# Assessing the impact of institutions on economic growth in the BRICS countries

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**Abstract**

This study examines the impact of institutional quality on economic performance in the BRICS countries for the period from 2002 to 2019. The panel data study was estimated using pooled OLS and a fixed effect model. The study employed six institutional quality indicators (Worldwide Governance Indicators) which included voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption. The study also controlled for conventional sources of growth, i.e. human capital, physical capital, government expenditure, and inflation. All of these factors were positive and significant in our study. The findings also reveal that government effectiveness, regulatory quality and control of corruption had a positive and significant impact on economic growth in the BRICS countries, whereas other institutional variables turned out to be insignificant.

**Keywords:** BRICS, economic growth, economic development, institutions, panel data, regression analysis.

**JEL:** C01, C13, O43, O10.

## Introduction

Economists have long argued about what affects economic growth. There are still gaps in the literature on the determinants of economic growth. Poor human development, low labor productivity, low standard of living and other factors severely impede a country's economic performance. In a similar vein, the government and its institutions have a critical role to play in enhancing a country's economic growth.

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Before proceeding any further, it is imperative to understand what we mean by institutions and how this affects a country's performance. North (1981) defines institutions as "a set of rules, compliance, procedures, and moral and ethical behavioral norms designed to constrain the behavior of individuals in the interests of maximizing the wealth or utility of principals." Sala-i-Martin (2002), on the other hand, states that institutions should encompass enforcement of contracts, protection of property rights, perceptions that the judiciary system is predictable and effective, transparency of the public administration, control of corruption, and pro-market regulations. It is particularly difficult to assess institutional quality in an empirical study due to the differences in definitions and measurements. However, the current study attempts to closely follow (Kaufmann et al., 2008) reports on Worldwide Governance Indicators which are useful for broad cross-country and over-time comparisons of the quality of institutions and governance.

The idea of exploring the relationship between institutional quality and economic growth has not emerged recently. There is already a rich body of empirical and theoretical studies that inquire into this relationship (Rodrik et al., 2004; Alexiou et al., 2014; Valeriani & Peluso, 2011). In addition, studies have also attempted to investigate the relationship of institutional quality with poverty and income inequality (Chong & Gradstein, 2004; Hasan et al., 2007). Moreover, many other studies have tried to inspect the relationship of economic growth with specific indicators of institutional quality, such as corruption, rule of law, quality of contract enforcement, property rights (see, for example, Knack and Keefer (1995b), Mauro (1995), Vijayraghavan and Ward (2001)).

The general consensus is that improvement in the quality of institutions will inevitably lead to a rise in economic growth. The literature provides strong evidence supporting the concept that institutions are very important for a country's performance. If there is convincing evidence that poor political and economic institutions significantly impede progress, policymakers may recommend actions to strengthen institutions in specific ways or encourage more pertinent political structures (Aron, 1996).

From an empirical standpoint, there is a lack of data regarding institutional quality. It is even more so because analyses on institutional quality use subjective measures, including voice and accountability, corruption, freedom of expression, and others. But the availability of quantitative measures of institutional quality (for example, from the World Bank) has contributed to the growth of literature that focuses on the impact of institutions on economic growth and average income. However, empirical studies assessing the link between different aspects of institutional quality and economic growth in emerging market economies are still limited. The BRICS countries constitute the five major developing economies, namely Brazil, Russia, India, China and South Africa. The BRICS have experienced remarkable economic progress. In the next 40 years, they may be larger than the economies of the United States, Japan, and Europe combined. Furthermore, investments in the BRICS countries are growing rapidly. These nations account for 42% of the world's population, with a combined population of almost 3 billion people. Such a large population implies a great potential for development. Apart from this, these countries do face such problems as political imperfection, massive corruption and poor institutional quality.

In this context, the study attempts to make a contribution to the existing body of literature by focusing on examining the link between institutions and economic growth in the BRICS countries.

Moreover, the study attempts to identify specific indicators of institutional quality that are more critical in determining economic growth in the BRICS countries. Previous studies state that good institutional quality leads to higher economic growth and, as a result, higher economic growth requires more refined and quality institutions. Thus, the study conducts an empirical analysis to quantify the impact of institutional quality on economic growth in selected emerging market economies, i.e. the BRICS countries, over the period 2002−2019 using a fixed effects model.

The structure of the paper is as follows. The next section provides an in-depth discussion of the relationship between institutions and economic growth. Section 2 presents an overview of the literature used for our work. Section 3 explains the econometric model. Section 4 presents the dataset used for our analysis. Section 5 offers the results, followed by a detailed discussion of our analysis. The last section is a description of possibilities for further study. Appendix and Notes can be found at the end of the paper.

## 1. Relationship between institutions, institutional quality and economic growth

The work of such academics as Douglas North, Robert Fogel, Daron Acemoğlu and others have had an important impact on economists' ideas about governance and institutions and their relationship with economic performance. But what are institutions? In fact, what do we mean by institutional quality and what is its linkage to economic growth? This section attempts to answer these questions.

From a theoretical standpoint, one can view institutional quality as an *aggregate index* that covers a multitude of attributes, such as protection of property rights, perception of the judiciary system as predictable and effective, transparency of public administration, and so on, without considering every single aspect related to *institutions*. Most scholars follow this approach to examine the relationship between institutions and economic growth. But what makes the role of institutions so critical for a nation's economic growth? North (1990) asserts that institutions play a vital role in determining the structure of a society. Hasan et al. (2007) note that countries are rich or poor depending on whether their institutional constraints define a set of payoffs to political and economic activities that encourage productive activity. In other words, when institutions are not robust, they allow organizations, including firms, trade unions, political parties, business associations, etc., to engage in "unproductive" activities.

Acemoğlu et al. (2005), Knack and Keefer (1995), Rodrik et al. (2004) conclude that the contribution of institutions to determining long-run causes of economic growth is more significant than other variables. We subdivide institutions into "economic institutions" and "political institutions." Economic institutions differ from political institutions in how they influence the structure of incentives in society. Put differently, economic

institutions are engaged in allocating resources and determining the growth potential of a country, while political institutions determine constraints and incentives within the political spectrum. Both types of institutions support each other to augment economic growth and development.

In this setting, the institutional framework in developing countries allows for more redistributive than productive activities, which in fact restrict opportunities rather than expand them. North (1990) states: "They seldom induce investment in education that increases productivity." Thus, institutions influence not only capital accumulation but also the "process of converting this capital into output" (Hasan et al., 2007). In developing economies, the effect of establishing quality institutions in terms of the rule of law or the practice of democracy on economic growth is extensively debated in the development literature.

It is argued that the current institutional quality in developing nations provides for a weak incentive to augment growth, which results in them continuing to be poor. Hasan et al. (2007) state that such market economies not only require a "dynamic" private sector to emerge but also need a "modicum of equity" to function effectively. Rodrik (2000) poignantly points out the importance of institutions that provide stabilizing and regulatory functions, as well as provide social assurance in order for markets to thrive. Russia, for instance, failed after privatization due to the lack of any regulatory framework. The same thing followed during the Asian financial crisis due to the lack of financial regulation.

The study uses the World Governance Indicators[1] produced by the World Bank. The dataset contains six aspects of institutional quality. These are control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, the rule of law, and voice and accountability. The aggregate indicators are based on several hundred individual underlying variables taken from a wide variety of existing data sources. The data reflect the views on governance of survey respondents and experts from public, private, and non-governmental organizations worldwide and allow for meaningful cross-country and over-time comparisons.

## 2. Literature review

Contrary to the popular opinion that factors such as capital stock and labor have a significant impact on economic growth, many pure institutionalists believe that institutions and institutional quality are the only basic determinants of economic behavior and growth.

According to the literature on institutional economics, institutional quality is arguably one of the most important factors of development (Acemoğlu et al., 2003; Rodrick et al., 2002). The quality of institutions, such as the rule of law, a good bureaucratic structure, and corruption, is critical to understanding the growth of a country. High institutional quality has been proposed as a driver of economic growth through motivating economic

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[1] The methodology by which World Governance Indicators are constructed can be viewed at https://info.worldbank.org/governance/wgi/Home/Documents

activities such as consumption and investment, more efficiently allocating resources, and promoting freedom of choice (Nguyen et al., 2018).

In their article on creative destruction and economic growth and the role of various institutions in the process of economic restructuring and growth, Caballero and Hammour (2000) discussed that an effective institutional structure was critical for the introduction of new technologies, redistribution of labor forces and keeping up with global economic developments. According to Rodrik et al. (2002), the quality of formal institutions is a prominent factor for understanding differences in income levels between countries. Scully (1988), while examining informal institutions, concluded that they were a vital source of information about the differences in real per capita growth rates between countries. Valeriani and Peluso (2011) examined the institutional framework through which economic growth occurs and growth differences among countries. The study concluded that the quality of economic institutions had a positive impact on the growth and development of a nation.

There are significant theoretical and empirical studies of the hypothesis that factors such as capital stock, human capital, government expenditure, inflation etc. have a significant impact on growth. Arayama and Miyoshi (2004) and Chow (1993) found a positive relationship between investments in physical capital and growth in China. Physical capital plays a key role in facilitating an economy's development. At a given level of GDP, a higher ratio of human capital to physical capital leads to rapid growth due to two factors. First, high human capital eases the introduction of advanced technologies in developed countries. Second, it is more difficult to adjust human capital than physical capital (Barro, 2001; Glaeser, 1994; Goetz, 1996; Bassanini & Scarpetta, 2002).

In many empirical studies, government expenditure is a determinant of growth. These studies have yielded conflicting results. Ram (1986) found that government expenditure had a significant positive effect on growth, particularly in developing countries, but total government spending had a negative effect on growth. Bose et al. (2007) argued that government investment and education expenditures contributed to growth. Moreno-Dodson (2012) contemplated that the net effect of public spending on growth was positive in a sample of seven fast-growing developing countries.

Fischer (1983), taking an average of 54 countries over two different time periods, found a significant negative relationship between growth and inflation rate. Barro (1995) suggested the same for about 100 countries between 1960 and 1990. He also argued that statistically meaningful results emerged only when high-inflation events were included in the sample. Although inflation had a minor impact on growth, the long-term repercussions on living standards were significant.

## 3. Econometric model and estimation

The study aims to examine the impact of institutions on economic growth in the five BRICS nations. To find out the relationship between institutions and economic growth, the following model was estimated:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln H_{it} + \beta_2 \ln K_{it} + \beta_3 GOVEX_{it} + \beta_4 CPI_{it} + \beta_5 INS_{jit} + \varepsilon_{it} \ (*), \qquad (1)$$

where: $i = 1,2,....,5$ $t = 1,2,......,18$ $j = 1,2,.....,6$.

Here $i$ refers to the number of cross-sectional subjects in the panel dataset, $t$ refers to the time dimension of the panel dataset, and $j$ refers to the various dimensions of institutional quality which have been considered in this study. $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$, $\beta_5$ represent the regression coefficients of the model. The control variables chosen along with data sources are mentioned in Table 1.

The estimation methods used in this study are pooled OLS estimation and fixed effects estimation. Given that there is a realistic expectation of heterogeneity among the BRICS nations, intuitively, the pooled OLS estimation method will not be the most appropriate estimation method because lumping together different countries may result in subsuming the individuality of different countries (Gujarati, 2014). Moreover, it does not appear that the random effects estimation method is the appropriate method because we are working with a small panel, and cross-sectional units in our sample aren't drawn at random. Additionally, "even if it is assumed that the underlying model is pooled or random, the fixed effects estimators are always consistent" (Gujarati, 2014). Hence, we believe that the fixed effects method is the most appropriate estimating method for this study. The econometric model was estimated by both methods. The decision regarding the most appropriate estimation method(s) was made based on the F-test (see Appendix A4).

The study makes use of six dimensions of institutional quality. Data on different dimensions of institutional quality were used alternately to evaluate the econometric model given in equation (1).[2] This ensures two things. First, the problems related to imperfect multicollinearity are avoided, since it is only reasonable to expect that the data on different aspects of institutional quality are correlated with each other. This expectation is borne out by reality (see Appendix A2). Second, the dimensions of institutional quality, which are more important for determining economic growth in the BRICS countries, can be identified conveniently and accurately. Additionally, when different dimensions of institutional quality were taken into consideration individually, all six models were free from heteroskedasticity.

## 4. Data sources

This study uses a panel dataset that was compiled from larger datasets provided by the World Bank, UNDP. The compiled dataset includes data on BRICS members - the five most important economies in the world (Brazil, Russia, India, China, and South Africa). The data was compiled from 2002 to 2019 as per data availability. The period was limited to the years from 2002 to 2019 due to huge gaps in data on the chosen variables, especially in the case of China. In order to avoid the same, the chosen period was taken up in the study to provide an accurate understanding of the topic.

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[2] Our dataset includes 5 nations, R allows users to run random effects estimation only if the equation contains 5 variables including the intercept in the model. However, our regression equation contains 6 variables including the intercept. Hence random effect model has not been estimated.

A description of the data on the dependent variable and control variables is given in Table 1.

**Table 1.** Description of data on the dependent and independent variables

| Conceptual variable | Observable variable | Classification | Source |
|---|---|---|---|
| Total output/ Income (Y) | GDP at constant 2010 prices (USD) | Dependent variable | World Bank |
| Human capital (H) | Education index | Control variable | United Nations Development Program (UNDP) |
| Physical capital (K) | Gross capital formation at constant 2010 prices (USD) | Control variable | World Bank |
| Government expenditure (GOVEX) | General government final consumption expenditure (% of GDP) | Control variable | World Bank |
| (CPI) | Inflation, consumer prices (annual %) | Control variable | World Bank |

*Source:* compiled by the author based on data provided by the United Nations Development Program and World Development Indicators.

This study took into account data on all six dimensions of institutional quality offered by World Governance Indicators. Table 2 describes the data on dimensions of institutional quality. These are estimates ranging from −2.5 to +2.5, with higher values representing better governance performance.

**Table 2.** Description of data on various aspects of institutional quality

| Dimensions of institutional quality | Classification | Description |
|---|---|---|
| Voice and accountability (VA) | Independent variable | It measures perceptions of the extent to which a country's citizens are able to participate in the election of their government, as well as freedom of expression, freedom of association, and freedom of the media |
| Political stability and absence of violence/ terrorism (PT) | Independent variable | It measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism |
| Government effectiveness (GE) | Independent variable | It captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressure, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies |

**Table 2.** Continued

| Dimensions of institutional quality | Classification | Description |
|---|---|---|
| Regulatory quality (RQ) | Independent variable | It captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote the development of the private sector |
| Rule of law (RL) | Independent variable | It captures 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, police and courts, as well as the likelihood of crime and violence |
| Control of corruption (CC) | Independent variable | It captures perceptions of the extent to which public power is exercised for private gain, including both small and major forms of corruption, as well as "seizure" of the state by elites and private interests |

*Source:* compiled by the author based on information provided by World Governance Indicators.

## 5. Estimation results and their interpretation

This section presents results based on the pooled OLS and fixed effects estimation methods. Based on the results of the F-test, the correct estimation method(s) was determined.

Descriptive statistics of the compiled dataset and the results of the F-test can be found in the Appendix (see Appendix A3 and Appendix A4). The estimation results of Equation (1) based on the different estimation methods are given in Tables 3 and 4.

**Table 3.** Pooled OLS estimation results

| Regressor | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Constant | 3.6276 (0.0000)*** | 4.1799 (0.0000)*** | 5.2089 (0.0000)*** | 5.2568 (0.0000)*** | 5.0458 (0.0000)*** | 4.7372 (0.0000)*** |
| lnH | −0.0146 (0.9257) | −0.3607 (0.0217)* | −0.2789 (0.0261)* | −0.4145 (0.0040)** | −0.4274 (0.0100)* | −0.3973 (0.0186)* |
| lnK | 0.8823 (0.0000)*** | 0.8414 (0.0000)*** | 0.8173 (0.0000)*** | 0.8023 (0.0000)*** | 0.8171 (0.0000)*** | 0.8262 (0.0000)*** |
| GOVEX | 0.0490 (0.0000)*** | 0.0678 (0.0000)*** | 0.0538 (0.0000)*** | 0.0669 (0.0000)*** | 0.0544 (0.0000)*** | 0.0594 (0.0000)*** |

**Table 3.** Continued

| Regressor | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| CPI | 0.0094 (0.0377)* | 0.0078 (0.1095) | 0.0009 (0.8233) | 0.0075 (0.0903) | 0.0079 (0.0978) | 0.0081 (0.0973) |
| VA | 0.0777 (0.0048)** | - | - | - | - | - |
| PT | - | −0.1141 (0.0459)* | - | - | - | - |
| GE | - | - | −0.2712 (0.0000)*** | - | - | - |
| RQ | - | - | - | −0.2592 (0.0001)*** | - | - |
| RL | - | - | - | - | −0.1428 (0.0211)* | - |
| CC | - | - | - | - | - | −0.1015 (0.0606) |
| Adjusted R² | 0.97949 | 0.9784 | 0.9835 | 0.9809 | 0.9788 | 0.9783 |

*Note:* The values in parentheses represent the *p-value*; *** represents significance at the 1 percent level of significance, ** represents significance at the 5 percent level of significance, and * represents significance at the 10 percent level of significance.

*Source:* calculated by the author based on the compiled dataset.

Based on the results of the statistical test (see Appendix A4), it can be concluded that the fixed effects estimation approach is the best suitable estimation method for this study. This also supports our intuitive reasoning discussed in Section 3. As a result, the findings of the estimations shown in Table 4 are all that is required for statistical inference and interpretation.

**Table 4.** Fixed effects estimation results

| Regressor | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| lnH | 1.0932 (0.0000)*** | 1.1234 (0.0000)*** | 1.0690 (0.0000)*** | 1.1984 (0.0000)*** | 1.1581 (0.0000)*** | 1.1796 (0.0000)*** |
| lnK | 0.5401 (0.0000)*** | 0.5314 (0.0000)*** | 0.5174 (0.0000)*** | 0.5231 (0.0000)*** | 0.5239 (0.0000)*** | 0.5162 (0.0000)*** |
| GOVEX | 0.0277 (0.0008)*** | 0.0286 (0.0005)*** | 0.0313 (0.0000)*** | 0.0376 (0.0000)*** | 0.0269 (0.0009)*** | 0.0402 (0.0000)*** |
| CPI | −0.0051 (0.0178)* | −0.0049 (0.0168)* | −0.0047 (0.0065)** | −0.0061 (0.0021)*** | −0.0048 (0.0170)* | −0.0040 (0.0263)* |

**Table 4.** Continued

| Regressor | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| VA | −0.0246 (0.6672) | - | - | - | - | - |
| PT | - | 0.0369 (0.2231) | - | - | - | - |
| GE | - | - | 0.1771 (0.0000)*** | - | - | - |
| RQ | - | - | - | 0.1289 (0.0061)** | - | - |
| RL | - | - | - | - | 0.0913 (0.1173) | - |
| CC | - | - | - | - | - | 0.1659 (0.0000)*** |
| Adjusted $R^2$ | 0.9645 | 0.9650 | 0.9742 | 0.9676 | 0.9655 | 0.9720 |

*Note:* The values in parentheses represent the *p-value*; *** represents significance at the 1 percent level of significance, ** represents significance at the 5 percent level of significance, and * represents significance at the 10 percent level of significance.

*Source:* calculated by the author based on the compiled dataset.

The results shown in Table 4 can be interpreted as follows. In the BRICS countries, a one percent increase in physical capital leads to an increase in total output/income by an average of 0.52−0.54%. Likewise, a one percent increase in human capital leads to an increase in total output/income by an average of 1.07−1.2%. A one unit increase in government expenditure leads to an increase in total output/income by an average of 2.7−4.02%. On the other hand, a one unit increase in inflation leads to a decrease in total output/income by an average of 0.4−0.6%. Partial slope coefficients associated with the natural log of physical capital and human capital, government expenditure and inflation are highly statistically significant in all six regression equations.

On the other hand, the coefficients for different indicators of institutional quality have different interpretations. In the BRICS countries, an increase by one standard deviation unit in regulatory quality, control of corruption, government effectiveness, the rule of law, and political stability and absence of violence leads to an increase in total output/income by an average of 12 ,16 ,17, 9 and 3%, respectively. However, an increase by one standard deviation unit in voice and accountability leads to an average decrease in total output/total income by 2%. All indicators of institutional quality turned out to be highly statistically significant, except for the rule of law, voice and accountability, and political stability and absence of violence.

According to the findings of Kossele et al. (2017), there is a positive substantial relation between government effectiveness and economic growth. Our results help reinforce the same statement. A nation with a smooth-running government develops effective policy

making, thereby accelerating growth and development for all its citizens. Additionally, regulatory quality and economic growth are expected to be positively linked (Kaufmann, et al., 2002). The sign of this coefficient in our study corresponds to the a priori expectation. The improved regulatory quality creates incentives for both public and private sectors, which as a result contributes to boosting the growth of a nation.

A popular theory devised by Sirowy and Inkeles in 1990 states that if a country achieves a higher level of democracy before reaching the threshold level of economic growth, it may face difficulties in achieving a higher level of economic growth. Put it differently, developing countries struggle to achieve higher growth as they tend to satisfy the demands of everyone in the short run. On the other hand, authoritarian states tend to achieve greater economic growth due to their better ability to control resources and implement policies. Interestingly, the coefficient of voice and accountability turned out to be negative and insignificant. Our study includes China and South Africa, which have been largely authoritarian for a long time and the repercussions of this are felt decades later.

Effective public governance ensures the adoption of laws and their accessibility to citizens. As a result, this helps to improve the economic growth of the nation (Burgess, 2012). The existence of the rule of law in a country provides stability, which will undoubtedly increase investments because investors will feel protected by the implementation of laws by the judiciary, which will ensure full justice. Although the rule of law was insignificant, the sign of this coefficient corresponds to our a priori expectation. The coefficient for political stability and absence of violence/terrorism turned out to be insignificant, but the sign is positive. Younis et al. (2008) note that a stable political environment in a country not only increases the accumulation of human capital and physical capital but also stimulates the growth process.

One more thing should be noted here: achieving a one standard deviation unit increase/decrease in any of the dimensions of institutional quality is of great importance. Such results are the culmination of ideas formed over decades. This explains why a change in the unit of measurement in any dimension of institutional quality has a greater impact on total output/total income than a change in the unit of measurement in any of the control variables: physical capital, human capital, government expenditure, and inflation.

## 6. Conclusion

The study manages to identify some of the most critical dimensions pertaining to the empirical relationship between institutional quality and economic growth in the BRICS countries. Most countries devise policies taking into account factors such as capital stock, human capital, government expenditure, inflation, etc. with the objective of achieving higher growth and development. However, this research suggests that the impact of institutions on economic growth may be as important as the influence of other conventional determinants.

According to this study, other control variables, such as physical capital, human capital, and government expenditure, show a positive relationship with the real per capita

GDP growth. On the other hand, inflation shows a negative relationship with the real per capita GDP growth. From the above results, it is obvious that the impact of institutions on economic growth is higher than the influence of other variables, such as physical capital, human capital, government expenditure and inflation.

Our findings reveal that control of corruption, regulatory quality and government effectiveness are the most important dimensions of institutional quality that influence economic growth. Control of corruption shows a significant positive relationship with economic growth at the 1% significance level. Similarly, both government effectiveness and regulatory quality show a significant positive relationship with economic growth at the 1% significance level.

Interestingly, control of corruption turned out to be positive, in contrast to the popular belief. The discussion section above elaborates on this in more detail. China is part of our sample and is notorious for fostering rapid growth despite rampant corruption. Moreover, voice and accountability is another dimension that turned out to be negative. This highlights that some socially important factors, such as democracy and freedom, do not significantly affect economic growth.

This study concludes that there is a significant relationship between institutions and economic growth in these emerging market economies. Six different dimensions of institutional quality are important determinants of growth in the context of BRICS. The study suggests that the countries should improve these institutional structures to promote higher growth and development. Since institutions have been found to be a significant determinant of economic growth in all sampled countries, the study recommends the development of effective institutions for enhancing economic growth in these countries.

## 7. Further research proposals

To obtain effective estimators, it is necessary to evaluate endogeneity and simultaneity. This can be done by using instrumental variables. Hence, the model developed in our study can be refined by using instrumental variables. It is very difficult to find good instruments that correlate with exogenous variables, but not with the dependent variable. The literature suggests some possible instruments that can be used. Mauro (1995) argues that the index of ethnic fractionalization is a valid instrument for institutional variables. Acemoğlu et al. (2001) use settler mortality as an indicator of institutions which is available only for 56 countries — a country's high settler mortality is a sign of weak institutions. According to Easterly and William (2002), tropical weather, pathogens, and crops have an indirect impact on development, which then affects institutions. Colonial provenance, assessed by the percentage of the population speaking one of the main European languages, was used as an instrument by Hall and Jones (1999).

We were unable to add instrumental variables due to a lack of data (in a continuous interval for our sample). Once this is taken into account, the estimators will have more precise values. Therefore, the authors urge future researchers to take these factors into consideration in order to provide a comprehensive understanding of the relationship between institutions and economic growth in countries.

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## Appendix

**A1.** Scatter plot of lnY and different explanatory variables
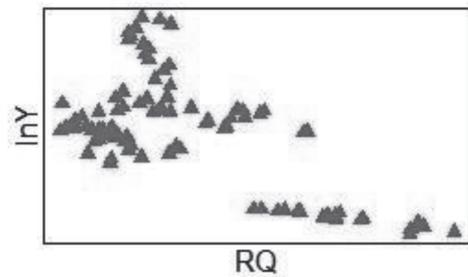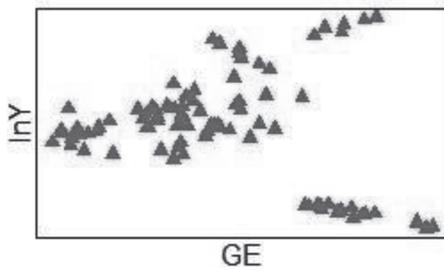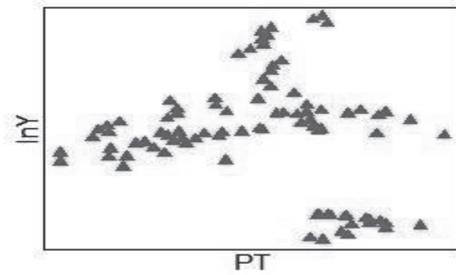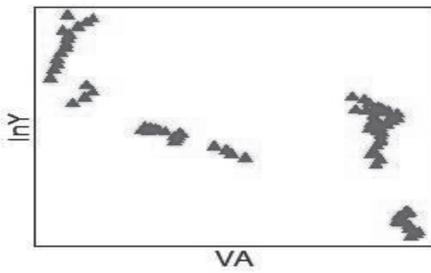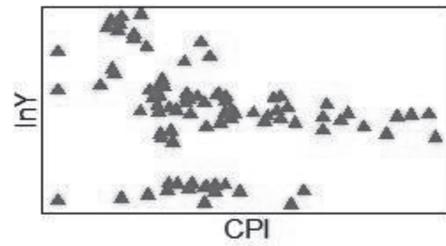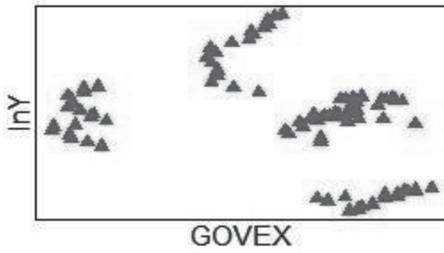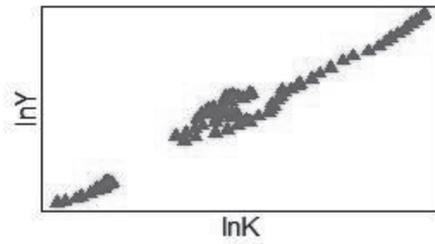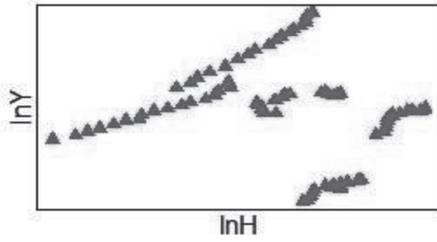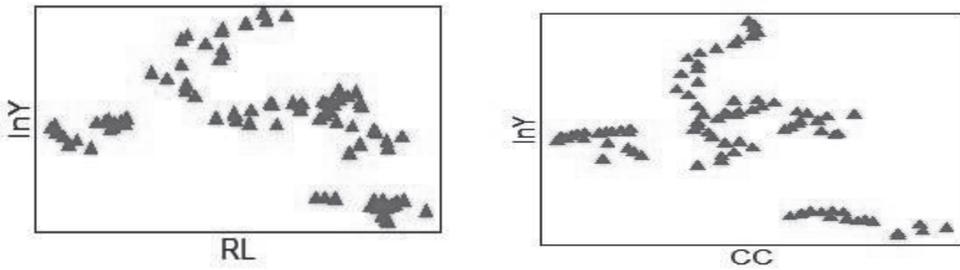
## A2. Correlation matrix for different aspects of institutional quality

|      | VA     | PT     | GE     | RQ     | RL     | CC |
|------|--------|--------|--------|--------|--------|----|
| VA   | 1      |        |        |        |        |    |
| PT   | 0.1776 | 1      |        |        |        |    |
| GE   | 0.1782 | 0.5346 | 1      |        |        |    |
| RQ   | 0.5239 | 0.7148 | 0.6539 | 1      |        |    |
| RL   | 0.7335 | 0.3024 | 0.6097 | 0.5373 | 1      |    |
| CC   | 0.6208 | 0.6555 | 0.7400 | 0.8256 | 0.7995 | 1  |

*Source:* calculated by the author based on the compiled dataset.

## A3. Descriptive statistics of the compiled dataset

|       | Mean      | Median    | Standard Deviation | Minimum   | Maximum   |
|-------|-----------|-----------|--------------------|-----------|-----------|
| lnY   | 28.12478  | 28.1675   | 0.935634           | 26.37224  | 30.07337  |
| lnH   | −0.46625  | −0.43541  | 0.177863           | −0.94161  | −0.1948   |
| lnK   | 26.78219  | 26.74064  | 1.194982           | 24.49177  | 29.26222  |
| GOVEX | 16.66439  | 17.87334  | 3.464636           | 9.80247   | 21.29574  |
| CPI   | 5.933053  | 5.292291  | 3.573              | −0.73197  | 15.78873  |
| VA    | −0.19885  | 0.41349   | 0.903644           | −1.74897  | 0.715737  |
| PT    | −0.56409  | −0.51219  | 0.440802           | −1.51335  | 0.329845  |
| GE    | 0.032914  | −0.00623  | 0.302806           | −0.50049  | 0.692696  |
| RQ    | −0.09925  | −0.21437  | 0.327086           | −0.52078  | 0.804242  |
| RL    | −0.27265  | −0.19176  | 0.352807           | −0.97012  | 0.255048  |
| CC    | −0.34604  | −0.3551   | 0.398238           | −1.13205  | 0.568106  |

*Source:* calculated by the author based on the compiled dataset.

## A4. Statistical tests to determine the appropriate estimation method(s) F-Test (Pooled OLS v/s Fixed Effects)

*Ho:* Both the pooled OLS method and fixed effects method give consistent estimators.
*H1:* Fixed effects method gives consistent estimators.

**Table A4.** Results of F-tests

| Dimension of institutional quality in the regression model | F-Tests statistics | Appropriate estimation method |
|---|---|---|
| VA | 115.26 (0.0000)*** | Fixed Effects |
| PT | 124.18 (0.0000)*** | Fixed Effects |
| GE | 129.85 (0.0000)*** | Fixed Effects |
| RQ | 118.09 (0.0000)*** | Fixed Effects |
| RL | 123.63 (0.0000)*** | Fixed Effects |
| CC | 161.02 (0.0000)*** | Fixed Effects |

*Note:* The values in parentheses represent the *p-value*; *** represents significance at the 1 percent level of significance.

*Source:* calculated by the author based on the compiled dataset.