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Article

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Revisiting the governance-growth nexus: Evidence from the world's largest economies

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Abstract: This study delves into the symmetric effects of governance on economic growth for the world's ten largest economies, employing a model augmented with well-known growth, governance, and control predictors to inform model specification. Using panel and time-series techniques, both collectively and individually, the initial results reveal that governance predictors and growth postulate a long-run symmetric nexus. Applying the autoregressive distributed lags (ARDL) model, the results show that although governance predictors positively impact the economic growth of the panel both in the short and long runs, growth is weakly sensitive to governance predictors. The results of the ARDL estimates for cross-country show that Canada's growth is highly sensitive to governance predictors, followed by France, showing moderate sensitivity. Moreover, the findings support the notion that the US, China, Germany, India, the UK, Brazil, and Italy exhibit weak sensitivity to governance predictors. Besides, the error-correction results demonstrate a high speed of adjustment of the short-run symmetries of the panel to its long-run equilibrium. Since economic growth swiftly responds to the rise and fall of governance predictors, specific policy adjustments are required to maintain sustainable and long-run growth.

Subjects: Macroeconomics; Econometrics; Development Economics

Keywords: Governance indicators; ARDL; symmetric effects; economic growth; nexus
JEL code: K0; C01; O4

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Mohammad Naim Azimi (PhD) is an associate professor serving in the department of statistics and econometrics of the Faculty of Economics at Kabul University, located in the capital of Afghanistan. He served the university in different positions, such as the vice chancellor for academic affairs and director of quality assurance, where one of his main tasks was to manage and lead the research committee of the university. Based on his academic background, his research areas include financial economics, financial econometrics, and government economics. Considering the emerging needs for research outputs to formulate public policies, Dr. Azimi has greatly focused on public economic studies to help policymakers design effective growth tools through good governance.

PUBLIC INTEREST STATEMENT

Governance is a multi-faceted and broad concept that explains the degree of power a state exercises to control and govern its economic, social, technological, and political endeavors for the benefit of its nation. Effective and productive governance of the economic and social components of a nation posits a significant nexus and postulates a non-monotonous impact on economic growth. In an empirical sense, everyone assumes that effective governance is an important and essential element of economic growth both in developing and developed economies, implying that the larger the economy, the greater the positive effects of governance quality on economic growth. This study adds to the existing literature that the general assumption does not hold perfectly, as clear variations are evident with respect to the effects of good governance on economic growth in the largest economies.

1. Introduction

Since the 1980s, investigating the impact of good governance on growth has been one of the most penetrating research topics that gained popularity among economic scholars (Altin et al., 2017; Bernal et al., 2020; Daniel Kaufmann et al., 1999; Imran et al., 2020; Sardar, 1989), academics, and policy-makers to shed statistical light on the uncovered sensitive impulse of growth to governance predictors. It is believed that good governance, political stability, an organized and well-run bureaucratic administrative system, the effective rule of law, and legal support for domestic and foreign investment in a country lead to driving economic growth, although some empirical evidence suggests otherwise (Baldé & Dicko, 2018; Mazenda & Cheteni, 2021). It is evident that in sustainable business environments that attract domestic and foreign investments, a nation's productivity increases and human development takes place due to a strong, transparent, and corruption-free governance foundation.

More interesting is the real-world example of the developing and developed economies, where the former suffers both from fading governance and declining economic growth over the last few decades, while the latter enjoys economic prosperity. This fact leads to continued research and policy discussions on the so-called "growth dilemma". According to Emara and Chiu (2016), the declining economic performance in many developing economies has been inauspicious in recent decades, whereas the booming performance of many developed economies has been surprisingly inspirational to local and foreign investment and overall economic endeavors. This shows a significant uneven pattern of growth across the world. Thus, it is important to understand the scale and magnitude of the governance effects on economic growth. Though the existing literature shows a vast number of empirical works concerning the effects of governance on growth for African economies (Fayissa & Nsiah, 2013; Inekwe et al., 2021; Mlambo et al., 2019; Orayo & Mose, 2016), European countries (Lien, 2018; Radulović, 2020), and individual economies. But studies are scarce to collectively test the effects of governance on growth for the world's largest economies. To address and fill this gap in the literature, the present study develops and tests three competing hypotheses. H_1: governance predictors have a significant positive impact on growth and could lead the economies to optimize resource accumulation and allocation; H_2: the developed countries' growing economies exhibit high sensitivity towards governance predictors in both the short and long-runs; and H_3: the governance predictors are non-monotonous, that is, they have varying effects in explaining growth in developed economies. Based on the Solow and the new growth models, the accumulation of human capital, physical capital, and technology are the key growth pillars, whereas the emerging literature augments governance and social infrastructures as paramount determinants of economic growth to account for the environment in which economic activities are practiced and supported (Hall & Jones, 1999; Acemoglu et al., 2005). The connotation of "governance" is assumed to stimulate the institutions that are vital to facilitate economic growth. These institutions include contract enforcement, property rights, the rule of law, government effectiveness, and well-established macroeconomic settings (D Kaufmann et al., 2011) that significantly influence the growth in two ways. First, as the Solow model demonstrates, human and physical capital accumulation impact economic growth. Good governance improves institutional quality, which enhances the productivity of human and physical capital accumulation, leading to derive growth (Li-an, 2007). Second, considering new growth models that account for the economic environment as an essential element of growth, good governance improves the environmental quality presented by social infrastructure that facilitates sound financial system integration and attracts domestic and foreign capital investments to stimulate sustainable economic growth (Castiglione et al., 2015).

According to Knack and Keefer (1995), governance quality is an essential element of explaining investment by enhancing the economic environment and ensuring the capital market is stable to ease economic growth. A strict rule of law empowers the market and provides equal opportunity for human capital engagement in economic activities and encourages foreign investments, whereas regulatory quality ensures that effective and encouraging policies are formulated and implemented to support the private sector's development to spur economic growth. A well-established administrative bureaucracy enhances the public sector's performance and reduces the extent of corruption to facilitate productive economic performance (Campos et al., 1999). One way or another, political

stability is also a key element of good governance, which plays an important role in empowering the economic systems through which economic affairs pass through (Baum & Lake, 2003).

The present study is intensely different from the existing literature, and the contribution made is twofold. First, it employs quantitative techniques to estimate the scale and magnitude of the effects of governance predictors on growth, employing an ECM-based ARDL model to allow for the estimation of both short-run and long-run estimates. Second, as this study compares the large economies' sensitivities to governance predictors, it builds a foundational empirical literature and provokes further studies to build upon it in the future. The most interesting results noted by the present study are threefold. First, it is to be noted that growth is symmetrically affected by good governance in the short run, while it is found that in the long run, countries show different growth behaviors by scale and magnitude to the indicators. Second, based on the interesting results and the innovative classifications that are developed in this study, some countries are found to have weak, moderate, and high sensitivities to good governance. Third, it provides evidence that developed countries' growing economies' variations are non-monotonously explained by the governance indicators.

The rest of this article is organized as follows. Section two presents a review of relevant theoretical and empirical literature. Section three discusses the data and variables used in the study. Section four explains the estimation techniques both for time-series and panel data analysis. Section five presents the results and discusses the statistical findings. Finally, section six concludes the study and recommends a set of policy measures to the relevant policymakers.

2. Literature review

Based on the Worldwide Governance Indicators, governance includes six predictors. They are control of corruption, government effectiveness, political stability, regulatory quality, the rule of law, and voice and accountability. According to WGI (2014), governance is a multi-facet and broad concept that explains the degree of power of a state that exercises to control and govern its economic, social, technological, and political endeavors for the benefit of its nation. As a general definition produced by recent authors, effective and productive governance of the economic and social components of a nation posits a significant nexus and postulates a non-monotonous impact on economic growth (Acemoglu & Robinson, 2012; Greif, 1993; North, 1991). Beginning with the control of corruption as the first indicator of governance, it is defined as the extent to which the state controls the misuse of public power and assets for private gains by public officials in rendering services to the citizens (Boudreaux et al., 2018; Choi & Thum, 2005). Evidence shows that corruption reduces domestic and foreign investments, diminishes human capital engagement in productive economic endeavors, and reduces the confidence of society in the public sector (Adzima & Baita, 2019). The next indicator is government effectiveness. It is used to measure the quality of services rendered by the public to citizens, the quality of policies easing higher standards, and uplift the credibility of public sector services (Duho et al., 2020). This index also measures how public officials are aside from political pressures and engagements in service delivery. The third governance indicator is political stability. It measures the likelihood of upheavals or destabilization of a state by means of violence, like war, conflicts, and or the acts of terrorism. This predictor shows that the quality of a state is negatively affected by violence and unexpected changes that weaken the ability of citizens to choose and replace authorities peacefully and democratically (Kaufmann & Kraay, 2002; Kraay et al., 2010). The next index is the regulatory quality, which measures the extent to which the government's policies facilitate the enhancement of public capacity in delivering credible and comprehensive services to citizens and in developing the private sector. The last index is voice and accountability. This indicator is used to measure the capacity of citizens to participate in the democratic process of selecting the government of their choice. It also encompasses freedom of speech, freedom of association, freedom of choice, and free media in the country.

The existing literature largely documents the governance-growth nexus (Mira & Hammadache, 2018; Rothstein & Teorell, 2008). According to Olson et al. (2000), good governance that uplifts high quality in formulating and implementing specific policies to promote and advance services to

citizens is foundational to driving growth, though the nexus between the quality of governance and economic growth and the direction of their causality have always been significant issues for developed economies and international organizations such as the World Bank and IMF. Nonetheless, according to Mehanna et al. (2010), the issue of causality direction and the level of impact of governance on growth is affected by several indicators in different economies with identical GDP and economic infrastructure, which helps policymakers in their choices between specific institutional policies and pro-growth patterns, though the direction of causality from governance to growth is a critical subject of dissimilarity between scholars and policymakers (Acemoglu et al., 2001, 2005a, 2012; Albouy, 2012).

Mehanna et al. (2010) used a dataset for 23 MENA economies and found that there is a significant nexus between economic development and governance indicators. The authors extended the analysis and found that voice and accountability, control of corruption, and government effectiveness are significant predictors that positively affect economic development, while the remainder of the predictors are not significant to impact economic development. Gani (2011) tested the governance-growth nexus for developing economies using a set of panel data estimation procedures. The author found that political stability and government effectiveness are positively correlated with growth, while voice and accountability, regulatory quality, and control of corruption have adverse relationships. Ahmad et al. (2012) examined the nexus between corruption and economic growth using a set of panel data and found that a unit decrease in the corruption index spurs growth by an inverted U-shaped pattern (see, also: Al Qudah et al., 2020). Tarek and Ahmed (2013) examined the effects of governance indicators on economic performance for developing economies and found that corruption negatively affects growth, while political stability, regulatory quality, and voice and accountability are statistically significant to positively affect growth in developing countries.

Han et al. (2014) investigated the impact of governance on growth for above-average governance and below-average governance ranks, using a set of data from 1998 to 2011. The authors found that government effectiveness, political stability, control of corruption, and regulatory quality have significantly greater positive impact on growth than voice and accountability and the rule of law. The authors also present that developing Asian economies with a surplus in government effectiveness, regulatory quality, and corruption control grow faster than those with a deficit in the stated predictors by up to two percentage points annually.

Bayar (2016) investigated the governance-growth nexus for European economies using a set of data from 2002 to 2013. The author found that all governance indicators except regulatory quality exert positive impacts on growth, while growth shows a high sensitivity to control of corruption and the rule of law, among all others. Wilson (2016) investigated the causal relationship between economic growth and governance quality in China using a set of data from 1985 to 2005. The author found that there is a reverse behavior of growth on governance and suggested that improvement in formal government has not been significant in explaining the rapidly growing economy in China. Instead, the perceived positive relationship between governance and growth reveals the capacity of provincial governments to harness the potential formed by growth to devise successive governance developments. Maune (2017) presented statistically significant effects of political stability and voice and accountability on growth, while the author found that control of corruption exerts a negative impact on growth. The results presented in a study by Al Mamun et al. (2017) showed that the quality of governance is a key driver for spurring economic growth in 50 oil-exporting economies, while the authors also documented a significant nexus between governance and economic growth for countries having greater access to information and communication technology. Hadj Fraj et al. (2018) examined the governance-growth nexus in 21 developed and 29 emerging economies using a set of panel data from 1996–2012. The authors applied a generalized method of moment and found that governance indicators are not statistically significant in spurring economic growth, while exchange rate flexibility is found to destabilize emerging economies and boost growth in developed economies. Similarly, the authors found that good governance boosts the choice of a flexible exchange rate regime, which requires the improvement of governance to encourage economic growth in emerging economies.

Abdelbary and Benhin (2019) examined the effects of governance indicators on economic growth for the Arab region's economies using a set of panel data from 1995–2014. They discovered significant evidence on the impact of human capital and investment, but no evidence on the impact of regulatory quality on economic growth. Chand et al. (2020) investigated the nexus among governance indicators, exports, and economic growth in the context of Fiji. Using statistical procedures to test the hypothesis, the authors found that governance and export have a co-movement to accelerate economic growth with a meaningful interplay among the indicators. Azimi and Shafiq (2020) hypothesized a causality nexus between governance predictors and economic growth for Afghanistan, using a set of time-series data from 2002–2019. The authors found that besides the fact that there exists a causal relationship between governance and growth, the governance indicators exhibit multidimensional and complex interdependencies.

As a general approach to examining the impact of governance on growth, almost all of the recent studies have used both time-series and panel datasets to test the governance–growth nexus for the largest economies but in individual contexts. Yet there is no study concerning the symmetric effects of governance on growth collectively for the world's largest economies, each of which holds a different economic size and performance. This article is a distinctive work that contributes to the literature and fills the existing gap that has been missed by recent studies.

3. Data

This study uses two sets of data for the world's 10 largest economies, such as the US, China, Japan, Germany, India, the UK, France, Brazil, Italy, and Canada, ranging from 2002 to 2019. The first set of data includes time-series observations used to analyze the varying responses of the underlying economies to governance predictors, while the second set contains panel data used to analyze the group responses to governance predictors. The choice of countries is based on five criteria, such as GDP, GDP growth, population, per capita GDP, and share of the world's GDP. Following Solow's growth model, GDP growth is used as the dependent variable, governance indicators are used as the explanatory variables, and net national saving rate (%), working population with secondary education (total population %), and fixed capital formation (GDP %) as a proxy for physical capital are used as control variables. Governance indicators are largely accepted as measures of good governance worldwide, while GDP is largely used as a proxy to measure economic growth. Following Solow's growth model, this study controls for saving rate, human capital, and physical capital to avoid any spurious results. The variables are consistent with the recent literature (Fawaz et al., 2021; Han et al., 2014), and they are collected from the WGI (Worldwide Governance Indicators) and WDI (World Development Indicators) sources relevant to the World Bank Group. Table 1 reports the complete definition and sources of the variables. WGI presents six indicators to measure good governance; they include control of corruption, government effectiveness, political stability or absence of violence, regulatory quality, the rule of law, and voice and accountability. The governance indicators used are expressed in percentile ranks 0–100, implying that a higher percentile rank equals stronger governance in each of the indicators, while lower percentile ranks indicate otherwise. Gross domestic product growth is expressed as an annual percentage of growth.

4. Methodology

This section explains the econometric methods used to delve into the effects of governance predictors on economic growth. First, it explains the methods used to investigate the nexus and effects of governance predictors on growth for each individual economies included in this study—that is, the symmetric, say, linear ARDL model proposed by Pesaran et al. (2001). Let Y,X_1, and X_2 be a set of multivariate macroeconomic and governance indicators presenting GDP growth, governance, and the control predictors respectively (see, Table 1). It is assumed that the predictors follow mixed integrating orders of I(0) and I(1) without any I(2) series. To test for integrating order of the predictors, Augmented Dickey and Fuller (1979) and Phillips and Perron (1988) tests are

Table 1. Variables definition and sources

Variables	Symbols	Definition	Sources
Dependent variable			
GDP growth	GDPG	GDP growth is used as the dependent variable and it is expressed as the annual percentage of growth.	WDI
Governance variables			
Control of corruption	CC	This variable is used to capture the perception of the extent to which public power is used to prevent any personal gains from public power and assets. For brevity, this and the following independent variables are expressed as a percentile rank ranging from 0 to 100.	WGI
Government effectiveness	GE	This indicator is used to capture the quality of public and civil services to citizens as political-free organizations.	WGI
Political stability	PS	Political stability is used to capture the probability of political instability in the relevant countries.	WGI
Regulatory quality	RQ	This variable is used to measure the ability of a government to formulate and implement effective policies to support the promotion and development of private sector engagement.	WGI
Rule of law	RL	The rule of law is used to describe the degree of enforcement of property rights, agreements, police, courts of law, and legal actions against violence and crime.	WGI
Voice and accountability	VA	This indicator measures the degree to which citizens have freedom to select their government, freedom of speech, freedom of association, and media freedom.	WGI
Control variables			
Net national saving rate	NSR	Net national saving rate is used as a proxy for net saving expressed in percentage. This variable is used as a control variable. The net national saving equals to gross national savings less the value of fixed capital consumption.	WDI
Human capital	HC	Working population with secondary education is used as a proxy for the human capital. This indicator is expressed as percentage of total population.	WDI
Physical capital	PC	Fixed capital formation as GDP % is used as a proxy for physical capital and includes values of land, plant, machinery, construction of roads, and equipment purchases.	WDI

Notes: Sample size adjusted from 2002 to 2019. WDI: World Development Indicators, WGI: Worldwide Governance Indicators.
Source: Author's compilation (2021).

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employed. Satisfying the statistical requirement on evidence of mixed integrating order, the symmetric ARDL model can be expressed as follows:

$$\Delta Y_t = \varphi_i + \lambda_{i1} Y_{t-1} + \lambda_{i2} X_{1t-1} + \lambda_{i3} X_{2t-1} + \gamma k_t + \sum_{i=1}^{u=1} \delta_{i1} \Delta Y_{t-i} + \sum_{i=1}^{v=1} \delta_{i2} \Delta X_{1t-i} + \sum_{i=1}^{v=1} \delta_{i3} \Delta X_{2t-i} + e_t \quad (1)$$

where the change sign Δ denotes difference operator, φ is constant, $\lambda_1 - \lambda_3$ ($\delta_1 - \delta_3$) are the long (short) coefficients, γ is a vector of deterministic regressor regarded as exogenous, like trend, and e is the stochastic error term, which follows *i.i.n.d.* assumption. To initiate the estimation of equation (1), the first step is to test for cointegration. Thus, equation (1) is assumed to be cointegrated if Y, X_1, and X_2 posit long-run nexus, say, they are cointegrated and reject the null hypothesis of no cointegration, separately $\lambda_{i1} = 0, \lambda_{i2} = 0, \lambda_{i3} = 0$ or jointly $\lambda_{i1} = \lambda_{i2} = \lambda_{i3} = 0$, using F-statistics. For brevity, if the F-statistics is less than the lower bound I(0) critical value, say, at 5%, the null hypothesis cannot be rejected, while one can easily reject the null hypothesis if the F-statistics is greater than the upper bound I(1) critical value, say, at 5%. If the F-statistics fall between the critical values for the lower and upper bounds, the test is inconclusive about the null. Extending the analysis to respond to governance volatilities and at constant speed, the present study incorporates the error-correction term in equation (1) and rewrites it as follows:

$$\Delta Y_t = \varphi_i + \lambda_{i1} Y_{t-1} + \lambda_{i2} X_{1t-1} + \lambda_{i3} X_{2t-1} + \gamma_i k_t + \sum_{i=1}^{p-1} \delta_{i1} \Delta Y_{t-i} + \sum_{i=1}^{q-1} \delta_{i2} \Delta X_{1t-i} + \sum_{i=1}^{q-1} \delta_{i3} \Delta X_{2t-i} + \xi ECT_t + e_t \quad (2)$$

where all variables are explained before, ECT is the error correcting term in equation (2), which measures the speed of adjustment of long-run symmetries to short-run equilibrium. Second, this study further employs the panel ARDL model to delve into the long (short) run effects of governance predictors on economic growth and to extract the ECT of the panel features to discover the short-run dynamics. The ARDL is an appropriate model to test for the long-run relationship among the indicators and has several comparative advantages over the commonly used cointegration techniques. First, the computation of the ARDL test is quite easy in empirical analysis, and it uses the OLS method to estimate the long-run relationship among variables and extract the short-run effects for panel data all in one computation. Second, its estimated coefficients are consistent and efficient for finite and small samples. Third, it allows the indicators to exhibit both I(0) and I(1) series. Fourth, it is consistent for models with endogenous variables. Fifth, it allows both dependent and independent variables to use different lags (Haug, 2002; Sakyi et al., 2015). To build panel data model, econometric literature suggests to consider the integration order of the series. To do this, panel unit root test proposed by Levin et al. (2002), Im et al. (2003), Fisher Augmented Dickey-Fuller, and Fisher Philips-Perron are used. For the panel ARDL estimation, assuming that the predictors follow I(0) and I(1) without any I(2) series, equations (3) and (4) are simultaneously estimated to test for the long (short) run effects and the ECT:

$$\Delta Y_{it} = \varphi_i + \sum_{j=1}^{p-1} \delta_{i1} \Delta Y_{i,t-j} + \sum_{j=1}^{q-1} \delta_{i2} \Delta X_{1i,t-j} + \sum_{j=1}^{q-1} \delta_{i3} \Delta X_{2i,t-j} + \varepsilon_{it} \quad (3)$$

$$\Delta Y_{it} = \varphi_i + \sum_{j=1}^{p-1} \delta_{i1} \Delta Y_{i,t-j} + \sum_{j=1}^{q-1} \delta_{i2} \Delta X_{1i,t-j} + \sum_{j=1}^{q-1} \delta_{i3} \Delta X_{2i,t-j} + \xi ECT_{i,t-1} + \varepsilon_{it} \quad (4)$$

The panel ECT is incorporated in (4) as given in (5), in which the sign of ξ is expected to be negative and it is used for two purposes. First, to measure the speed of adjustment of the long-run divergence to its short-run equilibrium. Second, to validate the existence of long-run nexus amid indicators. Thus, for brevity, the present study uses the results of ξ to make statistical inferences about the long-run bounds among indicators.

$$ECT_{it} = Y_{it} - \varphi - \left[\sum_{j=1}^{p-1}\delta_{i1}Y_{i,t-i} - \sum_{j=1}^{q-1}\delta_{i2}X_{1i,t-i} - \sum_{j=1}^{q-1}\delta_{i3}X_{2i,t-i}\right] \quad (5)$$

Finally, several post-estimate examination tests are employed to ensure the results are statistically valid. These tests are (i) Breusch Pegan-Godfrey for testing the residuals heteroscedasticity, (ii) Breusch Godfrey LM test for serial correlation test, (iii) Jarque-Bera test for the normal distribution of the residuals, (iv) CUSUM (cumulative sum) test for model stability, and (v) CUSUMSQ (cumulative sum of squares) test for the stability of the coefficients. The use of CUSUM and CUSUMSQ is also based on testing whether economic growth of the countries shows stability to governance predictors.

5. Results and discussions

This section begins with the summary statistics. Table A1 of appendix A presents some descriptive highlights of the variables for each selected economy. It shows that the average economic growth for Canada stands at 2.61%, while the growth rates for Brazil, France, India, the UK, Germany, Japan, China, the US, and Italy are 2.33%, 1.25%, 6.71%, 1.69%, 1.24%, 0.83%, 9.08%, 2.04%, and 0.123% respectively. Among all the others, results show that China has the highest economic growth rate, at 9.08%, with the minimum rate of 5.94%, and a maximum growth rate of 14.23%. This happened when almost all the economies suffered from the financial crisis during 2008–2009 with almost identical negative growth rates, but China has been enjoying a positive growth of 5.94%.

For the governance indicators, Canada and Japan show to have good governance practices, while China, India, and Brazil exhibit the percentile ranks for control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice and accountability to be even below the average. For instance, it reveals that the mean for control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice & accountability are 17.82, 44.24, 18.42, 40.30, and 22.53 respectively, which are all comparatively low in showing the extent to which the practice of good governance is expected. Comparatively, the summary statistics for Canada in terms of the governance indicators demonstrate higher percentile ranks than others. For instance, the mean for the control of corruption, which indicates the power of the government to avoid any misuse of public power and assets for any personal gains, stands at 94.89 percentile rank, while the mean for government effectiveness, regulatory quality, rule of law, and voice and accountability are 95.74, 85.83, 94.94, and 95.42 respectively. Likewise, the governance indicators for the US stand at a mean value of 89.37, 91.17, 58.85, 91.36, 91.46, and 85.72 for control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice and accountability, respectively, while the mean value for China stands at 40.35, 60.57, 30.06, 45.31, 39.06, and 60.22 percentile rank for control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice & accountability respectively. According to Quibria (2006), an economy is assumed to have a surplus in governance indicators if its score is greater than its expected values corresponding to its per capita real income, and an economy is assumed to have a deficit in governance indicators if its governance score is less than its values corresponding to its per capita real income in a specified period, say, annually. Using China as a starting point for further investigation into the effects of governance indicators on economic growth, it demonstrates the highest economic growth of 14.23% versus low good governance percentile ranks among all of the world's nine largest economies during the period covered by this study.

Moreover, the unit root analysis is performed to determine the integrating order of the predictors both for cross-country and panel data. The results are presented in Tables B1 and B2 of appendix B. Table B1 shows for Canada that GDPG, GE, RL, and RQ are I(0) series by the ADF test, while the PP test only confirms the stationarity of GDPG at level. Other indicators such as CC, PS, VA, NSR, HC, and PC are I(1) series, that is, they are first differenced stationary. Only VA in Brazil is an I(0) series according to both the ADF and PP tests. All of its other predictors are I(1) series because they become stationary at the first difference. The predictors such as GDPG, CC, PS, RQ, and RL for France are I(0), while its remaining predictors are I(1) both by the ADF and PP tests. Moreover, for India, only GDPG and CC are I

(0), while its other predictors are first difference stationary. This also triggers diving into analyzing the panel unit root. Table B2 demonstrates that GDPG, CC, GE, RL, and HC by LLC, GDPG, GE, and RL, and VA by IPS and ADF Fisher, GDPG, GE, PS, RQ, and RL by PP Fisher are I(0), while the remaining predictors are first difference stationary series in the panel dataset. For brevity, the results for the unit root conclude that both for cross-country and panel, the predictors follow mixed integrating orders of I(0) and I(1) without any I(2) series. Next, the present study computes the cointegration tests. Using the ARDL bound test, the long-run relationships between the predictors are confirmed for Canada, Brazil, the UK, Germany, the US, and Italy, while no statistical evidence is found to support long-run bounds amid indicators for France, Japan, and China (see, Table C1 of appendix C). Proceeding with the estimation of cointegration for the panel presented in Table C2 of appendix C, the results of the Pedroni test confirm that there is a long-run relationship between the group. Next, the present study computes the symmetric ARDL model based on automatic lag selection using AIC (Akaike Information Criterion), SIC (Schwarz Information Criterion), and HQIC (Hannan-Quinn Information Criterion) approaches. The results of the ARDL model are reported in Table 2 and they are discussed for each country as follows.

For the US, the results of the short-run effects demonstrate that all the governance indicators are statistically significant and affect growth. It indicates that with a percentile increase in control of corruption, growth increases by 0.241%, while a unit increase in the percentile rank of government effectiveness, political stability, regulatory quality, rule of law, and voice and accountability causes economic growth to increase by 0.336%, 0.042%, 0.042%, 0.133%, and 0.177% respectively. Besides, the inclusion of control variables indicates a significant impact on growth. NSR and PC affect economic growth by 0.930% and 0.222%, respectively, in the short-run. For the long-run effects, the results reveal that PS, NSR, and PC impact economic growth by 0.108%, 0.898%, and 0.567% respectively. Although US growth shows lower sensitivity to governance predictors, the results of the present study reject the assumption of Mira and Hammadache (2017), who believed that governance predictors can only affect economic growth when an economy reaches a certain level of economic development and industrialization. The rejection of this hypothesis is also true in the cases of China, Japan, Germany, the UK, Italy, and Brazil.

Proceeding with the analysis, the results indicate for China that control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice and accountability are significant predictors of economic growth in the short run, increasing it by 0.122%, 0.080%, 0.0.095%, and 0.211%, 0.101%, and 0.144%, while in the long run, control of corruption, political stability, rule of law, and voice and accountability increase economic growth by 0.111%, 0.265%, 0.167%, 0.379, and 0.485%. Though the results are consistent with the findings of Liu et al. (2018) and Wilson (2016), who documented that governance quality spurs economic growth in China, comparatively, as new evidence, it is found that China's growth is less sensitive to all governance predictors. In exploring the effects of governance indicators on growth for Japan, the results report that except for the human capital, all governance indicators and control variables affect economic growth in the short-run, while for the long-run, except for the political stability and the human capital, all indicators are statistically significant in spurring economic growth. However, Japan has undergone serious governance reforms since 1960, adjusted its policies to suit urbanization, and it majorly focused on economic growth by encouraging good governance practices (Biswas et al., 2021). The results show that the efforts were still insignificant to highly link good governance with economic growth.

For Germany, the results reveal that economic growth shows high sensitivity to the rule of law but low sensitivity to other governance predictors. It demonstrates that control of corruption, government effectiveness, regulatory quality, rule of law, and voice and accountability increase growth by 0.300%, 0.219%, 0.299%, 0.850%, and 0.158%% in the short-run, while the long-run effects show that only government effectiveness and regulatory quality are significant in spurring economic growth. The results are linked with the fact that despite Germany's being centered on growth and promoting good governance, its spatial planning in a multi-path governance approach causes to show evidence of its growth to be less sensitive to governance predictors (see, for example, Ayadi et al., 2019). For India, the results show that its growth is highly impacted by voice and accountability, while other governance

predictors show lower effects. It is also evident that predictors of governance have only short-run effects on growth. Thus, based on the findings, India's economic growth is less sensitive to governance predictors. Apart from other political reasons, this might be due to several reasons. First, its complex bureaucratic administrative system, which still allows a wide range of corruption; second, the lack of government responsiveness to citizens; and third, comprehensive implementation of the rule of law both at central and state levels (see, for instance, Rajesh Raj et al., 2020).

The UK's growth also shows moderate sensitivity to control of corruption, while governance predictors show lower effects on growth. The results show that control of corruption, government effectiveness, regulatory quality, and rule of law increase economic growth by 0.713%, 0.067%, 0.049%, 0.442%, and 0.260%, respectively, in the short run, but it shows a higher proportionality in the long run for all the predictors other than voice and accountability. The results support the findings of Hulten (1996) and Cooray (2009), who found that good governance is central to improving economic growth in the UK. Investigating the governance effects on economic growth in France, the results show that except for the rule of law, its growth is weakly explained by governance predictors both in the short and long runs. In the short run, the control of corruption, political stability, regulatory quality, and rule of law are the predictors that impact France's growth by 0.062%, 0.073%, 0.095%, and 0.773%, while for the long-run, by a percentile rank increase in control of corruption, political stability, and rule of law the growth increases by 0.097%, 0.139%, and 1% in the long-run. Comparatively, France's growth is highly motivated by the control variables that are included in the model. These findings are consistent with the results of Buchanan et al. (2012), who demonstrated that institutional quality, therefore, good governance impacts the flow of investments leading to higher economic growth in the EU countries. The growth of both Brazil and Italy shows low sensitivity to governance indicators. The results reveal that the governance indicators only impact the economic growth of Brazil and Italy in the short-run, while no long-run impact is evident. Most distinctively, Canada seems to have interesting results. It indicates that Canada's economic growth is highly sensitive to governance predictors in the short run, with no impact in the long run. The results reveal that in the short-run, a percentile increase in control of corruption increases economic growth by 2.443%, while an increase in government effectiveness causes the growth to increase by 1.186%. It further shows that political stability, rule of law, regulatory quality, rule of law, and voice and accountability spur economic growth by 0.516%, 0.212%, 1.423%, and 1.422%, respectively.

Table 2 also reports additional results on the goodness of fit, ECT, and some diagnostic results. It shows that the results computed and reported do not suffer from heteroskedasticity, serial correlation, and abnormal distribution of the residuals. Moreover, the results show that almost all the economies included in the present study are stable in terms of coefficients and model fitness. The CUSUM (cumulative sum) and CUSUMSQ (cumulative some of the squares) results are presented in (Figure D1-D20). For a comparative analysis of the differences between the economies, the present study, based on the ARDL coefficients, divides the scale of growth responses to governance predictors into three classes: high sensitivity, moderate sensitivity, and low sensitivity. Considering the coefficients, an economy is highly sensitive to governance predictors if its coefficient is ≥ 0.75; moderately sensitive if $< 0.50 < 0.75$; and lowly sensitive if $< 0 < 0.50$. Table 3 presents the analysis.

Lastly, Table 4 reports the results of panel ARDL model using the PMG estimators selected on the basis of the rejected null hypothesis of MG preference over PMG estimators. The results reveal that the economic growth of the panel members is significantly impacted by good governance, both in the short and long runs. It shows that a percentile increase in control of corruption, government effectiveness, political stability, regulatory quality, the rule of law, and the voice and accountability, respectively, cause economic growth to increase by 0.321%, 0.063%, 0.054%, 0.063%, 0.089%, and 0.011% in the short-run, while they positively spur economic growth by 0.017%, 0.051%, 0.073%, 0.012%, 0.059%, and 0.451% respectively in the long-run. Evidence shows that the group restores its long-run divergence by 97.6% per year. Compared with recent empirical works on the governance-growth nexus, complicated results are postulated both for developed and developing economies. On one hand, for instance, Zhuo et al. (2020) discovered that

Table 2. Symmetric ARDL test results

Dependent variables: GDPG	Model estimated: ARDL (AIC, SIC, and HQ)									
	US	**China**	**Japan**	**Germany**	**India**	**UK**	**France**	**Brazil**	**Italy**	**Canada**
Short-run coefficients										
CC	0.241*** (5.033) [0.000]	0.122*** (3.999) [0.000]	0.222*** (4.225) [0.000]	0.300*** (5.417) [0.000]	0.222*** (5.758) [0.000]	0.713*** (3.651) [0.000]	0.062*** (9.172) [0.000]	0.198*** (3.831) [0.000]	0.231*** (3.202) [0.003]	2.443*** (3.028) [0.004]
GE	0.336*** (8.100) [0.000]	0.080*** (2.762) [0.008]	0.133*** (3.614) [0.003]	0.219** (2.491) [0.016]	0.037** (2.462) [0.019]	0.067** (2.076) [0.045]	0.013 (0.447) [0.656]	0.008 (0.410) [0.683]	0.004 (0.126) [0.899]	1.186*** (3.742) [0.000]
PS	0.042*** (3.249) [0.001]	0.095*** (3.119) [0.002]	0.196*** (5.603) [0.000]	0.012 (0.484) [0.630]	0.502*** (10.816) [0.000]	0.049** (2.235) [0.023]	0.073*** (3.577) [0.000]	0.020*** (3.558) [0.000]	0.011 (0.501) [0.614]	0.516*** (4.675) [0.000]
RQ	0.042*** (4.521) [0.000]	0.211*** (5.781) [0.000]	0.097*** (3.817) [0.000]	0.299** (2.102) [0.048]	0.278*** (7.708) [0.000]	0.442*** (5.965) [0.000]	0.095*** (3.538) [0.009]	0.074*** (4.268) [0.000]	0.212*** (5.621) [0.000]	0.212*** (5.231) [0.000]
RL	0.133*** (6.591) [0.000]	0.101*** (2.986) [0.000]	1.186*** (5.870) [0.000]	0.850** (2.063) [0.044]	0.025 (0.942) [0.350]	0.260*** (2.765) [0.009]	0.773*** (4.593) [0.000]	0.242*** (4.255) [0.000]	0.171** (2.309) [0.025]	1.423*** (3.490) [0.001]
VA	0.177*** (3.972) [0.001]	0.144*** (3.717) [0.000]	0.117*** (4.424) [0.000]	0.158*** (3.592) [0.008]	0.961*** (7.790) [0.000]	0.044 (1.639) [0.110]	0.034 (1.368) [0.178]	0.314*** (4.270) [0.000]	0.104** (2.298) [0.025]	1.142*** (4.318) [0.001]
NSR	0.930*** (9.382) [0.000]	0.092** (2.379) [0.021]	2.152*** (11.493) [0.000]	0.630*** (10.111) [0.000]	0.812*** (7.303) [0.000]	0.607*** (5.367) [0.000]	1.242*** (7.472) [0.000]	1.951*** (8.428) [0.000]	0.089* (1.860) [0.068]	0.531*** (3.005) [0.004]
HC	0.202 (0.952) [0.345]	0.320*** (3.721) [0.000]	0.056 (1.457) [0.146]	0.362*** (3.067) [0.003]	7.154*** (4.825) [0.000]	3.766* (1.728) [0.093]	0.912*** (4.493) [0.000]	0.219 (1.153) [0.254]	2.705*** (3.699) [0.000]	0.084*** (4.800) [0.000]
PC	0.222** (2.193) [0.032]	0.548 (0.333) [0.737]	2.100*** (5.517) [0.000]	0.161 (0.764) [0.448]	0.349** (2.201) [0.032]	1.732*** (3.796) [0.000]	0.676*** (4.632) [0.000]	1.445*** (4.993) [0.000]	1.090*** (10.359) [0.000]	0.722*** (4.025) [0.001]
Long-run coefficients										
CC	0.048 (0.033) [0.973]	0.111*** (7.180) [0.000]	1.455*** (2.790) [0.003]	0.327 (0.381) [0.704]	0.568 (1.558) [0.125]	0.749*** (6.753) [0.000]	0.097** (2.019) [0.049]	0.014 (0.189) [0.850]	0.070 (0.569) [0.571]	0.127 (0.189) [0.850]
GE	0.294 (1.423) [0.160]	0.004 (0.067) [0.946]	1.005** (2.363) [0.022]	0.731** (2.409) [0.019]	0.424 (1.436) [0.157]	0.078** (2.123) [0.041]	0.020 (0.443) [0.659]	0.036 (0.404) [0.689]	0.013 (0.126) [0.899]	0.206 (0.586) [0.560]
PS	0.108*** (3.010) [0.003]	0.265*** (3.602) [0.000]	0.025 (0.213) [0.831]	0.040 (0.469) [0.640]	0.021 (0.072) [0.942]	0.097*** (7.154) [0.000]	0.139*** (5.188) [0.000]	0.084 (1.077) [0.286]	0.036 (0.521) [0.604]	0.090 (0.712) [0.479]
RQ	0.108 (1.241) [0.219]	0.014 (0.136) [0.892]	0.636** (2.381) [0.021]	0.978** (2.168) [0.018]	0.307 (0.664) [0.509]	0.427*** (6.584) [0.000]	0.050 (1.484) [0.145]	0.030 (0.359) [0.720]	0.012 (0.054) [0.956]	0.174 (0.952) [0.346]

(*Continued*)

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Table 2. (*Continued*)

Dependent variables: GDPG	Model estimated: ARDL (AIC, SIC, and HQ)									
	US	**China**	**Japan**	**Germany**	**India**	**UK**	**France**	**Brazil**	**Italy**	**Canada**
RL	0.340 (1.253) [0.368]	0.167*** (3.072) [0.001]	1.078* (1.865) [0.068]	−0.333 (−0.798) [0.429]	0.295 (0.797) [0.429]	0.458*** (7.533) [0.000]	1.002*** (7.056) [0.000]	0.012 (0.107) [0.914]	0.069 (0.558) [0.579]	0.518 (0.813) [0.420]
VA	0.130 (0.905) [0.368]	0.379*** (6.911) [0.000]	0.765** (2.546) [0.014]	0.016 (0.035) [0.971]	1.629* (1.940) [0.058]	0.051 (1.596) [0.119]	0.053 (1.377) [0.175]	0.192 (1.056) [0.295]	0.058 (0.605) [0.547]	0.284 (0.398) [0.692]
NSR	0.898*** (5.452) [0.000]	0.485*** (2.758) [0.003]	1.891*** (2.879) [0.005]	0.918*** (2.711) [0.009]	2.035 (1.038) [0.304]	0.444*** (8.639) [0.000]	0.672*** (6.663) [0.000]	0.699 (1.744) [0.162]	0.289* (1.775) [0.082]	0.172 (0.959) [0.342]
HC	0.516 (0.972) [0.334]	1.120* (1.960) [0.056]	0.370 (1.389) [0.171]	1.016 (0.730) [0.468]	0.585 (0.867) [0.390]	0.733*** (4.267) [0.000]	1.428*** (6.351) [0.000]	0.898 (1.928) [0.279]	1.848 (1.547) [0.128]	−0.265 (−0.782) [0.385]
PC	0.567** (2.143) [0.036]	0.098*** (4.052) [0.000]	−0.237 (−0.432) [0.667]	0.538 (0.745) [0.459]	0.763 (0.575) [0.567]	1.211*** (10.415) [0.000]	1.059*** (6.208) [0.000]	0.665 (1.188) [0.240]	0.805 (1.223) [0.226]	0.240 (0.590) [0.557]
Constant	−28.400* (−1.678) [0.096]	92.106** (2.082) [0.042]	19.675** (2.443) [0.018]	−86.651 (−0.544) [0.588]	−16.244 (−0.218) [0.828]	−1.170 (−0.062) [0.950]	13.163* (1.846) [0.071]	−67.87 (−1.331) [0.189]	87.300*** (4.497) [0.000]	29.157 (0.415) [0.679]
Diagnostic checks										
ECT	−0.393*** (−5.94)	−0.276*** (−7.116)	−0.253*** (−11.463)	−0.300*** (−9.259)	−0.872*** (−16.230)	−0.859*** (−12.73)	−0.638*** (−13.00)	−0.243 (−18.443)	−0.307*** (−15.099)	−0.317*** (−9.25)
Adjusted R-squared	0.907	0.994	0.983	0.905	0.992	0.981	0.950	0.994	0.901	0.891
BPG	1.125 [0.242]	0.941 [0.825]	26.619* [0.086]	3.369 [0.340]	6.029 [0.998]	10.427 [0.999]	26.612 [0.272]	18.641 [0.287]	1.641 [0.862]	27.331 [0.126]
BG-LM	0.743 [0.689]	2.119 [0.469]	4.046 [0.132]	4.420 [0.109]	1.348 [0.825]	3.454 [0.481]	5.529 [0.127]	3.319 [0.276]	3.014 [0.387]	1.938 [0.645]
JB	0.109 [0.846]	1.978 [0.671]	1.218 [0.146]	2.058 [0.179]	2.840 [0.241]	1.552 [0.739]	2.449 [0.126]	0.870 [0.647]	1.736 [0.645]	4.049 [0.132]
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable	Partially stable	Partially stable	Stable	Stable	Stable	Stable	Stable

Notes: *** Significant if $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$. Optimal lag length selection is based on AIC, SC, and HQ. CC: Control of corruption, GE: Government effectiveness, PS: Political stability, RQ: Regulatory quality, RL. Rule of law, VA: Voice and accountability, NSR: Net national saving rate, HC: Human capital, PC: Physical capital, BPGL Breusch Pegan Godfrey, BP: Breusch Godfrey, JB: Jarque-Bera. CUSUM: cumulative sum, CUSUMSQ: cumulative sum of squares. () denotes t-statistics, [] denotes p-values.

Source: Author's compilation (2021).

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Table 3. Comparative analysis

Categories	Cross-country difference analysis									
	US	China	Japan	Germany	India	UK	France	Brazil	Italy	Canada
C1: High sensitivity										
CC										√
GE										
PS										
RQ										
RL			√	√			√			√
VA					√					√
C2: Moderate sensitivity										
CC						√				
GE										
PS										√
RQ										
RL							√			
VA										
C3: Low sensitivity										
CC	√	√	√	√	√		√	√	√	
GE	√	√	√	√	√	√				
PS	√	√	√			√	√	√	√	
RQ	√	√	√	√	√	√	√	√	√	√
RL	√	√		√		√		√	√	
VA	√	√	√	√				√	√	

Notes: √ represents the sensitivity of the predictors based on the ARDL coefficients. C1 = ≥ 0.75; C2 = < 0.50 < 0.75; C3 = < 0 < 0.50. CC: Control of corruption, GE: Government effectiveness, PS: Political stability, RQ: Regulatory quality, RL: Rule of law, VA: Voice and accountability.

Source: Author's compilation (2021).

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Table 4. Panel ARDL estimates

Estimates	Model estimated: Dynamic panel ARDL								
	CC	GE	PS	RQ	RL	VA	NSR	HC	PC
Short-run estimates									
Coefficients	0.321***	0.063***	0.054***	0.063***	0.089***	0.011***	0.641***	0.874***	0.238***
t-statistics	8.081	9.250	5.021	12.403	3.701	3.791	12.420	10.152	8.889
p-values	0.000	0.000	0.001	0.000	0.003	0.000	0.000	0.000	0.000
ECT	−0.976***								
Long-run estimates									
Coefficients	0.017***	0.051***	0.073***	0.012***	0.059***	0.451***	0.239***	0.499***	0.445***
t-statistics	10.991	4.091	4.952	5.140	6.121	11.015	5.871	8.011	4.692
p-values	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diagnostic checks									
JB	0.976 [0.861]								
Hausman	1.998 [0.845]								

Notes: *** Significant if $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$. CC: Control of corruption, GE: Government effectiveness, PS: Political stability, RQ: Regulatory quality, RL. Rule of law, VA: Voice and accountability, NSR: Net national saving rate, HC: Human capital, PC: Physical capital, JB: Jarque-Bera, [] denotes p-values. Hausman test—Ho: PMG over MG.

Source: Author's compilation (2021).

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governance indicators have a significant impact on economic growth in developed countries, whereas Fawaz et al. (2021) presented statistically significant effects of governance indicators on growth of high-income and low-income developing economies.

In sum, considering the statistical findings of the present study, two interesting results can be discussed. First, Al-Bassam (2013), Mira and Hammadache (2017), and Hashem (2019), who posit that the governance-growth nexus is rather complicated and depends upon homogenous economies, to their evidence on the complexity of the results, this paper clarifies the homogeneity of the economies with respect to their sensitivity to governance predictors and classifies them into three categories as discussed earlier. Second, by the application of the symmetric ARDL model, it is evident that some of the countries included in this study have economic growth that shows stability to governance predictors, while some other economies show only partial stability. For example, the economic growth of the US, China, Japan, Brazil, Italy, and Canada exhibit full stability to governance predictors, whereas Germany, India, the UK, and France show partial stability.

6. Conclusions

The existing literature largely documents that governance indicators affect economic growth either positively or negatively depending on the income level, social infrastructure, and technology of the underlying economies (Acemoglu et al., 2005b). Considering the theoretical assumptions and the empirical studies that posit confounded results, this study delves into in-depth analysis to test three competing hypotheses relevant to the world's 10 largest economies, including the US, China, Japan, Germany, India, the UK, France, Brazil, Italy, and Canada. The selection of the countries is based on five criteria, such as GDP, GDP growth, population growth, per capita GDP, and share of the world's GDP. First, this study tests whether the governance indicators have a significant positive impact on economic growth. Second, it tests whether developed economies, say, the largest economies included in the present study, exhibit neutral sensitivity towards governance indicators. Third, it tests the non-monotonous behavior of governance indicators in explaining the variation of economic growth in the largest economies. For this purpose, the present study uses both panel and time-series datasets ranging from 2002 to 2019, collected from WGI and WDI official sources. To avoid model misspecification, the analysis begins with the unit root test to exclude any variable showing an I(2) series. Applying appropriate techniques, it is found that the indicators follow a mixed integration order, while the results obtained from both panel and time-series cointegration techniques confirm the presence of a long-run bound among the variables. In line with this, the dynamic panel ARDL model is applied to test the short and long-run effects of governance indicators on economic growth for the group, and the symmetric ARDL model is applied to test the short and long-run symmetries for each individual economy.

The dynamic panel ARDL results reveal that economic growth postulates moderate sensitivity to governance predictors by different scales and magnitudes in the runs. Exploring the results of the symmetric ARDL for individual economies, this study provides strong evidence that the variation in economic growth is explained by governance indicators on different scales and magnitudes. It is also found that some countries show low sensitivity to governance indicators both in the short and long runs. Noticeably, the panel shows a high speed of adjustment of the short-run symmetries to its long-run equilibrium. Since growth swiftly responds to the rise and fall of governance predictors, specific policy adjustments are required to maintain sustainable and long-run growth. The results obtained are statistically validated using the appropriate post-estimate examinations. In light of the interesting findings, the present study recommends a set of policy measures considering the high, moderate, and low sensitivity of economic growth to governance indicators. They are as follows:

(i) High sensitivity: Canada has a high sensitivity to governance predictors, implying that governments must pay close attention to corruption control, regulatory quality, the rule of law, and voice and accountability in order to improve the quality of existing regulations, impose a greater emphasis on the rule of law, and support voice and accountability as one of the integral strands of good governance in the long-run in order to sustain economic growth.

(ii) Moderate sensitivity: The UK, France, and Canada show moderate sensitivity to some governance indicators. Control of corruption, government effectiveness, regulatory quality, and political stability are the predictors that governments should pay close attention to in order to ensure public officials are more effective in providing relevant services to support domestic and foreign investments and to raise standards in the formulation and implementation of sound policies to support economic growth in both the short and long run.

(iii) Low sensitivity: The countries that exhibit low sensitivity to governance indicators need to continue effective structural and policy reforms to facilitate greater opportunities for private sector development, sound financial projects, and to enhance the implementation of the rule of law to facilitate higher growth in the long run.

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Abbreviations
ADF: Augmented Dicky & Fuller, ARDL: Autoregressive distributed lags, CC: control of corruption, CUSUM: cumulative sum, CUSUMSQ: Cumulative sum of squares, ECM: error-correcting mechanism, ECT: error-correction term, GDPG: GDP growth, GE: government effectiveness, PS: political stability, NSR: Net national saving rate, HC: Human capital, PC: Physical capital, RQ: regulatory quality, RL: rule of law, VA: voice and accountability, PP: Philips-Perron, WDI: World Development Indicators, WGI: Worldwide Governance Indicators.

Availability of data and materials
The data relevant to governance indicators including control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice & accountability are collected from WGI (Worldwide Governance Indicators) available at (https://info.worldbank.org/governance/wgi/) and data for GDP growth come from WDI (World Development Indicators) available at (https://databank.worldbank.org/source/world-development-indicators).

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Appendix A

Table A1. A summary of descriptive statistics

Statistics	GDPG	CC	GE	PS	RQ	RL	VA	NSR	HC	PC		GDPG	CC	GE	PS	RQ	RL	VA	NSR	HC	PC
	1. Canada											6. Germany									
Mean	2.6	94.9	95.7	85.8	94.9	95.4	95.6	5.7	68.6	22.7		1.2	93.8	92.2	73.5	93.6	93.0	94.1	8.6	66.0	20.0
Standard error	2.1	1.1	1.0	5.7	1.6	0.9	1.1	3.0	0.9	1.4		2.2	0.8	1.8	6.4	1.6	1.3	1.1	1.9	0.7	0.6
Minimum	−2.9	92.2	94.7	72.8	91.8	93.8	93.8	1.5	66.5	20.0		−5.7	92.2	89.2	65.3	91.1	91.4	92.4	4.7	64.6	19.1
Maximum	6.9	96.7	97.6	95.2	97.6	96.7	97.5	10.3	69.5	24.5		2.2	95.2	94.7	86.2	96.2	95.2	96.1	11.2	67.4	21.4
	2. Brazil											7. Japan									
Mean	2.3	52.5	50.0	38.5	53.3	48.1	62.3	8.6	68.2	18.0		0.8	88.9	90.7	83.7	84.2	88.5	94.1	3.7	63.6	24.9
Standard error	2.9	8.3	6.6	8.0	5.4	5.3	1.7	2.3	1.4	2.1		1.9	3.1	3.8	4.1	4.8	1.8	3.0	2.4	2.8	1.0
Minimum	−3.5	36.1	36.1	24.8	39.9	39.2	58.6	4.4	65.5	14.6		−5.4	82.3	83.2	77.4	68.9	84.2	75.5	2.8	59.4	22.6
Maximum	7.5	63.0	63.3	57.1	63.8	56.3	65.9	11.5	69.7	20.9		4.2	92.8	96.2	90.8	90.4	90.4	85.0	1.0	67.6	26.3
	3. China											8. France									
Mean	1.3	89.2	89.2	59.9	85.2	89.6	89.1	32.1	72.2	41.3		9.1	40.4	60.6	30.1	45.3	39.1	60.2	4.9	63.9	22.2
Standard error	1.3	1.2	1.7	8.4	2.3	1.3	2.4	4.0	1.1	2.8		2.2	5.6	5.9	3.9	3.8	4.4	1.4	1.4	1.2	0.8
Minimum	−2.9	84.9	87.7	43.3	80.6	85.6	85.1	27.0	69.6	35.1		5.9	33.2	51.5	25.6	34.2	31.1	4.7	3.0	61.8	21.0
Maximum	2.8	91.8	92.6	79.9	90.9	91.9	92.8	38.5	73.3	44.5		14.2	49.0	71.6	38.6	51.0	48.1	8.9	7.0	65.0	23.6
	4. India											9. United States									
Mean	6.71	42.3	54.6	14.2	41	55	60.5	23.0	64.3	31.3		2.04	89.4	91.2	58.9	91.4	91.5	85.7	2.2	66.4	20.8
Standard error	1.68	4.59	4.34	3.19	3.7	2.06	1.22	2.7	1.8	2.7		1.43	2.55	1	8.47	2.83	1.05	3.53	1.8	0.5	1.4
Minimum	3.08	35.5	45.2	9.04	34.6	52.4	57.6	17.9	61.5	28.2		−2.54	84.6	89.9	37.4	85.6	89.9	78.8	−2.4	65.2	18.4
Maximum	8.49	49.5	63.9	21.4	48.6	58.9	63.2	26.7	67.0	35.8		3.79	92.9	93.2	67.1	95.6	93.1	92	4.3	66.9	23.0
	5. United Kingdom											10. Italy									
Mean	1.69	93.5	92.2	58.8	96.3	93.4	92.3	−0.5	65.2	17.1		0.12	64.7	69.3	61.1	65.2	79.6	78.9	2.5	65.3	19.4
Standard error	1.68	1.05	1.69	6.19	1.64	1.25	1.31	1.96	0.83	0.84		1.85	4.42	4.3	4.72	3.72	3.51	2.38	2.3	1.0	1.86
Minimum	−4.24	91.9	88	48.3	93.8	91.4	90.2	−3.4	63.8	15.6		−5.28	57.7	60.2	54.5	61.5	74.6	72.6	−0.7	63.8	16.7
Maximum	3.27	95.5	95.1	69.3	99.5	95.7	95.2	2.43	66.1	18		1.79	73.2	77.6	75.7	74.8	86.5	81.1	6.0	66.9	21.7

Notes: CC: control of corruption, GDPG: gross domestic product growth, GE: government effectiveness, PS: political stability, RQ: regulatory quality, RL: rule of law, VA: voice and accountability, NSR: Net national saving rate, HC: Human capital, PC: Physical capital, Obs.: Observations. Sample size adjusted from 2002 to 2019.

Source: Author's compilation (2021).

Appendix B

Table B1. Cross-country unit root analysis

Indicators	Augmented Dickey-Fuller			Philips-Perron			Augmented Dickey-Fuller			Philips-Perron	
	I(0)	I(1)		I(0)	I(1)		I(0)	I(1)		I(0)	I(1)
1. Canada							6. Germany				
GDPG	−2.89*††			−3.01**			−3.82***††			−6.74***	
CC	−1.84	−4.15***		−2.11	−3.69***		−1.48	−4.28***		−1.55	−4.87***
GE	−5.41***			−3.66	−3.91***		−1.33	−5.16***		−2.17	−11.52***
PS	−1.98	−4.32***		−1.98	−3.81***		−2.96*			−3.07**	
RQ	−3.16**			−3.21	−5.77***		−1.32	−4.43***		−1.08	−6.54***
RL	−2.87*			−2.87	−5.21***		−2.06	−3.24***		−1.53	−4.65***
VA	−2.65	−5.42***		−2.59	−5.43***		−1.51	−4.89***		−1.51	−5.28***
NSR	−1.48	−3.89***		−1.54	−4.74**		−3.30**			−2.18	−5.01***
HC	−1.81	−4.91**		−1.38	−4.78***		−1.85	−4.30***		−0.58	−3.55**
PC	−2.25	−3.32**		−2.25	−4.37***		−0.91	−4.12***		−1.00	−5.01***
2. Brazil							7. Japan				
GDPG	−2.61††	−4.65***		−2.61	−9.91***		−4.02***††			−4.77***	
CC	−0.83	−3.46***		−0.89	−3.46***		−2.46	−7.77***		−2.58	−7.13***
GE	−1.70	−3.00**		−1.58	−3.60***		−2.25	−5.77***		−2.24	−6.09***
PS	−2.89	5.192***		−2.84	−5.53***		−4.07***			−4.08***	
RQ	−1.33	−7.51***		−1.99	−7.36***		−4.99***			−4.36***	
RL	−1.32	−3.41**		−1.49	−3.03***		−2.65	−4.42***		−2.68*	
VA	−3.42***			3.51***			−3.03*			−2.83*	
NSR	−0.23	−3.73***		−0.30	−3.74***		−1.53	−4.53***		−1.62	−3.53**
HC	−2.20	−4.34***		−4.50***			−0.77	−3.93***		−0.13	−4.25***
PC	−1.65	−4.52***		−1.09	−4.55***		−2.02	−3.70***		−1.85	−3.73***
3. France							8. China				
GDPG	−3.45***††			−3.41***			−0.92	−3.60***		−0.82	−4.99***
CC	−2.95**			−2.95*			−2.62	−6.19***		−1.73	−5.87***
GE	−1.26	−7.96***		−2.81*			−0.43	−4.07***		−0.15	−4.85***
PS	−3.84***			−3.78**			−1.63	−5.32***		−1.59	−5.46***
RQ	−2.78*			−2.93*			−4.14***			−4.02***	
RL	−4.61***			−4.15***			−1.60	−3.20***		−0.95	−3.27***

(*Continued*)

Table B1. (*Continued*)

Indicators	Augmented Dickey-Fuller			Philips-Perron			Augmented Dickey-Fuller			Philips-Perron	
	I(0)	I(1)		I(0)	I(1)		I(0)	I(1)		I(0)	I(1)
VA	−2.27	−4.92***		−2.28	−3.74***		−1.86	−3.59***		−1.92	−3.57***
NSR	−1.77	−3.67***		−1.73	−3.71***		−0.78	−3.08**		−1.16	−3.83***
HC	−0.68	−3.95***		−1.36	−3.91***		−0.73	−3.30**		−2.26	−3.33**
PC	−2.39	−3.92***		−1.58	−3.89**		−2.57	−3.27**		−2.57	−3.31**
4. India							9. United States				
GDPG	−3.93***††			−3.98***			−2.61*††			−2.14	−3.56***
CC	3.36***			−1.85	−4.88***		−1.71	−4.48***		−1.23	−3.99***
GE	−1.97	−4.61***		−2.02	−4.62***		−2.80*			−2.30	−4.07***
PS	−1.10	−5.97***		−2.16	−5.96***		−3.41***			−4.22***	
RQ	−1.32	−4.27***		−1.32	−4.28***		−1.43	−5.04***		−1.75	−3.17**
RL	−2.43	−7.30***		−2.41	−7.48***		−1.23	−5.67***		−1.32	−4.30***
VA	−1.88	−5.99***		−1.70	−5.88***		−0.66	−4.09***		−0.75	−3.92***
5. United Kingdom							10. Italy				
GDPG	−2.79*††			−2.81*			−3.28**††			−3.21**	
CC	−3.46**			−1.81	−4.42***		−2.13	−3.77***		−2.22	−4.01***
GE	−2.30	−3.91***		−2.05	−5.15***		−3.30***			−2.11	−3.67***
PS	−5.83***			−4.36***			−6.32***			−6.39***	
RQ	−2.45	−4.87***		−2.45	−5.53***		−1.36	−4.59***		−1.33	−4.61***
RL	−3.03*			−2.96*			−3.00**			−3.20**	
VA	−4.14***			−4.14***			−2.13	−4.90***		−2.11	−4.88***
NSR	−1.75	−4.20***		−1.76	−4.84***		−1.55	−3.72***		−1.63	−3.73***
HC	−3.10**			−0.38	−4.72***		−0.65	−4.07***		−1.27	−4.76***
PC	−1.67	−4.42***		−1.47	−4.44***		−1.13	−4.05***		−0.99	−4.175***

Notes: *** Significant if $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$. ADF: augmented Dickey-Fuller, CC: control of corruption, GDPG: gross domestic product growth, GE: government effectiveness, PS: political stability, PP: Philips-Perron, RQ: regulatory quality, RL: rule of law, VA: voice & accountability, NSR: Net national saving rate, HC: Human capital, PC: Physical capital. Sample size adjusted from 2002 to 2019. Optimal lag based on AIC and SC. ††: ADF test with break point.

Source: Author's compilation (2021).

Table B2. Panel unit root test results

Indicators	Liven, Lin, & Chu			Im, Pesaran, & Shin			ADF Fisher			PP Fisher	
	I(0)	I(1)		I(0)	I(1)		I(0)	I(1)		I(0)	I(1)
GDPG	−4.99***			−4.12***			54.02***			76.49***	
CC	−1.91**			−0.88	−4.48***		23.41	56.60***		24.74	120.48***
GE	−3.13***			−2.14**			36.46**			42.21***	
PS	0.56	−3.51***		−1.64	−7.60***		31.29	90.07***		68.81***	
RQ	−0.17	−2.14**		−0.64	−5.18***		19.89	63.83***		45.19***	
RL	−2.95***			−2.68***			37.90***			42.54***	
VA	0.04	−1.99**		−1.52*			30.14*			35.96	141.08***
NSR	−0.81	−5.92***		−0.08	−4.68***		19.62	58.38***		16.10	78.68***
HC	−5.04***			−0.12	−0.71		30.36	47.80***		16.88	150.36***
PC	−165*			−1.61	−3.01***		23.58	40.55***		17.08	54.97***

Notes: *** Significant if $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$. ADF: augmented Dickey-Fuller, CC: control of corruption, CIPS: cross-sectional Im, Pesaran, and Shin, GDPG: gross domestic product growth, GE: government effectiveness, LLC: Liven, Lin, and Chu, PS: political stability, PP: Philips-Perron, RQ: regulatory quality, RL: rule of law, VA: voice & accountability, NSR: Net national saving rate, HC: Human capital, PC: Physical capital. Sample size adjusted from 2002 to 2019. Optimal lag based on AIC and SC.

Source: Author's compilation (2021).

Appendix C

Table C1. ARDL bound test results

Sections	Model specification	1% critical value			5% critical value		F-statistics
		I(0)	I(1)		I(0)	I(1)	
Canada	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	10.21*** (k = 6)
Brazil	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	5.84*** (k = 6)
France	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	1.83 (k = 6)
India	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	1.27 (k = 6)
United Kingdom	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	3.10** (k = 6)
Germany	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	11.71*** (k = 6)
Japan	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	2.05 (k = 6)
China	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	2.12 (k = 6)
United States	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	14.90*** (k = 6)
Italy	F_{GDPG} (GDPG | CC, GE, PS, RQ, RL, VA, NSR, HC, PC)	2.5	3.68		2.04	2.08	6.77*** (k = 6)

Notes: *** Significant if $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$. ARDL: Autoregressive distributed lags. Lags are selected on the basis of AIC, SC, and HQ. k denotes the number of independent variables, CC: control of corruption, GE: government effectiveness, PS: political stability, RQ: regulatory quality, RL: rule of law, VA: voice & accountability, NSR: Net national saving rate, HC: Human capital, PC: Physical capital, k denotes the number of independent variables.

Source: Author's compilation (2021).

Table C2. Panel cointegration test results

Null: No Cointegration	No trend			Trend	
	Test statistics	P-value		Test statistic	P-value
Part (i): Pedroni (1999-Pedroni, 2004) test results					
Within-dimension					
Panel v-statistic	−9.24***	[0.947]		−8.12***	[0.912]
Panel rho-statistic	−4.33***	[0.971]		−5.02***	[0.884]
Panel PP-statistic	−12.71***	[0.000]		−11.03***	[0.000]
Panel ADF-statistic	0.88	[0.935]		1.04	[0.924]
Between-dimension					
Group rho-statistic	−6.12***	[0.998]		−5.67***	[0.998]
Group PP-statistic	−5.99***	[0.009]		−3.54***	[0.000]
Group ADF-statistic	−13.11***	[0.992]		−12.04***	[0.809]

Notes: *** Significant at 1% ($p < 0.01$), **Significant at 5% ($p < 0.05$), *Significant at 10% ($p < 0.10$). [] denotes p-values for the relevant test statistics. Sample size adjusted from 2002 to 2019. Lag length: AIC, SC, and HQ.

Source: Author's compilation (2021).

Appendix D

Figure D1. U.S.A. CUSUM test results.

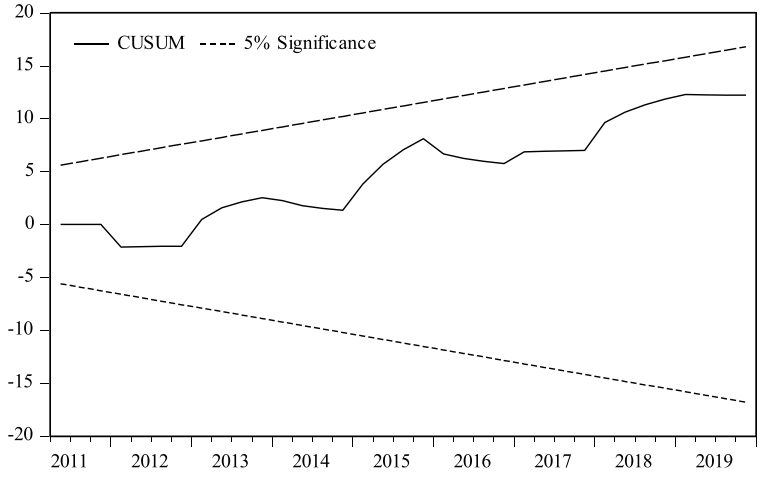

Figure D2. U.S.A. CUSUMSQ test results.

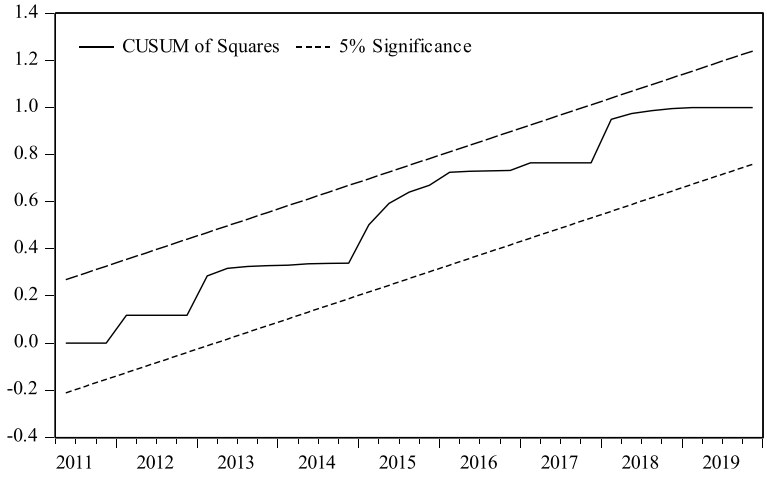

Figure D3. China's CUSUM test results.

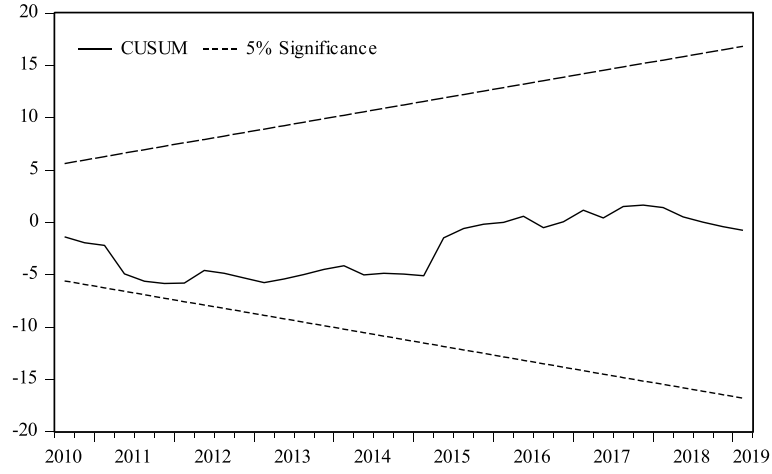

Figure D4. China's CUSUMSQ test results.

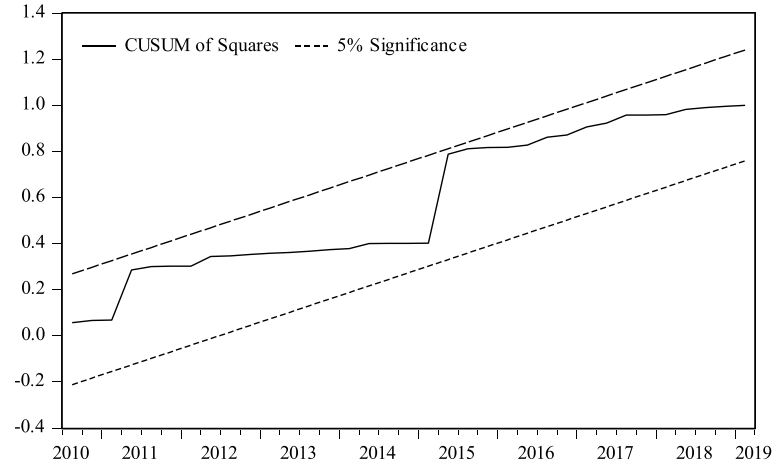

Figure D5. Japan's CUSUM test results.

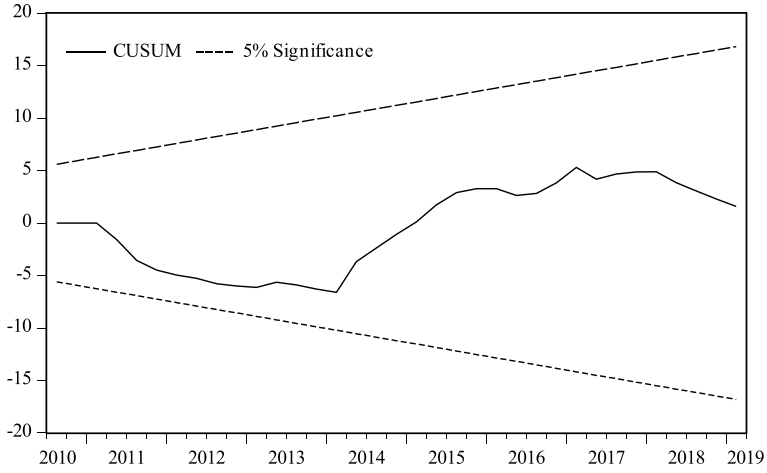

Figure D6. Japan's CUSUMSQ test results.

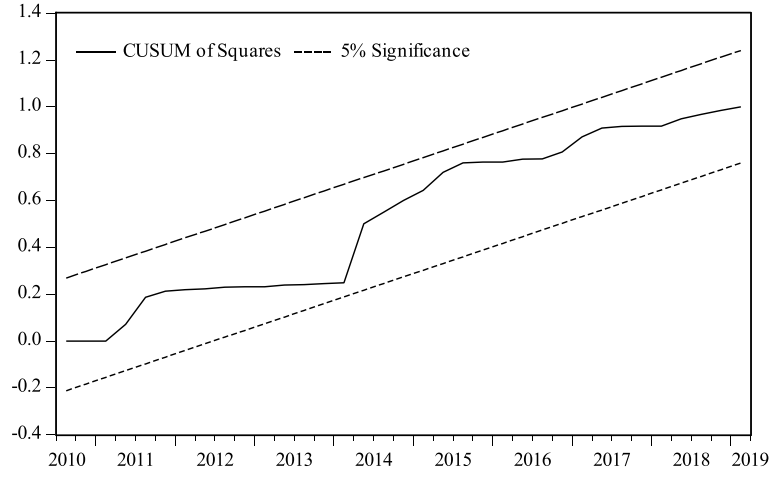

Figure D7. Germany's CUSUM test results.

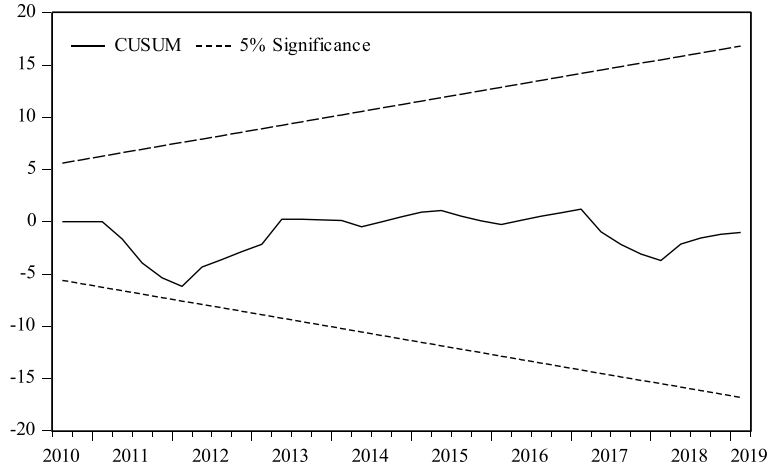

Figure D8. Germany's CUSUMSQ test results.

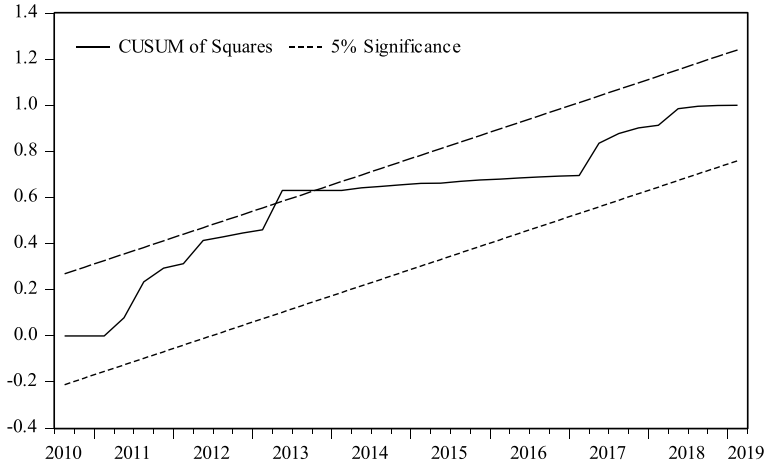

Figure D9. India's CUSUM test results.

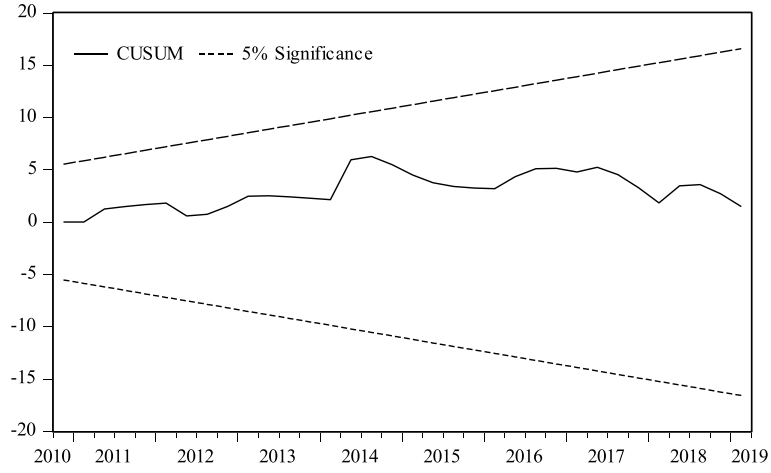

Figure D10. India's CUSUMSQ test results.

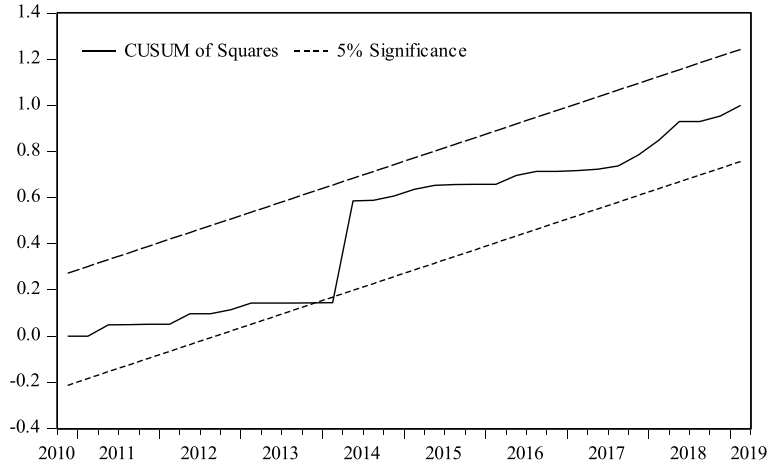

Figure D11. UK's CUSUM test results.

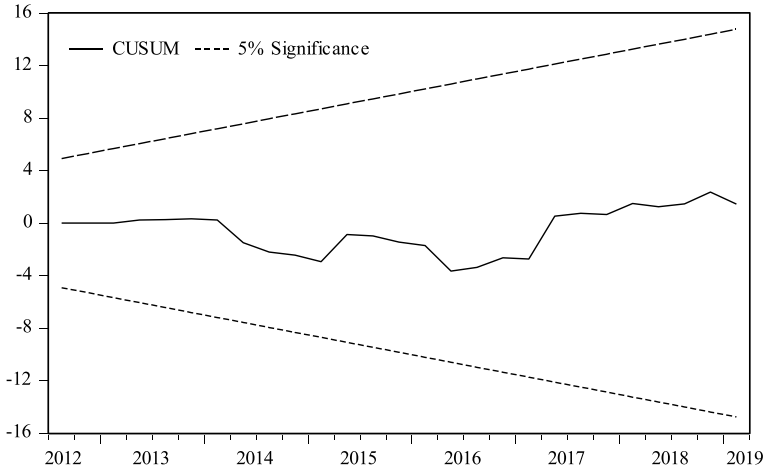

Figure D12. UK's CUSUMSQ test results.

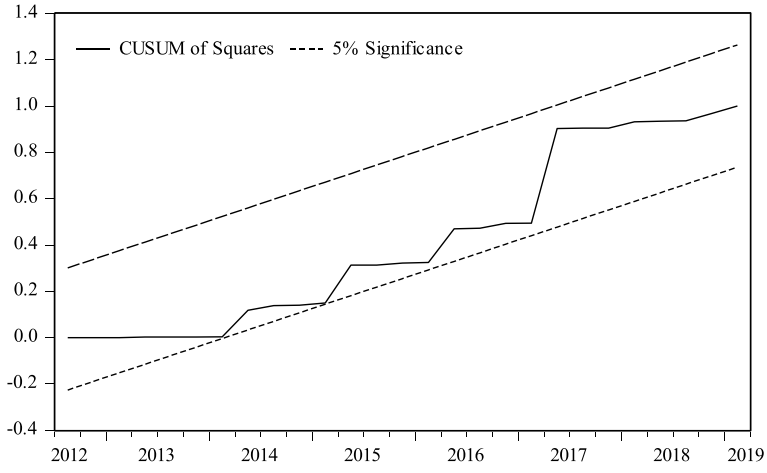

Figure D13. France's CUSUM test results.

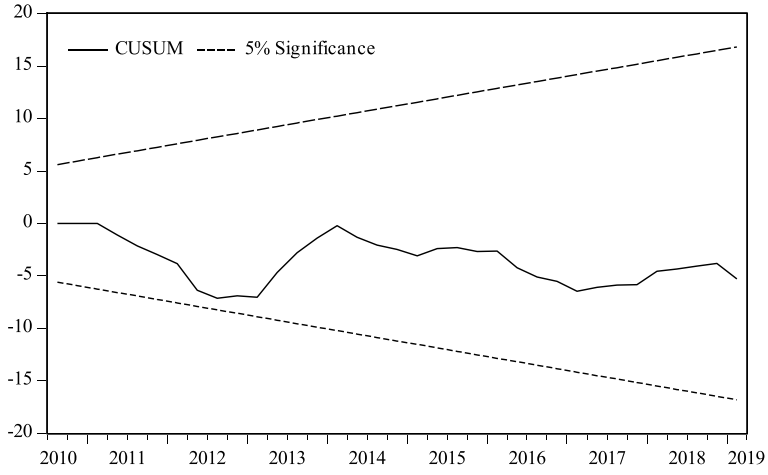

Figure D14. France's CUSUMSQ test results.

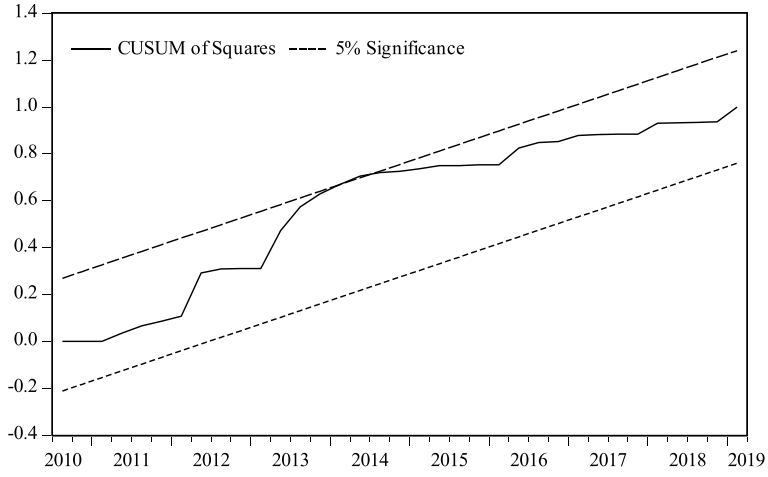

Figure D15. Brazil's CUSUM test results.

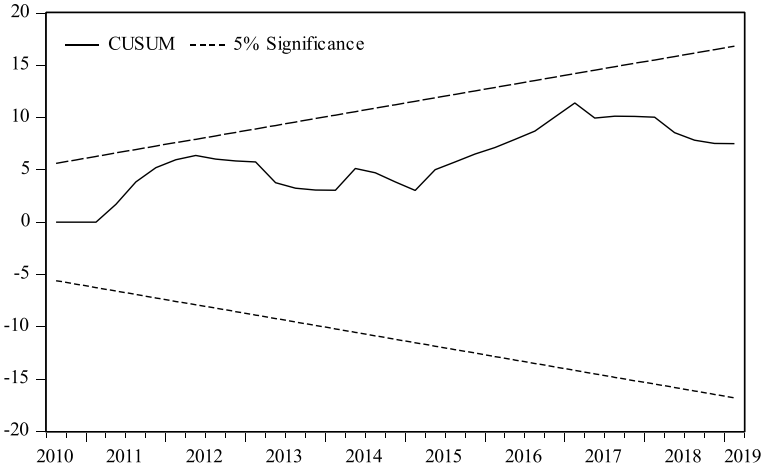

Figure D16. Brazil's CUSUMSQ test results.

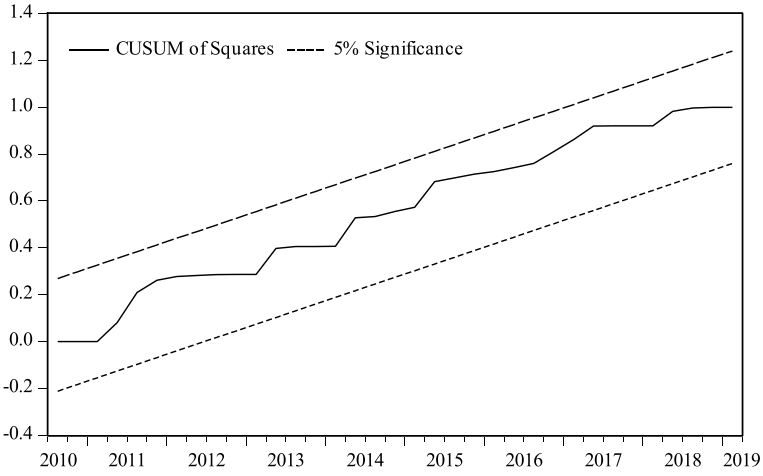

Figure D17. Italy's CUSUM test results.

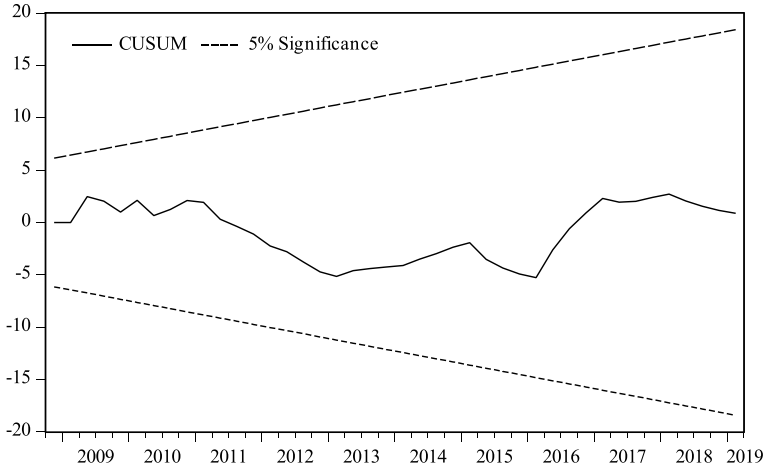

Figure D18. Italy's CUSUMSQ test results.

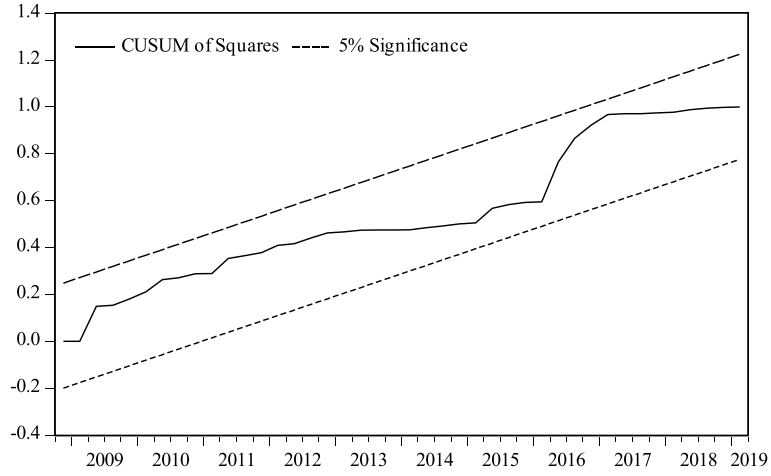

Figure D19. Canada's CUSUM test results.

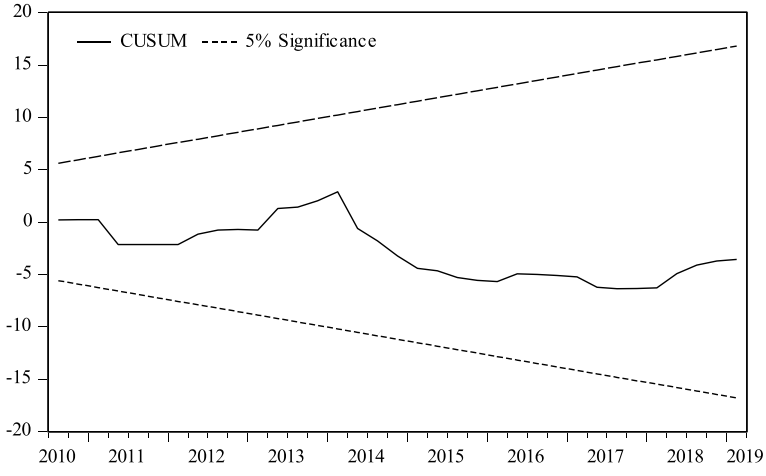

Figure D20. Canada's CUSUMSQ test results.