Does Higher Institutional Quality Result in Environmental Sustainability? A Comparative Study of India and China

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Abstract
There is a lack of comprehensive research comparing India and China in terms of institutional quality and environmental degradation. This special issue aims to make threefold distinct contributions. By comparing India and China, we can learn from each other's experiences and gain insight into the shared difficulties both nations face when trying to achieve environmental sustainability in the face of high-quality institutional frameworks. The impact of corruption, economic development, ecological risk, and renewable energy sources on carbon dioxide emissions in China and India is investigated in this study. For this reason, we also employ the ARDL model and pairwise Granger causality to prove that something caused another. Applying the ARDL long-run bound test, the empirical results reveal a long-run connection between variables in both China and India. In the case of China and India, the estimated results also reveal a negative correlation between carbon emissions and the usage of renewable energy sources, but a positive correlation between carbon emissions and economic growth, corruption, and environmental risk.
Improving institutional quality is the goal, and the present theoretical and applied discourse on comparative environmental sustainability is a good place to start. As a result, policymakers in China and India should oppose unfair practices that undermine competition laws and policies by instituting stringent anti-corruption measures and environmental rules. Energy efficiency measures that reduce carbon emissions without slowing economic growth should also be the government's primary focus.

Keywords: Carbon Emission, Corruption, Environmental Sustainability, ARDL, India, China

JEL classification- Q5, C5, O43

1. Introduction

The responsibility of institutions in promoting sustainability is an area of intense discussion in this age of mounting worries about climate change, resource loss, and environmental degradation Hawken, P. (2007). Environmental policymaking, regulatory enforcement, and sustainable development are all greatly influenced by institutional factors, which include governmental frameworks, regulatory frameworks, and governance systems Praveen et al. (2022). The rapid economic development of both China and India in recent decades has contributed to a surge in studies comparing the two countries. This is due in large part to the fact that, despite their vastly different political and economic systems, the challenges that these two nations confront are remarkably similar. Several studies in the area of public policy have compared different approaches to science and technology policy, environmental policy, and telecommunications policy. These studies include Jayakar and Liu (2014), Govindaraju and Tang (2013), Surana and Diaz Anadon (2015), and Mittal et al. (2016).

This study compares and contrasts two large and fast-developing countries like China and India to see how institutional quality relates to environmental sustainability. Because of their massive populations, fast industrialization, and paths to economic growth, India and China face comparable problems. A rare chance to compare the effect of institutional quality on environmental outcomes exists, nevertheless, because their institutional traits and governance frameworks are different.

Is environmental sustainability a consequence of improved institutional quality? This research seeks to answer by comparing and contrasting India and China across several sustainability related metrics including institutional quality, environmental performance, and overall success. Also seeks to uncover the important institutional elements that have an impact on environmental sustainability in both countries by conducting a comparative analysis.

The extensive body of research on environmental sustainability now includes this study. Nevertheless, there are three distinct ways in which this study stands out. Firstly, there is a dearth of research on the impact of environmental risk on carbon emission, therefore, this gap is filled by the study. Secondly, we are hoping that the study of the interconnections between institutions and environments would contribute to the field for both socialist and democratic countries, China and India. Third, we added several additional factors to the reading, including GDP, usage of renewable energy, corruption, and environmental risk. Using time series data from India and China, together with other controlled variables, this study aims to elucidate the interplay between institutional structures and environmental sustainability.

There are five parts to the remainder of the paper. In Section 2, the existing literature is reviewed, and in Section 3, the research variables and econometric modeling are covered. You may find the discussion and empirical results in Section 4. Section 5 concludes the study and discusses the policy implications of its findings.

2. Review of literature

Extensive study and discussion have focused on the correlation between institutional quality and environmental sustainability in the realms of environmental economics, political science, and sustainability studies. This literature review summarizes important research and conclusions related to the issue, including comparative comparisons of institutional quality and environmental consequences in India and China.

Various studies have investigated how institutional quality influences environmental policy and results. Acemoglu and Robinson (2013) contend that inclusive political institutions, such as democratic government, rule of law, and accountable institutions, promote better environmental stewardship. Authoritarian regimes lacking strong institutions may favour immediate economic benefits at the expense of long-term environmental sustainability Salimifar (2021).

India and China have both implemented institutional reforms to encourage sustainable growth. India's National Green Tribunal, founded in 2010, functions as a specialist environmental court that deals with environmental conflicts and enforces regulatory adherence Divan & Rosencranz (2022); Hamid et al. (2023). China's Five-Year Plans prioritize ecological protection and green development, indicating a move towards more sustainable growth models Zheng et al. (2023); Araral & Wu (2016). Comparative comparison of India and China is intriguing due to their comparable difficulties and differing institutional frameworks. China's autocratic government and centralized administration style have facilitated quick industrial growth but have also resulted in environmental deterioration and pollution Wang et al. (2019); Chen et al. (2018). India's democratic system enables more public involvement and responsibility, although has challenges with regulatory compliance and bureaucratic inefficiencies Mangla, A. (2024)

Based on the literature assessment, it is evident that institutions and the environment are closely linked, prompting more research in many fields and economies. As far as the authors are aware, no study has explored the connection between corruption and environmental deterioration in India and China as a comparative analysis. This study aims to investigate institutional structures and environmental sustainability in India, together with other controllable variables, using robust econometric methodologies. This study also examines the relationship between country risk and emissions in India, which may be compared to China. We feel that the current research has significant potential to enhance the existing literature.

3. Material and Methodology

3.1. Data Source

This study employs annual data for empirical analysis spanning from 1990 to 2022. The study variables' data were obtained from the World Development Indicator (WDI) released by the World Bank. All variables' data are transformed into logarithms to account for differing units of measurement, a crucial step to achieve a stationary process. Narayan & Smyth (2005). Table 1 contains the explanation of the factors utilized in our study. Data and factors have been gathered for comparative research between India and China. Table 1 shows the summary of the variables.

Table 1:

Label	Variable Name	Units of Measurement	Sources
Carbon emission	y	CO2 emissions (metric tons per capita)	WDI
GDP per capita	X1	GDP per capita (constant 2015 US$)	
Environmental risks and health	X2	Total greenhouse gas emissions (kt of CO2 equivalent)	
Renewable energy	X3	Renewable energy consumption (% of total final energy consumption)	
Corruption	X4	Corruption: Estimate	

3.2.Methodology

This study uses a bound test to examine the relationship between variables like carbon emissions, corruption, GDP per capita, environmental risk, and renewable energy consumption in India and China. We employ an Autoregressive Distributed Lag (ARDL) model to ascertain the presence of either a long-run or short-run relationship among the variables. Utilizing this approach instead of Johansen and Juselius's approach offers specific benefits. Johansen, S., & Juselius (1990). Compared to the standard cointegration technique that examines long-term connections through a system of equations, the ARDL method relies on a single condensed equation proposed by Pesaran & Shin (1995). It is crucial to test the

relationship between components in levels regardless of whether the principal regressors are strictly I (0), I (1), or a mixture of both. This is because the ARDL technique does not involve pretesting variables. This factor alone renders the typical cointegration approach unsuitable because of the data's cyclical components. The existing unit root tests used to determine the integration order are still problematic.
Additionally, the ARDL technique does not necessitate the conventional cointegration test criteria. Options include determining the quantity of endogenous and exogenous parameters, managing deterministic systems, and selecting the optimal number of delays to define. Empirical results can be influenced by the approach used, and the estimating technique offers various alternatives Pesaran & Smith (1998). The ARDL model allows for alternative optimal time delays for individual parameters, a feature not present in the standard cointegration test. The ARDL model can be applied with a small sample size of 32 observations. Narayan (2004) utilized GAUSS to determine a series of crucial values. Persson, & Tabellini, (2006) introduced a novel cointegration test called the "autoregressive distributed lag" (ARDL) method to address this issue without the need for pretesting for unit roots. The study also uses the Granger-causality test by Granger (1969) to analyse the relationship between the variables.

3.3. Econometric modelling

This study aims to investigate the relationship between carbon emissions, corruption, environmental risks, GDP per capita and renewable energy consumption in India and China. The following is the functional form of the suggested model: eqn 1 for India and eqn 2 for China.

$$LNy_{India} = F(x1, x2, x3\ x4) \quad (1)$$
$$LNy_{China} = F(x1, x2, x3\ x4) \quad (2)$$

Our baseline model in Equation (1) and (2), which may be represented in equation form as follows:

$$LNyt_{India} = a + b1x1_{tIndia} + b2x2_{tIndia} + b3x3_{tIndia} + b4x4_{tIndia} + u_{tIndia} \quad (3)$$
$$LNyt_{India} = a + b1x1_{tIndia} + b2x2_{tIndia} + b3x3_{tIndia} + b4x4_{tIndia} + u_{tIndia} \quad (4)$$

where LN y is the log of “carbon dioxide emission”, x1 is the GDP per capita, x2 is the environmental risk and health, x3 is the renewable energy, and x4 is the corruption, in India and China where ‘t’ signifies period and U_t error term in eqn 3 and 4.
We developed the (UECM) unconstrained Error Correction Model for the bound test approach, presented in Equation (5) and (6).

$$\triangle LNy2tIndia = b0 + \sum_{i=1}^{D} w1it \triangle LNy2t - i + \sum_{i=0}^{D} w2i \triangle LNx1t - i + \sum_{i=0}^{D} w3i \triangle LNx2t - i + \sum_{i=0}^{D} w4i \triangle LNx3t - i + \sum_{i=0}^{D} w5i \triangle LNx4t - i + \sum_{i=0}^{D} w6i \triangle LNut - i + w7i \triangle LNy2t - i + w8i \triangle LNX1t - i + w9i \triangle LNX2t - i + w10i \triangle LNX3t - i + w11i \triangle LNX4t - i + w12i \triangle LNut - i + ut \quad (5)$$

$$\triangle LNy2tChina = b0 + \sum_{i=1}^{D} \omega1it \triangle LNy2t - i + \sum_{i=0}^{D} w2i \triangle LNx1t - i + \sum_{i=0}^{D} w3i \triangle LNx2t - i + \sum_{i=0}^{D} w4i \triangle LNx3t - i + \sum_{i=0}^{D} w5i \triangle LNx4t - i + \sum_{i=0}^{D} w6i \triangle LNut - i + w7i \triangle LNy2t - i +$$

$w8i \triangle LNX1t - i \ + w9i \triangle LNX2t - i + w10i \triangle LNX3t - i \ + w11i \triangle LNX4t - i \ + w12i \triangle LNut - i \ + ut$ (6)

D is the first difference operator, "D" signifies a number of lags, "t" denotes the trend variable and ut is the error term. We test the hypothesis of no-cointegration on the level variable in the equation to validate the co-integration among the variables in the presented model for India and China in equation (5) and (6) which is:

Hypothesis 1: $w6 = w7 = w8 = w9 = 0$ (No co-integration exists in the series);
Hypothesis 2: $w6 \neq w7 \neq w8 \neq w9 \neq 0$ (There is co-integration in the series).

The F-statistic was utilized to forecast the presence of co-integration. The F-statistic value is compared to the critical value. If the estimated f-statistic value exceeds the upper limit value in the table. Under these circumstances, we can reject the null hypothesis and accept the alternative hypothesis, indicating the presence of co-integration. If the F-statistics value is below the lower bound and the suggested model does not include co-integration, the null hypothesis cannot be rejected, and the alternative hypothesis must be accepted.

$$LNy2tIndia = b0 + \sum_{i=1}^{c} w1iLNy2t - 1 + \sum_{i=1}^{c} w2iLNx1t - 1 + \sum_{i=1}^{c} w3iLNx2t - 1 + \sum_{i=1}^{c} w4iLNx3t - 1 + \sum_{i=1}^{c} w5iLNx4t - 1 + \sum_{i=1}^{c} w6iLNUt - 1 + ut \quad (7)$$

$$LNy2tChina = b0 + \sum_{i=1}^{c} w1iLNy2t - 1 + \sum_{i=1}^{c} w2iLNx1t - 1 + \sum_{i=1}^{c} w3iLNx2t - 1 + \sum_{i=1}^{c} w4iLNx3t - 1 + \sum_{i=1}^{c} w5iLNx4t - 1 + \sum_{i=1}^{c} w6iLNUt - 1 + ut \quad (8)$$

This study use the ARDL model to analyse the long- and short-term relationships between variables. Equation (7) and (8) displays the ARDL representation for our study in case on India and China respectively.
Equations (9) and (10) can be used to compute the short-term and long-term coefficients in the ARDL error correcting model.

$$LNy2tIndia = b0 + \sum_{i=1}^{c} w1iLNy2t - 1 + \sum_{i=1}^{c} w2iLNx1t - 1 + \sum_{i=1}^{c} w3iLNx2t - 1 + \sum_{i=1}^{c} w4iLNx3t - 1 + \sum_{i=1}^{c} w5iLNx4t - 1 + \sum_{i=1}^{c} w6iLNUt - 1 + \emptyset ECTt - 1 + ut \quad (9)$$

$$LNy2tChina = b0 + \sum_{i=1}^{c} w1iLNy2t - 1 + \sum_{i=1}^{c} w2iLNx1t - 1 + \sum_{i=1}^{c} w3iLNx2t - 1 + \sum_{i=1}^{c} w4iLNx3t - 1 + \sum_{i=1}^{c} w5iLNx4t - 1 + \sum_{i=1}^{c} w6iLNUt - 1 + \emptyset ECTt - 1 + ut \quad (10)$$

4. Results and Discussion

The study utilizes ARDL time series analysis, requiring an examination of the stationarity of variables to avoid spurious regression. An Augmented Dickey-Fuller (ADF) unit root test is performed for India and China.
The test results indicate in table 2 and 3 that all variables in this study exhibit a combination of order of

integration at level and first difference, specifically I(0) and I(1), at a significance level of 5% (p-value < 0.05), suggesting that the Autoregressive Distributed Lag (ARDL) model is appropriate for the data.

Table 2: Standard Unit Root test for India

Variable	ADF		Degree of Integration
	Level	**1st diff**	
Co2	-3.90*	-1.28	I(0)
X1	6.43	-4.69*	I(1)
X2	-1.70	-1.34*	I(1)
X3	-3.96*	-1.87	I(0)
X4	-0.66	-3.70*	I(1)

Source: Authors' calculation

*Note: * and ** shows stationarity at the 0.05 and 0.01 significance level*

Table 3: Standard Unit Root Test for China

Variable	ADF		Degree of Integration
	Level	**1st diff**	
Co2	-4.08*	-2.04	I(0)
X1	-1.46	-2.56*	I(1)
X2	-3.74*	-2.76	I(0)
X3	-1.49*	-2.44	I(0)
X4	-0.86	-0.00*	I(1)

Source: Authors' calculation

*Note: * and ** shows stationarity at the 0.05 and 0.01 significance level*

The ARDL bound F-test was utilized in this research to analyze the cointegration relationship between the variables, as presented in Tables 4 and 5 for India and China. We reject the null hypothesis of cointegration due to the F-statistics exceeding the upper constraint. This study found a significant cointegration link between CO2 and several parameters through the bound test examination.

Table 4: Bound Test result for India

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistics	**Value**	**Significance**	**I(0)**	**I(1)**
F-statistics	10.90	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Authors' calculation

Table 5: Bound Test result for China

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistics	**Value**	**Significance**	**I(0)**	**I(1)**
F-statistics	7.11	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Authors' calculation

Table 6 and 7 display the results of the error correction mechanism (ECM) for short-run elasticities. Recent findings show that carbon emissions have a negative effect on environmental sustainability in the short run. Additionally, corruption, environmental hazards, and the use of renewable energy also influence carbon emissions in India. The results align with Saidi, K., & Omri, A. (2020) study on developed countries. The substantial and adverse values of the error correction term were used to verify the result of the long-term estimation (ECT). The negative value confirms that the variables will accumulate over time, and ECT indicates the "speed of adjustment" for this model. India and China experienced convergence of 93 percent and 56 percent, respectively, of the disequilibria from the previous year's shock towards long-run equilibrium in the current year. The explanatory variables account for 95% of the variation in the model for India and 89% for China, as indicated by the R-square.

Table 6: Estimation of short-run restricted error correction model (ECM) for India

Model of Carbon Dioxide Emission (LogC02)			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
D(LogCO2(-1))	0.109659	3.354222	0.0064*
D(LogX2)	1.314091	33.32548	0.0000*
D(LogX3)	-0.3583	-9.18127	0.0000*
D(Log4(-1))	0.022461	4.935801	0.0004*
CointEq(-1)*	-0.9389	-9.75371	0.0000*
R-squared	0.957175		
Adjusted R-squared	0.915057		

Source: Authors' calculation

*Note: * and ** shows stationarity at the 0.05 and 0.01 significance level*

Table 7: Estimation of short-run restricted error correction model (ECM) for China

Model of Carbon Dioxide Emission (LogC02)			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
D(LY(-1))	-0.56821	-5.46515	0.0055
D(LX1)	0.480223	10.06301	0.0005
D(LX2)	1.08024	59.64532	0
D(LX3(-2))	0.244179	9.446739	0.0007
D(LX4)	-0.0091	-7.0716	0.0021
CointEq(-1)*	-0.56179	9.80132	0.0006

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R-squared	0.899748
Adjusted R-squared	0.859217

Source: Authors' calculation
*Note: * and ** shows stationarity at the 0.05 and 0.01 significance level*

We used cumulative sum of the square of recursive residuals (CUSUMSQ) stability residual tests to improve the consistency of our results. The coefficient of this model, represented by the blue line in Figures 1 and 2, is steady and consistent since the results consistently fall within the critical boundaries indicated by the two red lines. This study's findings can be utilized to inform policy decisions.

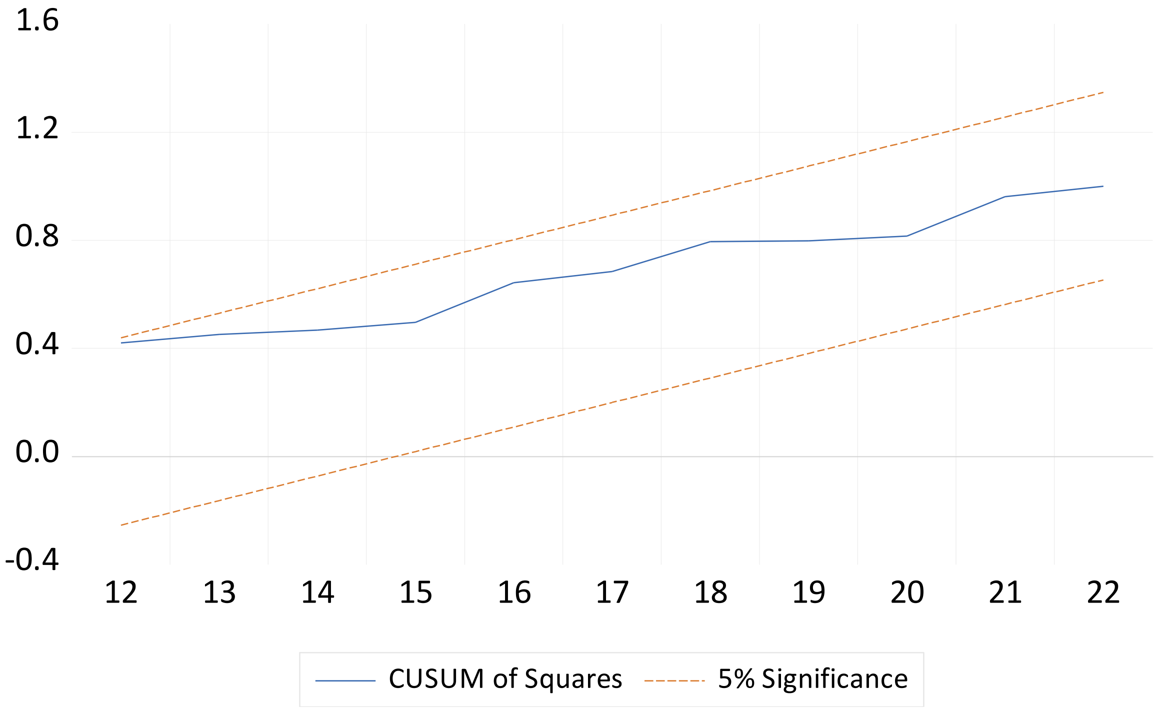

Figure 1: CUSUM Square (for India)

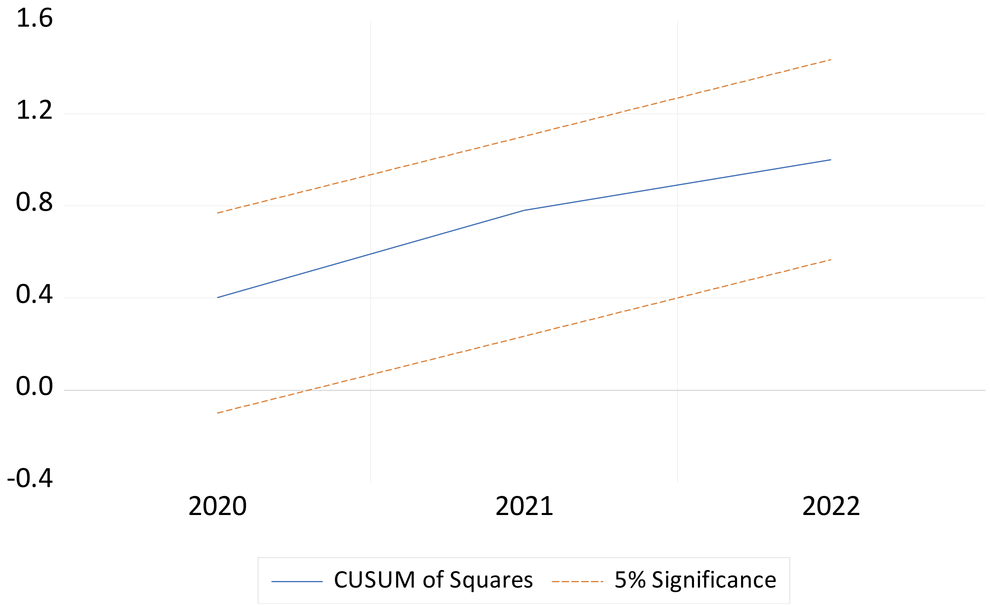

Figure 2: *CUSUM Square (for China)*

Prior to analysing short- and long-run elasticities, we need to ensure that our expected models are coherent and unbiased. There is no significant serial association ($p > 0.05$) in the data, as demonstrated in Table 8 and 9 for India and China. The diagnostics test used in this model authorized a significant test for serial correlation.

Table 8: Diagnostic test results for India

Model of Co2	F- Statistics	p-value
Breusch-Godfrey Serial Correlation LM Test:	1.64	0.23

Source: Authors' calculation

Table 9: *Diagnostic test results (for China)*

Model of Co2	F- Statistics	p-value
Breusch-Godfrey Serial Correlation LM Test:	20.73	0.19

Source: Authors' calculation

The ARDL model elucidates how an independent variable affects the dependent variable in both the long run and short run while maintaining the cause-and-effect link between them, indicating the direction of the causal relationship.

The pair-wise Granger causality technique is employed to address this issue. The results of pair-wise Granger causality analysis from Table 10 and 11 were utilized to establish the direction of causation between CO2 and the other variables examined in case of India and China respectively.

Table 10 displays the pair-wise Granger causality analysis for India, indicating bidirectional causation between CO2 and GDP per capita, environment risk, and unidirectional causality between CO2 and corruption and renewable energy consumption that is inferred from the p-value which is statistically significant at a 5% level of significance. Mardones and Baeza (2018) discovered comparable outcomes for Latin American countries. Changes in short-term renewable energy may explain this outcome, but it is not indicative of changes in GDP or vice versa.

For China, Table 11 indicates bidirectional correlation between CO2 and GDP, and unidirectional causality between CO2 and environmental risk, renewable energy utilization, and corruption.

Table 10: Pairwise Granger causality test results (for India)

Null Hypothesis:	Obs	F-Statistic	Prob.
LX1 does not Granger Cause LY		0.03213	0.0284*
LY does not Granger Cause LX1	31	0.05828	0.0001*

LX2 does not Granger Cause LY		2.19962	0.0211*
LY does not Granger Cause LX2	31	1.93794	0.0002*
LX3 does not Granger Cause LY		1.01025	0.0378*
LY does not Granger Cause LX3	31	0.17102	0.8437*
LX4 does not Granger Cause LY		2.07888	0.0154*
LY does not Granger Cause LX4	31	0.0592	0.9426
LX2 does not Granger Cause LX1		0.23189	0.0047*
LX1 does not Granger Cause LX2	31	0.12716	0.8811
LX3 does not Granger Cause LX1		0.47665	0.6262
LX1 does not Granger Cause LX3	31	0.5934	0.5598
LX4 does not Granger Cause LX1	31	4.59494	0.0196*
LX1 does not Granger Cause LX4		0.1631	0.8504
LX3 does not Granger Cause LX2		0.20605	0.8151
LX2 does not Granger Cause LX3	31	0.39848	0.6754
LX4 does not Granger Cause LX2		2.5556	0.097
LX2 does not Granger Cause LX4	31	0.0573	0.9444
LX4 does not Granger Cause LX3		0.81197	0.4549
LX3 does not Granger Cause LX4	31	0.05398	0.9476

Source: Authors' calculation

*Note: * and ** show significance level at the 0.05 and 0.01*

Table 11: Pairwise Granger causality test results (for China)

Null Hypothesis:	Obs	F-Statistic	Prob.
LX1 does not Granger Cause LY		2.77428	0.0409*
LY does not Granger Cause LX1	31	7.32571	0.003*
LX2 does not Granger Cause LY		0.07747	0.0037*
LY does not Granger Cause LX2	31	0.566	0.5746
LX3 does not Granger Cause LY		0.96212	0.0001*
LY does not Granger Cause LX3	31	0.95351	0.3985
LX4 does not Granger Cause LY		0.58525	0.002*
LY does not Granger Cause LX4	31	2.3081	0.1195
LX2 does not Granger Cause LX1		7.16323	0.0033*
LX1 does not Granger Cause LX2	31	3.77015	0.0365
LX3 does not Granger Cause LX1		4.19368	0.0264*
LX1 does not Granger Cause LX3	31	0.31224	0.7345
LX4 does not Granger Cause LX1		6.62425	0.0047*
LX1 does not Granger Cause LX4	31	2.18197	0.133
LX3 does not Granger Cause LX2		1.50333	0.2411
LX2 does not Granger Cause LX3	31	1.03261	0.3702
LX4 does not Granger Cause LX2		0.65073	0.53
LX2 does not Granger Cause LX4	31	2.30167	0.1201
LX4 does not Granger Cause LX3		4.37062	0.0231
LX3 does not Granger Cause LX4	31	1.84385	0.1783

Source: Authors' calculation
*Note: * and ** shows significance level at the 0.05 and 0.01*

5. Conclusion and Policy Recommendation

The study examines the institutional quality of India and China in relation to their differing approaches to environmental sustainability. Both countries experience significant environmental issues, but India and China diverge in their governmental strategies and methods to encourage growth. China's government has implemented strict environmental restrictions and made significant investments in green technologies, leading to noticeable progress in achieving sustainability. Conversely, less robust institutions have hindered India's ability to uphold its environmental regulations and adopt sustainable methods.

This study analysed how GDP, environmental risk, renewable energy, and corruption affect carbon emissions in India and China. The unit root tests showed that the variables in the study are stationary. Subsequently, the bound test was conducted, revealing a significant long-term association between the variables. Prior to discussing short-run and long-run elasticities, it is essential to ensure that our model is not affected by serial correlation bias, a common issue in time series data. The diagnostic test results from our study indicate the absence of serial correlation. CUSUMSQ is utilized to assess the stability of the model. Our results show that there is no correlation beyond the acute lines, suggesting that the regression parameters remain constant. Our analysis using the ARDL model indicates a positive correlation between corruption, environmental risks, and GDP with carbon emissions in India, and a negative correlation with renewable energy consumption. China exhibits identical outcomes. The findings align with Shahbaz et al.'s (2015) study on Malaysia but contradict Saidi, K., & Omri, A.'s (2020) research on BRICS.
The study's findings provide many policy recommendations for the governments of India and China, as outlined below: Firstly, India and China must enhance their institutional capabilities to strengthen their environmental regulating agencies. This involves improving implementation methods, investing in training programs for officials, and promoting transparency and accountability in decision-making. Secondly, India and China should prioritize collaboration and information exchange to address environmental concerns that transcend national boundaries. This should include sharing best practices, technology advances, and policy initiatives. These actions can be accomplished through bilateral agreements, collaborative research initiatives, or participation in international forums. Thirdly, implementing economic incentives and disincentives in the governments of both countries might encourage firms and industries to embrace ecologically friendly methods. Possible actions could be tax incentives for environmentally friendly enterprises, financial support for sustainable energy initiatives, or fines for breaking pollution regulations. Lastly, long-range forecasting and change are finally here. India and China must utilize long-term planning and adaptation strategies to proactively mitigate the effects of global warming and environmental pollution. This involves establishing resilient resources, implementing sustainable land use policies, and integrating climate considerations into urban development strategies. India and China may achieve sustainability, economic growth, and social development by implementing these policy ideas and focusing on improving institutional quality simultaneously.

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