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Research article

Does human capital investment influence unemployment rate in Bangladesh: a fresh analysis

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Abstract: This study looks at how Bangladesh's human capital investment has affected unemployment from 1995 to 2019. To identify the study's unit root, we employed the ADF and PP tests. The short-term and long-term impacts of human capital investment on unemployment are estimated using the Autoregressive Distributive Lag (ARDL) model. The presence or absence of cointegration is assessed using the ARDL bound cointegration test. The Pairwise Granger Causality test, in contrast, is used to ascertain whether there exist causal relationships between variables. The study's findings demonstrate that government health spending on human capital has a significant impact on Bangladesh's long-term unemployment rate. Government spending on education and the unemployment rate are causally related in a single direction, according to the Pairwise Granger test. In the short term, the analysis showed no discernible relationship between human capital investment and unemployment rates. To build a healthy nation and eventually lower Bangladesh's unemployment rate, it is urged that the government should increase health spending and strengthen the health sector. To connect education with employment, the government may give vocational and career-focused education equal weight with general education.

Keywords: human capital; unemployment; health expenditure; educational expenditure

JEL Codes: J24, J64, I15, I22

1. Introduction

Investment in human capital is a crucial driver of economic growth. Human capital is defined as "education, health, skills, knowledge, and other human traits that may help a country's labor productivity". "Economic Development with Unlimited Supplies of Labor", a 1954 book by A. W. Lewis, represented the idea of human capital. Schultz (1961) made a contribution to the growth of the human capital sector. Alfred Marshall (1890) defined human capital as "all those energy, faculties, and habits that directly contribute to making people industrially efficient" in his book "Principles of Economics". The caliber of a nation's labor force is one of the most important determinants of its capacity for production.

A nation may have an abundance of physical resources and other resources, but due to a lack of productive workforce, it cannot utilize these resources effectively. Any government is interested in investing in human capital since it will help in identifying and putting into practice technological advancements that take place all over the world for its development. People in a country are more productive and able to work more efficiently when they are highly educated, knowledgeable, and physically fit, which can help the country reduce unemployment. The Human Capital Index (HCI) score for Bangladesh is not particularly high. In 2020, Bangladesh had a Human Capital Index (HCI) score of 0.46 on a scale of 0–1, placing it 123rd out of 174 nations, according to a World Bank assessment. The score fell by two percentage points from 2018 to 2020.

Spending on health and education are the two main components of human capital investment. A nation cannot experience long-term economic growth if the majority of its people lack education. A person with a good education not only benefits himself but also his community and nation. An educated workforce has numerous advantages. Education makes it easier for a country to accept new technology. The effectiveness and quality of work may fluctuate depending on the education, talent, and experience levels involved. Higher educated and more experienced people make more money and have more job opportunities. A higher level of education may result in a more stable job.

All other things being equal, Cazes and Verick (2013) claim that the amount of years spent in education boosts a person's chances of finding employment. Education is used as a crucial rationing tool in the majority of occupations. To improve educational quality and give the population of the nation better educational opportunities, several economists and socialists have argued for more government investment on education. The risk of losing a job can be reduced with more education. The improvement of one's health has a positive impact on economic growth and development by increasing labor productivity, making it another crucial component of human capital. A sick person is unable to perform their job well.

A serious and persistent illness may lead to job losses. Public health spending generates more significant returns in the majority of poor and developing countries than it does in developed ones (Ke et al., 2011). Spending on one's health is necessary to improve it, which increases work productivity. Unemployment is one of the most pressing challenges in Bangladesh and most emerging nations. When people who are employed in a nation actively look for work but are unable to find any, this is known as unemployment. Stronger levels of employment opportunities are a result of both strong human capital and better economic growth rates.

As a result, unemployment and human capital investment are related. Adam Smith made a contribution to the relationship between human capital and employment by drawing an analogy between man and machine in his book "The Wealth of Nations" (1776). Smith asserted that in order

for a human to advance, just like a machine, economic resources must be used. According to Becker, employees with specialized training have less motivation to quit their employment and are less likely to be let go by their employers (1964). Therefore, greater human capital contributes to a decline in unemployment. Figure 1 displays the trend in Bangladesh's unemployment rate and government spending on health and education (as a percent of GDP) (as a percent of GDP).

Figure 1 shows a trend of rising and falling unemployment in Bangladesh from 1995 to 2013, with the rate generally remaining steady from 2014 to 2019. The WDI estimates that the unemployment rate was 4.22 percent in 2019, which was 0.07 percent lower than in 2018, but that it would increase to 5.3 percent in 2020, which would be 1.08 percent higher than in 2019. The COVID-19 epidemic, which has caused a considerable decline in economic activity and the loss of many employments, is one of the main causes of this. In this graph, we can observe that government spending on education has many ups and downs. Despite the fact that the Bangladeshi government gives education a high priority in each of its five-year plans, there hasn't been much progress made in terms of finance (Rahman et al., 2016). Despite a slight decline in certain years, government health spending has been rising continuously as a percentage of GDP.

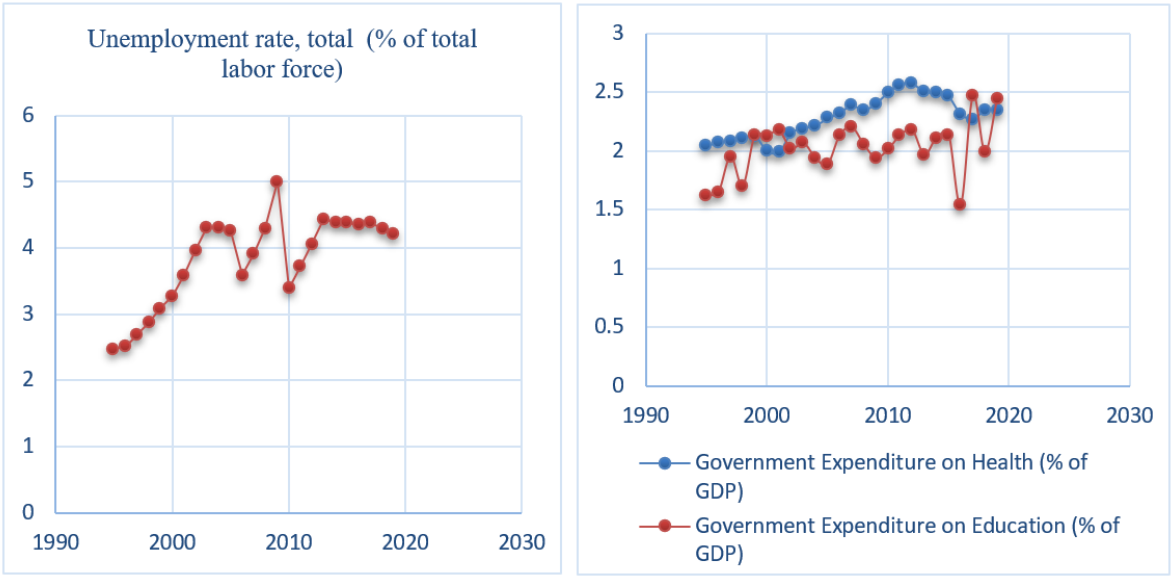

Figure 1. Trends in Unemployment Rate and Government Expenditure on Health and Education (as percentage of GDP) in Bangladesh (Data source: World Development Indicators).

This study looks at the relationship between human capital investment and unemployment in Bangladesh. The majority of human capital investment goes toward training, education, and health. The main objective of the study is to determine the relationship between government spending on health and education and unemployment in Bangladesh.

The study is organized as follows: This introductory part is followed by Section 2, which expresses the previous literature. Section 3 reports the data and model specification. Section 4 reveals the methodology. Section 5 analyzes the results and discussion, and Section 6 concludes the paper.

2. Previous literature

Only a few notable studies have been carried out in Bangladesh, despite the fact that several research projects have been completed to examine the impact of human capital investment on unemployment in various nations using various statistical methodologies throughout various time periods. Denny and Harmon (2000) examine the effects of education and training on the labor market experiences of young adults in Ireland from 1990 to 1995 using a Multinomial Logit model. Their research indicates that family background, notably the social standing, educational background, and occupation of the father, affect employment.

In his essay "Investment in Human Capital and Personal Income Distribution," Mincer (1958), demonstrates how human capital investment and income distribution are positively correlated. Human capital investment is positively correlated with the income distribution among various human occupations, as demonstrated by Mincer (1958) in his work titled "Investment in Human Capital and Personal Income Distribution." Using the OLS estimating method, Mete and Schultz (2002) examine the effects of Taiwan's health status on labor force participation from 1989 to 1996. They found that a decline in both men's and women's participation in the job market is associated with poor health. Data from the Health and Retirement Study are used by Pelkowski and Berger (2004) to examine how health affects employment. They discover a negative relationship between employment and chronic illness. Kalwij and Vermeulen (2005) study how being healthy can increase labor force participation in Europe (2005).

The results of their study's probit model show that educated men who live in couple homes with more kids are more likely to have jobs. Rahman (2006) identifies in Bangladesh the relationships between education and poverty as well as the means of reducing poverty through improved work possibilities. The study uses enrollment rates, SSC completion rates, and school quality as indicators of educational access. The study's findings show that while education increases young men's chances of obtaining better jobs, unemployment rates are greater in non-poor groups than in poor groups, and jobless rates rise as educational levels rise.

O'Higgins and Ivanov (2006) analyze education and employment opportunities in Roma based on two surveys conducted in 2002 and 2004 and come to the conclusion that the relatively high percentage of unemployment among Roma is due to a lack of formal education. Laplagne et al. (2007) use panel data to examine the relationship between changes in human capital indicators and changes in the labor force participation rate. They examine trends in Australian households, income, and the labor market between 2001 and 2004.

In their study, they found that labor force participation is positively related to education, better experiences, and having diploma certificates, and negatively related to major injury, cardiovascular disease, mental/nervous condition, diabetes, arthritis, and cancer. They did this by using the standard Multinomial Logit (standard MNL) model, the panel Multinomial Logit (panel MNL) model, and the Simultaneous Equations (SE) model. Faridi et al. (2010) examine the effect of education and health on employment using cross-section data collected via field survey in 2008 and 2009. They estimated the impact of education at all levels on employment in their study using the logistic regression technique, and the findings show that education has a positive and significant impact. They demonstrate that a growth in employment is related to education, married status, life events, and urban living. Garrouste et al. (2010) use binary logit and binary scobit models to examine the relationship between education and long-term unemployment for the years 2004 to 2006.

The value of education declines after the age of 40, the study finds, and a person's level of education has a significant impact on their probabilities of continuing in long-term unemployment. The Johansson Cointegration test and the Vector Error Correction Model are used by Bashir et al. (2012) to highlight some significant contributions that health and education have made to raising employment levels over the course of the period from 1972 to 2010. (VECM). According to the study's long-term findings, raising Pakistan's employment level depends in large part on factors such as spending on education, total student enrollment, the number of hospitals, health expenditures, and gross fixed capital development.

Samiullah (2014) highlights the effects of human capital determinants on unemployment in Pakistan using data from 1972 to 2010 including population, life expectancy, health, and education. The Johansen Cointegration test was used to assess the long-term relationships between variables, and the Vector Error Correction Model (VECM) was applied to make short-run corrections. The results show that life expectancy and the pace of population growth are both favorably correlated with unemployment. Huq et al. (2014) use data from the 2005 Household Income Expenditure Survey and a sample of persons aged 15 to 65 to assess the effect of health on Bangladeshi productivity.

According to the study, both rural and urban Bangladeshi workers are more productive when they are in good health. In Nigeria from 1981 to 2015, Kenny (2019) investigate the impact of human capital investment on unemployment volatility. According to their findings, increasing government spending on education and investing in human capital are both important to lower Nigeria's unemployment volatility.

It will be challenging to draw conclusions and implement appropriate policies based on the existing studies because there are few studies in Bangladesh that specifically assess the influence of human capital investment on unemployment. The statistical method used in this study is different from the methods used in the majority of earlier studies. As a result, our study will contribute to the development of the literature in this area.

3. Data and model specification

The World Development Indicators 2021 of the World Bank, the Bangladesh Statistical Yearbook 2011 and the Bangladesh Statistical Yearbook 2020 of the BBS are the primary secondary sources of data used in this study. We use annual time series data for the years 1995 to 2020 to examine the relationship between human capital investment and unemployment in Bangladesh. Data are collected for six variables: unemployment rate, government expenditure on health (percent of GDP), government expenditure on education (percent of GDP), economic growth rate, population growth rate, and inflation rate.

The dependent variable in our analysis is the unemployment rate, while the other variables are explanatory variables. Government health spending is calculated as a percentage of GDP and is expected to have a negative influence on the unemployment rate. Increased health spending helps a nation's health system. People in the nation therefore have a lower probability of staying unemployed since they are healthier, more productive, and more able to work. According to Bashir et al. (2012), a healthy country may actively participate in nearly every economic activity, which results in increased employment rates and a lower unemployment rate.

According to priory expectations, government spending on education as a percentage of GDP also has a negative impact on the jobless rate. An increase in educational spending boosts a nation's literacy rate. People who have more education have a better chance of finding employment, which helps to

lower the unemployment rate. According to Kenny (2019), there is a negative correlation between the unemployment rate and government spending on education.

In that it indicates the overall number of people in the nation, a country's population can be considered a measure of its human capital. Given the scarcity of resources, population expansion that is outpacing labor supply results in an increase in the number of people without jobs. The population growth rate and unemployment have a positive correlation, according to Yousuf (2011) and Samiullah (2014). Therefore, we anticipate that a rise in the unemployment rate will accompany a rise in population growth.

Economic growth rate in our study refers to real economic growth rate, and we anticipate that it will have a negative association with the unemployment rate. Increased employment opportunities result from an expanding economy, which lowers the unemployment rate. According to Okun's law, the unemployment rate and the rate of economic growth have a negative connection (Okun, 1962). Utilizing the GDP deflator, the inflation rate used in this study was computed. According to our past expectations, an increase in inflation rate will result in a decrease in the unemployment rate. In the short run, Phillips Curve demonstrates an inverse link between inflation and the unemployment rate (Phillips, 1958).

3.1. Model specification

To investigate the impact of human capital investment on unemployment, Unemployment rate can be expressed as follows:

$$Unemployment\ rate = f(Health\ expenditure, Education\ expenditure, Population\ growth, GDP\ growth, Inflation) \quad (1)$$

Where unemployment rate is a function of government health expenditure (Bashir et al., 2012; Kenny, 2019), government educational expenditure (Bashir et al., 2012; Kenny, 2019); Population growth rate (Samiullah, 2014), GDP growth rate (Okun, 1962), and Inflation rate (Phillips, 1958).

So, we estimate the following equation,

$$UEMR_t = ß_0 + ß_1 HE_t + ß_2\ EE_t + ß_3 PG_t + ß_4 GG_t + ß_5 IF_t + u_t \quad (2)$$

where, UEMR=Unemployment rate, HE=Government expenditure on health, EE=Government expenditure on education, PG=Population growth rate, GG=Real GDP growth rate, IF=Inflation rate, u_t=Stochastic disturbance term, $ß_0$ is the intercept term and $ß_1$, $ß_2$, $ß_3$, $ß_4$, $ß_5$ are slope co-efficients.and a priori expectation,$ß_1$, $ß_2$, $ß_4$, $ß_5 < 0$ and $ß_3 > 0$.

4. Methodology

4.1. Unit root tests

In order to check stationarity of the time series variables, two widely used procedures of unit root tests are applied in this study. These are Augmented Dickey-Fuller (ADF) Test (Dickey and Fuller, 1981) and the Phillips-Perron (PP) Test (Phillips and Perron, 1988).

4.2. The ARDL approach

An autoregressive distributed lag (ARDL) model includes the lagged value(s) of the dependent variable and also the lagged values of explanatory variables. The study employ ARDL model to estimate the short-run dynamics and the long-run relationships among the variables. The ARDL framework of Pesaran et al. (2001) for Equation (2) can be written as:

$$\Delta UEMR_t = \gamma_0 + \sum_{i=1}^{p} \gamma_{1i} \Delta UEMR_{t-i} + \sum_{i=1}^{q1} \gamma_{2i} \Delta HE_{t-i} + \sum_{i=1}^{q2} \gamma_{3i} \Delta EE_{t-i} + \sum_{i=1}^{q3} \gamma_{4i} \Delta PG_{t-i} + \sum_{i=1}^{q4} \gamma_{5i} \Delta GG_{t-i} + \sum_{i=1}^{q5} \gamma_{6i} \Delta IF_{t-i} + \delta_1 UEMR_{t-1} + \delta_2 HE_{t-1} + \delta_3 EE_{t-1} + \delta_4 PG_{t-1} + \delta_5 GG_{t-1} + \delta_6 IF_{t-1} + \mu_t \quad (3)$$

Here, Δ represents the first difference operator, γ_0 is the constant term. On the other hand, $p, q1, q2, q3, q4$ show the optimum lag lengths; γ_1, $\gamma_2\gamma_3\gamma_4\gamma_5$, γ_6 present short run parameters .The estimates of $\delta_2, \delta_3, \delta_4, \delta_5, \delta_6$ express the long run effects which are normalized on $\delta_1$and μ_t is the white noise error term.

We use ARDL bounds test for cointegration to check the presence of the long run relationship among the variables. If the variables are cointegrated, one can specify both short run and long run model, otherwise only short run model can be specified. The null hypothesis for no cointegration is $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$ and the alternative hypothesis which says cointegration exists is $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq 0$. The null hypothesis can be rejected if the calculated F statistic is greater than the critical value of the upper bound. On the other hand, the null hypothesis cannot be rejected if the calculated F statistic is lower than the critical value of the lower bound. The result is inconclusive if the calculated F statistic fall between these two bounds. If cointegration exists there, both the short-run and long-run dynamic relationships can be estimated. So, the error correction model representation can be specified as,

$$\Delta UEMR_t = \gamma_0 + \sum_{i=1}^{p} \gamma_{1i} \Delta UEMR_{t-i} + \sum_{i=1}^{q1} \gamma_{2i} \Delta HE_{t-i} + \sum_{i=1}^{q2} \gamma_{3i} \Delta EE_{t-i} + \sum_{i=1}^{q3} \gamma_{4i} \Delta PG_{t-i} + \sum_{i=1}^{q4} \gamma_{5i} \Delta GG_{t-i} + \sum_{i=1}^{q5} \gamma_{6i} \Delta IF_{t-i} + \delta_1 UEMR_{t-1} + \varphi ECT_{t-1} + \nu_t \quad (4)$$

where, φ=Speed of adjustment parameter and ECT is Error Correction Term.

The study use Pairwise Granger causality tests (Granger, 1969) for determining the causal relationships among the variables. The null hypothesis of the Granger causality test is, for instance, variable x doesn't granger cause variable y or variable y doesn't granger cause variable x.

5. Results and discussion

Table 1 and 2 display the results of the Augmented Dickey-Fuller (ADF) Test and the Phillips–Perron (PP) Test. In both of these tests, the constant and trend terms are part of the model. The

dependent variable unemployment rate is stationary at the first difference, as can be seen by looking at tables 1 and 2. Not all explanatory variables integrate in the same sequence. While the population growth rate, GDP growth rate, and inflation rate are all stationary at their initial differences, the inflation rate is stationary at its current level. Education spending is stationary at the first difference, while the PP test reveals that the variable is stationary at the level. Therefore, every variable is either stationary at level I (0) or at the initial difference (1). In this situation, the ARDL model can deliver better outcomes.

The results of the ARDL bound test for cointegration are shown in Table 3. Here, the estimated F statistic of 3.99 is higher than the upper bound's critical value at a 5% level of significance. There is a long-term link between the variables, and the null hypothesis of no cointegration may thus be rejected. We establish the outcomes of the ARDL long run and short run estimations after the long run connection has been confirmed.

Table 1. Results of the Augmented Dickey-Fuller (ADF) test.

Variable Name	ADF test at level			ADF test at first difference			Status
	t-statistic	Critical value at 5%	Decision	t-statistic	Critical value at 5%	Decision	
UEMR	−2.512 (1)	−3.600	Non stationary	−5.743 (0)	−3.600	Stationary	I (1)
HE	−1.560 (1)	−3.600	Non stationary	−3.625 (0)	−3.600	Stationary	I (1)
EE	−3.532 (1)	−3.600	Non stationary	−5.037 (1)	−3.600	stationary	I (1)
PG	−1.483 (4)	−3.600	Non stationary	−3.813 (1)	−3.600	stationary	I (1)
GG	−3.173 (1)	−3.600	Non stationary	−4.416 (0)	−3.600	Stationary	I (1)
IF	−7.560 (1)	−3.600	Stationary				I (0)

Notes: figures within parentheses represents lag lengths selected by the Akaike Information Criterion (AIC). Source: Author's computation using STATA 16 software.

The ARDL technique is used in the study to look at both short- and long-term relationships between variables. There are no short run correlations between the unemployment rate and any of the explanatory variables, according to the coefficients of all explanatory variables in the short term. The majority of the long run coefficients, however, are very statistically significant. At the 5% level of significance, the long-term health expenditure coefficient is −3.408512, which is statistically significant. It means that, other things being equal, a long-term 1% increase in government health spending is correlated with an average drop in the unemployment rate of 3.40851%. According to our analysis, spending on health is a significant part of investing in human capital, which over time lowers unemployment in Bangladesh. Increased public health spending does not instantly lower the unemployment rate since the short-term coefficient is negligible.

Table 3. ARDL bound test of cointegration.

H_0: No Cointegration	F-Statistics=3.99**	
Critical Value	Lower Bound Value	Upper Bound Value
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Notes: (a) ** indicates the rejection of null hypothesis at 5% level of significance. (b) Optimal lag length (1, 1, 1, 4, 1, 1) is selected by the Akaike's information criterion. Source: Author's computation using STATA 16 software.

However, over time, it improves people's physical condition and limits their ability to work as much, which reduces their likelihood of becoming unemployed. Long-term, this causes the unemployment rate to fall. The long run coefficient of GDP growth rate is −0.5499827, which is statistically significant even at a 1% level of significance. This means that, ceteris paribus, if GDP growth rate increases by 1%, the long run unemployment rate will typically decrease by 0.5499827 percent. The outcome confirms Okun's law, which asserts that the unemployment rate and economic growth rate are inversely related (Okun, 1962). Government educational spending and inflation do not have any statistically meaningful long-run connections with unemployment since their long-run coefficients are statistically negligible. Despite being statistically small, the sign of the long-term coefficient of educational spending is related to what we expect.

In the long run, a one percent increase in population growth leads to a 4.078681 percent decline in the unemployment rate, all other things being equal, according to the long run population growth rate coefficient, which is −4.07868 and statistically significant at the one percent level of significance. This outcome does not match what we anticipated. However, it is feasible if the population increases its level of productivity and makes enough investments in human capital. So, a growing population also indicates a growing labor force that is productive. An efficient use of the economy's resources and the long-term achievement of full employment are both made possible by highly productive labor.

The unemployment rate declines and only natural unemployment remains in the economy at full employment output levels. In fact, increasing population implies the nation will eventually have more productive doctors, engineers, teachers, farmers, and researchers if higher productivity of the people can be ensured. Population growth is portrayed by Todaro and Smith (2011) in their book "Economic Development" as a desirable phenomenon in the sense that it creates the necessary consumer demand for favorable skill economies of production, lowers production costs through the availability of low-cost labor, and ultimately helps to increase output and employment. The adjustment coefficient, in the end, demonstrates the extent to which the adjustment errors of the prior era would be rectified in the present period. At the 1% level of significance, the coefficient, −1.59701, is statistically significant. The adjustment coefficient's negative sign and significant outcome reinforce the long-term relationship's validity.

Table 4. Results of the estimated short run and long run Coefficients.

Long run estimates				
Variable	Coefficient	Std. Error	t-Statistic	Prob. values
HE	−3.408512**	1.119565	−3.04	0.023
EE	−0.1811113	6059248	−0.30	0.775
PG	−4.078681***	6244464	−6.53	0.001
GG	−0.5499827 ***	0.1203884	−4.57	0.004
IF	0.0118888	0.1331817	0.09	0.932
R-squared=0.8671, Adj R-square=0.5569				
Short run estimates				
Variable	Coefficient	Std. Error	t-Statistic	Prob. values
ΔHE	2.713017	2.138452	1.27	0.252
ΔEE	0.0245135	0.5343957	0.05	0.965
ΔPG	−12.71281	14.8984	−0.85	0.426
LD(PG)	−11.32426	30.52702	0.37	0.723
L2D(PG)	32.61236	30.31046	1.08	0.323
L3D(PG)	−10.96617	13.287	−0.83	0.441
ΔGG	0.1668133	0.2252789	0.74	0.487
ΔIF	−0.0574813	0.1440774	−0.40	0.704
Adjustment L(UEMR)	−1.59701***	0.3772961	−4.23	0.005

Notes: (a) *** and ** indicate the statistical significance level of the estimated coefficients at 1%, and 5% significance level, respectively (b)optimal lag length (1, 1, 1, 4, 1, 1) is selected by the Akaike's information criterion. Source: Author's computation using STATA 16 software.

Table 5. Post estimation results.

$\chi_{BP}{}^2$	$\chi_{WT}{}^2$	$\chi_{HT}{}^2$	$\chi_{SK}{}^2$	$\chi_{KT}{}^2$	CUSUMQ
0.13	21.00	21.00	13.00	0.63	Stable
(0.7221)	(0.3971)	(0.3971)	(0.5188)	(0.4256)	

Notes: BP: Breusch-Pagan/Cook-Weisberg test for heteroskedasticity. Null hypothesis of BP test: Constant variance. WT: White test. Null hypothesis of WT test: Homoskedasticity. SK: Skewness. Null hypothesis: normally distrusted; KT: kurtosis. Null hypothesis: normally distrusted. CUSUMQ: CUSUM square test for stability of the model.

In order to validate the validity of the ARDL analysis, which is summarized in Table 5, this study evaluates a number of validation tests. All diagnostic results show that none of the ARDL model-based estimations have any of the aforementioned statistical problems.

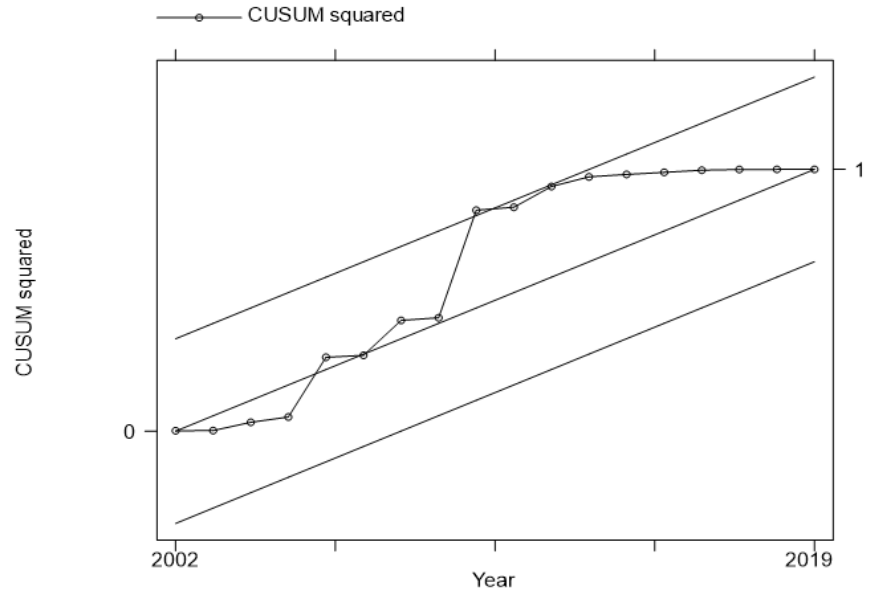

Figure 2. CUSUMsq test.

This study also investigates the stability of the predicted parameters in the ARDL model using a cumulative sum of squares. Figure 2 shows that the parameters are well-specified and stable at a 5 percent significant level and that the plot of the CUSUMsq test lies inside the important line.

Table 6. Results of pairwise granger causality tests.

Number of observations:23, Lags:2			
Null Hypothesis	F-Statistic	Probability Value	Remark
UEMR does not Granger Cause HE	1.74268	0.2033	No Causality
HE does not Granger Cause UEMR	0.65448	0.5316	No Causality
UEMR does not Granger Cause EE	0.6133	0.5526	No Causality
EE does not Granger Cause UEMR	4.72714	0.0224**	Causality
UEMR does not Granger Cause PG	2.69894	0.0944	No Causality
PG does not Granger Cause UEMR	1.44019	0.2629	No Causality
UEMR does not Granger Cause GG	4.74542	0.0221**	Causality
GG does not Granger Cause UEMR	0.93802	0.4097	No Causality
UEMR does not Granger Cause IF	5.39195	0.0146**	Causality
IF does not Granger Cause UEMR	0.41034	0.6695	No Causality

Notes: ** indicates the rejection of null hypothesis at 5% level of significance. Source: Author's computation using Eviews.

The findings of the Pairwise Granger Causality Tests are listed in Table 6. At a significance level of 5%, there is a causal relationship connecting government educational spending and unemployment rate, suggesting that previous levels of government educational spending can be used to predict future levels of unemployment rate. However, unemployment rate does not directly impact government spending on education, indicating that there is only one way that these two variables are related. Both the unemployment rate and the pace of population increase were found to be independently not to be

causally related by the study. At a significance level of 5%, Table 5 also demonstrates the existence of unidirectional causality connecting the unemployment rate with both the GDP growth rate and the inflation rate. It implies that current unemployment rates can be used to predict future GDP growth rates and inflation rates.

6. Conclusions and policy suggestions

The study makes an effort to determine how Bangladesh's human capital investment affects unemployment. All variables are stationary at either the label or the first difference, according to the ADF and PP tests for unit root. The outcome of the ARDL bound cointegration test implies that variables may have long-term correlations. In the study, we employ the ARDL technique for both short- and long-term estimation. The study's findings indicate that none of the explanatory variables had any discernible short-term effects on unemployment rate. Long-term unemployment rate reduction can be significantly impacted by government health spending on human capital. The study's findings also indicate a significant long-term negative link between the unemployment rate and the rate of real economic growth.

Both in the short and long terms, the effect of government educational spending on the unemployment rate is negligible. Over time, there is an inverse relationship between population increase and unemployment. The Pairwise Granger causality test results reveal a unidirectional causal relationship between government spending on education and the unemployment rate. The test also demonstrates the existence of causal links between the unemployment rate and both inflation and GDP growth. The country's human capital stock is enhanced if the health sector can grow through increased health spending by producing younger, healthier, and more productive generations, which lowers the long-term unemployment rate. Initiatives aimed at creating jobs should be taken into account while adopting strategies for economic growth.

According to the study's findings, the government should work more to improve the health sector because doing so will eventually help Bangladesh's unemployment rate decline. For the purpose of promoting good diet, personal cleanliness, and sanitation, the government can set up a number of programs. The government should make sure that these hospitals offer appropriate care in addition to increasing the number of hospitals. The government may concentrate on career-oriented education, technical education, and vocational training in addition to general education in order to link education with employment, as the study showed no discernible relationship between educational spending and the unemployment rate. In addition, because there are few jobs available, the government can offer incentives to encourage the educated youth labor population to engage in self-employment and entrepreneurship. The study's conclusions indicate that Bangladesh's long-term jobless rate is also lowered by the country's economic growth rate. Policies pertaining to employment creation should be given priority while adopting measures for economic growth.

The finding creates opportunities for additional study in this area. Future studies could look at total enrollment in primary, secondary, and tertiary education, government funding allocated to general and vocational education, and the number of government-provided training programs to see more clearly whether any of the factors influencing education can lower unemployment in Bangladesh. In addition, a future study might examine the number of hospitals, community clinics, and life expectancies to see which of these factors contributes the most over time to lowering the jobless rate. Future research should employ a large data collection to see long-term effective benefits.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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