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Institutional Quality and Real Sector Economy: Evidence from Belt and Road Economies

Nur Muhammad Shipon[1] Dr. Md. Tariqul Islam[2] Dr. Mollah Aminul Islam[3]

Abstract

Purpose: The aim of this study is to investigate the role of institutional quality (IQ) in developing the real sector economy of a country.

Rationale of the study: The IQ works as a trust symbol for the whole socio-economic culture of the nation. It is reasonable to believe that if an economy achieves high trust from domestic and cross-border investors and business entrepreneurs, in terms of security of common citizens, investors' rights protection, a rational and easygoing bureaucratic system, fewer inland and border tensions, and a culture of citizens' willingness to follow the law and order, they will be more likely to select the country as their investment destination. Based upon the theoretical assertions, this study examines the relationship under consideration.

Method: This study considers data from 79 Belt and Road Initiative (BRI) partner countries over the 1999–2019 period. Additionally, the study utilizes principal component analysis (PCA) to combine each set of indicators into one while capturing the maximum variance of the data. The dependent variable in this research is economic growth, which is measured by GDP at constant prices. We also controlled for FDI, financial development, human capital, inflation, and domestic investment. Trade openness, infrastructure, and population. Finally, the study deploys pooled OLS and fixed and random effect modelling to reveal the relationship.

Findings: The research finds that IQ has a highly positive and significant effect on the economic growth of a country, especially in the BRI partner countries. We find a highly significant coefficient of the IQ variable on economic growth of 0.156 ($p<0.01$), while we consider the combined index of six different IQ indicators. Moreover, we consider each of the six IQ indicators separately to check the robustness of the study, and we find all of the indicators to have highly significant and positive coefficients. In addition, with alternative methodologies, the results are found to be consistent and robust in terms of sign and significance.

Originality: The research pioneers the investigations about the impacts of IQ on economic growth, especially for the BRI country groups. It conducts a detailed analysis utilizing world governance indicators and political risk indicators as alternative IQ measures. Moreover, it combines each set of IQ measures into one single index utilizing PCA, which establishes the consideration of all IQ measures.

Keywords: Institutional Quality, Belt and Road Initiative, Principal Component Analysis

JEL Code: C23, E44, F21, F36, G15, P45

[1] *Assistant Professor, Accounting, Dhaka Commerce College, Mirpur, Dhaka*
[2] *Associate Professor, Department of Finance and Banking, Jatiya Kabi Kazi Nazrul Islam University, Mymensingh*
[3] *Associate Professor, Department of Accounting and Information Systems, Jatiya Kabi Kazi Nazrul Islam University, Mymensingh*

1. Introduction

The economic impact or growth is a highly complex and integrated phenomenon while all limbs of the country are interconnected (M. A. Islam et al., 2020; M. A. Islam, Liu, et al., 2018). Institutions are the constraints and structures made by humans for the purposes of practicing political, social, and economic activities (North, 1991). The quality of institutions (hereafter termed as institutional quality (IQ)) depends on the efficiency and correctness of institutional forces, such as rules, laws, taboos, etc., in the current time period and the enforceability of those (M. A. Islam, Hossain, Khan, Hasan, & Hassan, 2021). Therefore, the better the institutional practices are in an economy, the better the output of human behavior can be expected (Khan, Islam, & Akbar, 2020). For example, in a country where the laws and rules are strict and the law-enforcing agencies are very cautious and prompt in taking any necessary actions, the citizens will be accustomed to having an excellent attitude towards law abidance. The citizens of a country that has such quality institutions, i.e., laws, rules, and social taboos, are expected to have a social culture that fulfills contracts and takes enough care so that no one is harmed or deprived.

While the financial sector of a country is a major component in the development of peace, it is the quality of institutions that can ensure the development of the financial sector and finally contribute to economic growth. The IQ is measured as a major source of trust (M. A. Islam, Liu, et al., 2018) for an economy or a country's potential investors. It can be simply expected that investors (local and foreign) are more active in investing while they have a certain level of trust in the economy regarding common rules and laws of the country, public beliefs and taboos, and financial and investors' rights protection regulations (M. A. Islam, Liu, Khan, Islam, & Sultanuzzaman, 2021).

Since the seminal work of North (1991), IQ has been recognized as one of the most important development factors for a country's development as it enhances trade and investment (Aibai, Huang, Luo, & Peng, 2019). Once the IQ of a country reaches such high standards, investors invest more in the country, which creates businesses and enhances the production of the country. At the same time, it generates new employment opportunities for the people of the country. All the effects of the activities end up adding value to the economic growth of the country.

With such intuition, this specific piece of research is devoted to empirically investigating the truth, i.e., the effect of IQ on economic growth. Although countries have different perspectives and are separate from others with regards to the rules, laws, regulations, and social taboos (i.e., IQ), some commonality is expected in IQ across countries. The commonness is in terms of investor protection, contract enforcement, restricting malpractices, punishing criminals, facilitating financial settlements and protecting investor rights. Therefore, this research investigates the issues on a sample of Belt and Road Initiative (BRI) partner countries.

BRI is the largest international macroeconomic tie up (Liu, Islam, Khan, Md Ismail, & Pervaiz, 2020) following the Marshal Plan which aims to financial integration among the partner countries (M. A. Islam, Das, & Hassan, 2021). There are certain other reasons for taking a sample from BRI countries. After being declared by Chinese President Xi Jinping in 2013, the BRI countries are considered the largest group of countries (Liu et al., 2020). The countries are diverse in location and are in different economic stages (M. A. Islam et al., 2020). Countries from Asia, Africa, Europe, and Latin America are participating in the initiative, while the participants are from

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advanced markets (AM), emerging markets (EM), and low-income countries (LIC). The BRI country group is comprised of more than 120 countries (M. A. Islam et al., 2020), which cover more than 60% of the world's population and 30% of the global GDP (Liu et al., 2020). Therefore, such a sample is representative of the whole world and the research findings with this sample gain high generalizability.

To have an overview of the IQ of the member BRI countries, we can follow Figure 1 below. The figure presents average values of the IQ variable derived from principal component analysis for each country. As per the average IQ of each country, Finland, New Zealand, Singapore, France, Chile, Barbados, Portugal, Estonia, Slovenia, and Israel are the ten countries with the highest average IQ, respectively, while Russia, Ecuador, Sierra Leone, Kyrgyz Republic, Cameroon, Cambodia, Cote d'Ivoire, Nigeria, Libya, and Tajikistan are the ten countries with the lowest average IQ, respectively. However, we can observe that many countries have very low or negative values for IQ, which means that most of the countries in the BRI partnership are institutionally underdeveloped. Such low achievements in IQ have probably contributed to the lower economic growth of the members.

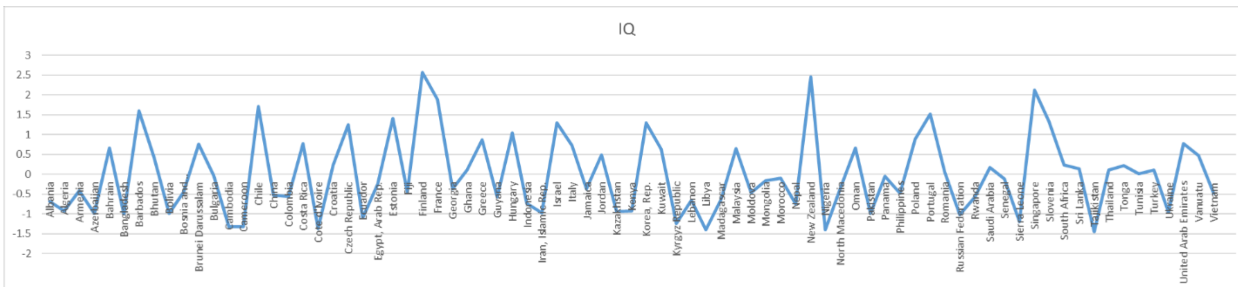

Figure 1. Average IQ status of selected BRI countries

In this study, we find that IQ has a highly significant and positive impact on economic growth. More elaborately, the study analyzed all 6 separate indicators of world governance indicators (WGI) and a combined series using PCA. Similarly, it analyzes 12 separate indicators of political risk and a combined series using PCA. We also controlled for other important macroeconomic issues that may affect the IQ-EG nexus. The study utilized pooled OLS and fixed effect regressions as alternative ways to find robust results. In all material respects, while using separate indicators and combined proxies, we find a significant effect of IQ on economic growth. The results are robust across alternative methodologies and proxies.

The next section outlines the methodologies utilized in this study. The third section presents detailed discussions of the findings of the empirical analysis. Finally, the fourth section concludes the paper with policy guidelines and future research directions.

2. Research methodology

2.1 Data and Variable

This research empirically investigates the impacts of institutional quality on economic growth. However, IQ is a largely complex phenomenon to be assessed as a large number of social and economic aspects are treated as IQ proxies, and each one has a completely different perspective on the institutions of the country. Therefore, in this research, we utilized proxies for two different indicators. Firstly, we deploy a governance indicator provided by the Worldwide Governance Indicator (WGI) of the World Bank (WB). This indicator contains six different sub-indicators, such as control of corruption, government efficiency, political stability, regulatory quality, rule of law, voice, and accountability. The data for these variables comes from WGI (2019). Secondly, we utilize the political risk indicator of the International Country Risk Guide (ICRG) (2019) provided by the Political Risk Service (PRS) Group (PRS, 2019). This indicator contains a different series of sub-indicators such as "government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality" (M. A. Islam et al., 2020). The first five elements of the ICRG risk indicator are scaled as 0–12, while the rest are scaled as 0–6. A low risk is indicated by a rise in any of the twelve sub-indicators (Howell, 2013). However, following M. A. Islam et al. (2020), we apply principal component analysis (PCA) to combine the sub-indicators into one single indicator. I did it for both sets of governance and risk indicators. PCA is a specific and widely used technique to combine different series of data into one while keeping the maximum variation of the data (M. A. Islam et al., 2020).

The dependent variable we used is the natural logarithm of constant gross domestic product. We use the stock of inward FDI per capita to measure FDI (Farla, de Crombrugghe, & Verspagen, 2016).FDI stock reflects the accumulated value of FDI into a country, which includes new investment and reinvestments out of profit. Therefore, this variable better represents the scenario of FDI in comparison to others (Liu et al., 2020). The financial development (FD) of a country is measured by the financial development index provided by the IMF, which is recognized as the most comprehensive indicator in this connection (M. A. Islam, Liu, et al., 2021). The human capital variable (HC) is proxied by the log of life expectancy at birth. It has been frequently used to proxy for HC in the literature (M. A. Islam, Liu, et al., 2021). We proxy macroeconomic instability with inflation data, which is represented by the consumer price index (CPI) (Khan et al., 2020). CPI is an index comprised of the price variations of commodities in a market. A positive value represents an inflationary situation, and the more there is inflation, the more there is macroeconomic instability. We proxy domestic investment (DI) by the log of gross fixed capital formation. As higher domestic investment can enrich the domestic investment environment and so attract FDI, therefore, it is necessary to control for it (Ali, Rashid, & Islam, 2010; Yahia, Haiyun, Khan, Shah, & Islam, 2018) in this study. We proxy trade openness (TO) by the sum of exports and imports in relation to the GDP of the country. This measure is a commonly used proxy of TO in literature (Hassan, Das, & Islam, 2016; M. A. Islam, Das, et al., 2021). The more a country is prone to TO, the better its expected investment environment will be. The number of fixed telephone lines per 1000 people in a country is used as a proxy for infrastructural development (M. A. Islam, Hassan, & Rana, 2019; M. A. Islam et al., 2020; M. A. Islam, Liu, et al., 2021).development is one of the strongest requirements for better investment and trade in a country (M. A. Islam, Nesa, & Hossain, 2018; Karim, Rashid, & Islam, 2017). Therefore, it reveals how important it is to control it. Moreover, the total population of a country comprises the domestic market, which may be an important factor for market-seeking multinational companies (MNCs) to locate their investments (Ali et al., 2010; Kutan, Samargandi, & Sohag, 2017). As a result, it is critical to account for such a factor. The data for the control variable comes from the world development indicator (WDI) of the world bank.

The data is collected for the years 1999 to 2019 for 79 BRI partner countries [1]. The selection of the countries and time span is solely based on data availability. We endeavored to focus on maximum data availability, although the data finally used has a few missing data points. We ignored the issue due to its small weight.

2.2 The Estimation Strategy

To estimate our models, we consider panel data analysis techniques as our data is short panel, having a time dimension (t) of 21 years and a cross section (n) of 79 countries. Therefore, we primarily deploy the pooled ordinary least square (POLS) technique, which is the most commonly utilized panel data technique. The POLS technique creates a pool of the cross section and estimates the results. It is well known to researchers that pooled analysis makes a combination of time series data across cross-sections. The characteristics of pooled data are that it has repeated observations, generally in periods, on time-fixed units, for example, firms, states, nations, etc. A pooled array of data represents a combination of N spatial units over T temporal units and produces an observation (Podestà, 2002). Due to ignoring cross-sectional effects, M. A. Islam et al. (2020) opined it was not the best technique for a heterogeneous panel. Therefore, as a part of the robustness check of our POLS estimation results, we deploy fixed and random effect modeling, whereby we decide upon fixed or random with a houseman test.

2.3 The Model

A. Islam et al. (2020) acknowledged the moderating role of IQ to attract foreign direct investment (FDI) into the host economy which often adds positive effects to economic growth both directly and through spillover effects (M. A. Islam et al., 2019; Sultanuzzaman, Fan, Mohamued, Hossain, & Islam, 2019). However, none of the authors acknowledged the effect of IQ on real sector development. We largely follow the methodology from the previous literature to address the issue and design the following functional form relation:

$$EG_{it} = \beta_0 + \beta_1 IQ_{it} + \beta_{\mathrm{i}} Controls_{it} + \mu_{it} \qquad (1)$$

Where, IQ_{it} represent, Institutional Quality for country *i* and time *t*. EG_{it} represents Economic growth of country i and time t. $Controls_{it}$ represents a set of control variables for country i and time *t*. μ_{it} is the white nose term for country *i* and time *t*. the βs represent regression coefficients

Because economic factors are so intertwined with so many other factors and forces, we believe it is necessary to control for the most important economic factors in order to form an acceptable model for this current study. Therefore, following recent literature, we control for a set of variables such as inward FDI, financial development (FD), human capital (HC), economic instability in terms of inflation (I), domestic investment (DI), trade openness (TO), infrastructure (Inf) and market size in terms of the total population of the country (Pop). Considering all the control variables, the new equation is shaped as follows:

$$EG_{it} = \beta_0 + \beta_1 IQ_{it} + \beta_2 FDI_{it} + \beta_3 FD_{it} + \beta_4 HC_{it} + \beta_5 I_{it} + \beta_6 DI_{it} + \beta_7 TO_{it} + \beta_8 Inf_{it} + \beta_9 Pop_{it} + \mu_{it} \quad (2)$$

To normalize the variables, we deploy natural logarithm for appropriate cases. Therefore, the equation 2 can be rewritten as below while ln represents natural logarithm:

$$EG_{it} = \beta_0 + \beta_1 IQ_{it} + \beta_2 lnFDI_{it} + \beta_3 FD_{it} + \beta_4 lnHC_{it} + \beta_5 lnI_{it} + \beta_6 lnDI_{it} + \beta_7 lnTO_{it} + \beta_8 Inf_{it} + \beta_9 lnPop_{it} + \mu_{it} \quad (3)$$

3. Empirical results and discussions

3.1 Finding principal components using Principal Component Analysis (PCA)

Before going for empirical research to investigate the impact of IQ on real sector growth, we formulate principal components using PCA methodology for variables from the World Governance Indicator and International Country Risk Guide. PCA formulates an overall index (or composite index) by allowing orthogonal linear transformation of original high dimension variables into low-dimension ones. We consider the eigenvalues and scree plots while conducting PCA.

3.1.1 *PCA with World Governance Indicators (WGI)*

To conduct the PCA with governance indicators from World Governance Indicators of the World Bank, we first check the summary statistics and correlation matrix of the variables. We consider all six indicators contained in the original dataset. The indicators are different indexes named "Control of Corruption (CC), Government Effectiveness (GE), Political Stability and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (ROL), and Voice and Accountability (VAA)" (Kaufman, Kraay, & Mastruzzi, 2010; WGI, 2019). The summary statistics and correlation matrix of the relevant variables can be noticed in Table 1 and Table 2. We can find the total number of observations is 1659, which is in a combination of 79 countries for the years 1999 to 2019. The minimum and maximum values show a considerable variation in the data. Looking at the correlation matrix, we find that correlations among the variables range from o.508 to 0.934, which represents a considerably high correlation among the variables. These are evident for the factors (WGI indicators) having sufficient reasons to be combined into a composite index using a correlation matrix.

Table 1: Descriptive Statistics for Institutional Quality Variables (WGI)

Variable	Obs	Mean	Std.Dev.	Min	Max
CC	1659	-.0996	.843	-1.6267	2.465
FD	1659	.0388	.781	-1.8905	2.437
PS	1659	-.1757	.9008	-2.81	1.7552
RQ	1659	.0613	.7797	-2.2745	2.2605
ROL	1659	-.058	.7917	-1.8167	2.1003
VAA	1659	-.1457	.8443	-1.9829	1.7836

Table 2: Correlation matrix of Institutional Quality Variables (WGI)

	CC	FD	PS	RQ	ROL	VAA
CC	1					
FD	0.914***	1				
PS	0.689***	0.640***	1			
RQ	0.833***	0.900***	0.605***	1		
ROL	0.934***	0.923***	0.719***	0.883***	1	
VAA	0.611***	0.598***	0.508***	0.658***	0.676***	1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Thus, we deploy PCA for these variables. We first compute eigenvalues and the components of the WGI indicators. The results reveal that the first component bears a value of 4.7398, which alone is capable of explaining 79% of the rest, which contains eigenvalues lower than 0.70. To maintain brevity, the details of the computations of the principal components and eigenvectors are avoided being presented here and are instead presented in appendix A (please see Table A1 and Table A2, respectively). However, the scree plot constructed based on eigenvalues can be taken into consideration to see the nature of the computation. Figure 1 graphically illustrates the component eigenvalues where we can find that the first component, as mentioned here before, contains an eigenvalue much higher than unity, while the others are lower than unity. However, we generate the composite index considering all the factors discussed here and name it the WGIpca.

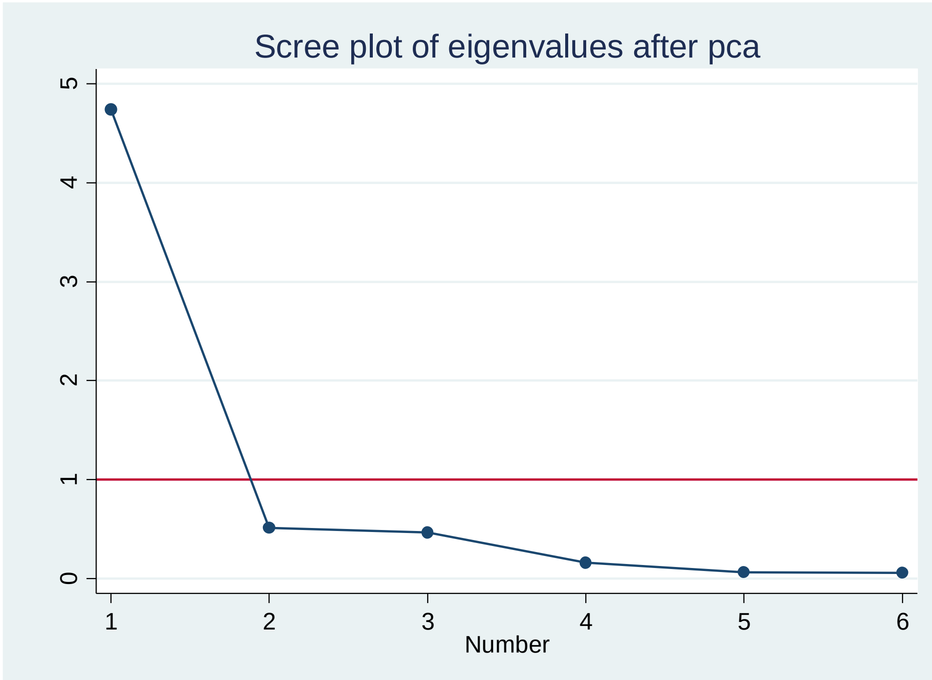

Figure 1: Scree plot for PCA generated composite WGI index
Source: Author's calculation based on appropriate data

3.1.2 *PCA with political risk indicators from ICRG*

Similar to the WGI indicators, for political risk indicators, we conduct a PCA to transcribe the high-dimensional original variables into a low-dimensional composite index while retaining the maximum possible variances of the original variables. The indicators used here are Socio-economic Conditions (SC), Government Stability (GS), Investment Profile (IP), External Conflict (EC), Internal Conflict (IC), Military in Politics (MP), Corruption or Local Governance (LG), Ethnic Tensions (ET), Religious Tensions (RT), Democratic Accountability (DA), Bureaucracy Quality (BQ), Law and Order (LO). The indicators differ in measurement scale. While the first five are measured on a 0–4 scale, the others are measured on a 0–12 scale. We first look at the summary statistics and correlation analysis to see how the data are organized and to see if they can be used to make a composite index.

From the summary statistics, we find that the number of observations has now been lowered to 1374, while the number of groups available is 64. This happened due to missing data for ICRG variables for the other 15 countries. The summary statistics show us a high variation in the data values. This is because there are substantial scale differences. Thus, we came up with the decision to conduct the PCA with a correlation matrix.

The correlation matrix also shows substantial variation in the pairwise correlations, which may have happened for the same reason of scale differences. However, most of the pairs show a high correlation, which further proves that these variables can be merged into one with a standard PCA procedure. The summary statistics and correlation matrix can be viewed in appendix A (please see Table A3 and Table A4).

We calculate the eigenvalues and the eigenvector to construct a PCA with the country risk variables. Table A5 (in appendix A) can be seen to have a look at the calculation of eigenvalues. The first component has an eigenvalue of 4.7222, which explains around 39.35% of the variation. The second and third components have eigenvalues of 1.6580 and 1.3413, which explain the phenomena by 13.82% and 11.18%, respectively. These three principal components gain eigenvalues greater than 1, whereas these three components cumulatively explain the phenomenon by 64.35%. However, to retain the maximum variance, we follow Jolliffe (2011) and retain components having eigenvalues of over 0.70. Hence, we opt for the fourth principal component, which has an eigenvalue of 0.9590 and an explanatory power of 07.99%. The rest of the components have eigenvalues lower than 0.70. All four components combined explain the phenomenon by 72.34%. Table A6 (in appendix A) presents the eigenvectors for ICRG variables considering all twelve components, while Table A7 (in appendix A) presents the same considering the retention of components having eigenvalues over 0.70. Figure 2 presents the scree plot considering the eigenvalues of the components involved in the procedure. In figure 2, it is clearly visible that the first three components have eigenvalues of over unity, while we additionally consider the fourth component to have an eigenvalue slightly below unity, following Jolliffe (2011). Considering we calculate the composite index and name it ICRGpca.

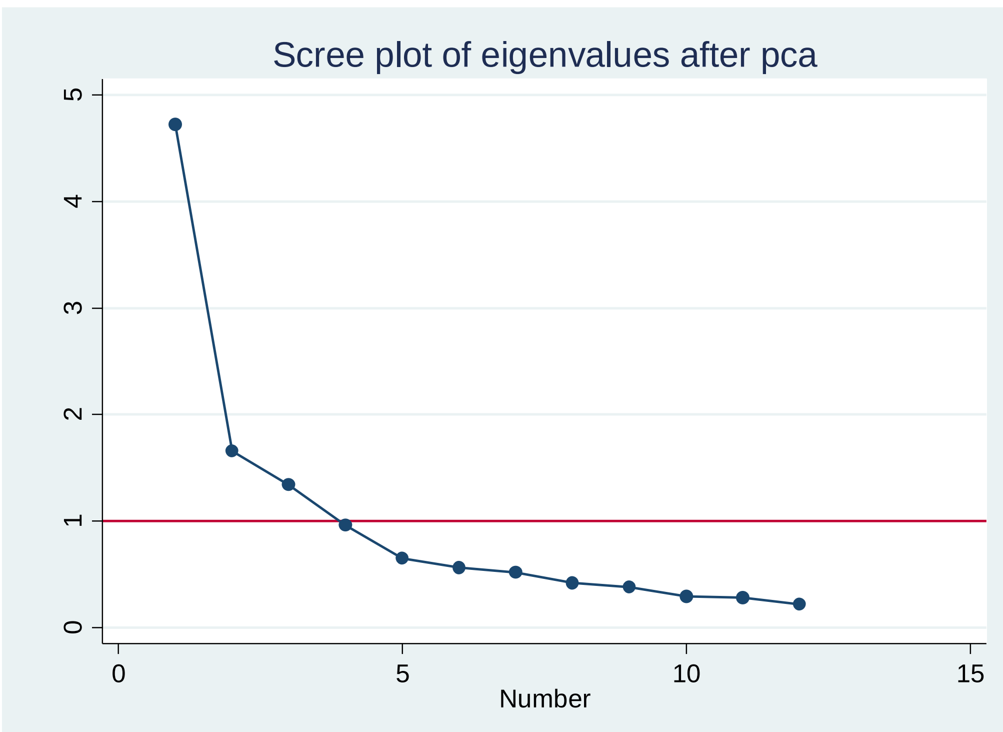

Figure 2: Scree plot for PCA generated composite ICRG index
Source: Author’s calculation based on appropriate data

3.2 **Descriptive Statistics of key variables**

In this section, we briefly present descriptive statistics of the key variables used in the current research under consideration. Table 3 presents the summary statistics in terms of mean, standard deviation, the minimum and maximum values, and observation count. As the summary statistics of the separated IQ were presented in the previous section, we avoid the details here and present the statistics in brief. We find that most of the variables have a number of observations of 1659, which is for 79 countries and for 21 years from the year 1999 to 2019. The countries and time span are subjectively selected solely based upon the maximum data availability. However, some series are missing a tiny amount of missing data, which is acceptable according to economic literature. Moreover, the ICRGpca variable is showing an observation count of 1374, which is completely missing data for 15 countries within our 79-country panel. To attain the normality of data, appropriate variables are transformed into natural logarithms.

Table 3: Descriptive Statistics of the main variables (variables original form)

Variable	Obs	Mean	Std.Dev.	Min	Max
lnFDI	1659	23.135	2.1567	15.3017	28.0304
FD	1659	.5485	.1608	.1729	.9269
lnHC	1659	7.446	.7912	5.5318	9.3711
lnGDP	1659	8.5079	1.2737	5.6126	11.0482
lnI	1623	4.4798	.3455	2.5873	5.8204
lnDI	1646	9.7431	1.8104	.0085	17.8071
lnTO	1656	4.3711	.4489	3.0312	6.0904
INF	1656	3.8326	1.8706	.2702	8.0807
lnPop	1659	16.1826	1.7102	11.4885	21.05
ICRGpca	1374	0	1	-2.3874	1.2479
WGIpca	1659	0	1	-2.2214	2.7262

Table 4 shows the pairwise correlations among the main variables. The table reveals that EG (the dependent variable) and WGIpca (the primary IQ variable) have a reasonable correlation of 0.752, which is highly significant at 1% ($p<0.01$). In the correlation matrix, it can also be found that the correlation values of most of the pairs are significant. Furthermore, the correlation values are within the acceptable limit of 80% (Gujarati & Porter, 2009; Rahman, Ashraf, Zheng, & Begum, 2017) and can thus be used for further analysis without any high chance of multicollinearity.

Table 4: Correlation matrix of main variables

	lnGDP	lnFDI	FD	lnHC	lnI	lnDI	lnTO	INF	lnPop	WGIpca
lnGDP	1									
lnFDI	0.565***	1								
FD	0.791***	0.720***	1							
lnHC	0.688***	0.417***	0.588***	1						
lnI	0.200***	0.337***	0.213***	0.258***	1					
lnDI	0.0524**	0.0599**	0.0890***	0.236***	0.110***	1				
lnTO	0.243***	0.00634	0.155***	0.274***	0.0313	0.148***	1			
INF	0.803***	0.457***	0.700***	0.710***	0.0743***	0.0658**	0.229***	1		
lnPop	-0.183***	0.561***	0.175***	-0.166***	-0.0142	-0.0172	-0.471***	-0.166***	1	
WGIpca	0.752***	0.326***	0.702***	0.589***	0.108***	0.101***	0.292***	0.636***	-0.289***	1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.3 **Role of Institutional quality to promote economic growth – the baseline study**

This study explores the IQ-EG nexus in the BRI country panel, while this section presents the baseline analysis of the relationship applying pooled OLS modeling. We have 79 countries' data for 21 years, which produces a total observation of 1659. The baseline estimation results with pooled OLS are given in Table 5. To investigate the relationship, we regress the explanatory variable IQ, WGIpca, on the dependent variable EG. We also control for other macroeconomic variables as discussed earlier.

Table 5. Role of Institutional quality to promote economic growth- the baseline study

	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WGIpca	0.156***						
	(0.014)						
CC		0.155***					
		(0.016)					
GE			0.184***				
			(0.018)				
PS				0.066***			
				(0.010)			
RG					0.158***		
					(0.016)		
ROL						0.197***	
						(0.018)	
VAA							0.049***
							(0.016)
lnFDI	0.061***	0.067***	0.064***	0.064***	0.056***	0.061***	0.070***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
FD	0.972***	1.001***	0.930***	1.106***	0.946***	0.972***	1.157***
	(0.087)	(0.089)	(0.089)	(0.089)	(0.089)	(0.087)	(0.090)
lnHC	0.732***	0.883***	1.017***	0.947***	1.050***	0.732***	1.077***
	(0.149)	(0.149)	(0.147)	(0.153)	(0.147)	(0.149)	(0.153)
lnI	0.051***	0.028	0.037**	0.043**	0.035**	0.051***	0.025
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
lnDI	0.000	-0.002	-0.000	-0.002	0.001	0.000	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
lnTO	-0.071***	-0.086***	-0.078***	-0.065***	-0.090***	-0.071***	-0.080***
	(0.021)	(0.021)	(0.021)	(0.022)	(0.021)	(0.021)	(0.022)
INF	0.065***	0.064***	0.058***	0.062***	0.062***	0.065***	0.068***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
lnPop	-0.253***	-0.255***	-0.261***	-0.260***	-0.263***	-0.253***	-0.284***
	(0.026)	(0.026)	(0.026)	(0.027)	(0.026)	(0.026)	(0.026)
cons	7.477***	6.927***	6.464***	6.595***	6.574***	7.489***	6.344***
	(0.711)	(0.715)	(0.708)	(0.726)	(0.710)	(0.711)	(0.733)
Country Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES

Standard errors are in parenthesis; *** *p<0.01*, ** *p<0.05*, * *p<0.1*

Here in Table 5, a total of seven models are presented. The first column presents the regression result for the impact of IQ on EG, while the PCA generated variable from WGI indicators (WGIpca) has been utilized as an IQ proxy. The second to seventh columns consider the control of corruption index, government effectiveness index, political stability index, regulatory quality index, the rule of law index, and voice and accountability index separately as IQ indicators. All models (from first to seventh) were controlled for similar variable sets to derive a comparable result. As can be noticed in the table, the coefficient of WGIpca is 0.156. The coefficients for FDx while individual governance indicators are deployed to proxy for IQ (from the second to seventh column) are 1.155, 0.184, 0.066, 0.158, 0.197, and 0.049, respectively. The coefficients are found to be highly significant at a 1% level of significance. This means that IQ, especially measured with governance indicators, significantly and positively affects the economic growth of BRI economies. All these things mean that we can have an argument for the presence of a significant role for IQ in developing the economy. However, among the governance indicators, the rule of law (ROL) is found to have the highest impact on economic growth. Therefore, policymakers should promote the rule of law and a strong legal culture. Although the voice and accountability indicator show a minimum coefficient, they are found to be positive and highly significant, which means they are of high importance to ensure higher economic growth. The results are consistent with those of Asghar, Qureshi, and Nadeem (2020); Berhane (2018); Samarasinghe (2018); and Abubakar (2020).

3.4 **Role of Institutional quality to promote economic growth- Robustness check with FE model**

The pooled OLS estimations might be prone to biases due to heteroscedasticity and autocorrelation as the POLS estimator ignores cross-sectional heterogeneity. Thus, the properties of the best linear unbiased estimator (BLUE) may be violated in certain settings (Omar M. Al Nasser, 2007; Omar M. Al Nasser & Gomez, 2009; M. T. Islam, Afrin, & Islam, 2013; Jones & Manuelli, 2005). To arrive at a solution, re-examine the same relationship with a fixed and random effect model which accounts for heterogeneity in the cross-sections. At this stage, we operate similar models with fixed and random modeling, and to choose between them we utilize a Hausman test. The test runs with a null hypothesis of "difference in coefficients is not systematic" or, in other words, explanatory variables are independent of random effects, while the alternative hypothesis is that the null is false. In the current analysis, we find evidence that the models have fixed effects, as in all seven models the probability value of the Chi-square test of the Hausman test is coming in below 0.05, which rejects the null and accepts the alternative hypothesis, i.e., there are fixed effects in the models. The estimation results for the fixed effects are presented below in Table 6. We do not present the random effect results here for the shake of brevity. However, we include the hasuman test statistics in appendix A (please see Table A8).

Table 6. Role of Institutional quality to promote economic growth- A robustness check with FE estimator

	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WGIpca	0.134***						
	(0.013)						
Corruption		0.123***					
		(0.015)					
GE			0.148***				
			(0.016)				
PS				0.062***			
				(0.010)			
RG					0.138***		
					(0.014)		
ROL						0.169***	
						(0.016)	
VAA							0.029**
							(0.015)
lnFDI	0.043***	0.048***	0.046***	0.043***	0.038***	0.043***	0.050***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
FD	0.645***	0.672***	0.623***	0.729***	0.612***	0.645***	0.760***
	(0.083)	(0.084)	(0.085)	(0.085)	(0.084)	(0.083)	(0.086)
lnHC	0.606***	0.734***	0.865***	0.735***	0.888***	0.606***	0.913***
	(0.146)	(0.147)	(0.144)	(0.149)	(0.143)	(0.146)	(0.148)
lnI	0.078***	0.058***	0.064***	0.075***	0.063***	0.078***	0.058***
	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)	(0.017)
lnDI	0.007***	0.005**	0.007***	0.005**	0.007***	0.007***	0.008***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
lnTO	-0.083***	-0.096***	-0.089***	-0.076***	-0.100***	-0.083***	-0.093***
	(0.019)	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)	(0.020)
INF	0.048***	0.046***	0.042***	0.043***	0.045***	0.048***	0.048***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)
lnPop	-0.500***	-0.500***	-0.505***	-0.503***	-0.511***	-0.500***	-0.558***
	(0.043)	(0.044)	(0.043)	(0.045)	(0.043)	(0.043)	(0.044)
cons	12.603***	12.097***	11.613***	12.089***	11.846***	12.613***	12.140***
	(0.806)	(0.816)	(0.814)	(0.823)	(0.809)	(0.806)	(0.835)
Obs.	1456	1456	1456	1456	1456	1456	1456
R-squared	0.753	0.745	0.748	0.741	0.750	0.753	0.734
Country Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES

The results derived from the exercise presented in Table 6 are mostly consistent with the baseline results in terms of sign and significance. The major issue under consideration, i.e., the impact of IQ on EG, is found to be positive and highly significant, which is in line with the baseline estimations and thus can be treated as robust.

3.5 Role of IQ to promote real sector economy- Robustness check with political risk indicators

As a part of the robustness check of our baseline estimation results, we change the IQ variables. Here we proxy IQ with political risk indicators in place of governance indicators. To maintain comparability, we retain the other variables, measurements, and timeframe as the same. At this stage, we utilize both POLS and FE/RE estimation. Table 7 presents the results for POLS estimations.

Table 7. Role of Institutional quality to promote real sector economy- A robustness check with IQ variables from ICRG and POLS estimator

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ICRGpca	0.017*												
	(0.010)												
BQ		0.057**											
		(0.022)											
LG			0.032***										
			(0.007)										
DA				-0.011*									
				(0.006)									
ET					-0.003								
					(0.007)								
EC						0.016***							
						(0.006)							
GS							0.007**						
							(0.004)						
IC								-0.004					
								(0.004)					
IP									0.014***				
									(0.004)				
LO										-0.015			
										(0.009)			
MP											0.017*		
											(0.009)		
RT												-0.013*	
												(0.008)	
SC													0.051***
													(0.004)
lnFDI	0.078***	0.075***	0.079***	0.078***	0.077***	0.077***	0.078***	0.077***	0.075***	0.079***	0.077***	0.080***	0.065***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)
FD	1.235***	1.210***	1.202***	1.235***	1.233***	1.230***	1.211***	1.229***	1.203***	1.254***	1.227***	1.232***	0.895***
	(0.106)	(0.105)	(0.104)	(0.106)	(0.106)	(0.105)	(0.106)	(0.105)	(0.105)	(0.106)	(0.105)	(0.106)	(0.105)
lnHC	0.602***	0.499**	0.598***	0.602***	0.566***	0.529***	0.560***	0.552***	0.552***	0.607***	0.531***	0.602***	0.696***
	(0.195)	(0.195)	(0.193)	(0.195)	(0.196)	(0.194)	(0.194)	(0.194)	(0.193)	(0.195)	(0.195)	(0.195)	(0.185)
lnI	0.008	0.012	0.010	0.008	0.008	0.019	0.009	0.011	0.011	0.007	0.009	0.008	-0.010
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.018)
lnDI	-0.000	0.000	-0.001	-0.000	-0.000	0.000	-0.001	0.000	-0.002	-0.001	-0.000	0.000	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
lnTO	-0.126***	-0.125***	-0.135***	-0.126***	-0.126***	-0.125***	-0.125***	-0.125***	-0.108***	-0.123***	-0.131***	-0.123***	-0.108***
	(0.025)	(0.025)	(0.024)	(0.025)	(0.025)	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.024)
INF	0.072***	0.072***	0.071***	0.072***	0.072***	0.071***	0.072***	0.074***	0.072***	0.074***	0.072***	0.072***	0.069***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
lnPop	-0.390***	-0.394***	-0.404***	-0.390***	-0.396***	-0.398***	-0.394***	-0.400***	-0.394***	-0.392***	-0.390***	-0.394***	-0.330***
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.028)
Cons	10.378***	10.833***	10.581***	10.419***	10.666***	10.643***	10.577***	10.788***	10.560***	10.392***	10.667***	10.456***	9.259***
	(0.939)	(0.939)	(0.933)	(0.938)	(0.943)	(0.937)	(0.938)	(0.943)	(0.933)	(0.937)	(0.938)	(0.938)	(0.893)
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors are in parenthesis; *** *p<0.01*, ** *p<0.05*, * *p<0.1;* Country and year fixed effects utilized

The results of PLOS estimation using political risk IQ indicators show that over IQ has a highly significant positive effect on the real economy.That is, the higher the IQ of BRI countries, the greater their potential for higher economic growth.The results are in line with the previous results found in Table 5 and Table 6. The individual political risk indicators show mostly consistent effects on the real economy as well. However, among the political risk indicators, corruption is found to have the strongest and most positive contribution to economic growth. Therefore, policymakers should concentrate on lowering corruption or enhancing local governance.

We consider a similar sinario with fixed and randon effect modelling. With the Hausman test to decide between fixed and random effects, fixed effects are found to be more appropriate for our models. For the sake of brevity, we avoid presenting random effects and hausman test results here. Table 8 presents the results from the fixed effect model.

Table 8. Role of Institutional quality to promote real sector economy- A robustness check with IQ variables from ICRG and FE estimator

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ICRGpca	0.018*												
	(0.010)												
BQ		0.021											
		(0.022)											
LG			0.028***										
			(0.007)										
DA				-0.011*									
				(0.006)									
ET					0.001								
					(0.006)								
EC						0.019***							
						(0.005)							
GS							0.007**						
							(0.003)						
IC								-0.007*					
								(0.004)					
IP									0.014***				
									(0.003)				
LO										-0.025***			
										(0.009)			
MP											0.006		
											(0.009)		
RT												-0.010	
												(0.007)	
SC													0.047***
													(0.004)
lnFDI	0.060***	0.060***	0.063***	0.060***	0.061***	0.061***	0.061***	0.061***	0.059***	0.061***	0.060***	0.062***	0.047***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
FD	0.831***	0.827***	0.809***	0.831***	0.832***	0.836***	0.818***	0.834***	0.795***	0.848***	0.835***	0.833***	0.558***
	(0.102)	(0.102)	(0.101)	(0.102)	(0.103)	(0.101)	(0.102)	(0.102)	(0.102)	(0.102)	(0.102)	(0.102)	(0.099)
lnHC	0.069	0.054	0.140	0.069	0.059	0.040	0.054	0.062	0.071	0.062	0.052	0.075	0.119
	(0.194)	(0.194)	(0.193)	(0.194)	(0.195)	(0.193)	(0.194)	(0.194)	(0.192)	(0.193)	(0.195)	(0.194)	(0.183)
lnI	0.047***	0.047***	0.046***	0.047***	0.047***	0.058***	0.047***	0.050***	0.049***	0.048***	0.047***	0.047***	0.032*
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.017)
lnDI	0.007**	0.007**	0.005*	0.007**	0.007**	0.007**	0.006**	0.007**	0.005*	0.006**	0.006**	0.007**	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
lnTO	-0.128***	-0.128***	-0.138***	-0.128***	-0.128***	-0.128***	-0.128***	-0.128***	-0.111***	-0.125***	-0.130***	-0.127***	-0.110***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.021)
INF	0.054***	0.055***	0.055***	0.054***	0.056***	0.054***	0.055***	0.057***	0.054***	0.055***	0.055***	0.054***	0.051***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
lnPop	-0.575***	-0.590***	-0.608***	-0.575***	-0.586***	-0.594***	-0.580***	-0.596***	-0.602***	-0.577***	-0.584***	-0.581***	-0.470***
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.046)	(0.047)	(0.047)	(0.046)	(0.046)	(0.047)	(0.047)	(0.045)
_cons	16.267***	16.532***	16.428***	16.309***	16.476***	16.455***	16.348***	16.664***	16.580***	16.370***	16.455***	16.332***	14.560***
	(1.025)	(1.024)	(1.014)	(1.023)	(1.028)	(1.016)	(1.020)	(1.028)	(1.014)	(1.018)	(1.021)	(1.024)	(0.979)
Obs.	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180	1180
R-squared	0.733	0.733	0.737	0.733	0.733	0.736	0.734	0.733	0.737	0.735	0.733	0.733	0.761

Standard errors are in parenthesis; *** *p<0.01*, ** *p<0.05*, * *p<0.1;* Country and year fixed effects utilized

The results revealed in Table 8 are mostly consistent with the base line results. It means that IQ has a significant positive impact on the real economy. However, while considering the individual political risk indicators of IQ, few of them were found to be less significant and/or to have a reverse impact on the economy. Although the reverse effects are not expected as per economic theories, they may happen due to distortion of economic resources and policy deficiencies in BRI countries. In terms of the relationships of the control variable, the results are mostly consistent.

4. Conclusion

In this specific piece of paper, we analyzed the impact of IQ on developing the economies of BRI partner countries. While IQ is a much more complex phenomenon for any country, we utilized two renowned indicators which are widely used in literature as IQ proxies. The first one is the worldwide governance indicator, and the other one is the political risk indicator. Each of the indicators contains a number of indicators that represent the IQ of a country. To have an overall idea, we combined the indicators into one, in each case, using principal component analysis. However, we used individual indicators as well as indicator-specific ideas to develop a concise and indicator-specific understanding of the impact of IQ on economies.

The study has much significance as it is the first attempt in literature to investigate the issue, especially in the case of BRI countries. The results of the study clearly and robustly show that there is a positive expected impact. Therefore, the policymakers of BRI countries or similar countries should pay more attention to policy formulation, changes, and improvement activities to create more IQ values in all segments. Because IQ is a complex phenomenon spread across a wide range of segments, improving IQ for the entire economy is a time-consuming endeavor. Yet, it is suggestive of the research as any improvement in IQ can add positive value to the real sector's growth. More specifically, it is highly suggestive for the policymakers of these countries to make more efforts to enhance the rule of law and control corruption.

In the future, researchers should invest more effort in policy issues to improve IQ. Moreover, they should investigate the issues in the cases of non-BRI countries as well. As most of the BRI countries are poor-class countries, it is especially suggested for future researchers to look into issues in countries that are resource-rich and have higher IQ values. New investigations and research may yield useful findings for policymakers, political and social leaders, and may benefit the economy by raising IQ.

Appendix

Table A1: Principal components/correlation for WGI variables

Number of obs = 1,501
Number of comp. = 6
Trace = 6
Rotation: (unrotated = principal) Rho = 1.0000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.7398	4.2260	0.7900	0.7900
Comp2	0.5138	0.0463	0.0856	0.8756
Comp3	0.4675	0.3085	0.0779	0.9535
Comp4	0.1590	0.0937	0.0265	0.9800
Comp5	0.0652	0.0106	0.0109	0.9909
Comp6	0.0547	.	0.0091	1.0000

Table A2: Principal components (eigenvectors) considering all components for WGI

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
CC	0.4337	-0.1863	-0.1569	-0.5958	-0.2769	0.5665	0
FD	0.4340	-0.1614	-0.3250	0.0060	0.8218	-0.0674	0
PS	0.3553	-0.3823	0.8281	0.1837	0.0682	0.0581	0
RQ	0.4244	0.0448	-0.3163	0.7474	-0.3272	0.2283	0
ROL	0.4461	-0.0822	-0.0995	-0.2055	-0.3540	-0.7854	0
VAA	0.3437	0.8856	0.2720	-0.1018	0.1046	0.0476	0

Table A3: Descriptive Statistics for Risk indicators from ICRG

Variable	Obs	Mean	Std.Dev.	Min	Max
BQ	1216	2.1862	.8922	0	4
Cor	1216	2.5531	.9828	.5	6
DA	1216	3.9404	1.6505	0	6
ET	1216	4.0645	1.3049	1	6
EC	1216	9.917	1.2816	2.58	12
GS	1216	8.3365	1.6467	4.04	12
IC	1216	9.0928	1.6027	.42	12
IP	1216	8.5727	1.9462	0	12
LO	1216	3.7612	1.1282	1	6
MP	1216	4.048	1.4651	0	6
RT	1216	4.3753	1.3336	.5	6
SC	1216	5.8008	2.1623	1.5	11

Table A4: Correlation matrix of Institutional Quality Variables (ICRG)

	BQ	Cor	DA	ET	EC	GS	IC	IP	LO	MP	RT	SC
BQ	1											
Cor	0.563***	1										
DA	0.346***	0.323***	1									
ET	0.286***	0.146***	-0.0119	1								
EC	0.213***	0.254***	0.103***	0.159***	1							
GS	-0.0366	0.0541*	-0.443***	0.153***	0.191***	1						
IC	0.342***	0.300***	0.108***	0.408***	0.474***	0.243***	1					
IP	0.543***	0.446***	0.203***	0.362***	0.284***	0.172***	0.472***	1				
LO	0.443***	0.463***	0.0245	0.405***	0.119***	0.153***	0.483***	0.471***	1			
MP	0.509***	0.342***	0.329***	0.466***	0.367***	0.00130	0.638***	0.551***	0.470***	1		
RT	0.236***	0.295***	0.301***	0.366***	0.336***	0.0451	0.502***	0.276***	0.218***	0.518***	1	
SC	0.608***	0.412***	0.0156	0.383***	0.110***	0.108***	0.458***	0.624***	0.623***	0.490***	0.186***	1

Table A5: Principal components/correlation for ICRG variables

Number of obs = 1,216
Number of comp. = 12
Trace = 12
Rotation: (unrotated = principal)
Rho = 1.0000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.7222	3.0642	0.3935	0.3935
Comp2	1.6580	0.3167	0.1382	0.5317
Comp3	1.3413	0.3823	0.1118	0.6435
Comp4	0.9590	0.3095	0.0799	0.7234
Comp5	0.6495	0.0862	0.0541	0.7775
Comp6	0.5633	0.0465	0.0469	0.8244
Comp7	0.5168	0.0988	0.0431	0.8675
Comp8	0.4179	0.0379	0.0348	0.9023
Comp9	0.3800	0.0885	0.0317	0.9340
Comp10	0.2915	0.0122	0.0243	0.9583
Comp11	0.2794	0.0583	0.0233	0.9816
Comp12	0.2210	.	0.0184	1.0000

Table A6: Principal components (eigenvectors) for ICRG components

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8	Comp9	Comp10	Comp11	Comp12	Unexplained

BQ	0.3326	-0.2004	-0.2839	0.1570	-0.1008	0.2851	-0.1509	-0.4325	0.4879	-0.0061	0.1507	-0.4265	0
Cor	0.2904	-0.1810	-0.1870	0.4602	0.5284	-0.0174	-0.2396	0.0598	-0.1708	-0.0058	-0.5019	0.1205	0
DA	0.1392	-0.6468	0.1211	0.02 69	0.0561	0.1307	0.1832	0.4320	0.2449	0.2691	0.2961	0.2940	0
ET	0.2626	0.2051	0.0753	-0.5700	0.1201	0.4503	-0.5042	0.2080	-0.0023	0.1835	-0.0850	0.0531	0
EC	0.2089	0.0693	0.4956	0.4651	-0.3813	-0.0393	-0.4880	0.0019	-0.1544	-0.0513	0.2526	0.1196	0
GS	0.0711	0.6157	0.0842	0.3350	0.2731	0.3080	0.3043	0.1532	0.3767	-0.0330	0.1654	0.2015	0
IC	0.3451	0.1639	0.2868	-0.0346	-0.1331	-0.3986	0.1969	0.0366	0.2146	0.5718	-0.3512	-0.2400	0
IP	0.3515	0.0346	-0.1576	0.1100	-0.2825	0.3625	0.3811	0.2979	-0.5300	-0.0431	-0.0049	-0.3320	0
LO	0.3230	0.1520	-0.2995	-0.1056	0.2156	-0.5458	-0.1577	0.3416	0.0103	-0.1910	0.4625	-0.1874	0
MP	0.3709	-0.0874	0.1738	-0.2147	-0.2163	-0.0788	0.1584	0.0523	0.2684	-0.6789	-0.3402	0.2213	0
RT	0.2611	-0.1040	0.4789	-0.1805	0.4886	0.0194	0.2379	-0.4474	-0.2803	-0.0749	0.2657	-0.0915	0
SC	0.3396	0.1146	-0.3937	-0.0789	-0.2086	-0.0861	0.1035	-0.3825	-0.1714	0.2415	0.1252	0.6317	0

Table A 7: Principal components (eigenvectors) considering Eigen values > 0.70

Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
BQ	0.3326	-0.2004	-0.2839	0.1570	0.2793
Cor	0.2904	-0.1810	-0.1870	0.4602	0.2974
DA	0.1392	-0.6468	0.1211	0.0269	0.1945
ET	0.2626	0.2051	0.0753	-0.5700	0.2855
EC	0.2089	0.0693	0.4956	0.4651	0.2492
GS	0.0711	0.6157	0.0842	0.3350	0.2304
IC	0.3451	0.1639	0.2868	-0.0346	0.2816
IP	0.3515	0.0346	-0.1576	0.1100	0.3697
LO	0.3230	0.1520	-0.2995	-0.1056	0.3379
MP	0.3709	-0.0874	0.1738	-0.2147	0.2529
RT	0.2611	-0.1040	0.4789	-0.1805	0.3212
SC	0.3396	0.1146	-0.3937	-0.0789	0.2199

Table A8: Hausman test results to choose between FE and RE

	(1) WGIpca	(2) CC	(3) FD	(4) PS	(5) RQ	(6) ROL	(7) VAA
χ^2	59.57	55.31	54.81	57.66	60.06	60.27	44.69
P value	0.0000	0.0000	0.0000	0.0012	0.0006	0.0000	0.0315

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