$ represents $\ln\mathrm{FD}_{it}$, $\ln\mathrm{QL}_{it}$ and $\ln\mathrm{ICT}_{it}$, the econometric model used can thus be defined as:

$$\ln\mathrm{GDP}_{it} = \delta_0 + \delta_1 \ln\mathrm{CAP}_{it} + \delta_2 \ln\mathrm{FD}_{it} + \delta_3 \ln\mathrm{QL}_{it} + \delta_4 \ln\mathrm{ICT}_{it} + \varepsilon_{it} \tag{3}$$

where $\ln\mathrm{GDP}_{it}$ is the per capita real gross domestic product (GDP), $\ln\mathrm{CAP}_{it}$ refers to the per capita real capital stock and ε_{it} is the error-term. $\ln\mathrm{FD}_{it}$ represents financial development, $\ln\mathrm{ICT}_{it}$ is telecommunication technology, and $\ln\mathrm{QL}_{it}$ refers to leadership quality. To construct the financial development variable, four indicators of financial development (i.e., the ratio of M2, M3, domestic credit to the private sector, and domestic credit provided by the financial sector to GDP) were combined using the Principal Component Approach (PCA). We aware of the fact that past studies (e.g., Toader et al., 2018; Salahuddin and Alam, 2015; Kumar, 2014) used a variety of ICT indicators such as mobile cellular subscription, fixed-line telephone subscription, number of broadband internet users, etc. to capture its impact on economic growth. However, no single ICT indicator is comprehensive. Therefore, this study constructs the ICT variable premised upon the number of internet and telephony service subscribers per 1000 population with PCA. The choice is mainly due to the availability of data that covering the 44 selected countries under examination. Moreover, the quality of leadership variable was constructed using PCA that encompassed leadership-related indicators, namely, political stability, corruption, government effectiveness, and voice and accountability as suggested by Tan et al. (2010).

Besides, the model was further augmented to examine the indirect (moderating) effects of finance, leadership, and telecommunication by incorporating the interaction term:

$$\begin{aligned}\ln\mathrm{GDP}_{it} = \delta_0 + \delta_1 \ln\mathrm{CAP}_{it} + \delta_2 \ln\mathrm{FD}_{it} + \delta_3 \ln\mathrm{QL}_{it} + \delta_4 \ln\mathrm{ICT}_{it} \\ + \eta_1(\ln\mathrm{FD}_{it} \times \ln\mathrm{QL}_{it}) + \varepsilon_{it}\end{aligned} \tag{4}$$

$$\ln\mathrm{GDP}_{it} = \delta_0 + \delta_1 \ln\mathrm{CAP}_{it} + \delta_2 \ln\mathrm{FD}_{it} + \delta_3 \ln\mathrm{QL}_{it} + \delta_4 \ln\mathrm{ICT}_{it} + \eta_2(\ln\mathrm{FD}_{it} \times \ln\mathrm{ICT}_{it}) + \varepsilon_{it} \quad (5)$$

$$\ln\mathrm{GDP}_{it} = \delta_0 + \delta_1 \ln\mathrm{CAP}_{it} + \delta_2 \ln\mathrm{FD}_{it} + \delta_3 \ln\mathrm{QL}_{it} + \delta_4 \ln\mathrm{ICT}_{it} + \eta_3(\ln\mathrm{ICT}_{it} \times \ln\mathrm{QL}_{it}) + \varepsilon_{it} \quad (6)$$

where if η_1 and η_2 are significant, it can be construed that financial development's impact on economic growth is contingent upon leadership quality and ICT, respectively. Likewise, the significance of η_3, indicates that ICT's effect on growth is conditional upon leadership quality. Consequently, the marginal effects of financial development and ICT on growth can be calculated utilising partial derivation, namely $\partial\ln\mathrm{GDP}_{it}/\partial\ln\mathrm{FD}_{it}$ and $\partial\ln\mathrm{GDP}_{it}/\partial\ln\mathrm{ICT}_{it}$.

This study covers 44 developing economies in the world based on availability of complete data, namely Albania, Angola, Armenia, Bangladesh, Belarus, Bolivia, Brazil, Bulgaria, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, Gabon, Ghana, Guatemala, Honduras, India, Indonesia, Jordan, Kazakhstan, Kenya, Lebanon, Malaysia, Mexico, Moldova, Morocco, Namibia, Nigeria, Pakistan, Paraguay, Peru, the Philippines, Romania, Senegal, South Africa, Thailand, Tunisia, Turkey, Uganda, Ukraine, Vietnam, and Zambia. The data used in this study are collated from the databases of the World Development Indicators (WDI), the International Country Risk Guide (ICRG) and the International Financial Statistics (IFS).[1] Prior to estimating the model, the data's characteristics were first delineated. The descriptive statistics and the unit root tests for the variables under review are as reported in Table 1.

Table 1. Results of descriptive statistics and the panel unit root tests

Panel A: Descriptive statistics				
Variables	Minimum	Mean	Maximum	Std. Deviation
GDP_{it}	812.387	6475.067	22471.57	4489.969
CAP_{it}	83.270	8118.816	46408.87	8152.538
FD_{it}	0.009	3.536	45.989	6.262
QL_{it}	0.003	1.879	25.488	2.621
ICT_{it}	0.002	1.887	8.303	1.635

Panel B: Panel unit root tests			
Variables	LLC	IPS	CIPS
Level:			
$\ln\mathrm{GDP}_{it}$	0.095	–2.225	–2.215
$\ln\mathrm{CAP}_{it}$	19.929	–2.088	–2.135
$\ln\mathrm{FD}_{it}$	0.163	–2.025	–2.248
$\ln\mathrm{QL}_{it}$	–6.553***	–2.316***	–2.322***
$\ln\mathrm{ICT}_{it}$	–6.108***	–1.384	–3.011***
First difference:			
$\Delta\ln\mathrm{GDP}_{it}$	–22.062***	–3.926***	–3.695***
$\Delta\ln\mathrm{CAP}_{it}$	–71.736***	–9.704***	–3.190***
$\Delta\ln\mathrm{FD}_{it}$	–13.962***	–4.148***	–4.166***
$\Delta\ln\mathrm{QL}_{it}$	–22.000***	–4.239***	–3.996***
$\Delta\ln\mathrm{ICT}_{it}$	–10.273***	–3.905***	–4.280***

Note: *** denotes statistical significance at the 1 per cent level. The optimal lag length is selected based on the Akaike's Information Criterion (AIC). The choice of deterministic terms for the above unit root tests are based on the visual inspection of the plots.

[1] The datasets of this study are available from the corresponding author upon reasonable request.

Table 1 shows the degree of variation was quite substantial among the variables under investigation with capital stock having the largest standard deviation followed by GDP. However, the standard deviation for the rest of the series was relatively small. One way to minimise these variations is through the application of natural logarithms. The results of three-panel unit root tests (Panel B of Table 1) suggest that lnGDP_{it}, lnCAP_{it} and lnFD_{it}were integrated at order one, $I(1)$ while lnQL_{it} and lnICT_{it} were more likely to follow the $I(0)$ process. Since the panel unit root tests suggested that the order of integration oscillated between either $I(0)$ or $I(1)$, the Mean Group (MG) and the Pooled Mean Group (PMG) estimators introduced by Pesaran and Smith (1995) and Pesaran et al. (1999) respectively were selected to estimate the coefficients in Equations (3) to (6). As the MG estimator operates under the assumption of slope heterogeneity in the short- and long-run and the PMG estimator assumes slope heterogeneity only in the short-run, results from different estimators can vary substantially. To circumvent this problem, the Hausman specification test was deployed to choose the most efficient estimator. The analysis was based upon the following autoregressive distributed lag (ARDL) structure of unrestricted error-correction model (see Pesaran et al. (1999).

$$\Delta\text{lnGDP}_{it} = \alpha_i\text{lnGDP}_{it-1} + \lambda_i'\text{lnX}_{it-1} + \sum_{j=1}^{p-1}\gamma_{ij}\Delta\text{lnGDP}_{it-j} + \sum_{j=0}^{q-1}\psi_{ij}'\Delta\text{lnX}_{it-j} + \mu_i + \nu_{it} \tag{7}$$

where Δ is the first difference operator, μ_i represents the country-specific effect, ν_{it} is the well-behaved error-term, lnX_{it} is a vector of explanatory variables which covers capital stock, financial development, quality of leadership, and ICT. Assuming the series are cointegrated and $\alpha_i < 0$ for all i, the long-run coefficients between GDP and its determinants can be defined as $-\lambda_i'/\alpha_i$.

Table 2 illustrates the PMG results of the estimation and diagnostic analysis. Prior to analysis, diagnostic tests were conducted to obtain reliable estimation results. It was observed that the Hausman test failed to reject the null hypothesis of long-run slope homogeneity. This result signalled that the PMG estimator was superior to the MG estimator. However, the panel data econometric literature (i.e., Baltagi and Pirotte, 2010) documents that the existence of cross-sectional dependence (CD) in errors will jeopardise the reliability of inferential statistics thus contributing to flawed policy recommendations. We therefore checked for CD using the CD test proposed by Pesaran (2004). It was observed that the null hypothesis of errors are cross-sectionally independent cannot be rejected at the 5 per cent significant level. In light of this, we can proceed to interpret the estimated growth model in Table 2.

Our results show that capital stock was positively related to growth, a finding consanguineous with that of prevailing growth theory. Likewise, the quality of leadership was associated with growth implying that countries with exemplary leadership enjoyed better economic performance. This is in line with Jones and Olken (2005). In contrast, financial development and ICT tended to hinder growth in developing countries, a finding consistent with those of Bahrini and Qaffas (2019) and Law and Singh (2014) though it contradicted Kumar (2014). This contradiction is plausibly due to either Solow's technological paradox, resource misallocation or misplaced focus on unproductive sectors due to poor leadership.

Finally, the three interaction terms, i.e., $(\text{lnFD}_{\text{it}} \times \text{lnQL}_{it})$, $(\text{lnFD}_{\text{it}} \times \text{lnICT}_{it})$, and $(\text{lnICT}_{\text{it}} \times \text{lnQL}_{it})$ in Models 2 to Model 4 were statistically significant at the 5 per cent level or better. These results signal that finance's impact on growth was contingent upon leadership quality and/or ICT development. Similarly, ICT's effect on growth was conditional upon leadership quality. However, as Table 2 illustrates, the effects on growth are positive only at higher levels of leadership quality and ICT development implying that sophisticated finance-related ICT products and exemplary leadership attributes like visionary policy formulation, political acumen and good governance are imperative to promote growth.

Table 2: Results of pooled mean group estimations

Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
$\ln k_{it}$	0.465***	0.449***	0.520***	0.443***
	(0.000)	(0.000)	(0.000)	(0.000)
$\ln \mathrm{FD}_{it}$	–0.009*	–0.030***	–0.024***	–0.022***
	(0.063)	(0.000)	(0.000)	(0.000)
$\ln \mathrm{QL}_{it}$	0.027***	0.016***	0.010***	0.024***
	(0.000)	(0.000)	(0.000)	(0.000)
$\ln \mathrm{ICT}_{it}$	–0.023***	–0.021***	–0.049***	–0.020***
	(0.000)	(0.000)	(0.000)	(0.000)
$\ln \mathrm{FD}_{it} \times \ln \mathrm{QL}_{it}$	–	0.033***	–	–
		(0.000)		
$\ln \mathrm{FD}_{it} \times \ln \mathrm{ICT}_{it}$	–	–	0.039***	–
			(0.000)	
$\ln \mathrm{ICT}_{it} \times \ln \mathrm{QL}_{it}$	–	–	–	0.026***
				(0.000)
Marginal effects: $\partial \ln \mathrm{GDP}/\partial \ln \mathrm{FD}$				
$\delta_2 + \eta_1 \mathrm{QL}_{\mathrm{LOW}}$	–	–0.219***	–	–
		(0.000)		
$\delta_2 + \eta_1 \mathrm{QL}_{\mathrm{MID}}$	–	–0.030***	–	–
		(0.000)		
$\delta_2 + \eta_1 \mathrm{QL}_{\mathrm{HIGH}}$	–	0.075***	–	–
		(0.000)		
$\delta_2 + \eta_2 \mathrm{ICT}_{\mathrm{LOW}}$	–	–	–0.272***	–
			(0.000)	
$\delta_2 + \eta_2 \mathrm{ICT}_{\mathrm{MID}}$	–	–	–0.024***	–
			(0.000)	
$\delta_2 + \eta_2 \mathrm{ICT}_{\mathrm{HIGH}}$	–	–	0.058***	–
			(0.000)	
Marginal effects: $\partial \ln \mathrm{GDP}/\partial \ln \mathrm{ICT}$				
$\delta_4 + \eta_3 \mathrm{QL}_{\mathrm{LOW}}$	–	–	–	–0.189***
				(0.000)
$\delta_4 + \eta_3 \mathrm{QL}_{\mathrm{MID}}$	–	–	–	–0.020***
				(0.000)
$\delta_4 + \eta_3 \mathrm{QL}_{\mathrm{HIGH}}$	–	–	–	0.035***
				(0.000)
Diagnostic analysis				
Speed of adjustment, ε_{it-1}	–0.338***	–0.311***	–0.411***	–0.316***
	(0.000)	(0.000)	(0.000)	(0.000)
Hausman test: PMG vs MG	0.250	0.060	2.10	0.200
	(0.9928)	(0.9999)	(0.8345)	(0.9991)
Pesaran CD test	–0.416	–0.136	1.599	0.203
	(0.6776)	(0.8915)	(0.1098)	(0.8387)
$T \times N$	924	924	924	924

Note: *** and * indicate statistical significance at the 1 and 5 per cent levels, respectively. (.) denotes that *p*-values. The optimum lag length is selected based on Akaike's Information Criterion (AIC). Time dummies are accommodated to take into account the cross-sectional dependence. The inferential statistics for the marginal effects are calculated with the formula suggested in Brambor et al. (2006).

3. Concluding remarks

This paper purported to determine the modulating effects of leadership and telecommunication technology on the finance-growth nexus in developing countries using the PMG estimator. Our results demonstrate that exemplary leadership spurs economic growth. Additionally, excellent leadership also enhances the impact of financial development and telecommunication technology on growth. Thus, it can be surmised that "good" leadership is a mandatory prerequisite for sustainable growth.

Nonetheless, no study, including this one, is perfect. We discovered a few imperfections in the present study that could be addressed in future studies. The analysis of this study focuses merely on financial deepening while ignoring the role of financial stability in explaining economic growth which is a financial aspect that attested by Demetriades and Rewilak (2021). Besides that, the model specification of the present study has a small number of covariates and was based on the Cobb-Douglas production theoretical framework. As a result, future research could augment our growth model by considering financial stability and a larger number of covariates in order to further improve robustness.

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