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RESEARCH ARTICLE **OJMS0501002-563**

PRODUCTIVITY AND GROWTH: THE ROLE OF GOVERNANCE IN INDIA AND OTHER BRICS ECONOMIES

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ABSTRACT

Beyond innovations, capital availability and other growth drivers, are there other factors that can contribute to productivity? This paper focuses on investigating governance as a driver of economic growth via productivity. The aim is to ascertain that governance can serve as an improvement to the relationship between productivity and economic growth. VAR multivariate model by applying the Toda-Yamamoto model which is an extension of VAR. This empirical finding for BRICS points out the improvement that can be achieved in the growth of their economy by improving the quality of governance among member nations. There is a causal relationship between productivity and governance which can support the bi-directional causal relationship between productivity and growth in the economy. The result further showed that the contribution of productivity to growth at the early stage is higher than that of governance. However, the productivity contribution to growth declined while that of governance to economic growth was trending upward. The key takeaway from the Toda-Yamamoto model for the productivity-governance-economic growth link is that governance is an important factor that can improve productivity if the quality of the institution preserves the confidence of the factor of production. Thus, an economy that is interested in improving productivity beyond the threshold that has been previously identified in theories can focus on improving the quality of governance.

Keywords*:* *Productivity, BRICS, Economic growth, Governance, Toda Yamamoto*.

INTRODUCTION

Productivity has been debated over the years and its importance cannot be overemphasised when discussing its effect on growth and development (Yormirzoev, 2022; Surya, 2021; Gardiner, 2012; Timmer *et al.*, 2011). Productivity simply points out how efficient resources are being used in the pursuit of meeting the economy's macroeconomic objectives. Productivity is given much credence in the long run as sustenance of any level of output from declining is associated with productivity growth (Krugman, 1994). However, productivity growth in India has been following a cyclical trend (Virmani, 2004), reaching an all-time high point of 9.15% in 2016 and the lowest point was 0.54% in 2000. Recently, it faced a downward trend in 2022 as productivity declined by 2.53% and a similar trend is noticeable in some BRICS (BRICS is the acronym referring to countries grouping of Brazil, Russia, India, China, and South Africa) member economies. For instance, in 2022, giant economies among the BRICS nations such as China witnessed a decline of 4.82% in labour productivity while Russia recorded a decline of 3.61% in the first quarter of 2023. In the recent meeting held by BRICS member countries in May 2023, productivity and decent job creation served as part of the key issues addressed in that gathering showing the importance of productivity to economic expansion of member countries. This is because the government has a crucial part to play in the improvement of productivity in the economy as there is a vital stake in achieving this. According to the World Bank income classification, it is important to note that the five countries that formed BRICS are upper-middle income countries except for India which is a lower-middle income economy. So, the stakes are high and the spillover effect of the decision regarding productivity might be more advantageous to India.

It is important to note that previous research has examined the effect of productivity on economic growth along with key variables that influence productivity and much attention is not paid to the governance (institutional quality) of economic integrations (Balassa, 2013). The importance of capital alongside productivity has been examined in economic growth (Zelleke *et al.*, 2013; Baieret *et al.*, 2006). The impact that technological progress and productivity have on economic growth has also been covered (Alani, 2012; Carlaw and Lipsey, 2003). The nexus of factor prices and productivity has been investigated in economic growth (Ozdemir, 2024). Also, innovation is a driving force for productivity (Terzic, 2019). However, based on my research, the possible effect that governance may have on the relationship between productivity and growth has not been fully explored, especially for India and the rest of the BRICS member nations. The Worldwide Governance Indicator (WGI) elaborated by the World Bank is been the indicator capturing the perception that economic agents have about the quality of governance.

Beyond what the firms and industries put in place to drive the productivity level upward, the contribution of governance, either directly or indirectly, can also be significant. Burroni (2020) focused on the policies that have a direct influence on labour productivity. The study conducted by Eifert (2009) uncovered how governance can improve productivity through improvement in doing business. Reforms that positively influence doing business increase the demand for investment goods pushing firms to take advantage of productivity gain. The confidence in the rule of law that affects productivity such as contract laws can encourage labour to give their best knowing that their interest is protected. More so, a study has shown specific market intervention influencing productivity (Warr, 2006).

The literature on productivity and economic growth has formed the bearing for this present study. Recent studies have dived into investigating productivity at the sectoral level including tourism productivity (Lui and Wu, 2019), productivity in small and medium-scale enterprises (Surya *et al.*, 2021), and agricultural productivity (Güzel and Akin, 2021), however, productivity either at the national or sectoral level will still respond to the impulses from institutions. Slightly similar to this research line, Diewert (2001) discussed some of the factors that can explain the variation in productivity growth and further highlighted the role government can play in facilitating productivity growth which includes pursuing growth in investment, primary inputs, education, training, and human capital. Improving the functioning of the market coupled with increased specialization was also part of the identified role.

Although, the role of institutions in economic growth has been examined in isolation of productivity (Olaniyan *et al.*, 2022; Duodu and Baidoo, 2022; Forson *et al.*, 2021; de Almeida, 2020; Nirola and Sahu, 2019; Ogilvie and Carus, 2014). This current study calls into question the importance of the quality of governance by using a panel multivariate technique for 2002–2022 in BRICS. The exact impact of governance on the productivity-growth relationship can be positive or negative, indicating that the direction is ambiguous. However, that is not of importance as the major concern of this paper is to establish the existence of a relationship and to what measure. Based on the aforementioned, this paper examines the role of governance in the productivity and growth relationship among the BRICS nations.

MATERIALS AND METHOD

More attention has been paid to the relationship between productivity and economic growth but less focus has been paid to a third variable that can improve the outcome of economic growth. Considering the interest of this study, a vector autoregressive (VAR) multivariate model is the most appropriate model as it treats all series as endogenous and also helps in explaining the dynamic behaviour of economic series. The Toda-Yamamoto (TY) model is an extension of the VAR model and a common specification for multivariate models when the series are of different orders of integration. This is an advancement it has over other extensions of VAR just as the ARDL model can take care of a single equation of different order of integration.

Before specifying the model, the governance data is a composite index and it is generated with principal component analysis (PCA) which is a parametric approach. The choice of this method is that it factors in the weight of the indicators in generating the index. The governance index will be constructed based on the six World Bank governance indicators which are regulatory quality (RQ), government effectiveness (GE), rule of law (RL), control of corruption (CC), voice and accountability (VA) and political stability and absence of violence (PSA). The benchmark of the test is to select components that have an eigenvalue greater than one. Using the six indicators of the BRICS countries, two components have an eigenvalue that is greater than one and the two jointly account for 0.787 (PCA result available in appendix).

In examining the productivity (PRD_gr), governance (IQT), and economic growth (GDP_gr) relationship, the Toda-Yamamoto (1995) model was adopted and it is specified as:

$$GDP\_gr_t = \propto_0 + \sum_{i=1}^{k} \propto_{1i} GDP\_gr_{t-i} + \sum_{j=k+1}^{k+d_{max}} \propto_{2j} GDP\_gr_{t-j} + \sum_{i=1}^{k} \emptyset_{1i} PRD\_gr_{t-i} + \sum_{j=k+1}^{k+d_{max}} \emptyset_{2j} PRD\_gr_{i-j} + \sum_{i=1}^{k} \varphi_{1i} IQT_{t-i} + \sum_{j=k+1}^{k+d_{max}} \varphi_{2j} IQT_{i-j} + \varepsilon_{1t} \quad (1)$$

$$PRD\_gr_t = \propto_0 + \sum_{i=1}^{k} \propto_{1i} PRD\_gr_{t-i} + \sum_{j=k+1}^{k+d_{max}} \propto_{2j} PRD\_gr_{t-j} + \sum_{i=1}^{k} \emptyset_{1i} GDP\_gr_{t-i} + \sum_{j=k+1}^{k+d_{max}} \emptyset_{2j} GDP\_gr_{i-j} + \sum_{i=1}^{k} \varphi_{1i} IQT_{t-i} + \sum_{j=k+1}^{k+d_{max}} \varphi_{2j} IQT_{i-j} + \varepsilon_{1t} \quad (2)$$

$$IQT_t = \propto_0 + \sum_{i=1}^{k} \propto_{1i} IQT_{t-i} + \sum_{j=k+1}^{k+d_{max}} \propto_{2j} IQT_{t-j} + \sum_{i=1}^{k} \emptyset_{1i} PRD\_gr_{t-i} + \sum_{j=k+1}^{k+d_{max}} \emptyset_{2j} PRD\_gr_{i-j} + \sum_{i=1}^{k} \varphi_{1i} GDP\_gr_{t-i} + \sum_{j=k+1}^{k+d_{max}} \varphi_{2j} GDP\_gr_{i-j} + \varepsilon_{1t} \quad (3)$$

Where k denotes optimal lag length; d_{max} represents the maximum order of integration; all other variables remained as defined above; and ε denotes the error term.

The estimated model will be evaluated with two post-estimation tests. First, the LM test for examining that the model is free from serial correlation. Secondly, the residuals are tested to ensure they are homoscedastic. The interest of this study is covered by testing for causal relationships. The test is based on the causality assumption that $\beta_{1i} \neq 0$, $\emptyset_{1i} \neq 0$, and $\varphi_{1i} \neq 0$. The impulse response functions (IRF) and the forecast error variance decomposition (FEVD) will also be estimated to investigate the shocks to the economic growth of the BRICS member states.

Panel data set formed by the 5 member countries of BRICS (Brazil, Russia, India, China, and South Africa) are used for the empirical analysis between the period of 2002 to 2022. The rationale for this time selection is the availability of governance data which was available without break starting from the year 2002. The data for productivity growth which is measured as gross domestic product (GDP) per hour of work is sourced from Our World in Data and CEIC, economic growth which is also measured as GDP growth is sourced from the World Development Index (WDI), while governance indicators are sourced from World Governance Index (WGI) of the world bank.

RESULTS AND DISCUSSION

As presented in Figure 1, the positive relationship between productivity and economic growth is affirmed. The economic growth levels of two countries, Brazil and South Africa, among the BRICS member countries, are on the

same level seeing that their average productivity growth level do not differ that much. The economic and productivity growth of Russia is not too far from the two aforementioned countries. However, there is a wide gap between the growth level experienced in India which is almost doubled while growth in China is the highest among the BRICS member states.

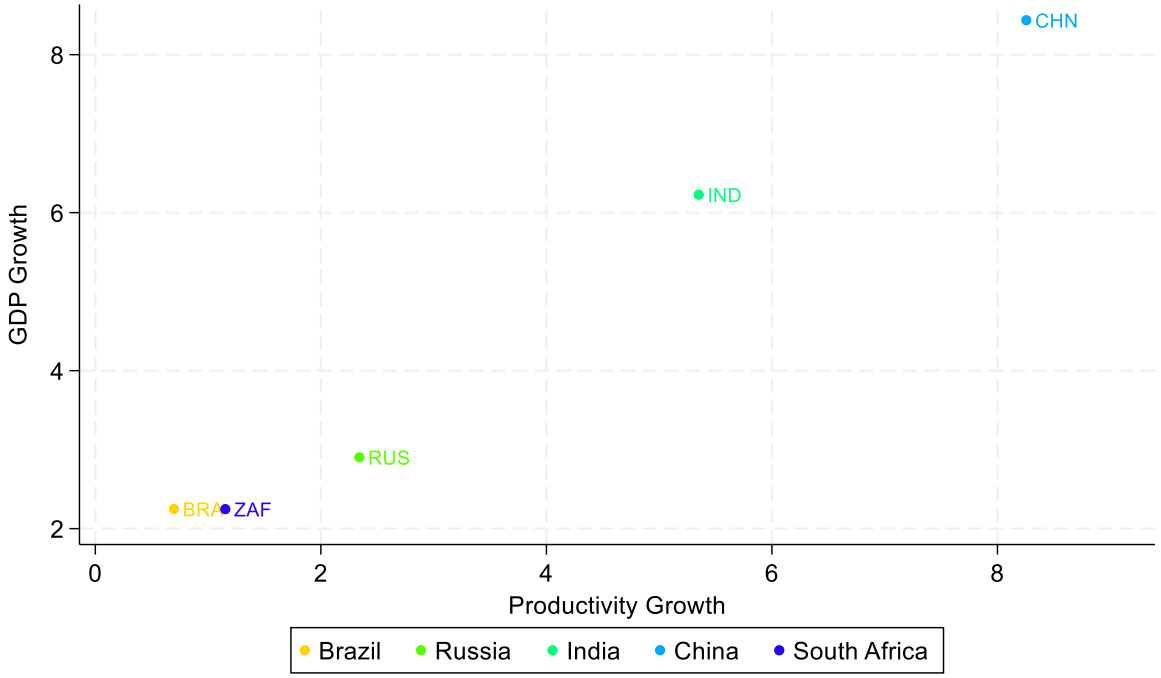

Figure 1: Graphical presentation of Economic and Productivity Growth in BRICS

The descriptive statistics of the variables which provide information about the statistical properties are presented in Table 1. The economic growth of the BRICS member countries has the minimum value as a negative growth rate. Russia had the lowest growth rate (-7.79) during the Great Recession while the highest economic growth rate was recorded in China. The lowest economic growth rate of India is a decline of 5.83%. However, economic growth in India except for 3 periods is higher than the average of the BRICS nations. The lowest productivity growth value was observed in Russia. It is important to note that there is no negative growth of productivity in both the economies of India and China. The institutional quality variable that is generated via principal component analysis showed that the highest quality of governance among the BRICS nations is 2.98 which is not far from the half of 5.0, the total value of quality governance. This indicates that the best-governed economy is a little above the half value of what is considered quality governance. The skewness and kurtosis values are near the normal value and the Jarque-Bera probability value is above 5%, indicating the normality of the series employed.

Table 1: Descriptive Statistics of Series

	GDP_GR	PRD_GR	IQT
Mean	4.411973	3.559554	1.90E-05
Median	4.699992	3.718113	0.059000
Maximum	14.23086	13.71717	2.988000
Minimum	-7.799994	-5.684489	-3.550000
Std. Dev.	4.034440	3.941324	1.480515
Skewness	-0.497430	0.142729	0.000708
Kurtosis	3.433565	2.457579	2.277147
Jarque-Bera	5.152554	1.643716	2.286021
Probability	0.076057	0.439614	0.318858
Observations	105	105	105

The optimal lag length for the analysis was selected based on the information criterion that has the lowest value. In the result presented in Table 2, the Akaike Information Criterion (AIC) indicates that lag one is the optimal lag for the series.

Table 2: Optimal Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-154.3216	NA*	7.410177	4.840666	4.941022*	4.880263
1	-152.8231	2.812607	7.298036*	4.825327*	4.959135	4.878123*
2	-152.7111	0.206720	7.501312	4.852651	5.019911	4.918646
3	-152.0821	1.142011	7.589105	4.864064	5.064776	4.943258
4	-150.9528	2.015239	7.561343	4.860087	5.094252	4.952480
5	-150.7501	0.355593	7.752345	4.884618	5.152235	4.990210
6	-150.7062	0.075587	7.988083	4.914038	5.215107	5.032829
7	-150.6611	0.076438	8.231782	4.943417	5.277938	5.075407
8	-150.5534	0.178828	8.467923	4.970875	5.338848	5.116064

* indicates lag order selected by the criterion

The stationarity test was considered to avoid spurious regression and the result is presented in Table 3. The first-generation unit root test assumes independence of cross-section units while the second generation assumes cross-sectional dependence. Levin, Lin, and Chu (LLC) and Im–Pesaran–Shin (IPS) are the first-generation tests with the null hypothesis that all panels contain unit root and both tests reported a mixed order of integration, that is I(0) and I(1). The single second-generation test also confirmed a mixed order of stationarity. This outcome rendered the Johansen cointegration test inappropriate and also made the Vector Autoregressive (VAR) and Vector Error

Correction Model (VECM) inapplicable for further analysis. The Toda-Yamamoto approach will be considered as it applies to series with mixed order of integration.

Table 3: Panel Unit Root Test

Variables	Levin, Lin, and Chu (LLC)		Im–Pesaran–Shin (IPS)		Phillips–Perron (PP)	
	Statistic	Order	Statistic	Order	Statistic	Order
GDP_gr	-2.506***	I(0)	-6.896***	I(1)	-3.630***	I(0)
PRD_gr	-6.293***	I(1)	-1.716**	I(0)	-3.937***	I(0)
IQT	-4.606***	I(1)	-2.485***	I(1)	-4.377***	I(1)

*Note: '***', '**', '*' indicate the level of significance of the test at the 1%, 5%, and 10%*

The Toda-Yamamoto model was estimated as the prerequisite to conduct further estimation to understand productivity, governance, and economic growth. Post-estimation test was conducted to investigate the soundness of the model. The LM test having the null hypothesis of no serial correlation has a probability value that is greater than 5%. No evidence to reject the hypothesis and it can be concluded that the model is free from serial correlation. The estimation will serve as the background for estimating Granger causality, impulse response function, and variance decomposition.

Panel Granger Causality Test

The existence of a long-run cointegration test among the variables does not indicate the direction of causality. Though causality is not necessarily implied by cointegrating relations, one can expect a causal relationship. The outcome of the Granger causality test can be unidirectional – moving from one variable to the other, bidirectional – moving from both variables to each other, or no causal relationship. The null hypothesis of the test is that there is no causal relationship. Based on the outcome of the two Granger causality tests reported in Table 4, four causal relationships are identified. The bi-causal relationship is identified between economic growth and productivity at the 5% level of significance. There is a causal relationship running from productivity growth to economic growth among the BRICS nations. A unidirectional causal relationship exists between productivity and governance quality and the causal relationship runs from governance quality to productivity growth. Lastly, out of the four causal relationships identified, there is one joint causal relationship. Productivity growth and quality of governance jointly cause economic growth at the 10% level of significance.

Table 4: Causality Test of Productivity, Governance, and Economic Growth

Variable Y	Directions of Causality	Variable X	Wald Test	F-Stat
GDP_gr		PRD_gr	5.039**	4.218**
PRD_gr		GDP_gr	0.020	3.840**
GDP_gr		IQT	0.371	0.473
IQT		GDP_gr	0.213	1.741
PRD_gr		IQT	3.853**	2.389*
IQT		PRD_gr	0.069	0.778
GDP_gr		PRD_gr and IQT	5.700*	
PRD_gr		GDP_gr and IQT	3.879	

*Note: '***', '**', and '*' denote the level of significance of the test at 1%, 5%, and 10% respectively*

Impulse Response Function (IRF)

The impulse response functions examine the impact of a system of a shock to an input and the effect of dynamic impact on the adjustment path of economic growth, productivity, and governance is presented in Figure 2. As shown in cell A of the figure, the response of economic growth to the innovation itself was positive in the first and second periods but later returned to its steady state at the end of period 4. Cell B presents the response of economic growth of the BRICS to innovation from productivity. The response to a one standard deviation shock from productivity to economic growth was at a steady state in the first period. The response increased to the positive region towards the end of the first period. Similar to the response of economic growth to itself, economic growth response to innovations from productivity growth returns to a steady state at the end of the fourth period. Response of economic growth to governance remained at the positive region and trended upwards all through the 10 period.

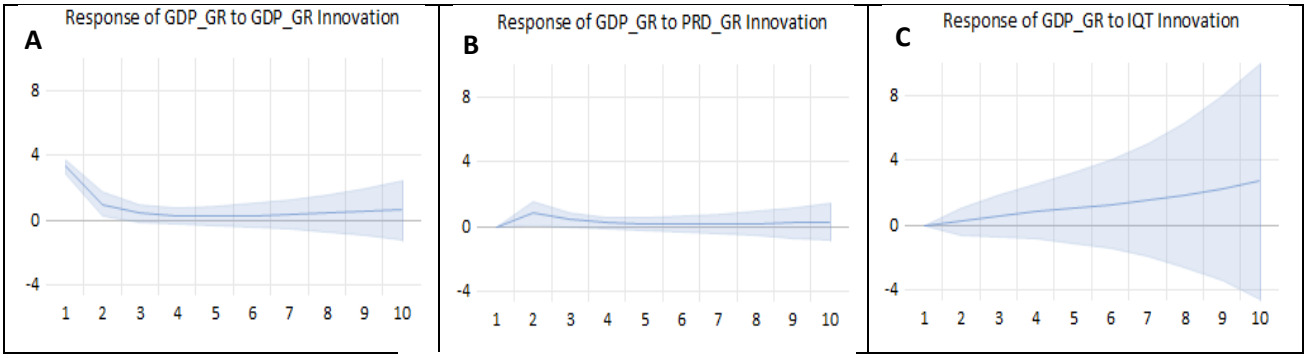

Figure 2: Impulse Response Function Plot

Forecast Error Variance Decomposition (FEVD)

Variance decomposition helps to explain variations of variables employed in the model as it decomposes the forecast error variance into the contribution from definite exogenous shocks. The FEVD result presented in Table 5 shows that the level of shocks accounted for by governance quality as shown by the IQT variable is minute to productivity at the early stage up to the third period. However, the shock accounted for by governance quality exceeded that of

productivity from the fourth period. In this fourth period, both productivity and governance accounted for 6.62% and .7.97% respectively. At the end of the tenth period, only 35.79% of innovation in economic growth can be attributed to itself while productivity only explains 3.20% of the innovations over the same period. This is a decline to what productivity accounted for in economic growth originally. The contribution of governance has increased to about 61% at the end of the tenth period.

Table 5: Variance Decomposition

Period	S.E.	GDP_GR	PRD_GR	IQT
1	3.301571	100.0000	0.000000	0.000000
		(0.00000)	(0.00000)	(0.00000)
2	3.562787	93.95435	5.524427	0.521218
		(5.26199)	(5.18833)	(2.26801)
3	3.666730	90.18419	6.655177	3.160637
		(8.63415)	(5.81538)	(7.06003)
4	3.781857	85.39966	6.626372	7.973971
		(13.5183)	(5.73988)	(12.9690)
5	3.942205	79.09732	6.264425	14.63826
		(18.3822)	(5.49416)	(18.4734)
6	4.165144	71.40910	5.744122	22.84678
		(22.3986)	(5.22997)	(22.8873)
7	4.469584	62.67386	5.129077	32.19706
		(25.3784)	(4.99094)	(26.0869)
8	4.877965	53.41267	4.469077	42.11825
		(27.3677)	(4.79652)	(28.1711)
9	5.416202	44.25436	3.813760	51.93188
		(28.5520)	(4.66094)	(29.3856)
10	6.113598	35.79167	3.207348	61.00099
		(29.1671)	(4.58025)	(30.0082)

Cholesky One S.D. (d.f. adjusted) Innovations
Cholesky ordering: GDP_GR PRD_GR IQT
Standard errors: Monte Carlo (100 repetitions) standard deviations in parentheses

The finding of bi-directional causality between productivity growth and economic growth is in agreement with previous literature and at variance with some literature. This finding is partly in agreement with the studies of Korkmaz and Korkmaz (2017) that reported a unidirectional causality among countries in the OECD. Solow's model also confirms the causality between productivity improvement and economic growth (Carlaw & Lipsey, 2003). However, the finding of M'baye (2022) using the West African Economic and Monetary Union region is in disagreement with the claim of this result. The rationale for this difference is possibly tied to the low labour productivity in the region.

Economic growth is also not driven by governance but it drives productivity and this joint causality can advance economic growth.

CONCLUSION

The relationship between productivity growth and economic growth of the BRICS member states with the contributing role of governance has been examined in this study. Panel analysis using data from Brazil, Russia, India, China, and South Africa covering the period of 2002 to 2022. The Toda-Yamamoto model estimate reflects how the productivity and governance of this economic group account for the variation in their economic growth.

An index was first generated from the six governance indicators for each of the member nations. This was included in the model having productivity growth and economic growth to examine the causality among the three variables of interest. Furthermore, impulse response function and variance decomposition were estimated to ascertain the response and variation of economic growth accounted for by productivity and governance.

Based on the result obtained, it was found that there exists a bi-directional causality between productivity growth and economic growth. Governance does not cause economic growth but it causes productivity that can improve economic growth as shown by the joint causality. The response of their economic growth to shocks from productivity growth and governance remained positive all through. However, the shock from economic growth itself and productivity growth was short-lived. The variance decomposition revealed that productivity growth accounts for economic growth more than governance in the early periods. However, this later changed as governance explains more of the variation in economic growth than the productivity growth of the region.

Both productivity and governance have proven relevant to economic growth from different perspectives. It has been noted that productivity will drive growth and this can be fully explored by focusing more on governance that can drive productivity. Improvement in governance quality will drive productivity and the aim of boosting economic growth can be achieved. Though the focus of this study is not to demystify to what extent the increase in governance quality contributes to productivity, the establishment of this insight about the BRICS member states is key. The extent of the contribution of governance to economic growth via productivity growth has been set aside for further research.

The application of the Toda-Yamamoto model to the nexus of productivity growth, governance, and economic growth in the BRICS member nations has established the important role governance plays in driving economic growth. The idea that governance can play a moderating or mediating role between productivity and economic growth has been pushed into the limelight.

CONFLICT-OF-INTEREST DISCLOSURE

The author declares that there is no form of conflict of interest regarding this publication

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Not Applicable

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