

# Examining the Impact of Institutional Quality, Unemployment, and Dependency Ratio on Human Development in Bangladesh: An ARDL Time Series Evidence

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## Abstract

*This study examines the impact of institutional quality, unemployment, and the dependency ratio on human development in Bangladesh from 1996 to 2022. Using ARDL models, the findings reveal that both unemployment and the dependency ratio negatively affect the Human Development Index (HDI) in the long term. Institutional quality, measured by three different indicators, shows no significant impact on HDI in any model. In the short run, only one dependency ratio coefficient is significant, with a negative effect across all models. Granger causality tests indicate that causalities run from institutions to both HDI and the dependency ratio, while the dependency ratio Granger causes HDI in all models. One model uniquely shows that unemployment Granger causes institutional quality. Policy recommendations emphasize reducing unemployment and managing the dependency ratio to improve human development, alongside strengthening institutions to support these efforts.*

**Keywords:** Human Development Index (HDI), Institutional Quality, Unemployment Rate, Dependency Ratio, ARDL Model

**JEL Codes:** O15, C32, P48

## 1. Introduction

In recent decades, Bangladesh has experienced important improvements in key human development indicators – evident from a steady increase in its Human Development Index (HDI) score from 0.441 to 0.67 between 1996 and 2022. Despite this progress, critical

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barriers persist: youth unemployment remains high at 11.9%, the age dependency ratio nears 50%, and institutional weaknesses—ranked 147th globally in governance efficacy (World Bank, 2023). Robust institutions are widely acknowledged as critical elements of sustainable progress, transparent governance, and equitable resource allocation (Acemoglu & Robinson, 2012; North, 1990). Concurrently, unemployment and high dependency ratios are associated with reduced access to education, healthcare, and intergenerational equity (Lee & Mason, 2009; Sen, 1999). Yet, studies on Bangladesh have predominantly prioritized GDP-centric frameworks.

None have systematically analyzed how institutional quality, along with unemployment and dependency ratios, shape human development outcomes in Bangladesh. This gap is critical because these factors collectively strain public resources, exacerbate inequality, and create feedback loops that perpetuate poverty. This study addresses this gap by employing the Autoregressive Distributed Lag (ARDL) time-series analysis to quantify the short and long run impacts of institutional quality, unemployment, and dependency ratios on Bangladesh's human development. The findings are intended to guide the development of focused policies, helping policymakers create cohesive strategies to tackle issues related to institutions, unemployment, and dependency.

The research aims to make a meaningful contribution by closely investigating how institutional quality, unemployment, and the dependency ratio together influence human development in Bangladesh, using data from 1996 to 2022. By employing the ARDL model along with bounds testing and diagnostic checks, this study sheds light on the complex interactions between these factors in both the short and long term. The study addresses the following key questions:

1. Does institutional quality affect human development in Bangladesh?
2. Is there a long-term relationship between human development, institutional quality, unemployment, and the dependency ratio?
3. What insights can be derived from the Granger causality analysis on these relationships?

By exploring these questions, this research not only fills a crucial gap in the literature but also offers valuable recommendations for policies aimed at enhancing human development in Bangladesh. The paper is organized as follows: Section 2 provides a review of the relevant literature, Section 3 outlines the data and methodology, Section 4 presents and discusses the results, Section 5 highlights the limitations and suggests directions for future research, and Section 6 concludes the paper.

## 2. Literature Review

Human development focuses on increasing people's freedoms and improving their well-being, which involves enhancing access to essential services like education, healthcare, and income. Sen (1999) emphasizes that human development is about enabling

individuals to lead meaningful lives by expanding their abilities, including access to knowledge, health, and opportunities for productive work. The United Nations Development Program (UNDP) introduced the HDI in 1990, to come up with a comprehensive measure of development beyond just quantitative economic growth. The HDI focuses on three aspects of a country's development: health (measured by life expectancy), education (measured by average and expected years of schooling), and living standards (measured by gross national income per capita). The index ranges from 0 to 1 with larger values reflecting higher levels of human development.

Institutions' role is pivotal as they create the necessary frameworks for veritable access to goods and services and resources driving human progress (De Muro & Tridico, 2008). Strong institutions are vital for ensuring economic stability, reducing inequality, and improving governance, which together help boost human capital and overall development (Acemoglu et al., 2014). Key components such as political systems, legal structures, and economic regulations significantly influence human development by shaping policies and creating an environment that encourages growth. Effective governance, marked by transparency, accountability, and respect for the law, attracts foreign direct investment, which contributes to economic growth and enhances living standards (Butkiewicz & Yanikkaya, 2006). On the other hand, weak institutions can lead to issues like corruption, greater inequality, and inadequate public services, all of which can stall human development (Seka, 2013). Research in various countries has consistently shown how crucial institutions are for fostering human development (Acemoglu et al., 2014; Ouedraogo et al., 2022; Rigobon & Rodrik, 2005).

North (1990) demonstrated the foundational influence of institutional frameworks on economic outcomes, noting their critical function in sustaining growth trajectories over extended periods. Sen (1999) contends that institutional structures that facilitate capability enhancement—such as ensuring equitable access to healthcare and educational resources—are indispensable for fostering individual and collective advancement. Acemoglu & Robinson (2012) expanded this discourse by contrasting participatory institutional frameworks, which drive positive socioeconomic transformations, with exploitative systems that perpetuate stagnation and inequality. Easterly (2001) cautions that temporary institutional interventions, such as anti-corruption initiatives, might generate preliminary improvements but lose momentum without enduring accountability mechanisms—a pattern evident in contexts like Bangladesh's ongoing challenges with administrative inefficacy (Khan, 2002).

Institutional inflexibility in managing demographic shifts, such as aging populations, can deepen disparities—a pressing issue for Bangladesh, where governance deficiencies hinder the conversion of economic expansion into tangible human development (World Bank, 2019). Asadullah et al. (2014) reveal that institutional quality gauged through governance indicators has not consistently translated into measurable progress in social development within Bangladesh. A cross-national study has identified persistent governance

shortcomings in both Bangladesh and India as key drivers of inequitable growth patterns that exclude marginalized populations (Abdullah-Al-Mamun & Akon, 2024). Shuaibu (2016) proposes that strategic enhancements in institutional frameworks and physical infrastructure act as catalysts for advancing human capital formation.

Unemployment harms human development by lowering income, increasing poverty, and restricting access to vital services such as healthcare and education. While the negative effects of unemployment are well established, their impact varies over time. In the short term, joblessness may lead individuals to seek opportunities in the informal sector or rely on temporary social support (Elder & Rosas, 2015). However, prolonged unemployment weakens human capital by reducing skills and creating intergenerational poverty (Blanchard & Summers, 1986; Sen, 1999). Research also highlights the adverse effects of unemployment in different contexts. Abamara et al. (2024) reported that unemployment significantly hinders human capital development in Nigeria. Bala et al. (2020) observed that rising unemployment slows economic growth in the country. Additionally, Tatli & Tasci (2021) found that higher female unemployment is linked to lower levels of human development.

The dependency ratio, which measures the number of economically inactive individuals (such as children and seniors) relative to the working-age population, plays a crucial role in shaping a nation's economic trajectory and societal well-being. Bloom & Williamson (1998) emphasized the economic advantages of a youthful population structure, where a reduced dependency ratio can enhance workforce productivity and spur growth. Conversely, in nations where this ratio remains elevated, economic resources become strained as a larger share must be allocated to support dependents. This dynamic restricts the allocation of funds toward essential sectors such as education and healthcare, hindering long-term human capital development and perpetuating cycles of limited opportunity.

Sofilda et al. (2015) showed that Indonesia's HDI suffered largely due to significant disparities between its Western and Eastern regions. This inequality stems from a centralized governance system that remained in place until 2001. Factors such as high unemployment rates and a large dependency ratio, combined with differences in spending on education and public services, contribute to this situation. Similarly, Sari (2022) looks into the factors affecting HDI in East Java and finds that both a high dependency ratio and rising unemployment have detrimental effects on HDI in the region. Additionally, Herianingrum et al. (2019) investigate how government spending and unemployment influence Indonesia's Islamic Human Development Index (IHDI) between 2010 and 2013. Their findings indicate that while unemployment negatively impacts the IHDI, the effect are not statistically significant, suggesting it may not have been a major factor during that time.

Singariya (2014) investigates the socioeconomic factors that affect the HDI across various Indian states, utilizing regression analysis and principal component analysis with

secondary data. The findings indicate that issues like poverty, child marriage, and infant mortality have a detrimental effect on HDI. On the other hand, positive influences on HDI include higher income levels, literacy rates, women's employment, urbanization, and improved access to essential services such as electricity and telecommunications. In a similar vein, Arisman (2018) examines the factors that impact HDI in ten ASEAN countries. Using a fixed effects model applied to panel data, the study concludes that population growth and per capita income are significant determinants of HDI, while unemployment appears to have minimal influence. These results suggest that although unemployment does not significantly affect HDI, it remains essential for governments to manage population growth and promote economic development to improve living standards.

The literature review clearly shows that, currently there exists a dearth of research with respect to analyzing the impacts of institutional quality on human development. This research aims to fill this gap by examining this link in the presence of unemployment and dependency. While previous studies have emphasized the crucial role of institutions in development, this research stands out by focusing specifically on Bangladesh.

### 3. Data and Methods

#### 3.1 Data

Based on the review of the existing works, we define a simple model of human development within an ARDL framework where human development is explained by its lagged values, institutional quality, unemployment rate and the dependency ratio. Human development is measured by the HDI published by the UNDP. To measure institutional quality, three indexes are used. The first index, InQ1, is a composite index formed applying the principal component analysis to the six indicators of the Worldwide Governance Indicators (WGIs). The second index, InQ2, is an average of the six WGIs. We use this index following the argument that the average of the WGIs might be a better indicator (Alonso & Garcimartín, 2013). The third index, InQ3, is the Quality of Government index reported by the International Country Risk Guide (ICRG). For each measure of the institutional quality, we estimate a different model, thus giving us three models for the three indicators used. The information on unemployment rate (U) and the dependency ratio (D) come from the World Bank's World Development Indicators.

Table 1 presents the five summary statistics of the variables considered in the three forms of the model in this analysis. For example, during the study period, i.e., 1996-2022, Bangladesh had a mean HDI of 0.552 with a median of 0.541. The minimum and maximum values are 0.441 and 0.67 respectively. The standard deviation of the variable is 0.067. Statistics for the other variables can be interpreted in a similar fashion.

**Table 1: Summary Statistics**

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
HDI	0.552	0.541	0.067	0.441	0.670
lnQ1	0.000	0.419	1.583	-4.336	1.516
lnQ2	-0.863	-0.856	0.126	-1.143	-0.617
lnQ3	0.410	0.430	0.051	0.282	0.462
Unemployment	4.121	4.294	0.834	2.510	5.828
Dependency	60.742	61.962	8.686	47.088	76.064

Source: Author's own calculation using Stata 16

### 3.2 Methods

We start the analysis by performing unit root tests on the variables using three methods: the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron (PP) test, and the modified Dickey-Fuller test (DF-GLS). These tests help determine whether any variables are integrated beyond the first order. After confirming the integration properties, we estimate the ARDL model, selecting the optimal lag order based on the Akaike Information Criterion (AIC). Following common practice in empirical research, all variables have been converted into their natural logarithmic forms.

As it incorporates lagged variables, the ARDL method can address issues such as omitted variable bias and autocorrelation, particularly when these problems arise due to the omission of lagged variables (Ghouse et al., 2018.; Muhammad & Abdullahi, 2020; Pesaran et al., 2001; Salahuddin et al., 2018). Unlike the Johansen and Engle-Granger models, the ARDL approach is better-suited for smaller samples and can handle variables with different levels of integration (Ghatak & Siddiki, 2001).

The empirical formulation of the ARDL models is given below, with  $p$  lags for the dependent variable and  $k$  lags for the independent variables. Since we use three indices of institutional quality, we have three equations—one for each index.

Model 1:

$$\ln HDI_t = \beta_0 + \sum_{i=1}^p \beta_i \ln HDI_{t-i} + \sum_{i=0}^k \gamma_i \ln \ln Q_{1,t-i} + \sum_{i=0}^k \delta_i \ln U_{t-i} + \sum_{i=0}^k \rho_i \ln D_{t-i} + \varepsilon_t \quad (1)$$

Model 1':

$$\ln HDI_t = \beta_0 + \sum_{i=1}^p \beta_i \ln HDI_{t-i} + \sum_{i=0}^k \gamma_i \ln \ln Q_{2,t-i} + \sum_{i=0}^k \delta_i \ln U_{t-i} + \sum_{i=0}^k \rho_i \ln D_{t-i} + \varepsilon_t \quad (2)$$

Model 1":

$$\ln HDI_t = \beta_0 + \sum_{i=1}^p \beta_i \ln HDI_{t-i} + \sum_{i=0}^k \gamma_i \ln \ln Q_{3\ t-i} + \sum_{i=0}^k \delta_i \ln U_{t-i} + \sum_{i=0}^k \rho_i \ln D_{t-i} + \varepsilon_t \quad (3)$$

The ARDL bounds test is formulated as below (Pesaran et al., 2001):

Model 1:

$$\Delta \ln HDI_t = \beta_0 + \sum_{i=1}^p \beta_i \Delta \ln HDI_{t-i} + \sum_{i=0}^k \gamma_i \Delta \ln \ln Q_{1\ t-i} + \sum_{i=0}^k \delta_i \Delta \ln U_{t-i} + \sum_{i=0}^k \rho_i \Delta \ln D_{t-i} + \lambda_1 \ln HDI_{t-1} + \lambda_2 \ln \ln Q_{1\ t-1} + \lambda_3 \ln U_{t-1} + \lambda_4 \ln D_{t-1} + \varepsilon_t \quad (4)$$

Model 1':

$$\Delta \ln HDI_t = \beta_0 + \sum_{i=1}^p \beta_i \Delta \ln HDI_{t-i} + \sum_{i=0}^k \gamma_i \Delta \ln \ln Q_{2\ t-i} + \sum_{i=0}^k \delta_i \Delta \ln U_{t-i} + \sum_{i=0}^k \rho_i \Delta \ln D_{t-i} + \lambda_1 \ln HDI_{t-1} + \lambda_2 \ln \ln Q_{2\ t-1} + \lambda_3 \ln U_{t-1} + \lambda_4 \ln D_{t-1} + \varepsilon_t \quad (5)$$

Models 1":

$$\Delta \ln HDI_t = \beta_0 + \sum_{i=1}^p \beta_i \Delta \ln HDI_{t-i} + \sum_{i=0}^k \gamma_i \Delta \ln \ln Q_{3\ t-i} + \sum_{i=0}^k \delta_i \Delta \ln U_{t-i} + \sum_{i=0}^k \rho_i \Delta \ln D_{t-i} + \lambda_1 \ln HDI_{t-1} + \lambda_2 \ln \ln Q_{3\ t-1} + \lambda_3 \ln U_{t-1} + \lambda_4 \ln D_{t-1} + \varepsilon_t \quad (6)$$

$\Delta$  is the first difference operator,  $t$  is the time index,  $i$  is the lag, and  $\varepsilon$  is the error term. The null hypothesis assumes that there is no co-integration, while the alternative hypothesis indicates that co-integration is present.

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0 \quad (7)$$

$$H_1: \lambda_1 \neq 0, \lambda_2 \neq 0, \lambda_3 \neq 0, \lambda_4 \neq 0 \quad (8)$$

To ensure the reliability of the results, we conduct several post-estimation diagnostic tests. For heteroscedasticity, we use the Breusch-Pagan test and the more general White's heteroscedasticity test. To detect autocorrelation, we apply the Breusch-Godfrey LM test and Durbin's alternative test. Residual normality is assessed using the Jarque-Bera test and the skewness-kurtosis test. The Ramsey RESET test is performed to check for omitted variable bias. Finally, both recursive and OLS-based CUSUM tests are used to evaluate the stability of the estimated parameters.

To identify causal relationships and as well as the direction of causality we also do the Granger causality test. Some argue that traditional causality tests like the Vector Error Correction Model (VECM) Granger causality and the Engle and Granger causality tests are restrictive and problematic in small samples (Sapnken et al., 2020). Toda & Yamamoto (1995) and Zapata & Rambaldi (1997) found that these methods can be sensitive to nuisance parameters, leading to unreliable results. Additionally, these tests often struggle

with correctly identifying the order of integration of the series (Mavrotas & Kelly, 2001). The Toda-Yamamoto (TY) procedure helps by augmenting a Vector Auto Regression (VAR) model with the highest order of integration from the series. This approach ensures that the Wald statistics have the necessary power and that there is no need to establish the order of integration before testing causality (Sapnken et al., 2020). The long-run causality test adjusts the lag order of the VAR by the highest order of integration, maintaining the standard asymptotic distribution of the Granger causality test statistics (Wolde-Rufael, 2010). This method makes sure the test statistics follow a chi-square distribution. It works even if the data series are non-stationary or have different orders of integration. Hence, following the work of Rahman & Kashem (2017) and Sapnken et al., (2020), we will assess Granger causality between the variables using an augmented VAR model with the Toda-Yamamoto method. When the null is rejected, the excluded variable Granger-causes the dependent variable. Non-rejection of the null indicates no Granger causality.

## 4. Results and Discussion

### 4.1 Results

In Table 2 we have a summary of the unit root tests. Following the unit root tests, lnHDI is I(0) following ADF and P-P tests whereas it is I(1) following DF-GLS. lnInQ1 is I(1) according to ADF and P-P tests and I(0) following DF-GLS. The same holds true for lnInQ2 and lnInQ3. All three tests identify lnU as I(1) while they all identify lnD as I(0). Hence all the variables are integrated of order 0 or 1 and none of them is integrated of an order higher than 1. This makes the data suitable for the application of the autoregressive distributed lag (ARDL) model.

**Table 2: Unit root tests**

	ADF		P-P		DF-GLS		I(?)
	<i>Level</i>	<i>First Diff.</i>	<i>Level</i>	<i>First Diff.</i>	<i>Level</i>	<i>First Diff.</i>	
lnHDI	-10.976***		-9.120***			-3.360***	I(0), I(1)
lnInQ <sub>1</sub>		-4.087***		-5.995***	-16.521***		I(0), I(1)
lnInQ <sub>2</sub>		-2.936**		-3.967***	-8.961***		I(0), I(1)
lnInQ <sub>3</sub>		-3.264**		-3.296**	-3.785***		I(0), I(1)
lnU		-5.234***		-5.301***		-4.513***	I(1)
lnD	-17.577***		-10.823***		-5.488***		I(0)

Source: Author's own calculation using Stata 16

To determine the order of the ARDL model we consult the Akaike Information Criteria (AIC). Table 3 reports the various information criteria and the corresponding lag order that minimizes them. Based on the AIC, for three models with three distinct indicators of institutional quality, the orders of the models are: Model 1 (1 2 1 3), Model 1' (1 2 1 3), and Model 1'' (1 2 1 3).

**Table 3: Determining the lag of the variables for the ARDL Model (1996-2022)**

Variable	AIC	HQIC	SBIC
lnHDI	-7.25334(1)	-7.22851(1)	-7.1546(1)
lnlnQ <sub>1</sub>	0.88035(2)	0.917599(2)	0.99942(1)
lnlnQ <sub>2</sub>	-3.16905(2)	-3.1318(2)	-3.02094(2)
lnlnQ <sub>3</sub>	-2.28375(2)	-2.2465(2)	-2.13564(2)
lnU	-1.4918(1)	-1.46697(1)	-1.39306(1)
lnD	-10.06(3)	-10.0103(3)	-9.8625(3)

Source: Author's own calculation using Stata 16

As mentioned in the previous section, we estimate three models – each for one indicator of institutional quality employed. The results of the ARDL estimation are summarized in Table 4. Table 5 summarizes the ARDL bounds test. The various diagnostic tests conducted are reported in Table 6.

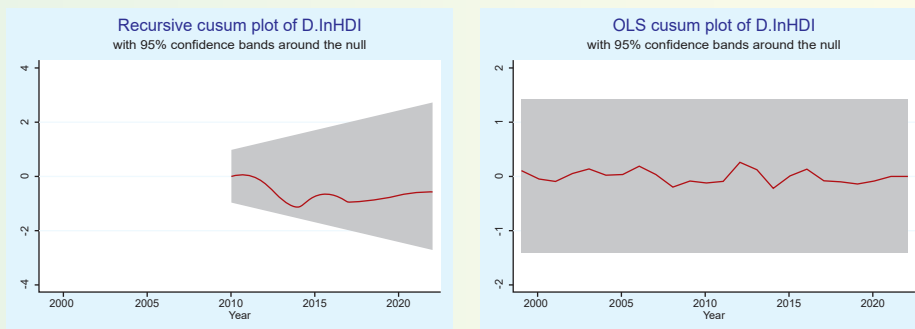
**Table 4: ARDL Model Human Development = f (Institutions, unemployment dependency) Estimation Results**

Y= lnHDI	Model 1 (1 2 1 3) 1996-2022	Model 1' (1 2 1 3) 1996-2022	Model 1'' (1 2 1 3) 1996-2022
Variable	Long run		
lnlnQ1	-0.0006(.002)		
lnlnQ2		-0.0057(.010)	
lnlnQ3			-0.006(.009)
lnU	-0.038**(.014)	-0.037**(.013)	-0.038**(.013)
lnD	-0.859***(.018)	-0.859***(.017)	-0.862***(.018)
	Short run		
Δ lnlnQ1	-0.0009(.003)		
Δ lnlnQ1(-1)	-0.0001(.003)		
Δ lnlnQ2		-0.029(.018)	
Δ lnlnQ2(-1)		0.013(.021)	

$\Delta \ln \ln Q3$			-0.0029(.014)
$\Delta \ln \ln Q3(-1)$			0.0048(.016)
$\Delta \ln U$	0.023(.014)	0.020(.015)	0.025(.0149)
$\Delta \ln D$	-1.503*(.836)	-1.371*(.709)	-1.737*(.838)
$\Delta \ln D(-1)$	2.137(1.527)	1.761(1.378)	2.384(1.466)
$\Delta \ln D(-2)$	0.763(.904)	0.996(.841)	0.817(.887)
Constant	3.857***(.780)	3.857(.808)	3.992***(.802)
ECT(-1)	-1.288***(.254)	-1.288***(.258)	-1.330***(.261)

Standard errors are presented in parentheses. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively. Source: Author's own calculation using Stata 16

**Model 1:** Unemployment rate and dependency ratio – both affect HDI negatively and significantly in the long run. The impact of institutional quality, proxied by  $\ln Q1$ , is approximately zero. If we look at the short run dynamics; we see that again  $\ln Q1$  fails to exert any important influence. The short run impact of unemployment is also insignificant. However, one of the short-term impacts of dependency ratio is significant at 10% with a negative sign. The ECT of -1.288 suggests that if deviated from the long run equilibrium, the model returns to equilibrium with a damped oscillation. Following the ARDL bounds test, all the variables in the model are cointegrated at 5%, i.e., they exhibit a long run relationship at 5% level of significance.



**Figure 1: Recursive and OLS CUSUM Tests for Model 1 (Source: Author's calculation using Stata 16)**

From Table 6 we see that 75.3% of the variation in human development is explained by this model. This reduces to 56.4% when adjusted for the degrees of freedom. Following both B-P and White's test, the residuals are normally distributed. The Ramsey RESET test shows that Model 1 does not suffer from omitted variable bias. BG LM test, Durbin's

alternative test and Durbin-Watson test – all confirm the absence of serial correlation. Both J-B and the skewness and kurtosis tests for normality assure that the residuals are normally distributed. Also, as illustrated in Figure 1, the estimated parameters exhibit stability.

Table 7 reports results of the Granger causality Wald tests which is adjusted for the sample size. Model 1 has three unidirectional causalities running from institutions to HDI, institutions to dependency ratio and dependency to HDI.

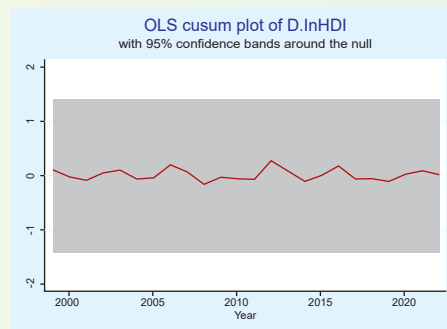
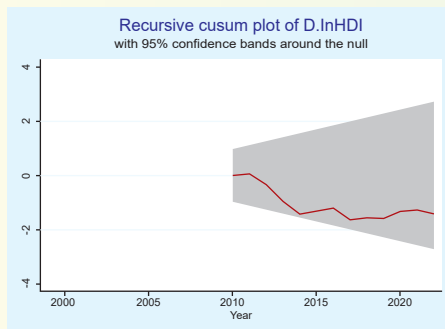
**Table 5: Pesaran, Shin, and Smith (2001) bounds test**

$H_0$ : no level relationship					
	Test statistic	Value	p-value I(0)	p-value I(1)	Decision
Model 1	F	6.757	0.008	0.028	Reject $H_0$ at 5%
	t	-5.055	0.001	0.010	
Model 1'	F	6.678	0.008	0.029	Reject $H_0$ at 5%
	t	-4.980	0.001	0.011	
Model 1''	F	6.703	0.008	0.029	Reject $H_0$ at 5%
	t	-5.093	0.001	0.009	

Kripfganz & Schneider (2020) critical values and approximate p-values.

Source: Author's own calculation using Stata 16

**Model 1'**: In the long run, institutional quality, represented by  $\ln Q_2$ , has no discernible impact on HDI. However, both unemployment rate and dependency ratio affect HDI negatively and significantly. In the short run, only one of the only one of the dependency coefficients is significant at 10% which is also negatively signed. The ECT suggests a damped oscillatory convergence towards long run equilibrium in case of a deviation. The bounds test confirms the existence of a LR relationship among the variables in Model 1'.



**Figure 2: Recursive and OLS CUSUM Tests for Model 1' (Source: Author's calculation using Stata 16)**

The model's explanatory power is 79.20% which is 63.20% when adjusted for the degrees of freedom. Model 1' does not suffer from heteroscedasticity, omitted variable bias, and non-normality. Though the B-G LM test suggests serial correlation, following the Durbin's alternative test, the residuals are not serially correlated. Recursive and OLS CUSUM tests, as displayed in Figure 2, the estimated parameters are stable.

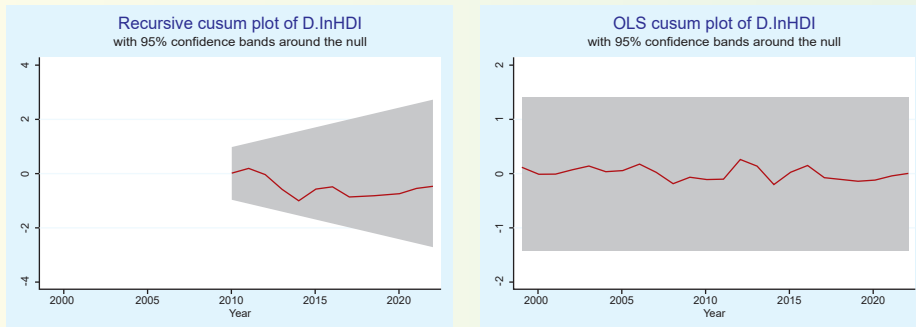
As reported in Table 7, Model 1' has four one-way causations – two running from institutions to HDI and dependency. The third one runs from dependency to HDI while the fourth one runs from unemployment to institutions.

**Table 6: ARDL Diagnostics**

	<b>Model 1</b>	<b>Model 1'</b>	<b>Model 1''</b>
R-squared	0.753	0.792	0.759
Adj R-squared	0.564	0.632	0.574
Breusch-Pagan / Cook-Weisberg test for Heteroscedasticity Ho: Constant variance	0.40 (0.526) Do not reject H <sub>0</sub>	0.75 (0.385) Do not reject H <sub>0</sub>	0.86 (0.354) Do not reject H <sub>0</sub>
White's test Ho: homoskedasticity	24.00(0.403) Do not reject H <sub>0</sub>	24.00(0.403) Do not reject H <sub>0</sub>	24.00(0.403) Do not reject H <sub>0</sub>
Ramsey RESET test Ho: model has no omitted variables	1.77 (0.216) Do not reject H <sub>0</sub>	1.11 (0.389) Do not reject H <sub>0</sub>	2.54 (0.115) Do not reject H <sub>0</sub>
Breusch-Godfrey LM test Ho: no serial correlation	2.282 (0.130) Do not reject H <sub>0</sub>	4.133(0.042) Reject H <sub>0</sub>	3.052 (0.080) Do not reject H <sub>0</sub>
Durbin's alternative test for autocorrelation Ho: no serial correlation	1.261 (0.261) Do not reject H <sub>0</sub>	2.497 (0.114) Do not reject H <sub>0</sub>	1.748 (0.186) Do not reject H <sub>0</sub>
Jarque-Bera test Ho: normality	1.942 (.378) Do not reject H <sub>0</sub>	2.774 (.249) Do not reject H <sub>0</sub>	1.986 (.370) Do not reject H <sub>0</sub>
Skewness-kurtosis tests for normality	2.54 (0.280) Do not reject H <sub>0</sub>	4.25(0.119) Do not reject H <sub>0</sub>	2.56 (0.277) Do not reject H <sub>0</sub>

Source: Author's own calculation using Stata 16

**Model 1''**: Quality of institution, now represented by InQ3, has no important influence on HDI. Again, unemployment rate and dependency ratio have significant negative impacts on HDI in the long run. In the short run, none of the coefficients are significant except for one dependency coefficient which is negative and significant only at 10%. The ECT of -1.330 indicates that Model 1'' converges to long run equilibrium, once deviation experienced, in a damped oscillatory manner. Also, the ARDL bounds test show that the variables in the model are cointegrated at 5% level.



**Figure 3: Recursive and OLS CUSUM Tests for Model 1'' (Source: Author's calculation using Stata 16)**

Model 1'' explains 75.90% variations in HDI which becomes 57.4% when adjusted for degrees of freedom. According to the diagnostic tests, Model 1'' is free from heteroscedasticity, omitted variable bias, serial correlation and non-normality. The stability of the estimated parameters is confirmed by recursive and OLS CUSUM tests, presented in Figure 3.

Model 1'' is characterized by three unidirectional causalities, listed in Table 7. Institutions Granger causes HDI and dependency. Additionally, a unidirectional causality runs from dependency to HDI.

**Table 7: Granger causality Wald tests**

Model	Variables	F stat (p-value)	Direction of Causality
Model 1	$\ln \ln Q_1 \rightarrow \ln \text{HDI}$	6.631 <sup>**</sup> (0.019)	Institutions Granger cause human development
	$\ln \ln Q_1 \rightarrow \ln D$	5.588 <sup>**</sup> (0.029)	Institutions Granger cause dependency
	$\ln D \rightarrow \ln \text{HDI}$	4.407 <sup>**</sup> (0.050)	Dependency Granger causes Human development
Model 1'	$\ln \ln Q_2 \rightarrow \ln \text{HDI}$	3.364 <sup>*</sup> (0.083)	Institutions Granger cause human development
	$\ln \ln Q_2 \rightarrow \ln D$	5.588 <sup>**</sup> (0.029)	Institutions Granger cause dependency
	$\ln D \rightarrow \ln \text{HDI}$	4.407 <sup>**</sup> (0.050)	Dependency Granger causes Human development
	$\ln U \rightarrow \ln \ln Q_2$	3.276 <sup>*</sup> (0.087)	Unemployment Granger causes institutions
Model 1''	$\ln \ln Q_3 \rightarrow \ln \text{HDI}$	11.725 <sup>***</sup> (0.003)	Institutions Granger cause human development
	$\ln \ln Q_3 \rightarrow \ln D$	7.650 <sup>*</sup> (0.012)	Institutions Granger cause dependency
	$\ln D \rightarrow \ln \text{HDI}$	16.211 <sup>***</sup> (0.0008)	Dependency Granger causes Human development

p-values in parentheses. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively. Source: Author's own calculation using Stata 16

## 4.2 Comparison

When comparing the three models, all show consistent results: both the unemployment rate and dependency ratio have a significant and negative impact on HDI in the long term. Institutional quality, represented by  $\ln Q_1$ ,  $\ln Q_2$ , or  $\ln Q_3$ , does not significantly influence HDI in any of the models.

In the short term, only one dependency ratio coefficient is significant at 10%, with a negative sign in each model. The ECT values in all models indicate that the system returns to long-term equilibrium after deviations, through a damped oscillation process. All models exhibit long run relationship among the variables as the null can be rejected at 5% level in all models.

Model 1 accounts for 75.3% of HDI variation, which adjusts to 56.4% after considering degrees of freedom. Model 1' offers the highest explanatory power, capturing 79.2% of the

variation (63.2% adjusted). Model 1'' explains 75.9% (57.4% adjusted). Across all models, diagnostic tests confirm no issues with heteroscedasticity, serial correlation, omitted variables, or non-normality. Stability of parameter estimates is validated by recursive and OLS CUSUM tests in each model.

In all three models, we find Granger causalities running from institutional quality to both human development and dependency and from dependency to HDI. Additionally, in Model 1' unemployment was found to Granger cause institutional quality.

### 4.3 Discussion

Table 8 summarizes the findings of the three models. According to the findings, the relationship between institutional quality and human development in Bangladesh is negative, in general, and insignificant. Hence, the overall evidence here is that of human development without governance during the 1996-2022 periods. As regards the short run positive impacts, in the short run, improvements in institutional quality can sometimes create optimism, bring investments, and ameliorate the delivery of public services, leading to immediate positive effects. Short run economic stimuli like foreign aid or policy reforms, can also support human development. But, in the long run, institutional inadequacies, bureaucratic incompetence, and structural limitations can undermine those initial gains, ultimately having a negative impact. If reforms are superficial, poorly executed, or driven by political motives, they can lead to ineffective resource distribution, declining quality of public services, and a reduced trust on the economic environment. Furthermore, issues such as improbity, policy inflexibility, and state volatility can slow down the process of human development. Also, changes in institutional quality often require an adjustment period. While early improvements may yield temporary dividends, continuous human development requires sustainable institutional strengthening and effective governance. Hence, longer term institutional challenges, economic inequalities, and inefficiencies can countervail the initial gains.

**Table 8: Summary of Findings from Three Models on Institutions and HDI**

Y=HDI		Model 1 with InQ <sub>1</sub>	Model 1' with InQ <sub>2</sub>	Model 1'' with InQ <sub>3</sub>
<i>Variable</i>		Sign & Significance	Sign & Significance	Sign & Significance
Institutional quality	LR	-	-	-
	SR	-, -	-, +	-, +
Unemployment	LR	**	**	**
	SR	+	+	+
Dependency Ratio	LR	***	***	***
	SR	*	*	*

\*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively.

In the literature there are works that support such evidence. North (1990) argues that institutional improvements that work in the short run can become rigid in the long run which might obstruct human development. Khan (2002), in the context of Bangladesh, argues that anti-corruption measures work in the short run and they become less effective in the long run as the patronage network reemerges. Some argue that extractive institutions can generate such outcomes (Acemoglu & Robinson, 2012). Such outcome can also be generated by institutional reforms that are good on paper but lack sustainability (Pritchett & De Weijer, 2010).

In all three models, regardless of the index for institutional quality used, total unemployment rate has a significant negative impact in the long run while it has an insignificant positive impact in the short run. In the short run, unemployment can raise human development owing to government supports, training programs, social safety nets, and household initiatives. However, in the long run, unemployment reduces income security, limits access to essential services like health and education, and increases social inequality, ultimately hindering human development (Sen, 1999). According Blanchard and Summers, unemployment lowers productivity and human development in the long run (Blanchard & Summers, 1986). The findings are also consistent with the 2015 ILO report that suggests that short-term unemployment can marginally increase informal work or education enrollment while long-term unemployment causes lasting adverse impacts including lower lifetime earnings and poorer health (Elder & Rosas, 2015).

In all models, age dependency ratio negatively impacts human development in both the short and long term due to the economic burden of supporting a larger share of non-working individuals, such as children and the elderly. In the short run, resources are diverted from education and healthcare to support dependents, reducing household income and limiting investments in productive activities. Over time, this pressure intensifies, constraining savings, hindering human capital formation, and increasing costs for aging populations, such as healthcare and pensions. These factors slow economic growth, exacerbate intergenerational inequality, and restrict access to essential services. The findings are consistent with Lee's argument that with higher dependency ratios households save less and the government invests less in health and education which reduce human development (Lee, 2012).

#### 4.4 Robustness

To evaluate the reliability of our conclusions regarding institutional quality's impact on human development, we utilize the methodological strength of using three indexes of institutional quality. Uniformity in outcomes across these different indexes reinforces the credibility of the results. The study demonstrates that institutional quality's influence on human development is similar irrespective of the indicator of institutional quality used, suggesting the observed relationship is not driven by measurement or methodological bias,

or the specific institutional index considered. For other variables, the impacts of unemployment and dependency ratio on human development are similar across models.

All models provide consistent evidence of a long-run relationship. Model 1' does not pass the B-G LM test for serial correlation. However, Durbin's alternative test indicates no evidence of serial correlation in Model 1'. All other diagnostic tests are satisfied by all models. Following the recursive and OLS CUSUM tests, the parameters in all models maintain stability over the entire estimation period, confirming that the relationships identified in the models are robust against structural changes or sudden disruptions in the data. Such parameter stability reinforces the reliability of the models in offering consistent and economically meaningful interpretations of the relationships under study.

### 5. Limitations and Future Research Directions

The research findings, though insightful, face constraints that require careful consideration.

- a. A key limitation lies in the dependence on aggregate indicators to assess institutional quality, which risks oversimplifying Bangladesh's governance context. Also these indexes ignore the role of informal institutions.
- b. The linear ARDL model cannot capture potential nonlinear dynamics in the model. Also, institutional improvements might have a threshold effect.
- c. Though the models used in the study do not suffer from omitted variable bias, they exclude potentially important variables like education, health, various macroeconomic variables, external shocks and policy interventions.
- d. The study is based on nationwide aggregated statistics and does not account for regional disparities.
- e. The applicability of the study is confined to Bangladesh, limiting cross-national relevance.
- f. The analysis is limited to the years 1996–2022, as the WGIs were introduced in 1996. Although the HDI extends back to 1990, substituting WGIs with alternative metrics to include earlier years (1990–1996) would yield a marginal six-year extension.

This study can lead to several potential directions for future research.

- a. Future studies should focus on developing indicators that reflect Bangladesh's institutional landscape, rather than relying on broad composite indices. This includes incorporating measures of informal institutions to better understand their impact on development.
- b. The Nonlinear Autoregressive Distributed Lag (NARDL) approach could help

capture the different effects of changes in institutions, unemployment, or dependency ratios. Additionally, threshold regression models could help identify specific levels of institutional performance beyond which human development accelerates.

- c. Future research should include additional variables that are potentially relevant and external shocks like economic crises or policy changes.
- d. Using regional data instead of national aggregates could reveal regional disparities in institutional quality and development, allowing for more targeted policy recommendations. Similarly, comparing Bangladesh with other countries facing similar challenges, could determine whether these findings are specific to Bangladesh or part of a broader trend.

## 6. Conclusions

### 6.1 Findings

The aim of the paper was to fill a research gap by analyzing the impact of institutional quality, unemployment rate and dependency ratio on the human development of Bangladesh. Using data for the 1996-2022 periods, we conduct three unit root tests and proceed to estimate ARDL models followed by bounds test and diagnostic tests.

The findings from all three models are consistent. Both the unemployment rate and the dependency ratio have a strong, negative effect on HDI over the long term. However, institutional quality, represented by  $InQ_1$ ,  $InQ_2$ , or  $InQ_3$ , does not have a significant impact on HDI in any of the models. There is evidence of long run relationship among the variables in all models. The ECTs indicate that after any short-term disruptions, the system gradually returns to its long-term balance through a process of damped oscillation. Across all models, institutions are found to Granger-cause both HDI and the dependency ratio, while the dependency ratio Granger-causes HDI.

### 6.2 Policy Implications

The findings and discussions of the study lead to several actionable policy implications.

- a. Reducing unemployment rate to achieve better human development can be achieved through following ways-
  - i. Collaborating with industries to develop vocational and digital training programs aligned with job market needs.
  - ii. Providing tax incentives to businesses that employ long-term unemployed individuals, including women and displaced workers.

- iii. Simplifying labor regulations to facilitate the transition of informal workers into the formal sector and support gig economy growth.
  - iv. Introducing unemployment benefits tied to mandatory skill enhancement programs.
- b. Tackling the challenges associated with dependency ratio will also improve human development and following policies can help in this regard:
- i. Enhancing female workforce participation through subsidized childcare, flexible work arrangements, and tax benefits for employers.
  - ii. Expanding pension schemes for informal sector workers and investing in universal early childhood education.
  - iii. Offering subsidized healthcare for the elderly and extend maternity benefits to support working parents.
  - iv. Strengthening family planning initiatives in regions with high fertility rates to manage demographic pressures.
- c. Though Bangladesh experienced human development without governance, robust institutions can help achieve and sustain higher human development. Following policies can help in achieving that-
- i. Incorporating transparency mechanisms, such as public audits, within development initiatives.
  - ii. Granting local governments financial autonomy and establish community-led monitoring systems.
  - iii. Creating independent regulatory bodies for education and healthcare while enhancing e-governance.
  - iv. Reforming the civil service by linking promotions to performance and minimizing political interference.
  - v. Promoting civic engagement through social audits and implementing progressive taxation to reduce wealth disparities.

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