World Academy of Science, Engineering and Technology
International Journal of Economics and Management Engineering
Vol:9, No:6, 2015

Governance and Economic Growth: Evidence of Ten Asian Countries

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***Abstract*—**This study utilizes a frequency domain approach over the period of 1996 to 2013 to examine the causal relationship between governance and economic growth in ten Asian countries, which have different levels of democracy; classified as "Free", "Partly Free", and "Not Free" countries. The empirical results show that there is no Granger causality running from governance to economic growth in "Not Free" countries and "Partly Free" countries with the exception of Singapore. As for "Free" countries such as South Korea and Taiwan, there is a one-way causality running from governance to economic growth. The findings of this study indicate that policy makers in South Korea, Taiwan, and Singapore could use governance index to improve their predictions of the future economic growth.

***Keywords*—**Economic growth, frequency domain, governance, Granger causality.

I. Introduction

GOOD governance has been widely discussed and applied in various fields of study since the World Bank first used the concept of good governance in its 1989 report. International organizations have constructed a variety of indicators to measure governance; one such is the World Bank's Worldwide Governance Indicators (WGI) covering six dimensions of governance including "voice and accountability", "political stability and absence of violence/terrorism", "government effectiveness", "regulatory quality", "rule of law", and "control of corruption". The WGI has become widely used among policymakers and academics.

Governance plays an important role in promoting a country's competitiveness and improving quality of life for its people. There has been increasing concern about governance issues in the development debate. One of the commonly discussed questions is whether good governance is beneficial to economic performance. A number of empirical studies, based on the WGI, have examined the impact of governance on economic growth and suggest that governance significantly affects economic growth. For example, Kaufmann et al. [1]'s study finds that good governance is beneficial for economic growth. Dollar and Kraay [2] and Rigobon and Rodrik [3] both find that the "rule of law" indicator of WGI significantly impacted economic growth. Meanwhile, [4] suggests that governance has a positive effect on per capita income. Similarly, [5] found that in a democratic country, "regulatory quality" had a positive effect on the trade and economic growth. Likewise, [6] suggests that that both "regulatory quality" and "government efficiency" WGI indicators have a significant positive impact on the GDP per capita in developing countries. Finally, [7] suggests that all four WGI indicators have positive impact on economic growth.

Studies that examine all six WGI indicators have also been conducted. For example, [8] suggests that the quality of governance is important for economic growth. Huynh and Jacho-Cha´vez [9] suggests that "political stability and absence of violence/terrorism", "government efficiency", and "rule of law" all have a positive impact on economic growth. Gani [10] suggests that "political stability and absence of violence/ terrorism" and "government efficiency" have significantly positive correlations with economic growth; "voice and accountability" and "control of corruption" have significantly negative correlations with economic growth in developing countries. Similarly, "regulatory quality" and "rule of law" are negatively but insignificantly correlated with economic growth. Finally, [11] found that good governance contributed to the differences among thirty-nine Sub-Saharan African countries and indicate that the role of governance in economic growth depends on the level of income.

In general, improvement in governance benefits a country's economic growth. Additionally, democracy is a fundamental precondition to an efficient market economy and for economic growth. Given that Asian countries have experienced a rapid growth in economic development in recent years, an opportunity presents itself for us to evaluate if good governance benefits economic growth, or if economic growth promotes better governance. Therefore, the purpose of this study is to investigate the causal relationship between governance and economic growth in ten Asia countries, which have different levels of democracy; classified as "Not Free" country, and "Free" country, respectively. This study adopts the WGI indicators and utilizes a frequency domain approach to examine whether governance have an impact on economic growth for countries with different levels of democracy.

II. Data and Methodology

A. Data

Annual data involving ten Asian countries from 1996 to 2013 was used in the analysis. We apply the average of "Political Rights" and "Civil Liberties" scores published by the Freedom House to classify the ten Asian countries as "Free" countries (Japan, South Korea, and Taiwan), 'Partly Free' countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand), and 'Not Free' countries (China and Vietnam) in

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The author is grateful to the Ministry of Science and Technology, Taiwan for financial support through project no. MOST 103-2410-H-035-008.

order to examine the causal relationship between governance and economic growth experienced within ten Asian countries with varying levels of democracy.

Variables *EG* and *GOV* indicate economic growth and the quality of governance, respectively. The quality of governance is measured by the average of six WGI indicators. The governance performance estimate of each dimension ranges from approximately -2.5 (weak) to 2.5 (strong). Additionally, economic growth is measured by the percentage change in real *GDP* obtained from the World Economic Outlook Database provided by the International Monetary Fund.

Table I provides the summary statistics of economic growth and the quality of governance for ten Asian countries. The results in Table I show that among ten Asian countries during the period of 1997 to 2013, China's economic growth (9.01%) is the greatest and Japan's economic growth (0.74%) is the lowest. Meanwhile, Singapore and Indonesia have the highest and lowest mean WGI score of 1.49 and -0.65, respectively. This indicates that Singapore's governance performance is the best and Indonesia's governance performance is the worst among the ten Asian countries during the period of our study.

TABLE I
SUMMARY STATISTICS OF EG AND GOV

	EG				*GOV*			
Country	Mean	Max.	Min.	Std. Dev.	Mean	Max.	Min.	Std. Dev.
				Free				
Japan	0.74	4.74	-5.42	2.21	1.13	1.31	0.94	0.11
Korea	3.83	9.95	-6.39	3.48	0.66	0.81	0.44	0.11
Taiwan	3.43	15.25	-11.44	7.06	0.86	1.00	0.76	0.08
				Not Free				
China	9.01	13.57	6.78	1.79	-0.52	-0.42	-0.60	0.05
Vietnam	5.25	7.60	3.21	1.06	-0.52	-0.42	-0.58	0.05
				Partly Free				
Indonesia	2.76	6.01	-14.39	4.52	-0.65	-0.35	-0.93	0.19
Malaysia	2.75	7.24	-9.64	3.95	0.36	0.49	0.20	0.08
Philippine	2.64	5.84	-2.73	2.18	-0.35	0.05	-0.55	0.19
Singapore	3.11	13.22	-5.49	4.78	1.49	1.58	1.39	0.04
Thailand	2.41	7.61	-11.53	4.52	-0.02	0.33	-0.34	0.27

B. Methodology

The time domain Granger causality test examines whether there is Granger causality among series in a given period but does not show the influence among different frequencies. In this study, we follow Brietung and Candelon [12]'s approach of utilizing frequency domain Granger causality test to examine the relationship between governance and economic growth. In the formula below, y_t represents governance and x_t represents economic growth rate. Both x_t and y_t are stationary in this formula. The two-variable vector autoregressive (VAR) with finite order p is shown as:

$$\Theta(L)\begin{pmatrix} x_t \\ y_t \end{pmatrix} = \begin{pmatrix} \Theta_{11}(L) & \Theta_{12}(L) \\ \Theta_{21}(L) & \Theta_{22}(L) \end{pmatrix}\begin{pmatrix} x_t \\ y_t \end{pmatrix} = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \tag{1}$$

Let $Z_t = [x_t, y_t]'$ and $\varepsilon_t = [\varepsilon_{1t}, \varepsilon_{2t}]'$, then:

$$\Theta(L)Z_t = \varepsilon_t \tag{2}$$

where $\Theta(L) = I - \Theta_1 L - \cdots - \Theta_p L^p$ is a 2×2 lag polynomial and $\Theta_1, \cdots, \Theta_p$ are 2×2 autoregressive parameter matrices, with $L^k Z_t = Z_{t-k}$. The error vector ε_t is white noise with $E(\varepsilon_t) = 0$ and $E(\varepsilon_t, \varepsilon_t') = \Omega$, where Ω is positive definite. For ease of exposition, there is no deterministic terms in (1) and (2).

The VAR in (2) can be written in an infinite moving average (MA) form:

$$Z_t = \Phi(L)\varepsilon_t \tag{3}$$

where $\Phi(L) = \Theta(L)^{-1}$. Suppose a Cholesky decomposition $GG' = \Omega$ exists, where G is a lower triangular matrix, such that $E(\eta_t, \eta_t') = I$ and $\eta_t = G\varepsilon_t$. Using the Cholesky decomposition, the MA form in (3) can be expressed as:

$$\begin{aligned} Z_t = \Phi(L)\varepsilon_t &= \begin{pmatrix} \Phi_{11}(L) & \Phi_{12}(L) \\ \Phi_{21}(L) & \Phi_{22}(L) \end{pmatrix}\begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} = \Psi(L)\eta_t \\ &= \begin{pmatrix} \Psi_{11}(L) & \Psi_{12}(L) \\ \Psi_{21}(L) & \Psi_{22}(L) \end{pmatrix}\begin{pmatrix} \eta_{1t} \\ \eta_{2t} \end{pmatrix} \end{aligned} \tag{4}$$

where $\Psi(L) = \Phi(L)G^{-1}$ and $(\eta_{1t}, \eta_{2t})' = G(\varepsilon_{1t}, \varepsilon_{2t})'$, so that $\text{cov}(\eta_{1t}, \eta_{2t}) = 0$ and $\text{var}(\eta_{1t}) = \text{var}(\eta_{2t}) = 1$.

Using this representation, the spectral density of x_t can be expressed as:

$$\mathrm{f}_x(\omega) = \frac{1}{2\pi}\{\left|\Psi_{11}(e^{-i\omega})\right|^2 + \left|\Psi_{12}(e^{-i\omega})\right|^2\} \tag{5}$$

According to [12]-[14], the measure of causality in the frequency domain is defined in the following way:

$$\mathrm{M}_{y\to x(\omega)} = \log\left[\frac{2\pi f_x(\omega)}{\left|\Psi_{11}(\mathrm{e}^{-i\omega})\right|^2}\right] = \log\left[1 + \frac{\left|\Psi_{12}(\mathrm{e}^{-i\omega})\right|^2}{\left|\Psi_{11}(\mathrm{e}^{-i\omega})\right|^2}\right] \tag{6}$$

This causality measure is zero if $\left|\Psi_{12}(e^{-i\omega})\right| = 0$, which means that *y* (governance) does not cause *x* (economic growth) at frequency ω. The causality from *x* to *y* is built using a similar approach.

To test the hypothesis that *y* does not cause *x* at frequency ω, the null hypothesis is $\mathrm{M}_{y\to x(\omega)} = 0$. We cannot reject the null hypothesis if $\left|\Psi_{12}(e^{-i\omega})\right| = 0$. Since $\Psi(L) = \Phi(L)G^{-1} = \Theta(L)^{-1}G^{-1}$, $\Psi_{12}(L)$ is as follows:

$$\Psi_{12}(L) = -\frac{g^{22}\Theta_{12}(L)}{|\Theta L|} \tag{7}$$

where g^{22} is the lower diagonal element of G^{-1} and $|\Theta(L)|$ is the determinant of $\Theta(L)$. Breitung and Candelon [12] show that the condition $|\Psi_{12}(e^{-i\omega})| = 0$ can be written as:

$$|\Theta_{12}(e^{-i\omega})| = \left|\sum_{k=1}^{p}\theta_{12,k}\cos(k\omega) - \sum_{k=1}^{p}\theta_{12,k}\sin(k\omega)i\right| = 0 \quad (8)$$

where $\theta_{12,k}$ is the (1, 2) the element of Θ_k. Thus, a necessary and sufficient set of conditions for $|\Theta_{12}(e^{-i\omega})| = 0$ (i.e. no Granger causality from *y* to *x* at frequency ω) is:

$$\sum_{k=1}^{p}\theta_{12,k}\cos(k\omega) = 0 \quad (9)$$

$$\sum_{k=1}^{p}\theta_{12,k}\sin(k\omega) = 0 \quad (10)$$

Since $\sin(k\omega) = 0$ for $\omega = 0$ and $\omega = \pi$, restriction (10) can be dropped in these cases.

The linear restrictions (9) and (10) on the coefficients can be tested by a standard F-test. The resulting F-statistic is approximately distributed as $F(2, T-2p)$, where 2 is the number of restrictions and *T* is the number of observations used to estimate the VAR model of order *p*.

III. Empirical Results

Before proceeding to the frequency domain Granger causality between governance and economic growth, it is necessary to determine the integration degree of variables. For ten Asian countries, economic growth is stationary with the exception of China and governance is nonstationary (integrated of order one) with the exception of Singapore. Therefore, cointegation tests are conducted by using bounds test proposed by [15] for all countries with the exception of Singapore. The bounds test procedure can be applied irrespective of whether the explanatory variables are I (0) or I(1). This is the reason why we use it in this study. Economic growth and governance are cointegrated for nine countries. Results of unit root and cointegation tests are not reported here, due to the limitation of pages.

This study then adopts Toda and Yamamto [16]'s VAR(p+d) model, where p is the optimal lag order and d is the maximum order of integration. We consistently chose a VAR(k) model with $k \geq 3$, given that for values $k = 1$ and $k = 2$, the F-statistic is constant for all frequency ω. Although p is 1 according to the SBC and d is 0 for Singapore and 1 for the other nine countries, a VAR (3) model instead of VAR (1) and VAR (2) is selected for Singapore and the other nine countries. Finally, we conduct Granger causality tests across the frequency domain by applying the methodology devised by [12]. The Granger causality tests between economic growth and governance across frequencies for ten Asian countries classified as "Free", "Partly Free", and "Not Free" countries are reported in Figs. 1-3.

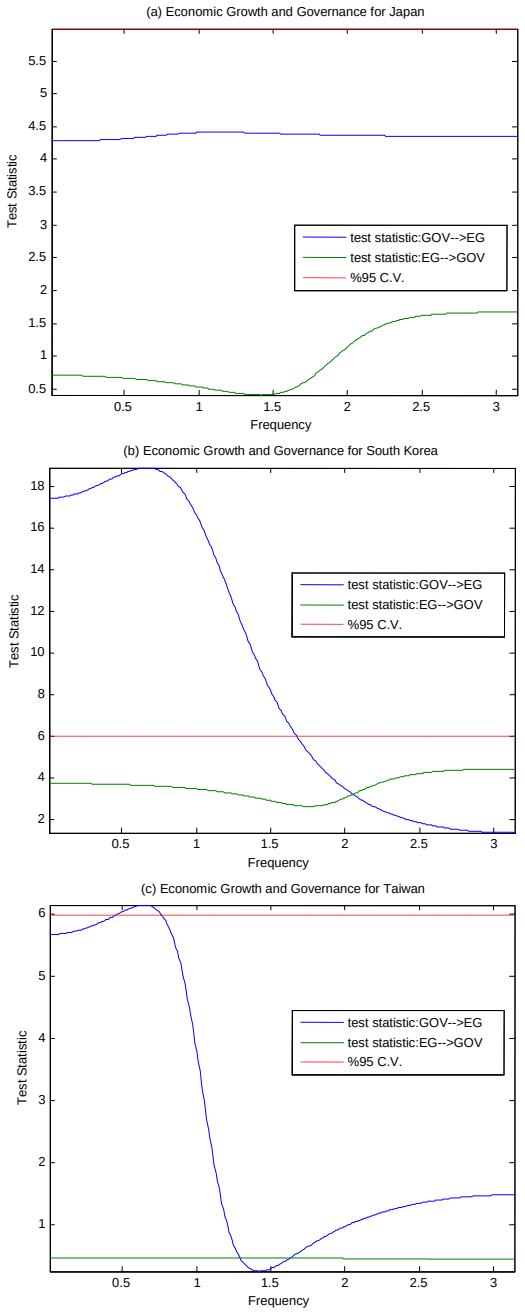
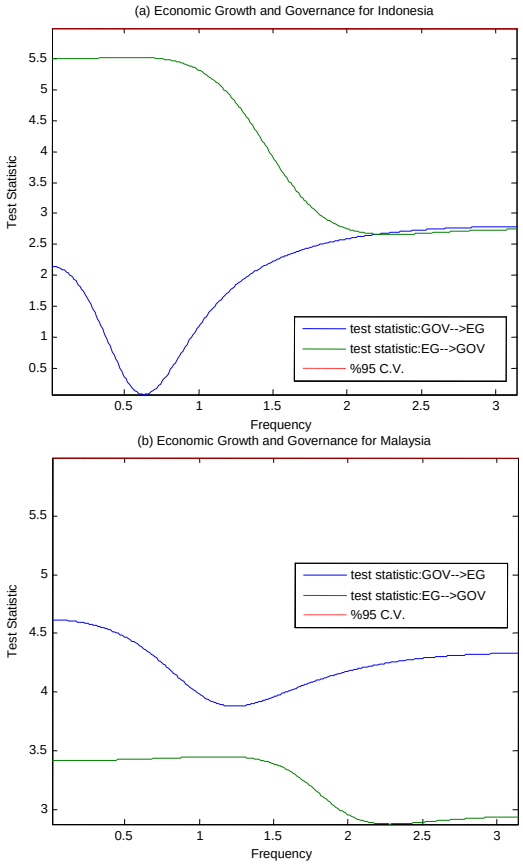


Fig. 1 (a) Granger causality tests for Japan, (b) Granger causality tests for South Korea, (c) Granger causality tests for Taiwan

Figs. 1 (a)-(c) report the Granger causality in frequency domain for "Free" countries those are Japan, South Korea, and Taiwan. It displays the test statistics along with their 5% critical values (dotted lines parallel to the frequency axis) for all frequencies in the interval $(0, \pi)$. Fig. 1 (a) shows that at the 5% level of significance, the null hypothesis of no Granger causality from governance to economic growth cannot be rejected and the null hypothesis of no Granger causality from economic growth to governance cannot be rejected. Thus, there

is no evidence of Granger causality between governance and economic growth in Japan. Fig. 1 (b) shows that there is a Granger causality running from governance to economic growth at frequencies less than 1.67 with to a wavelength of more than 3 years but no evidence of Granger causality running from to economic growth to governance at any frequency. Therefore, for South Korea, there is only a unidirectional causality from governance to economic growth. As shown in Fig. 1 (c), governance Granger causes economic growth in the range $\omega \in [0.47, 0.76]$ corresponding to 8.27-13.37 years cycle. However, the null hypothesis of no Granger causality from economic growth to governance cannot be rejected at any frequency. Thus, for Taiwan, there is a one-way causal effect from governance to economic growth at long-run frequencies.

For "Partly Free" countries as shown in Figs. 2 (a)-(e), the null hypothesis of no Granger causality from governance to economic growth cannot be rejected for all five "Partly Free" countries with the exception of Singapore in Fig. 2 (d). Fig. 2 (d) indicates governance Granger causes economic growth at frequencies greater than 2.43 with a wavelength of less than 3 years. For Singapore, there is a one-way causal effect from governance to economic growth at short-run frequencies. Additionally, the null hypothesis of no Granger causality from economic growth to governance cannot be rejected for all five "Partly Free" countries with the exception of Thailand in Fig. 2 (e). For Thailand, there exists the Granger causality from economic growth to governance at frequencies less than 1.64 corresponding to a wave length of more than 4 years.



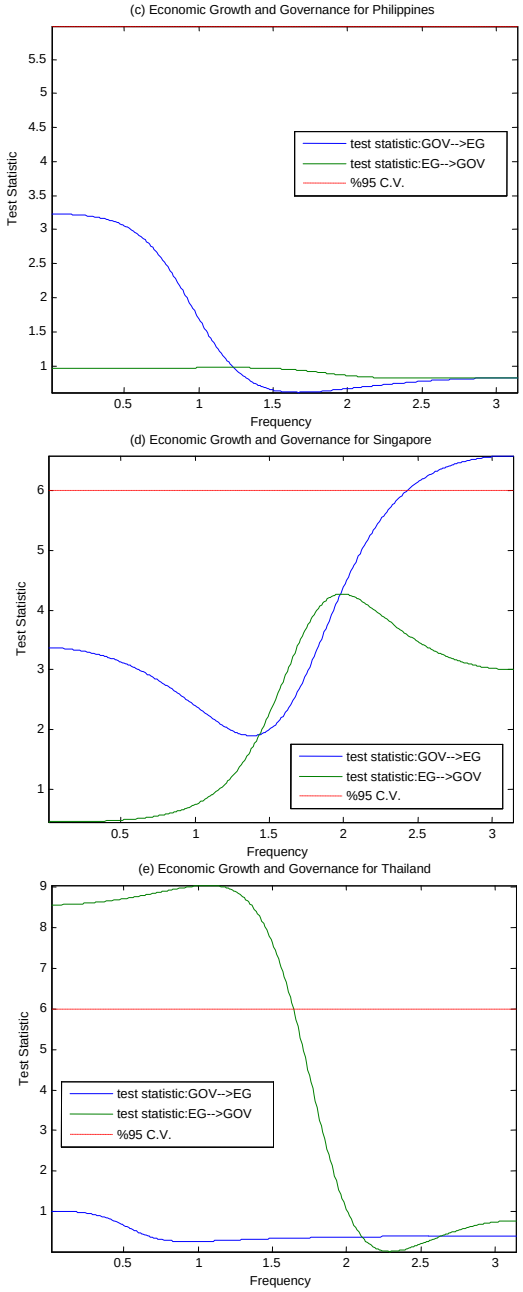


Fig. 2 (a) Granger causality tests for Indonesia, (b) Granger causality tests for Malaysia, (c) Granger causality tests for Philippine, (d) ranger causality tests for Singapore, (e) Granger causality tests for Thailand

Figs. 3 (a) and (b) show Granger causality in frequency domain for "Not Free" countries China and Vietnam. The results in Figs. 3 (a) and (b) represent that there is no Granger causality between governance and economic growth in both China and Vietnam.

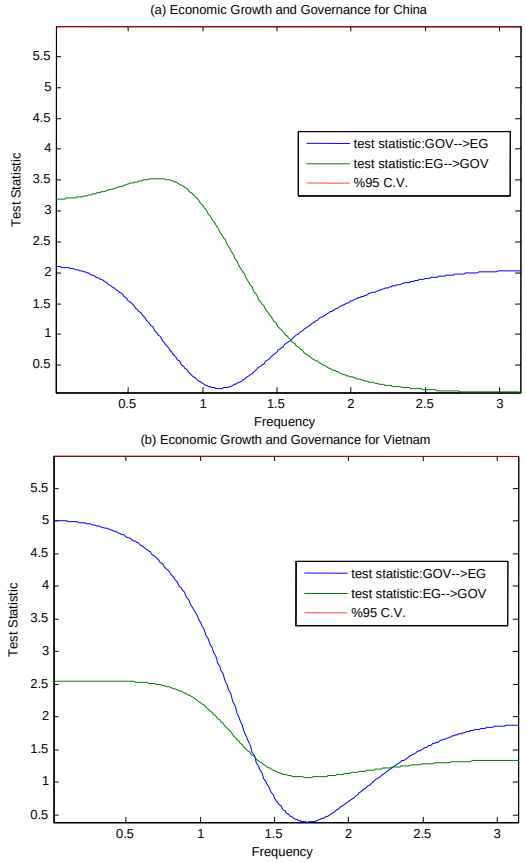


Fig. 3 (a) Granger causality tests for China, (b) Granger causality tests for Vietnam

IV. Conclusion

Asian countries have experienced rapid growth in economic development in recent years, prompting research around the relationship between governance and economic growth. More specifically, does good governance benefit economic growth, or does economic growth promote better governance? This study adopts the WGI of governance and utilizes the new frequency domain Granger causality test to examine the relationship between governance and economic growth during the period of 1997-2013 in ten Asian countries, which have different levels of democracy and are classified as 'Not Free' country, and 'Free' country, respectively.

Empirical results of the frequency domain Granger causality test show that there is no Granger causality running from governance to economic growth in ten Asian countries with the exception of 'Free' countries South Korea and Taiwan and 'Partly Free' countries Singapore. For South Korea and Taiwan, there exists the Granger causality from governance to economic growth at long-run frequencies while for Singapore; there is the Granger causality from governance to economic growth at short-run frequencies. Meanwhile, there is no Granger causality from economic growth to governance for all countries with the exception of Thailand. For Thailand, economic growth fluctuations have a significant effect on future governance (such as 'voice and accountability', 'political stability and absence of violence/terrorism', 'government effectiveness', 'regulatory quality', 'rule of law', and 'control of corruption') fluctuations.

The findings of this study indicate that policy makers in South Korea, Taiwan, and Singapore could use governance to improve its economic growth and improve its predictions of future real GDP growth rate. Furthermore, for Thailand, economic growth will promote governance. In conclusion, our findings suggest that economic growth appears to be driven by governance for South Korea and Taiwan with higher levels of democracy but governance seems to be driven by economic growth for Thailand with lower levels of democracy.

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