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The Relationship between Institutional Quality and Welfare: Panel-SUR Analysis on BRICS-T Countries

İsmail Şenturk[1], **Amjad Ali**[2]

Abstract
In this study, the relationship between institutional quality and welfare has been tried to be examined in BRICS-T countries. For this purpose, the World Bank Worldwide Governance Index was used as an indicator of institutional quality, and its effect on economic growth, which is an indicator of welfare, was examined for the period 2002-2020. It has been determined that there is cross-sectional dependence and heterogeneity in the slope coefficients in the panel. As a result of the panel cointegration test of Westerlund and Edgerton (2007), it has been concluded that there is cointegration between the variables. Panel-SUR has been preferred as the coefficient estimation method. This method yields effective results when N<T and especially when the number of units is less than 12. According to the findings, a positive relationship has been found between welfare and institutional quality, gross capital formation, and trade. In addition, there is a negative relationship between welfare and population and domestic credit to the private sector. The coefficient of inflation variable is significant for Russia and South Africa and has a negative sign. If policymakers implement radical reforms on institutional quality and follow positive policies, this will lead to an increase in the welfare of the countries concerned. Policy decision-makers should take this situation into account and implement their economic policies.

Keywords: Institutional quality, BRICS-T, welfare, Panel-SUR
JEL Codes: B15, H75

1. Introduction

North (1990) defined institutions as "humanly devised constraints that shape human interaction". The most important function of institutions is to reduce the uncertainties in daily life by "determining and limiting the choices of individuals". Therefore, the defining aspect of this definition is that it contains a certain type of limitation. According to North, institutions, and hence constraints can take both formal and informal forms. Another important distinction that North makes to define institutions is between the concepts of institution and organization. Organizations are structures created for the interaction of people just like institutions. Organizations are the players, while institutions are the rules of the game. The purpose of the rules is to determine how the game will be played; the goal of the team is to win the game with these rules. Similarly, North said that it is necessary to look at the institutional framework to determine which economic, political, or social organizations are formed and how they have been shaped over time. Official and informal institutions and how effectively they are enforced, that is, the power of enforcement determine the nature of the game.

To explain the impact of institutions on economic performance, North (1990) applied the concepts of costs of exchange and production. Together with the technology used, institutions determine the cost of transaction and production. In this way, institutions affect the performance of an economy by directly entering cost functions in that economy. Access to knowledge about the values of goods or services that are subjects of a transaction, protection of property rights, and enforcement of contracts is of great significance in terms of transaction costs. In developed countries, some institutions limit political power and thus ensure contract security and protect private property rights, but in Third World countries, private property rights are vaguely defined or not effectively protected, and enforcement of institutions is uncertain. Therefore, in terms of transaction costs, those of the Third World is higher than that of the developed ones and high transaction costs can lead to exchange not taking place at all.

To support the claim that economic success is affected by institutions, institutional quality has been made a measurable variable. What type and nature of institutions lead to higher economic performance? Empirical studies in the field have used institutional quality indicators to determine the quality of institutions. One of these quality indicators is Kaufmann et al. (1999)'s World Bank Worldwide Governance Indicators. The Worldwide Governance Indicators report on six broad dimensions of governance for over 200 countries and territories over the period 1996-2020. The World Bank (2021) defines these indicators as follows:

i. Voice and Accountability (VA) – capturing perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and free media.

[1] Department of Economics, Tokat Gaziosmanpasa University, Turkey
[2] European School of Administration and Management (ESAM)-France; Lahore School of Accountancy and Finance, University of Lahore, Pakistan

ii. Political Stability and Absence of Violence/Terrorism (PV) – capturing perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
iii. Government Effectiveness (GE) – capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
iv. Regulatory Quality (RQ) – capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
v. Rule of Law (RL) – capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
vi. Control of Corruption (CC) – capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

These indicators take values in the range of 0-100 for each country. The Worldwide Governance Index is obtained by taking the average of 6 indicators.

2. Literature Review

The determination of the relationship between institutions and economic development has been the subject of many theoretical and applied studies, especially in the last thirty years. The findings of these studies show that the differences in economic development between countries are mainly due to institutions. Stating that the effect of institutions on economic performance is an indisputable fact, North (1990) has tried to establish an analytical framework that will integrate institutional analysis into the science and history of economics, by identifying the deficiency in the current economic theory regarding the evaluation of this effect.

Acemoglu et al., (2001) proceeded from the assumption that the main reason for the differences between countries in terms of per capita income is institutions. Accordingly, better institutions and tightly protected private property rights are important factors in increasing per capita income. To determine the effect of institutions on economic performance, they examined the institutional differences created by the different colonization policies implemented by Europe in different countries. Europe's colonization experience is aimed at creating institutions that will ensure the rule of law and encourage investment in the United States, Australia, and New Zealand, while extractive states, which they created, are aimed at extracting natural resources such as gold and silver in colonies in Africa, Central America, the Caribbean, and South Asia. The colonial experience in these countries neither created a strong private property regime nor established a government system limited by separation of powers. According to the findings, experiences of colonialism that concentrated political power in the hands of elites and institutions for the rapid extraction and transfer of resources harmed economic development in these countries.

Easterly and Levine (2003) tested three hypotheses that could explain economic development in their study to investigate the reason for the large difference between Canada and Burundi in terms of per capita income. The first one is the geography hypothesis, based on the argument that geographic location and environmental conditions directly shape economic development. The second, policy hypothesis, argues that the factor that influences economic policies and institutions is knowledge. Accordingly, changes can be made in policies and institutions in line with the new knowledge to provide economic development. Therefore, in this context, the historical heritage of countries in terms of policies and institutions does not have a decisive effect on economic development. The last hypothesis is based on the argument that economic development could be explained largely by the role of institutions. Accordingly, the environmental advantages of countries can only be transformed into high income through certain political and legal institutions. According to their findings, the main determinant of the level of economic development is institutional quality.

Other studies are trying to investigate how institutional quality affects economic performance. For them, good quality institutions contribute to physical capital and human capital (Rodrik et al., 2004), and encourage firms to use high technology and invest in new knowledge generation (Loayza et al., 2005). By that means, competitiveness and performance of the economy improve.

Studies conducted to investigate the effect of institutional quality on economic development and their conclusions are as follows:

Butkiewicz and Yanıkkaya (2006) determined that countries with democratic institutions achieved a higher economic development performance. Siyakiya (2017) found that there is a positive and significant relationship

between economic performance and institutional quality and discovered that the effect of institutional improvements on economic performance is higher in developed countries compared to developing ones. Government effectiveness and voice and accountability have a positive and significant effect on economic performance in all the countries it has studied. On the other hand, control over corruption and political stability, and the absence of violence have negative signs. In addition, he has found that there is no evidence of the influence of regulatory quality and rule of law on economic growth. Recuero and Gonzales (2019) concluded that there is a positive relationship between institutional quality and economic development. They also claimed that the direction of causality may vary depending on the nature of the variables representing institutional quality. While legal institutional quality is effective in economic development, economic development also provides an improvement in institutional quality in the public sector. Hayat (2019) concluded that better institutional quality strengthens FDI-led economic development in low-and middle-income countries. Gherghina et al. (2019), in the context of institutional quality, have found that control of corruption, government effectiveness, regulatory quality, rule of law, and voice and accountability positively influence growth, while political stability and absence of violence/terrorism are not statistically significant in Central and Eastern European countries. Besides, they have shown that in the long run, unidirectional causal relationships run from each institutional quality indicator to economic growth and FDI. Glaeser et al. (2004) found that the main source of economic development is human capital rather than institutions. According to the results of their studies, while the institutional and productive capacity of a society is shaped by human and social capital, institutions have only secondary importance to economic performance. In addition, poor countries, according to the findings of this study, emerged from poverty mostly through good policies implemented by dictators, and then their political institutions improved. Bruinshoofd (2016) emphasizes that the concept of institutional quality includes law, individual rights, and high-quality government regulations and services, concluding that institutional quality and economic development reinforce each other in the long run, but the institutional quality is the cause of economic development. Using the Fraser Institute's Economic Freedom of the World Index for variables representing institutional quality, Gòes (2015) showed that improvements in institutional quality have a positive and significant effect on per capita income.

3. Data and Methodology

To examine the effects of governance indicators, which are indicators of institutional quality, and selected economic indicators on economic growth, the panel data analysis method have been used. Before proceeding to the estimation method, the cross-section dependence and stationarity of the series were examined. In determining the appropriate estimation method of the panel data model, firstly, the homogeneity of the slope parameters was tested with the Pesaran and Yamagata (2008) test. As a result of the test results, it has been decided to use the Seemingly Unrelated Regression (SUR) method, which is a heterogeneous estimator that takes into account the correlation between units.

Zellner (1962) developed the SUR (Seemingly Unrelated Regression) method, which gives results by applying the Generalized Least Squares (GLS) method developed by Aitken to the entire system of equations. It has been found that the regression equations obtained by the SUR method are asymptotically more effective than the simultaneous equations obtained by the least squares method. To ensure the effectiveness of the SUR method, the independent variables in different equations should not be highly correlated with each other and the error terms in different equations should be highly correlated (Zellner, 1962). By considering the correlation between the regression used in the SUR method and the residuals of the models, the system can be solved as a whole, and loss of effectiveness can be prevented (Tatoğlu, 2018). Because the estimates made by the least squares method cause unbiased, consistent, but insufficiently effective regression parameter estimates. The GLS method, which takes into account the correlation between the errors of the equations, increases the efficiency of the estimate. GLS is usually used as the estimation method in the SUR method (Aksakal and Arıcıgil, 2015).
The SUR method developed by Zellner (1962) is explained by equation (1) below.

$$y = X\beta + u \tag{1}$$

In order to make an apparently unrelated regression estimation, first, a standard regression model is estimated for each unit separately.

$$\begin{aligned} y_1 &= X_1\beta_1 + u_1 \\ y_2 &= X_2\beta_2 + u_2 \\ &\vdots \\ y_n &= X_n\beta_n + u_n \end{aligned} \tag{2}$$

The above n-number equation system is shown as a single equation in the form of a single equation, as in equation (3).

$$y_\delta = X_\delta\beta_\delta + u_\delta \tag{3}$$

In a system consisting of n equations, y_δ is the dimensional vector of observation values (Tx1) on the dependent variable; X_δ is the dimensional matrix of the observation value (T x l_δ) in a number of independent variables; β_δ

the vector of dimensional coefficients and and u_δ denotes the dimensional vector of error terms (Tx1), each of which has an average of zero.

The structural form of the model described in equation (4) can also be written in the following matrix terms:

$$\begin{bmatrix} y_1 \\ y_2 \\ . \\ . \\ y_n \end{bmatrix} = \begin{bmatrix} X_1 & 0 & . & . & 0 \\ 0 & X_2 & . & . & 0 \\ . & . & . & . & . \\ . & . & 0 & . & . \\ 0 & 0 & . & . & X_n \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ . \\ . \\ \beta_n \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \\ . \\ . \\ u_n \end{bmatrix} \quad (4)$$

where y=Xβ+u, y≡[$y_1 y_2 \dots \dots . y_n$], β≡[$\beta_1 \beta_2 \dots \dots . \beta_n$], u≡[$u_1 u_2 \dots \dots u_n$] and X represent the block diagonal matrix in the matrix (4).

In the study, the effect of the governance index, which is an indicator of institutional quality, and selected economic indicators on economic growth were investigated with the annua3l data of the BRICS-T countries for the period 2002-2020. The SUR method was preferred because it yields effective results when N<T and especially when the number of units is less than 12. The econometric model used in the analysis is given in equation (5).

$$GDP_{it} = \alpha + \beta_1 IQ_{it} + \beta_2 POP_{it} + \beta_3 GCF_{it} + \beta_4 INF_{it} + \beta_5 TRADE_{it} + \beta_6 DCPS_{it} + \varepsilon_{it} \quad (5)$$

In equation (5), i and t represent the country and time period, and ε the error term, respectively. The income per capita which is an indicator of welfare, represented by GDP in the models, is used as a dependent variable in all models. The variables used as independent variables in the models are the governance index as an indicator of institutional quality (IQ), population growth rate (POP), gross capital formation (GCF), inflation rate (INF), trade (TRADE), and domestic credit to the private sector (DCPS).

The World Governance Index was used as a measure of institutional structure in the model. Six composite indicators are used to measure the level of governance of countries. These indicators are freedom of expression and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. These governance indicators are reported in two different ways. In the first, each indicator takes values ranging from -2.5 to +2.5. In the second method, each indicator scores between 0 and 100. Higher values in both assessments indicate better governance outcomes. In this study, it is accepted that the governance index takes a value between 0 and 100. A single index was obtained by taking the average of six components.

4. Findings

If cross-sectional dependence is detected in panel series, first-generation unit root tests do not give effective results because they do not take this dependency into account (Tatoğlu, 2017: 105). Although LM, $LM_{adj,}$ and CD test results are given for the determination of cross-sectional dependence in the analysis, the test to be considered is the LM test. Because the time dimension is larger than the unit dimension in the panel.

Table 1: Cross-Sectional Dependency Test Results

Test	Statistic	p-value
LM	36.14	0.0017
LM_{adj}	5.314	0.0000
CD	4.963	0.0000

When the cross-sectional dependence results in Table 1 are examined, it is seen that there is a cross-sectional dependency in the panel. As can be seen, there are three test results in Table 1. Since the panel has N<T, the LM test result should be taken into account. Since the p probability value is less than 0.05 in the LM test, the null hypothesis of "*no cross-sectional dependence*" is not accepted. Pesaran and Yamagata's (2008) test was performed to test the heterogeneity of the slope coefficients in the panel.

Table 2: Pesaran and Yamagata (2008) Test Results

	Delta	p-value
Δ	2.274	0.023
Δ_{adj}	2.988	0.003

Considering the results of the delta tests in Table 2, the null hypothesis *of "the slope coefficients are homogeneous"* is not accepted because the p probability values of the Δ and Δ_{adj} tests are less than 0,05. As a result, the panel is in a structure where there is a horizontal cross-sectional dependency and the slope coefficients are heterogeneous. Since the panel has cross-sectional dependence, second-panel unit root tests should be used instead of first-generation panel unit root tests. Therefore, the Pesaran CADF test, which is the second-generation panel unit root test and takes into account the cross-sectional dependence, was used in the study.

Table 3: Pesaran's CADF Panel Unit Root Test Results

Variables	Pesaran's CADF Panel Unit Root			
	Level		First Difference	
	Constant	Constant + Trend	Constant	Constant + Trend
GDP	-1.688	-1.198	-2.724***	-3.197***
IQ	-2.774***	-3.289***	-2.780***	-3.257***
POP	-2.415**	-3.213***	-2.656***	-3.162***
GCF	-1.518	-2.555	-2.651***	-3.151***
INF	-3.249***	-2.919**	-2.869***	-3.221***
TRADE	-1.033	-1.562	-2.604***	-3.150**
DCPS	-2.117	-1.849	-2.754***	-3.234***
The symbols ***, **, * indicate that the p probability values are statistically significant at the 1%, 5%, and 10% significance levels, respectively. The appropriate lag length is determined as 1 according to the Akaike Information Criteria.				

When the panel unit root test results in Table 3 are examined, it is seen that the variables included in the analysis become stationary when the first difference is taken. When the first-degree difference is taken, the variables are stationary at the level of 1% in constant, while the variable of TRADE is stationary at the level of 5%, and other variables are stationary at the level of 1% for constant and trend. In the study, whether there is a cointegration relationship between the series or not was examined by Westerlund and Edgerton (2007)'s LM Bootstrap (self-inference) panel cointegration test. This test is based on the Lagrange test multiplier developed by McCoskey and Kao (1998). The test allows autocorrelation and varying variance in the cointegration equation under the assumption of cross-section dependence and gives good results even in small samples. It also avoids possible internality problems by using Fully Modified OLS. Table 4 shows the Westerlund and Edgerton (2007) Panel Cointegration Test Results.

Table 4: Westerlund and Edgerton (2007) Panel Cointegration Test Results.

	LM-stat	Asymptotic p-value	Bootstrap P value
Constant	43.235	0.000	0.345
Constant + Trend	44.634	0.000	0.217

The null hypothesis of this test is "there is cointegration between the series". In addition, Westerlund and Edgerton (2007) suggested that the panel cointegration test should consider the asymptotic probability value when there is no cross-sectional dependence, and the bootstrap probability value if there is a cross-sectional dependence. Since there is a cross-sectional dependency between the units included in the analysis, the bootstrap probability value should be evaluated in the panel cointegration test results. The bootstrap values in Table 4 also show that there is cointegration between the related variables in constant and constant trends. In other words, there is a long-term relationship between the variables. Panel SUR method was used to estimate the coefficient of this long-run relationship and the results are shown in Table 5 and Table 6.

Table 5: Overall Statistical Significance of Equations

Equation	RMSE	R-sq	Chi^2	p-value
GDP1	1.877	0.569	53.93	0.000
GDP2	1.450	0.908	367.54	0.000
GDP3	2.438	0.382	11.10	0.085
GDP4	1.032	0.814	121.42	0.000
GDP5	2.300	0.554	43.21	0.000
GDP6	2.050	0.378	17.14	0.009

RMSE refers to the root mean square estimation error.

When the p values in Table 5 are examined, it is seen that the equations created for each country are statistically significant at the 1% level, except for India, while the equation for India is significant at the 10% significance level. R square values of six equations show that their explanatory power is also sufficient. The panel SUR estimator results for each of the BRICS-T countries are given in Table 6.

Table 6: Panel SUR Estimations for BRICS-T Countries

Dependent Variable	Independent Variables	Coefficient	Std. Error	z	P>|z|
GDP1 (Brazil)	IQ1	0.201	0.083	2.41	0.018
	POP1	-7.937	4.066	-1.95	0.051
	GCF1	1.097	0.248	4.42	0.000
	INF1	-0.049	0.124	-0.39	0.694
	TRADE1	0.136	0.069	1.96	0.050
	DCPS1	-0.194	0.061	-3.17	0.002
	CONS.	12.495	5.785	2.16	0.035
GDP2 (Russia)	IQ2	0.184	0.088	2.08	0.038
	POP2	-4.291	2.422	-1.77	0.076
	GCF2	1.492	0.125	11.89	0.000
	INF2	-0.415	0.049	-8.55	0.000
	TRADE2	0.498	0.088	5.65	0.000
	DCPS2	-0.188	0.039	-4.80	0.000
	CONS.	-39.460	8.422	-4.69	0.000
GDP3 (India)	IQ3	0.306	0.176	1.74	0.081
	POP3	-16.970	7.655	-2.22	0.027
	GCF3	0.444	0.214	2.08	0.038
	INF3	0.043	0.185	0.23	0.818
	TRADE3	0.076	0.037	2.02	0.043
	DCPS3	-0.665	0.287	-2.32	0.020
	CONS.	52.634	19.458	2.70	0.007
GDP4 (China)	IQ4	0.029	0.018	1.62	0.092
	POP4	-3.929	2.067	-2.22	0.027
	GCF4	0.021	0.009	2.28	0.023
	INF4	-0.076	0.108	-0.71	0.480
	TRADE4	0.083	0.037	2.26	0.024
	DCPS4	-0.069	0.022	-3.16	0.002
	CONS.	17.649	6.888	2.56	0.010
GDP5 (South Africa)	IQ5	0.359	0.227	1.58	0.098
	POP5	-12.254	2.868	-4.27	0.000
	GCF5	0.653	0.193	3.39	0.001
	INF5	-0.051	0.025	-2.01	0.045
	TRADE5	0.034	0.021	1.61	0.095
	DCPS5	-0.071	0.040	-1.80	0.073
	CONS.	-51.214	23.458	-2.18	0.029
GDP6 (Turkiye)	IQ6	0.235	0.118	1.98	0.048
	POP6	-3.788	2.413	-1.57	0.099
	GCF6	0.229	0.137	1.67	0.083
	INF6	0.241	0.197	1.23	0.220
	TRADE6	0.112	0.060	1.87	0.069
	DCPS6	-0.008	0.005	-1.58	0.098
	CONS.	-14.977	6.697	-2.24	0.026

When the results in Table 6 are examined, the effect of institutional quality on economic growth is found to be positive in BRICS-T countries. While the institutional quality variable (IQ) is significant at the 5% significance level in Brazil, Russia, and Turkiye, it is statistically significant at the 10% significance level in India, China, and South Africa. The population variable (POP) has a negative effect on economic growth. Population variable is statistically significant at a 1% significance level in South Africa, 5% significance level in India and China, and 10% significance level in Brazil, Russia, and Turkiye. The gross capital formation variable (GCF) has a positive effect on economic growth. The gross capital formation variable is statistically significant at a 1% significance

level in Brazil, Russia, and South Africa, a 5% significance level in India and China, and a 10% significance level in Turkiye. While the inflation variable (INF) has a negative effect on economic growth only in Russia and South Africa, it is statistically insignificant in other countries. The inflation variable is statistically significant at a 1% significance level in Russia and a 5% significance level in South Africa. Trade variable (TRADE) has a positive effect on economic growth in BRICS-T countries. While the trade variable is statistically significant at the 1% significance level in Russia, it is statistically significant at the 5% significance level in Brazil, India, and China, and statistically significant at the 10% significance level in South Africa and Turkiye. It has been determined that the Domestic Credit to Private Sector (DCPS) variable has a negative effect on economic growth. While the DCPS variable is statistically significant at the 1% significance level in Brazil, Russia, and China, it is statistically significant at the 5% significance level in India, and at the 10% significance level in South Africa and Turkiye.

In absolute value, the POP variable shows the greatest effect on economic growth in Brazil. It is followed by GCF, IQ, DCPS, and TRADE variables, respectively. Since the INF variable is statistically insignificant, it is not included in the ranking. The POP variable shows the greatest impact on economic growth in Russia. It is followed by GCF, TRADE, INF, DCPS, and IQ variables. POP shows the biggest impact on economic growth in India. It is followed by DCPS, GCF, IQ, and TRADE, respectively. INF variable is statistically insignificant. POP variable shows the most effect on economic growth in China. It is followed by TRADE, INF, DCPS, IQ, and GCF variables, respectively. In South Africa, the POP variable has the most impact on economic growth. It is followed by GCF, IQ, DCPS, INF, and TRADE, respectively. POP variable shows the greatest impact on economic growth in Turkiye. It is followed by IQ, GCF, TRADE, and DCPS variables, respectively. INF variable is statistically insignificant.

5. Conclusions

Institutional quality refers to the quality of the system created by the rules, regulations, laws, and policies within the country. One of the reasons for the differences in welfare between countries is institutional quality. The quality of institutions affects economic growth by influencing the decisions of countries such as production, consumption, savings, and investment. The growth of the economy in real terms is accepted as an indicator of the welfare of the countries. Therefore, there is a direct relationship between institutional quality and welfare. In this study, panel SUR analysis is applied with the 2002-2020 period data of Brazil, Russia, India, China, South Africa, and Turkiye. It is aimed to determine the effects of the institutional quality, population, gross capital formation, trade, inflation, and domestic credit to private sector variables on economic growth, which is an indicator of welfare. As a result of the analysis, it has been determined that institutional quality has a positive effect on welfare in BRICS-T countries. It is seen that the difference in institutional quality explains the differences in the economic growth of the countries and hence differences in welfare. If policymakers implement radical reforms on institutional quality and follow positive policies, this will lead to an increase in the welfare of the countries concerned. Policy decision-makers should take this situation into account and implement their economic policies. In future studies, using more institutional quality indicators, increasing the number of countries included, and performing analyses with different econometric methods will contribute to the related field.

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