



Nexus between Government Debt, Globalization, FDI, Renewable Energy, and Institutional Quality in Bangladesh

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ABSTRACT

The present study has investigated the nexus between Renewable energy consumption, government debt, globalization, FDI, and Institutional quality in Bangladesh for 1995-2021 by implementing both symmetric and asymmetric frameworks. Regarding the stationary test, all the research variables have exposed stationary after the first difference, which is desirable for robust econometrical estimation. The long-run association between explained and explanatory variables has been documented through the cointegration test offered by Bayer and Hanck (2013) and Maki (2012). Moreover, the Bound testing approach, such as F-test, Wald test, and t-test, revealed that all the test statistics are statistically significant at a 1% level, suggesting the long-run association in the empirical nexus. As stated by the symmetric assessment, a positive and statistically significant linkage exists between globalization, FDI, financial development, and institutional quality, implying that with the positive intent of targeted macro fundamentals, the quality of the institutions can be enriched, especially in the long run. Additionally, an adverse connection was exposed between governmental debt propensity and institutional quality. The asymmetric investigation established both long-run and short-run asymmetric linkage between explanatory variables and institutional quality. Based on the study findings, several policy suggestions has derived to improve the present institutional quality.

Keywords: Institutional Quality, Debt, Globalization, FDI, Renewable energy, ARDL, NARDL, Fourier-TY Causality

JEL Classifications: O11, F60, K32

1. INTRODUCTION

Economic subfields across the board are beginning to recognize the importance of the institutional quality element. Institutions are social, political, and economic systems that are the result of human effort which combines official regulations (such laws, constitutions, and property rights) with unofficial limitations (unwritten taboos, customs, traditions, and codes of conduct) (Daude and Stein, 2007; Qamruzzaman, 2022a; Zhuo and Qamruzzaman, 2022). When regulations are contradictory or not implemented, corruption is widespread, rule enforcement is inefficient, and property rights are not clearly defined, there is probably an issue with the quality of the institutions. The goals will not be fully achieved because of poor resource allocation, poor service delivery, and biased decision-making. Institutional quality issues might lead to uncertainty, which would mislead

the market and reduce economic production. Economic and financial resources optimization and efficient reallocation demand effective and efficient institutions in the national system. Literature dealing with the effects of quality institutions in the economy has positively asserted that the active presence of quality institutions has enticed aggregated economic activities with the inclusion of cross-broader development. Quality institutions tremendously affect macroeconomic behavior, especially regarding investment security, efficient financial system, domestic trade liberalization, and governmental effectiveness (Llorca-Rodríguez et al., 2020).

Existing literature has revealed two vain of evidence. The first line of empirical studies has extensively investigated the effects of quality institutions and proportionately disclosed a positive linkage with trade openness, gross capital formation, inflows of FDI, financial development, income redistribution, and economic

growth (Buchanan et al., 2012; Chong and Calderón, 2000; Méon and Sekkat, 2008). Environmental production through the establishment of quality institutions, a growing number of studies has studied and exposed the beneficial role of quality institutions in environmental protection (Ahmad et al., 2021; Bekun et al., 2021; Hussain and Dogan, 2021). For the case of developing nations, Haldar and Sethi (2021) investigated the effects of institutional quality on carbon emission for 1995-2017 by employing an Augmented Mean Group and system GMM. Studies divulged that quality institutions strengthen environmental policies, energy consumption, and the adoption of carbon-efficient technologies. The study of Nguyen and Dang (2022) postulated that institutional quality enhances governmental effectiveness and managed bank-perceived risk involvement. Another strand of literature has posited the performance of quality institutions in establishing environmental sustainability and enticing effective and efficient policy formulation and implementation. Other strands of literature available focusing on the critical determinant of institutional quality and revealed mixed association, suggesting that few macro fundamentals assists in promoting quality institutions and few adversely influence ensuring quality institution (Alonso and Garcimartín, 2013; Chen et al., 2021; Fernández-Rodríguez et al., 2021; Li and Qamruzzaman, 2022).

In the study, we considered renewable energy (RE, hereafter), government debt (DEBT, hereafter), globalization (GLO, hereafter) and FDI in the equation of institutional quality. Regarding the nexus between RE and IQ, existing literature has been posted on directional linkage: the effects of IQ on RE inclusion and development across the economy. However, the potential effects of RE on achieving quality institutions have yet to explode significantly. The expansion of renewable energy is associated with improvements in institutional quality. A new study looks at how the increased use of renewable energy affects institutional quality, finding that it improves several vital areas. The study, published in *Nature Energy*, examined data from over 150 countries between 1980 and 2014. The researchers found that as renewable energy consumption increased, so too did measures of institutional quality, such as government effectiveness, the rule of law, and control of corruption. The findings suggest that the increased use of renewable energy can lead to improvements in institutional quality, which can help support the continued growth of renewable energy. The study highlights the importance of policy measures that promote the use of renewable energy, as well as the need for further research on the link between renewable energy and institutional quality.

The influence of government debt on institutional quality is a complex and often controversial issue (Mehmood et al., 2021; Qamruzzaman et al., 2022). On the one hand, some argue that high levels of government debt can lead to lower levels of institutional quality, as public funds are diverted away from essential investments in infrastructure and human capital. On the other hand, others contend that government debt can improve institutional quality by providing the resources necessary to make these investments. There is no easy answer to this question, as the effect of government debt on institutional quality depends on several factors. For example, countries with higher levels of

government debt tend to have lower levels of economic growth, which can lead to lower levels of investment in essential public goods and services. In addition, countries with large amounts of government debt may be more susceptible to external shocks, such as financial crises or natural disasters, which can also undermine institutional quality. Ultimately, the effect of government debt on institutional quality is a complex and nuanced issue. While high levels of government debt may have some negative consequences, it is essential to consider all factors before making any decisions about policy or investment.

Globalization has been a driving force behind the growth and development of institutional quality worldwide. The process of globalization has led to the increasing integration of economies and societies, which has, in turn, led to increased competition for resources and talent. This increased competition has spurred institutions to improve their quality to remain attractive and competitive. In addition, globalization has also exposed institutions to new ideas and best practices from other parts of the world, which has further helped to improve their quality. There is no doubt that globalization has had a positive impact on institutional quality. However, it is essential to note that this impact is not uniform across all institutions. Some institutions have benefited more from globalization, depending on their location, size, sector, and other factors. Nevertheless, globalization has helped raise the overall level of institutional quality worldwide.

The contribution of the study to the existing literature is as follows. First, as the world evolves, so does our reliance on energy. With an ever-growing population and rapidly depleting resources, finding sustainable solutions for our energy needs has become more critical. Renewable energy sources like solar, wind, hydro and geothermal have emerged as promising alternatives to traditional fossil fuels due to their eco-friendliness and cost-effectiveness. However, how do these renewable sources of power affect institutional quality? Second, regarding the nexus between debt and institutional quality, existing literature has portrayed one directional nexus: The impact of institutional quality on government debt propensity. The potential effects of government debt on quality institutions have been almost neglected in the literature. Thus, the present study has initiated the nexus with a motivation to explore fresh insight into explaining the government debt effects in ensuring quality institutions. Third, in terms of the nexus between FDI and IQ, existing literature on the effects of institutional quality on FDI has been extensively investigated (Aziz, 2018; Cieřlik and Hamza, 2022; Masron, 2017; Ullah and Khan, 2017). However, the question “does inflows of FDI have any catalyst role in improving the institutional quality?” has yet to be investigated extensively. Even though, in recent literature. Third, regarding the methodological concern, the present study has extended the empirical nexus by incorporating an asymmetric framework familiarized by Shin et al. (2014a). Implementing Fourier-TY casualty, including symmetric and asymmetric frameworks, has investigated the directional association.

The rest of the body is as follows. The literature deals with the target nexus displayed in section II. Section III concentrated on variables definition, measurements, and econometrical tools for

the nexus. The empirical model estimation and interpretation are explained in Section IV. A discussion of the study is available in section V. Finally, the conclusion and policy suggestions are explained in section VI.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Nexus between Government Debt and Institutional Quality

A recent analysis by Baklouti and Boujelbene (2022) highlighted that higher levels of corruption, a larger shadow economy, and a lower value of democracy are conducive to public debt accumulation. In addition, variables like corruption, democracy, and the shadow economy significantly impact public debt. Again, a study by Mehmood et al. (2021) confirms that poor institutional quality at country levels poses a substantial market risk as it indicates a less favorable economic environment that raises government debt. In another recent study, the author Kinyondo et al. (2021) stated that even though some indicators of governance, such as government effectiveness, the rule of law, regulatory quality, and voice and accountability, are positively correlated with economic growth as “good enough governance,” literature has repeatedly suggested. Debt cannot possibly be considered a positive predictor of economic growth. Moreover, it is also mentioned that debt does not influence economic growth, but at worst, it can negatively affect it. According to Ibrahim (2021) a high level of corruption also hampers long-term economic growth, increasing the negative effects of public debt on growth in developing countries.

On the other hand, in the study of Del Monte and Pennacchio (2020), it is stated that government spending increases the public debt but that the influence of corruption on public debt can be independent of government size. According to Imaginário and Guedes (2020), the estimation results from the FE model, the Control of Corruption (CC), and Voice and Accountability Lalountas et al. (2011) indices are negatively correlated and statistically significant for influencing government debt. Based on the findings of Apergis and Apergis (2019), if governments are sincerely concerned about reducing public debt, they should make an effort to control both corruption and the shadow economy. According to a study by Ben Ali et al. (2019), Public debt decreases with an increase in every governance indicator except control of corruption (CCOR). Benfratello et al. (2018) revealed that corruption substantially impacts public debt in advanced economies but is weaker and less statistically robust in less developed economies. Tarek and Ahmed (2017) performed a quantitative analysis that found that the greater the level of poor governance in a country, the more public debt is compared to national income.

Furthermore, three out of the six governance indicators support the hypothesis. The outcome of Eisl (2017) stated that a high level of political stability and better regulatory quality both have a significant impact on public debt reduction. Kim et al. (2017) explained that public debt benefits non-corrupt countries'

economies. Another empirical study by Liu et al. (2017) suggested that a state with a higher level of public corruption accumulates more state and local public debt. Further evidence can be found in Cooray et al. (2017), which concluded that governments should have a primary policy goal of reducing corruption to minimize the adverse effects of corruption on government debt through government expenditures.

2.2. Nexus between Institutional Quality and Globalization

Good institutions, according to Nunn (2007), can only provide a competitive advantage in areas where “relationship-specific investments” play a significant role. Connection-specific investments are those whose returns are contingent on continuing a prior connection. Nunn’s study concludes that extensive institutional improvements will help only a few enterprises. Levchenko (2007) presents a similar theoretical model, arguing that when trading nations share similar technology, more trade openness compels them to strengthen their institutions to compete on the global market. However, the quality of institutions will not increase if nations do not share the same technology and one of the trade partners already has a substantial competitive advantage in the commodities or services that depend on exceptional institutions. This indicates that the effects of economic integration on institutions may vary based on the similarity of trade partners, such as their development levels. Literature has posited three lines of evidence regarding the nexus between institutional quality and globalization.

First, the positive linkage between globalization and institutional quality (Asongu, 2017; Islam, 2019; Koyuncu and Ünver, 2017; Mukherjee and Dutta, 2018; Xu et al., 2021). For instance, Dutta and Mukherjee (2015) studied economic globalization that positively related to the rule of law, government effectiveness, regulatory quality, and voice and accountability. Additionally, Consistent with Attila (2013), globalization and corruption are positively related to developing Sub-Saharan African countries. These countries suffer because of globalization. Globalization has dramatically boosted global trade and investment over the past few decades. As a result, many countries’ institutional quality has improved. For example, globalization has contributed to the spread of democracy and the promotion of economic transformation. It has also helped to improve governance and reduce corruption.

Nevertheless, globalization has not benefitted all nations equally. People with weak institutions have repeatedly failed to capitalize on the opportunities given by globalization. As a result, they have fallen behind in economic advancement and poverty elimination. As a result, strategies that might help consolidate institutions in developing countries are needed. This would enable them to reap the advantages of globalization while also improving the lives of their people. In the study of Ezcurra (2012), globalization is positively correlated with the quality of governance. Das and DiRienzo (2009) found positive and negative relations depending on a country’s globalization level. Xu et al. (2021) performed an empirical study that revealed that globalization positively impacts economic growth, sound regulatory control, and political stability. Furthermore, it argues that sustainable economic development

can be achieved by making feasible, corruption-free economic policies.

The second vine of empirical literature has disclosed an adverse association between institutional quality and globalization (Dutta and Mukherjee, 2015; Erdogan and Ünver, 2015; Islam, 2019; Koyuncu and Ünver, 2017; Nadeem et al., 2014). As a consequence of globalization, it is believed that institution quality has declined. Due to the rise of globalization, nations' power to exert control and independence over their affairs has eroded. People now see institutions as less efficient and trustworthy as a result. The increasing number of failing countries is another indication of institutions in decline. The decline is attributable to various causes, including the fact that globalization has eroded the legitimacy of political institutions and made it more difficult for governments to supervise and regulate their economy. In addition, globalization has increased competition between countries, which has further eroded institutions. For example, Asongu (2014) stated that globalization could be a powerful tool to reduce corruption in mid and high-income countries. Moreover, the study of Asongu (2013) found a negative connection between corruption and globalization. Lalountas et al. (2011) conducted a study that expressed that globalization harms corruption only for the mid and high-income level economy. Nonetheless, a group of studies has unveiled a neutral linkage between institutional quality and globalization (Islam (2019), Asongu (2014), Lalountas et al. (2011)). Consistent with Mengistu and Adhikary (2011) findings, it was evident that globalization has no targeted association as the determinant of institutional quality.

2.3. Renewable Energy and Institutional Quality

Referring to the nexus between renewable energy and institutional quality, existing literature has revealed two lines of evidence that most dominantly institutional quality foster the inclusion and development of renewable energy in the economy (Adebayo et al., 2023; Haldar and Sethi, 2021; Islam et al., 2022; Kassi et al., 2023; Khan et al., 2022; Rahman and Sultana, 2022). The quality of institutions is a critical driver of renewable energy development. Institutional quality is the effectiveness of a country's laws, norms, and institutions in supporting economic growth and development. As their regulatory environment is predictable and accommodating, countries with higher levels of institutional quality are more likely to be suitable places for renewable energy investments. There is a strong association between institutional quality and renewable energy investment (Guan and Qamruzzaman, 2022; Qamruzzaman, 2022b; Shi and Qamruzzaman, 2022). Generally, countries with higher levels of institutional quality attract more renewable energy investment. Investors believe these countries provide a more stable and accommodating policy climate.

Moreover, countries with more vital institutions tend to have more stringent enforcement processes, which may boost investment security (Hussain et al., 2022; Kassi et al., 2023; Xia et al., 2022). Institutional quality is correlated with investment in renewable energy in both developed and developing economies. In developed countries, high levels of institutional quality are associated with more significant investments in renewable energy (Ju et al., 2023). In global indices of institutional quality,

Germany, one of the world's largest renewable energy markets, has consistently ranked highly. In contrast, countries with lower levels of institutional quality, such as Italy, have been unable to attract substantial renewable energy investments. The correlation between institutional quality and investment in renewable energy is much more robust in developing countries. This is because investor confidence is often lower in these markets, making it all the more important for strong institutions to provide the stability and predictability that investors want (Miao and Qamruzzaman, 2021; Qamruzzaman et al., 2019; Qamruzzaman and Wei, 2019).

The literature on the effect of renewable energy on institutional quality is inconclusive. Some studies find that renewable energy projects can improve institutional quality, while others find no significant effect. The inconclusive evidence may be because the effect of renewable energy on institutional quality depends on the specific context in which projects are implemented (Akram et al., 2021). In Bangladesh, for example, the successful implementation of renewable energy projects may be constrained by weak institutions. Given the importance of institutional quality for economic development, further Research is needed to understand the effect of renewable energy on institutional quality in Bangladesh and other developing countries (Akhmat et al., 2014).

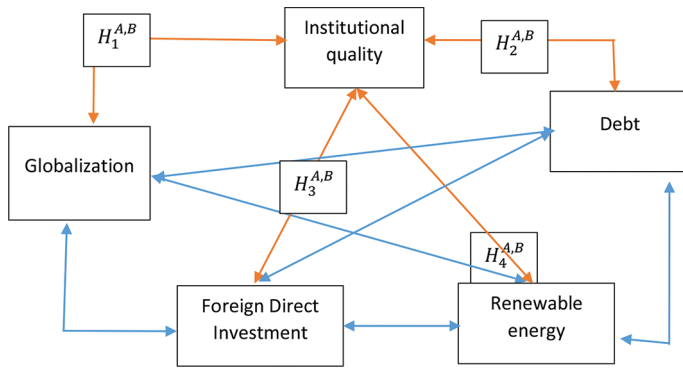
According to the findings of the study, renewable energy consumption has a positive effect on institutional quality. The results show that countries with higher levels of renewable energy consumption tend to have better institutions, as measured by the World Bank's Worldwide Governance Indicators. The study found that the effect of renewable energy consumption on institutional quality is significant and robust. The results are consistent with the hypothesis that renewable energy promotes good governance by providing clean, stable, and affordable energy that can help reduce corruption and improve accountability (Ahmad et al., 2016). The findings suggest policymakers should consider promoting renewable energy to improve institutional quality. This is especially true in countries where corruption is a severe problem, and renewable energy could significantly reduce it.

There is strong empirical evidence that renewable energy consumption positively affects institutional quality. The study results show that an increase in renewable energy consumption by 1% leads to an improvement in the overall institutional quality by 0.03%. The study also found that the impact of renewable energy consumption on institutional quality is more pronounced in countries with lower levels of income and development.

2.4. Conceptual Model and Proposed Hypothesis of the Study

The prime motivation of the study is not to explore the critical determinants of institutional quality in Bangladesh but to examine the impact of targeted macro fundamentals such as government debt, globalization, foreign direct investment, and financial development under the assumption of both symmetric and asymmetric frameworks. Considering the pertinent literature on the empirical nexus, the study has offered the following hypotheses to be tested in documenting their possible causality (Figure 1). Even though several causalities are available in the figure,

Figure 1: Directional association between explanatory and explained



however, we only intended to see the targeted causal association, that is, $H_1^{A,B}$; $H_2^{A,B}$; $H_3^{A,B}$; $H_4^{A,B}$.

Data definition and methodology of the study.

3. MODEL SPECIFICATION

The motivation of the study is to investigate the impact of government debt and globalization on institutional quality in Bangladesh from 1995 to 2011. The general empirical equation is as follows.

$$IQ = \beta_{debt} \cdot Debt + \beta_{Glo} \cdot Glo + RE \tag{1}$$

Where IQ, GD, and Glo explain institutional quality, government Debt, and Globalization, respectively. About existing literature, the present study has included two additional variables, such as inflows of FDI and Renewable energy (RE hereafter). The final empirical nexus between explained variable and explanatory variables are as follows.

$$IQ = \beta_{debt} \cdot Debt + \beta_{Glo} \cdot Glo + \beta_{FDI} \cdot FDI + \beta_{RE} \cdot RE \tag{2}$$

After transformation, the above equation (2) can be reported in the following regression equation for extracting the elasticities of explanatory variables on institutional quality.

$$IQ_t = \alpha_0 + \beta_{it} GD_t + \gamma_{it} GLO_t + \gamma_{it} FDI_t + \delta_{it} RE_t + \epsilon_t \tag{3}$$

Where the coefficients of β_{it} , γ_{it} , and δ_{it} explain the magnitudes of government debt, globalization, FDI, and financial development on institutional quality. The intercept and white noise report in α_0 and ϵ_t .

3.1. Measures and Variables Definite

Institutional Quality: According to the literature, two proxies are available for measuring institutional quality. The First used a single proxy from world governance indicators. As a dependent variable, the existing literature has produced two lines of studies focusing on the proxy measures; that is, one group of researchers measured IQ by taking into account a single proxy extracted from six indicators from the WGI database. The second group of studies considered the institutional quality index, constructed using principal component analysis. The second line of study considered IQ indexed, constructed by incorporating all six WGI indicators through Principal Component Analysis (PCA). The present

study has considered the second domain of institutional quality measurement, IQ indexed, developed through applying PCA. The results of PCA for IQ-indexed construction are displayed in Table 1.

3.2. Globalization

Globalization refers to sharing of culture, information, products, and services all over the world. Globalization can provide a competitive advantage to corporations. It can create new jobs and reduce costs for parent companies. Developing countries can get much investment through globalization. The globalization movement is believed to boost manufacturing, diversification, economic growth, and living standards for developing countries, allowing them to catch up with industrialized nations. Nowadays, globalization is pretty popular because there are now more connections between nations than ever before, thanks to things like air travel, containerized sea shipping, international trade agreements, legal treaties, and the Internet.

3.3. Empirical Model Justification and Theoretical Development

3.3.1. Unit root test

Variables order of integration has placed an apex importance in targeting the appropriate estimation. On the ground, we have implemented test for unit root test following the framework offered by Dickey and Fuller (1979), Phillips and Perron (1988), and Elliott et al. (1996) with the null hypothesis of “non-stationary: And Kwiatkowski et al. (1992) with the null of stationery. The study performed the Ng-Perron unit root test Ng and Perron (2001).

3.3.2. Bayer-hacked combined and maki cointegration test

For long-run assessment, the present study implemented the novel combined cointegration test, familiarized by Bayer and Hanck (2013), with the null hypothesis of a no-cointegration test, the following Fishers’ equation is considered in deriving the test statistics for detecting long-run association.

$$EG-JOH = -2[LN(PEG) + LN(PJOH)]$$

$$EG-JOH-BO-BD = -2[LN(PEG) - \ln(PJPH) + \ln(PBO) + \ln(PBDM)]$$

Furthermore, the Maki (2012) cointegration test has deployed with an unknown structural break. The test statistics for long-run assessment have been tested by executing the following equation.

3.3.3. Autoregressive distributed lagged (ARDL)

The ARDL approach has become popular among empirical researchers studying long-term connections since then (Karim et al., 2022; Nawaz et al., 2021; Pu et al., 2021; Qamruzzaman and Jianguo, 2018, 2020; Yang et al., 2021). One advantage of ARDL estimation over standard cointegration testing is that it produces a consistent estimate regardless of sample size (Ghatak and Siddiki, 2001). 2) capable of handling mixed-order variable integration with delayed requirements for improved model stability and efficiency (Pesaran et al., 2001). Finally, long-term and short-term elasticity tests should be conducted objectively. Based on Banerjee et al. (1993). Following Pesaran et al. (2001), the generalized ADRL model for the study was considered for detecting long-run and

Table 1: Results of PCA for IQ indexed

Principal components analysis						
Eigenvalues: (Sum=6, Average=1)						
Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion	
VA	2.900291	1.183529	0.4834	2.900291	0.4834	
PS	1.716762	0.989743	0.2861	4.617052	0.7695	
GE	0.727018	0.378415	0.1212	5.344071	0.8907	
RQ	0.348603	0.146670	0.0581	5.692674	0.9488	
RL	0.201933	0.096541	0.0337	5.894607	0.9824	
CC	0.105393	---	0.0176	6.000000	1.0000	
Eigenvectors (loadings)						
Variable	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6
VA	0.240874	0.558703	0.574069	0.133715	0.458008	0.269489
PS	0.264850	-0.647777	-0.066211	-0.087003	0.429827	0.559941
GE	0.465021	-0.269829	0.242075	0.714295	-0.358215	-0.117522
RQ	0.500593	-0.185303	0.313608	-0.564404	0.054178	-0.543353
RL	0.482683	0.314498	-0.227522	-0.311507	-0.541286	0.475726
CC	0.414745	0.249363	-0.676272	0.220781	0.425715	-0.280147
Ordinary correlations						
	VA	PS	GE	RQ	RL	CC
VA	1.000000					
PS	-0.412328	1.000000				
GE	0.163916	0.585930	1.000000			
RQ	0.266137	0.565258	0.678450	1.000000		
RL	0.492829	0.022516	0.420960	0.576992	1.000000	
CC	0.288381	0.087548	0.352485	0.345898	0.742557	1.000000

short-run coefficients by performing the following equation. The hypothesis testing of long-run cointegration displayed in Table 3.

$$\begin{aligned} \Delta \ln IQ_t &= \alpha_0 + \sum_{i=1}^n \mu_1 \Delta \ln IQ_{t-i} + \sum_{i=0}^n \mu_2 \Delta \ln DEBT_{t-i} \\ &+ \sum_{i=0}^n \mu_3 \Delta \ln GLO_{t-i} + \sum_{i=0}^n \mu_4 \Delta \ln RE_t + \sum_{i=0}^n \mu_5 \Delta \ln FDI_{t-i} \\ &+ \gamma_1 \ln IQ_{t-1} + \gamma_2 \ln DEBT_{t-1} + \gamma_3 \ln GLO_{t-1} \\ &+ \gamma_4 \ln RE_{t-1} + \gamma_5 \ln FDI_{t-1} + \omega_{1t} \end{aligned} \tag{4}$$

The study implemented the following equation with error correction terms to capture the short-run dynamics.

$$\begin{aligned} \Delta \ln IQ_t &= \alpha_2 + \sum_{i=1}^n \beta_1 \Delta \ln IQ_{t-i} + \sum_{i=0}^n \beta_2 \Delta \ln DEBT_{t-i} \\ &+ \sum_{i=0}^n \beta_3 \Delta \ln GLO_t + \sum_{i=0}^n \beta_6 \Delta \ln FDI_t + \sum_{i=0}^n \beta_7 \Delta \ln RE_{t-i} \\ &+ \rho ECT_{t-1} + \omega_{1t} \end{aligned} \tag{5}$$

We used several approaches to narrow down the potential diagnoses. The Harvey test was first used to determine whether the residuals from the refined ARDL model were heteroscedastic. Following this, we used the Breusch-Godfrey Serial Correlation LM test to look for serial correlation in the residuals. We then used the Ramsey RESET test to ensure our model parameters were correct. The Jarque-Bera normality test was then used to check whether the model residuals were normally distributed. In conclusion, the CUSUM and CUSUM of squares tests were used to demonstrate the stability of the model.

3.3.4. Nonlinear ARDL (NARDL)

The following nonlinear equation to be implemented for exploring the asymmetric elasticities of government debt, globalization, foreign direct investment, and financial development on institutional quality which is derived by following the asymmetric framework introduced by Shin et al. (2014b)

$$\begin{aligned} IQ_t &= (\pi^+ DEBT_{1,t}^+ + \pi^- DEBT_{1,t}^-) + (\beta^+ GLO_{1,t}^+ + \beta^- GLO_{1,t}^-) \\ &+ (\gamma^+ RE_{1,t}^+ + \gamma^- RE_{1,t}^-) + (\gamma^+ FDI_{1,t}^+ + \gamma^- FDI_{1,t}^-) + \varepsilon_t \end{aligned} \tag{6}$$

Where $\pi^+, \pi^-, \beta^+, \beta^-$, and γ^+, γ^- Stands for the long-run asymmetric coefficient of government debt, economic globalization, Renewable energy, and Foreign Direct investment. The decomposition of explanatory variables can be derived in the following manner.

$$\left\{ \begin{aligned} POS(DEBT)_{1,t} &= \sum_{k=1}^t \ln DEBT_k^+ = \sum_{K=1}^T MAX(\Delta \ln DEBT_k, 0) \\ NEG(DEBT)_t &= \sum_{k=1}^t \ln DEBT_k^- = \sum_{K=1}^T MIN(\Delta \ln DEBT_k, 0) \\ POS(GLO)_{1,t} &= \sum_{k=1}^t \ln GLO_k^+ = \sum_{K=1}^T MAX(\Delta \ln GLO_k, 0) \\ NEG(GLO)_t &= \sum_{k=1}^t \ln GLO_k^- = \sum_{K=1}^T MIN(\Delta \ln GLO_k, 0) \\ POS(RE)_{1,t} &= \sum_{k=1}^t \ln RE_k^+ = \sum_{K=1}^T MAX(\Delta \ln RE_k, 0) \\ NEG(RE)_t &= \sum_{k=1}^t \ln RE_k^- = \sum_{K=1}^T MIN(\Delta \ln RE_k, 0) \end{aligned} \right.$$

$$POS(FDI)_{1,t} = \sum_{k=1}^t \ln FDI_k^+ = \sum_{K=1}^T MAX(\Delta \ln FDI_k, 0)$$

$$NEG(FDI)_t = \sum_{k=1}^t \ln FDI_k^- = \sum_{K=1}^T MIN(\Delta \ln FDI_k, 0)$$

The following equation documents the asymmetric coefficients in the long- and short-run assessments.

$$\begin{aligned} \Delta IQ_t &= \partial U_{t-1} + (\pi^+ DEBT_{1,t-1}^+ + \pi^- DEBT_{1,t-1}^-) \\ &+ (\beta^+ GLO_{1,t-1}^+ + \beta^- GLO_{1,t-1}^-) + (\gamma^+ RE_{1,t-1}^+ + \gamma^- RE_{1,t-1}^-) \\ &+ (\gamma^+ FDI_{1,t-1}^+ + \gamma^- FDI_{1,t-1}^-) + \sum_{j=1}^{m-1} \lambda_j \Delta IQ_{t-j} \\ &+ \sum_{j=1}^{n-1} (\pi^+ \Delta DEBT_{1,t-1}^+ + \pi^- \Delta DEBT_{1,t-1}^-) \\ &+ \sum_{j=1}^{n-1} (\mu^+ \Delta GLO_{1,t-1}^+ + \mu^- \Delta GLO_{1,t-1}^-) + \sum_{j=0}^{m-1} (\beta^+ \Delta RE_{1,t-1}^+ + \beta^- \Delta RE_{1,t-1}^-) \\ &+ \sum_{j=0}^{m-1} (\beta^+ \Delta FDI_{1,t-1}^+ + \beta^- \Delta FDI_{1,t-1}^-) + \varepsilon_t \end{aligned} \tag{7}$$

The error correction term of the above equation is as follows

$$\begin{aligned} \Delta IQ_t &= \partial e_{t-1} + \sum_{j=1}^{m-1} \lambda_j \Delta IQ_{t-j} + \sum_{j=1}^{n-1} (\pi^+ \Delta DEBT_{1,t-1}^+ + \pi^- \Delta DEBT_{1,t-1}^-) \\ &+ \sum_{j=1}^{n-1} (\mu^+ \Delta GLO_{1,t-1}^+ + \mu^- \Delta GLO_{1,t-1}^-) + \sum_{j=0}^{m-1} (\beta^+ \Delta RE_{1,t-1}^+ + \beta^- \Delta RE_{1,t-1}^-) \\ &+ \sum_{j=0}^{m-1} (\beta^+ \Delta FDI_{1,t-1}^+ + \beta^- \Delta FDI_{1,t-1}^-) + \varepsilon_t + \varepsilon_t \end{aligned} \tag{8}$$

3.3.5. Asymmetric fourier causality test

The Fourier TY causality tests were developed by Nazlioglu et al. (2016) to compensate for this omission with the extension of the trigonometric term, and the VAR model can be reproduced in the following ways:

$$y_t = \alpha(t) + \beta_1 y_{t-1} + \dots + \beta_{p+d} y_{t-(p+d)} + \varepsilon_t \tag{9}$$

$$\begin{aligned} y_t &= \alpha(t) + \beta_1 y_{t-1} + \dots + \beta_{p+d} y_{t-(p+d)} \\ &+ \vartheta_1 \sin \frac{2k\pi t}{T} + \vartheta_2 \cos \frac{2k\pi t}{T} + \varepsilon_t \end{aligned} \tag{10}$$

4. RESULTS

4.1. Unit Root Test and Cointegration Test

Variable's order of integration has been posited as critical information in selecting the appropriate econometrical tools for empirical assessment. We have implemented a unit root test following the framework introduced by Dickey and Fuller (1979), Elliott et al. (1996), and Phillips and Perron (1988) with the null

hypothesis of non-stationary and Kwiatkowski et al. (1992) with the null of stationery. The results of the unit root are displayed in Table 4. In terms of the test statistic, it is vivid that all the variables are stationary after the first difference, which is desirable for appropriate model selection. Furthermore, the Ng-Perron unit root test results have exposed a similar line of static properties.

Following, the study implemented a static test with an unknown structural break following the unit root test introduced by Zivot and Andrews (2002) and results displayed in Table 5. According to test statistics, all the variables become stationary after the first difference with one structural break, particularly for institutional quality in 2009 (3), government debt in 2002 (1), globalization in 2005 (2), foreign direct investment in 2013 (3), and financial development in 2016 (2), respectively.

The study implemented a cointegration test for documenting the long-run association between explained and explanatory variables through combined cointegration Bayer and Hanck (2013), Maki (2012). The study found that all the test statistics are statistically significant at a 5% level, implying the long-run association by rejecting the null hypothesis of no-cointegration. Table 4 reports the results of the cointegration test.

4.2. Symmetric and Asymmetric Long-run Cointegration

Next, the study extended the long-run association assessment under the assumption of symmetric and asymmetric linkage by following the framework offered by Pesaran, Shin, and Smith [86], Narayan [100] n and Sam, McNown, and Goh [96]. The results of the symmetric and asymmetric long-run association have displayed in Table 7. The test, statistics extracted from $F_{overall}$, t_{DV} , and F_{IDV} were found statistically significant at a 1% level, educating the rejection of the null hypothesis of the no-cointegration test. Alternatively, revealed a long-run cointegration between IQ, DEBT, GLO, FD, and FDI under symmetry and asymmetry. Once the long-run association has been revealed, we document investigating the elasticities of explanatory variables on IQ in the following section.

4.3. Long-run and Short-run Coefficients: Symmetric and Asymmetric Assessment

According to the coefficients of government, external debt disclosed negative and statistically significant at a 1% level in both symmetric and asymmetric assessment (see Table 8). Study finding has suggested that the quality of institutions has been compromised due to the government's heavy reliance on external debt financing for reimbursing governmental expenditure. In particular, in terms of symmetric assessment, the institutional quality has smudged by 0.1202% (0.0685%) due to a 1% increase in government external debt financing in the long run (short-run). in addition, the asymmetric investigation revealed positive (negative) shocks in Debt are negative statistically significant tie with IQ both in the long-run (a coefficient of $DEBT^+ = -0.0314$; $DEBT^- = -0.05307$) and short-run (a coefficient of $DEBT^+ = -0.0683$; $DEBT^- = -0.0326$). Referring to asymmetric magnitudes, it is advocated that controlled external debt reliance has a positive and contributory effect in achieving institutional quality, whereas accepting additional external debt for managing

Table 2: Variables proxy measures and data sources

Variables	Notion	Measures	Units	Sources
Institutional quality	IQ`	IQ index, constructed by employing PCA with the six proxied derived from WGI		Authors calculation
Globalization	GLO	KFO index	Index	
Foreign direct investment	FDI	Net inflows of FDI as a % of GDP	%	WDI
Renewable energy	%	Renewable energy consumption as a % of total	%	WDI

Table 3: The null hypotheses for all three tests are defined as follows

Cointegration test	Null hypothesis	Alternative hypothesis
F-bound test a t-test on lagged dependent variable	$\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$ $\gamma_1 \neq 0$	Any, $\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6 \neq 0$ $\gamma_1 \neq 0$
F-test on the lagged independent variable	$\gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$	Any, $\gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6 \neq 0$

Table 4: Results of unit root test

Variables	At level				After first difference				
	ADF	GF-DLS	PP	KPSS	Variables	ADF	GF-DLS	PP	KPSS
IQ	-2.5329	-1.103	-0.9633	0.6268***	▲IQ	-9.3874***	-6.6972***	-6.2179***	0.0202
DEBT	-1.699	-2.3648	-0.29	0.8656***	▲DEBT	-7.2931***	-7.2044***	-7.9509***	0.0206
GLO	-1.0775	-1.4434	-1.4579	0.805***	▲GLO	-5.3062***	-5.6355***	-9.101***	0.0192
FDI	-2.2359	-1.0873	-0.9322	0.5885***	▲FDI	-7.2821***	-8.2433***	-6.3394***	0.0188
RE	-1.032	-0.6315	-2.2955	0.6392***	▲RE	-6.8098***	-7.5893***	-8.3436***	0.0189
Result of Ng-Perron unit root test									
Variables	MZa	MZt	MSB	MPT	Variables	MZa	MZt	MSB	MPT
IQ	-1.8863	-0.9001	0.3464	8.9551	▲IQ	-23.8575	-4.949	0.1335	4.7566
DEBT	-2.2224	-1.1567	0.311	8.1005	▲DEBT	-23.1303	-4.5005	0.1314	3.6257
GLO	-1.7036	-1.1321	0.3219	7.5646	▲GLO	-20.6779	-4.2112	0.1567	4.8623
FDI	-2.0079	-1.0519	0.2366	7.5569	▲FDI	-22.4786	-4.9197	0.1581	3.752
RE	-1.7371	-1.0105	0.3651	8.8437	▲RE	-21.2559	-5.0679	0.1732	4.3547
Asymptotic critical values: Ng and Perron (2001), Table 1				1%	-23.8	-3.42	0.143	4.03	
				5.48	-17.3	-2.91	0.168	5.48	
				6.67	-14.2	2.62	0.185	6.67	

Note: The superscripts *** explain the statistically significant at a 1% level. RE: Renewable energy, GLO: Globalization

Table 5: Result of unit root test with an unknown structural break

Variables	At level		After first difference	
	T-statistic	Time break	T-statistic	Time break
GG	3.2475 (1)	2000	6.9103 (3)***	2009
DEBT	1.9115 (1)	2002	5.2322 (1)***	2002
GLO	3.382 (1)	2005	4.5735 (2)***	2005
FDI	2.2894 (1)	1998	8.2487 (3)***	2013
RE	2.3556 (3)	2003	8.9316 (2)***	2016

The superscript *** denotes the level of significance at 1%, and the value in () explains the lag. RE: Renewable energy, GLO: Globalization

the government fiscal budget will result in the diminution of the quality of the institutions. Our study findings are supported by the existing literature such as (Phuc Canh, 2018; Waqas et al., 2021).

The study exposed the beneficial role of globalization on institutional quality, suggesting that economic and financial global integration prompts institutional development. Additionally, globalization opens the economic state in front of the world economy. It offers a distinctive comparative assessment with the current economy regarding institutional structure, financial system, and norms of governmental effectiveness. Regarding the symmetric investigation, a 1% progress in globalization will result in augmentation of institutional development by 0.1556% in the long run and 0.0112%

in the short run. Furthermore, the positive and negative shocks in globalization deluded positive and statistically significant at a 1% significance in the long and short run. Precisely, a 1% asymmetric shock in globalization will result in promotion (demotion) in institutional quality by 0.0704 % (0.0174%) in the long run and 0.0491% (0.0506%) in the short run. It is manifested that positive changes in globalization have significantly impacted institutional quality compared to short-run assessment. Our study findings of a positive linkage between globalization and institutional quality supported by the existing literature see (Berdiev et al., 2023; Bergh et al., 2014; Samadi and Owjimehr, 2021).

Renewable energy found a catalyst for improving institutional quality, implying a positive association between RE and IQ. The symmetric and asymmetric coefficients have disclosed positive signs and are statistically significant at a 1%. These findings are similar to the literature offered by. In particular, a 10% change in FD offers well-functioned institutions by improvising the existing institutional structure by 1.592% in the long run and by 0.575% in the short run. In addition, the asymmetric assessment established positive (negative) innovation in RE increase (decrease) the operational performance of institutions in the national system by 0.0665% (0.0383%) in the long run and 0.0223% (0.0427%) in the short-run due to a 1% innovation in RE.

Table 6: Result of bayer-hancked combined cointegration test

Panel-A: Bayer hancked combined cointegration test				
Cointegration test	Model-1	Model-2	Model-3	Model-4
EG-JOH	15.066	11.193	11.007	10.778
Critical value at a 5% level	11.229	10.895	10.637	10.576
EG-JOH-BO-BDM	26.601	28.687	24.326	21.587
Critical value at a 5% level	21.931	21.106	20.486	20.143

Panel-B: Maki (2012) cointegration test			
Number of breaks points	Test statistics	Critical values at a 5% level	Break points
Tb<5			
Model			
Model-0	-9.9577	-6.306	2009, 2012, 2010, 2006, 1998
Model-1	-8.3661	-6.494	2018, 2007, 2018, 2016, 1995
Model-2	-9.1538	-8.869	2004, 2015, 2011, 1990, 1995
Model-3	-9.7717	-9.482	2004, 2014, 2018, 2007, 2002

Table 7: Results of long-run association: Symmetric and asymmetric framework

long-run cointegration	F _{overall}	t _{DV}	F _{IDV}
$IQ Debt, GLO, RE, FDI$	8.089***	-6.853***	7.508***
$IQ Debt^+, Debt^-, GLO^+, GLO^-, RE^+, RE^-, FDI^+, FDI^-$	8.008***	-4.686***	8.466***

Note: The superscripts of *** denotes the statistically significant at a 1% level

Inflows of FDI unveiled contributory effects on IQ, implying a positive linkage between them which is exposed in both symmetric and asymmetric investigation. Our findings align with existing literature (Buchanan et al., 2012; Nxumalo and Makoni, 2021). Regarding symmetric output, a 1% acceleration in inflows of FDI fosters the process of achieving institutional quality by 0.1082% in the long run and 0.0522% in the short run. Furthermore, a positive and statistically significant connection was established between asymmetric shocks in FDI in the long run (coefficients of $FDI^+=0.0957$; $FDI^-=0.0228$) and short-run (a coefficient of $FDI^+=0.0281$; $FDI^-=0.0481$). More particularly, a 1% positive (negative) changes in FDI can causes the IQ by 0.975% (0.228%) in the long-run and by 0.281% (0.481%), respectively. Study findings have postulated that foreign ownership in the economy accelerates the domestic capital formation and policy formation in light of reducing the transaction cost.

The study has implemented a standard Wald test with the null symmetry hypothesis in the long and short run. The test statistics derived from the Wald test were statistically significant at a 1% level, suggesting the rejection of the null hypothesis. Alternatively, the asymmetric association between explanatory variables is governmental debt, globalization, FDI, and financial development and explained variables.

Table 8 Results of long-run and short-run Asymmetric coefficients.

4.4. Symmetric and Asymmetric Fourier –TY Causality Test

Next, we used the Fourier-TY causality test, including symmetric and asymmetric environments, to document the directional association. Table 8 exhibits the results of the causality test. As stated by the causality results in symmetric assessment, the feedback hypothesis holds in the elucidation of the causal tie between government debt and institutional quality [DEBT.IQ]

and foreign direct investment and institutional quality [FDI□□IQ]. Additionally, the unidirectional association follows from financial development to institutional quality [FD□IQ] and institutional quality to globalization [IQ□GLO].

5. DISCUSSION OF THE FINDINGS

In terms of asymmetric assessment, a study revealed a nonlinear linkage between renewable energy and institutional development in the long-run and short run. The study exposed renewable energy inclusion in the energy mix as having a positive and statistically significant effect on uplifting the overall institutional quality, especially in the long run. In Bangladesh, as in many other developing countries, the government has been the key player in promoting renewable energy. It has done so through various policy measures, including subsidies, tax breaks for renewable energy investors, and regulations encouraging renewables. As a result of these policies, Bangladesh has seen a significant increase in renewable energy investment and capacity over the past few years. There is still much room for improvement in Bangladesh’s institutional quality regarding renewable energy. For example, while the government has taken steps to encourage investments in renewables, it has not established adequate mechanisms to ensure that these investments are appropriately managed and monitored. This could lead to problems if projects are not carried out properly or cannot deliver on promises. Additionally, Bangladesh must continue improving its grid infrastructure to accommodate more renewable energy sources. Despite these challenges, Bangladesh’s progress in renewable energy is encouraging. Suppose the country can continue to make strides in improving its institutional quality. In that case, it will be well-positioned to take advantage of renewables’ many benefits.

The study documented an adverse association between government debt and institutional quality in the long and short-run investigation; ideally, the negative linkage has been revealed under symmetric and asymmetric frameworks. That is, the excessive external governmental debt reliance causes the declination of institutional quality. Improving the quality of institutions and ensuring robust governance may help nations better manage their public debts by lowering borrowing costs, minimizing exposure to financial risks, and fostering the growth of domestic debt markets, as proposed by

Table 8: Results of long-run and short-run asymmetric coefficients

Symmetric assessment				Asymmetric assessment			
	Coefficient	t-stat	Std. error		Coefficient	t-stat	Std. error
Panel-A: Long-run coefficients							
<i>DEBT</i>	-0.1202	0.0046	26.1304	<i>DEBT</i> ⁺	-0.0314	0.0074	-4.18896
<i>GLO</i>	0.1556	0.0108	14.4074	<i>DEBT</i> ⁻	-0.05307	0.0109	-4.8262
<i>RE</i>	0.1592	0.0057	27.9298	<i>GLO</i> ⁺	0.0704	0.0052	13.4016
<i>FDI</i>	0.1082	0.0075	14.4266	<i>GLO</i> ⁻	0.0174	0.0030	5.6485
				<i>RE</i> ⁺	0.0665	0.0109	6.0821
				<i>RE</i> ⁻	0.0383	0.0086	4.4254
				<i>FDI</i> ⁺	0.0957	0.0101	9.4454
				<i>FDI</i> ⁻	0.0228	0.0020	11.3637
C	0.0586	0.0051	11.3108	C	0.0479	0.0034	13.8963
WLR					8.793		
WLR					6.395		
					13.615		
Panel-B: short-run coefficients							
$\Delta DEBT$	-0.0685	0.011	-6.2272	$\Delta DEBT$ ⁺	-0.0683	0.0095	-7.1894
ΔGLO	0.0112	0.0025	4.448	$\Delta DEBT$ ⁻	-0.0326	0.0101	-3.2277
ΔRE	0.0575	0.002	28.75	ΔGLO ⁺	0.0491	0.0034	14.4117
ΔFDI	0.0527	0.0032	16.4687	ΔGLO ⁻	0.0506	0.009	5.6222
				ΔRE ⁺	0.0223	0.0068	3.2352
				ΔRE ⁻	0.0427	0.0072	5.9305
				ΔFDI ⁺	0.0281	0.0043	6.5116
				ΔFDI ⁻	0.0491	0.0077	6.3636
<i>ECT</i> (-1)	-0.3110	0.00476	-65.2681	<i>ECT</i> (-1)	-0.15664	0.0064	-24.4208
WSR					10.729		
WSR					2.954		
WSR					12.843		
Residual Diagnostic test							
Serial correlation	0.489				0.676		
Heteroskedasticity	0.814				0.553		
Normality	0.702				0.565		
RESET test	0.861				0.586		

Table 9: Results of symmetric and asymmetric fourier-TY causality test

Causality	Symmetric causality			Asymmetric causality			
	W-stat	P-value	Causality	Causality	W-stat	P-value	Causality
DEBT→IQ	10.191	0.0127	√	DEBT ⁺ →IQ	3.066		
FDI→IQ	9.901	0.0131	√	IQ→DEBT ⁺	11.190	0.0128	√
GLO→IQ	1.765			DEBT ⁻ →IQ	5.715	0.0446	√
RE→IQ	11.467	0.0132	√	IQ→DEBT ⁻	4.751		
IQ→DEBT	6.581	0.0367	√	FDI ⁺ →IQ	12.162	0.0128	√
IQ→FDI	5.367	0.0422	√	IQ→FDI ⁺	2.633		
IQ→GLO	1.752			FDI ⁻ →IQ	8.177	0.0306	√
IQ→RE	6.057	0.0254	√	IQ→FDI ⁻	4.723		
				GLO ⁺ →IQ	10.444	0.0126	√
				IQ→GLO ⁺	1.094		
				FD ⁻ →IQ	13.091	0.0130	√
				IQ→FD ⁻	12.252	0.0131	√
				FD ⁺ →IQ	5.858	0.0364	√
				IQ→FD ⁺	2.237		

The values in [] explain the Bootstrap P-value associated with w-statistics

Kim et al. (2017), Tarek and Ahmed (2017) and Ghazouani (2021). Strengthening and maintaining the domestic financial system may be indirectly influenced by the quality of the governance. High-quality institutions are crucial for maximizing the benefits of debt reduction initiatives, boosting economic development, and attracting new investment, as pointed out by both Asiedu (2013) and Dessy and Vencatachellum (2007).

The coefficients of globalization on IQ have divulged positive and statistically significant in both symmetric and asymmetric investigations. Thus it is established that global economic and financial integration fosters the prospect of institutional development along with economic sustainability. According to Al-Marhubi (2005) and Qamruzzaman (2022a), one of the implications of globalization is the increased availability of new points of view and knowledge. This may cause institutions to experience the

effects of globalization. Individuals who get information this way may become more demanding, which might contribute to developing solid civic institutions. According to Wagner and Ostrom (2008), misplaced expectations about the outcomes of various institutional configurations contribute to weak institutions' continued existence. Many aspects of globalization have the potential to curb the dissemination of erroneous information and bias, therefore easing the way for essential institutional reforms. As explained by Nunn (2007), good institutions are only a source of competitive advantage in businesses where so-called relationship-specific investments are considerable. Connection-specific investments are investments whose returns depend on preserving a particular relationship. Nunn's conclusion shows that institutional reforms benefit a restricted number of industries or areas. It has been shown by Bergh and Höijer (2008) that as a direct effect of globalization, low-quality countries may experience institutional transformations due to the increased rivalry between nations with various kinds of institutions. The argument is similar to one presented by Al-Marhubi (2005). He argues that countries with more access to global markets may pay more (and get less) due to bad policy decisions like rapid monetary expansions. Therefore, more openness promotes the development of more effective forms of government oversight, such as politically non-partisan central banks and tax authorities.

Regarding FDI's role in ensuring institutional quality, the study documented a contributory role for FDI in progressing the IQ in both symmetric and asymmetric assessment; that is, FDI support improves the institutional quality in the long and short run. Foreign Direct Investment (FDI) is an investment made by a company or individual in one country in a business in another country. In recent years, FDI has become an increasingly important source of capital for economies worldwide. There is a growing body of evidence that suggests that FDI can have a positive impact on institutional quality. For example, FDI is associated with the improved rule of law and corruption control. In addition, FDI can also lead to the transfer of best practices and technology from foreign companies to local firms. This can help improve local firms' productivity and competitiveness, ultimately leading to higher economic growth. Many factors can influence the level of FDI that a country attracts. These include economic stability, infrastructure development, market access, and political stability. Institutional quality is an essential determinant of FDI inflows. Investors are interested in investing in countries with well-functioning institutions. Well-functioning institutions provide a supportive environment for businesses, which helps to attract more Foreign Direct Investment. This can help improve institutions' quality even further-creating a virtuous circle of investment and improvement.

6. CONCLUSION AND POLICY SUGGESTIONS

The present study has investigated the effects of government debt, globalization, FDI, and financial development on Bangladesh's institutional quality for 1995-2021 by implementing both symmetric and asymmetric frameworks. The summary findings of the study are as follows.

First, Regarding the static test, all the research variables have exposed stationary after the first difference, which is desirable for robust econometrical estimation. The long-run association between explained and explanatory variables has been documented through the cointegration test offered by {Bayer, 2013 #259@@author-year} and Maki (2012). Moreover, the Bound testing approach, such as F-test, Wald test, and t-test following Pesaran et al. (2001), has executed and revealed all the test statistics are statistically significant at a 1% level, suggesting the long-run association in the empirical nexus. Second, as stated by the symmetric assessment, there is a positive and statistically significant link between globalization, FDI, financial development, and institutional quality. Additionally, an adverse connection was exposed between governmental debt propensity and institutional quality. Third, Asymmetric investigation established both long-run and short-run asymmetric linkage between explanatory variables and institutional quality. Referring to the asymmetric coefficients of explanatory variables that are positive and negative components of DEBT, GLO, FD, and FDI, it appears that asymmetric coefficients of globalization, financial development, and FDI established positive and statistically significant at a 1% level.

In contrast, the asymmetric coefficients DEBT disclosed negative and statistically significant. Fourth, As stated by the causality results in symmetric assessment, the feedback hypothesis holds in the elucidation of the causal tie between government debt and institutional quality [DEBT \leftarrow →IQ] and foreign direct investment and institutional quality [FDI \leftarrow →IQ]. Additionally, the unidirectional association follows from financial development to institutional quality [FD \rightarrow IQ] and institutional quality to globalization [IQ \rightarrow GLO].

Based on the study findings, the policy note offers the following suggestions.

1. The study found that renewable energy consumption positively affects institutional quality. The results suggest that policymakers should encourage the use of renewable energy in order to improve institutional quality. Furthermore, the findings suggest that practice should focus on increasing the use of renewable energy in order to improve institutional quality.
2. The study established an adverse linkage between debt and institutional quality. In the case of managing governmental fiscal expenditure, the government has to ensure an optimal level of debt financing, especially external debt accumulation. Thus for institutional efficiency and productive contribution to the economy, the undue influence on IQ due to external debt has to minimize as low as possible.
3. Financial development fosters institutional development and efficiency, implying that the effects of financial development in the economy can be picturized in terms of good governance and financial sustainability; thus, a better financial system may result in a better institutional presence in the economy.
4. In conclusion, renewable energy consumption positively affects institutional quality within societies. The results of this study suggest that increased use of renewables can help reduce greenhouse gas emissions and improve the overall environment while also providing economic benefits due to

decreased dependence upon fossil fuels. Further Research into renewable energy consumption effects on institutional quality will prove beneficial in understanding the overall implications for society and informing future policy decisions regarding energy sources.

7. DATA AVAILABILITY STATEMENT

The data supporting this study's findings are available from the corresponding author upon reasonable request.

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