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Military Expenditure and Unemployment Nexus in Bangladesh

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Research article

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Abstract

The purpose of this study is to investigate the impact of military expenditure on unemployment in Bangladesh, examining the cointegration among unemployment, military expenditure, and foreign direct investment. It also sheds light on the short and long run dynamics of the variables under consideration. The study employs the ARDL bounds testing approach to investigate the cointegration among the variables using time series annual data from the period of 1990-2018. The dependant variable is unemployment and military expenditure and FDI are the independent variables. This research found a long run relationship among the variables. An increase in military expenditure significantly reduces unemployment in the short run, however, no significant long-run relationship is found. The higher FDI, the higher unemployment in the long run. This study contributes to fill the research gap regarding the impact of military expenditure and FDI on unemployment. To the best of our knowledge, this is the first study to examine the relationship among unemployment, military expenditure and FDI in Bangladesh using ARDL bounds testing approach with time series annual data.

Keywords: Unemployment, military expenditure, FDI, ARDL, Bangladesh.

JEL Classification: A10, E00, E24

El nexo entre gasto military desempleo en Bangladesh

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Resumen

El propósito de este estudio es investigar el impacto del gasto militar en el desempleo en Bangladesh, investigando la cointegración entre desempleo, gasto militar e inversión extranjera directa (IED). También se busca aclarar las dinámicas de corto y largo plazo de estas variables. El estudio utiliza el enfoque ARDL con prueba de límites para investigar la cointegración entre variables mediante series de tiempo con datos anuales para el periodo 1990-2018. La variable dependiente es el desempleo y las variables independientes son el gasto militar y la IED. La investigación encontró una relación de larga duración entre las variables. Un incrmento en el gasto militar reduce el desempleo significativamente en el corto plazo, sin embargo, no se encontró ninguna relación significativa de largo plazo. A mayor la IED, mayor el desempleo en el largo plazo. Este estudio contribuye a cerrar la brecha en investigación sobre el impacto del gasto militar y la IED en el desempleo. Por lo que sabemos, este es el primer estudio en analizar la relación entre desempleo, gasto militar e IED en Bangladesh mediante ARDL con prueba de límites mediante series de tiempo con datos anuales.

Palabras clave: Desempleo, gasto militar, IED, ARDL, Bangladesh.

INTRODUCTION

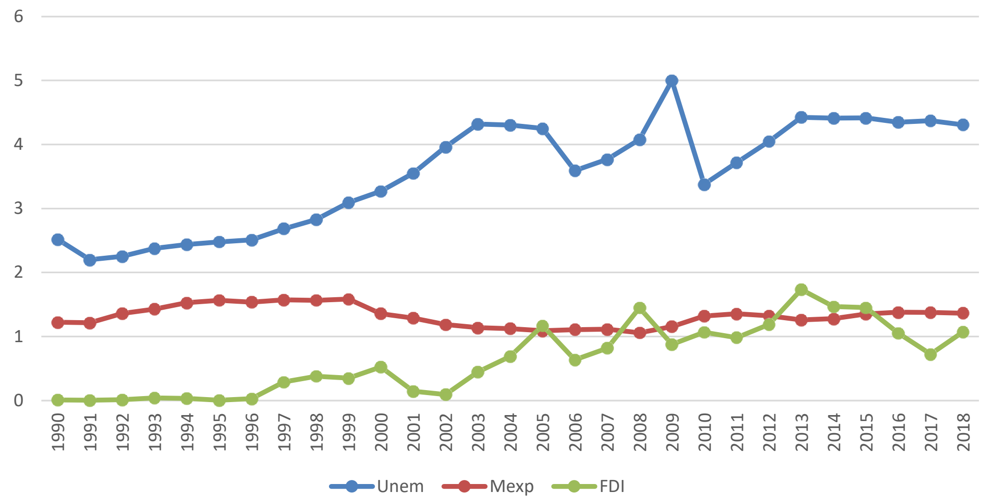
In order to attain maximum social welfare, every government tries to achieve full employment using all of its resources optimally available to it. At the prevailing wage structure, when labor supply exceeds labor demand unemployment occurs. In other words, when the skilled and qualified individuals do not find suitable jobs at the existing wage rate in the competitive market, although they are mentally ready to work, these job seekers are said to be unemployed. There are many determinants of unemployment; however, the present study is conducted to examine the impact of military expenditure on unemployment in Bangladesh using FDI as a control variable. Due to excessive military spending, many socio-economic problems may arise, including unemployment, inequality, and poverty (Anwar, 2017; Henderson, 1998). In this context, the classical and Keynesian schools of thought have different views on achieving full employment. The classical economists rely on the perception that in the system of laissez-faire, full employment will be achieved, meaning that without the intervention of the government the market forces take care of the whole economy while the government is concerned about only the law-and-order situation. On the other hand, Keynes argued that spending by the government is required to achieve full employment. Therefore, Keynes criticized the classical arguments that the economy unavoidably tends towards full employment, and instead advocated total expenditure as an influential factor to achieve full employment at which the role of the government cannot be ignored (Hoover, 1995).

Although different studies on the military expenditure-unemployment relationship have been conducted, comparatively fewer focus on the causal link using FDI as control variable. According to the Keynesian school of thought, output is affected through shifts in aggregate demand by militarily expenditure. Hence, the relationship between military expenditure and unemployment may be positive or negative. This study tries to find the causal relationship between military expenditure and unemployment applying ARDL bounds testing approach. Some previous studies such as Satya (1996) and Tang et al. (2009) showed that different countries have different causality direction between military expenditure and unemployment. So, the relationship of the variables of interest may be country specific and thus it is necessary to investigate the nature of the relationship in the case of Bangladesh.

In the last few decades, average military annual expenditure in Bangladesh is USD$ 1,324.37 million from 1973 until 2018. The highest of all time is USD$ 3,822 million in 2018, with a record low of USD$184 million in 1973. The defence budget for the fiscal year 2019-2020 increased slightly compared to the previous fiscal year. The size of the military expenditure for the fiscal year 2019-2020 is USD$ 3,870 million which is 8.3% of the total national budget and about 1.5% of the GDP (World Bank Indicator, 2019). The trends of unemployment, military expenditure and foreign direct investment are graphically presented in Figure 1.

Figure 1.

Unemployment, Military Expenditure, and Foreign Direct Investment Trend



Source: World Bank (2019).

Unemployment which is measured as percentage of total labor force was highest in 2009 and lowest in 1991. From 2013 to 2018, Bangladesh experienced small fluctuations. Military expenditure, measured as the percentage of GDP, had the lowest value in 2008 and the highest in 1999. Foreign Direct Investment (FDI), measured as the net inflows expressed as a percentage of GDP, reached its highest level in 2013 and its lowest in 1991.

The yearly rate of unemployment is available from 1990 to 2019. The average rate is 3.89%. In 2019, the population of Bangladesh reached 165.55 million.

Military Expenditure (as percentage of the GDP) was reported at 1.365 % in 2018. This records a decrease from the previous number of 1.375 % for 2017. The data reached an all-time high of 1.585 % in 1999 and a record low of 0.604 % in 1974.

This variation depends on the importance the government assigns to this matter each year. This study wants to answer the following research questions:

- What is the impact of military expenditure and FDI on unemployment in Bangladesh?
- How does military expenditure influence unemployment in the short and long run?

This study examines the impact of military expenditure on unemployment in Bangladesh and based on its findings proposes some recommendations. To the best of our knowledge, this is the first study in Bangladesh applying the ARDL bounds testing approach with times series data for the period 1990 to 2018.

Literature Review

The existing literature showed that there are many factors that cause unemployment. Numerous previous studies have examined the factors contributing to unemployment, however empirical studies on the impact of military expenditure on unemployment in the context of Bangladesh are still rare. In the existing literature, there is no consensus on the relationship between military expenditure and unemployment. While some studies have suggested that military expenditure leads to increased unemployment, other have found either a positive association or no significant relationship between them. For example, Chester (1978) conducted a study on the effect of military expenditure on unemployment rates for eight OECD countries. He applied regression analysis to cross sectional data and failed to find any meaningful effect of defence spending on unemployment rates. However, Tang et al. (2009) found that causality running from military expenditure to unemployment was statistically significant for low income and non-OECD countries when military expenditure was measured by military burden. Besides, it was statistically insignificant when measured by per capita expenditure for 23 OECD and 23 non-OECD countries from 1988 to 2004. In addition, Kollias et al. found that the increase in the USA's military expenditure led to a rise in the level of unemployment. The evidence, which was supported by quantile regression with disaggregated data from 1948 to 2017 was applicable across all unemployed persons (Kollias et al., 2020).

Furthermore, Ahmad (2013) investigated the association between oil prices, real interest rates and unemployment for Pakistan, using monthly data for the period between January 1991 and December 2010 and found a significant effect of oil prices on unemployment but no significant connection between real interest rates and unemployment. A study on G7 countries found unidirectional causality from military expenditure to unemployment for Japan, USA, and Canada, and from unemployment to defence expenditure for Germany and France. On the contrary, a bidirectional Granger causality was found for Italy and UK (Zhong et al., 2015).

Table 1.

Summary of Literature Review

Study	Findings
Satya (1996)	Different countries have different causality direction between military expenditure and unemployment.
Chester (1978)	Applied the regression analysis on cross sectional data that failed to find any meaningful effect of defense expending on unemployment rates.
Tang et al. (2009)	The causality running from military expenditure to unemployment was statistically significant for low income and non-OECD countries
Ahmad (2013)	Found a close positive linkage between FDI and employment during 1980-2008 in Tanzania.
Dunne & Smith (1990)	Military spending does not show a significant effect on the unemployment rate using sample dynamic reduced form regression analysis for the US and the UK, and pooled post-war data for 11 OECD countries.
Zeb, Qiang & Sharif (2014)	FDI, inflation and population growth are the main determinants of unemployment for Pakistan during 1991-2008.
Arouri et al. (2014)	This study found causality and linkage among military expenditure, crude oil export, and crude oil prices by the panel Granger causality, from 1980 to 2016 for seven OPEC countries.
Bakirtas & Akpolat (2020)	This 18 countries study examined the relationship between defence spending and unemployment during 1991-2018, by using Bootstrap Panel Causality.
Özşahin & Üçler (2021)	Unidirectional causality from military expenditure to employment was found for 5 out of 18 countries, while for 3 other counties it found causality from employment to defence spending.
Chowdhury & Hossain, (2014)	Inflation has positive impacts on unemployment, while GDP and exchange rates have negative impacts. The study used the ordinary least squares method for Bangladesh during 2000 to 2011.
Malizard (2014)	This paper analysed the impact of GDP, defence and non-defence spending on unemployment using ARDL approach. It found a negative impact on unemployment for France during 1975-2008.
Brincikova & Darmo (2014)	The authors found no significant effect of FDI inflows on employment. However, GDP had a positive effect in Slovak Republic, the Czech Republic, Hungary, and Poland during 1993-2012.
Hooker & Knetter (1994)	Positive association between unemployment and real military contracts per capita in US using OLS quintiles approach during 1963-1992.

Mpanju (2012) found a close positive linkage between FDI and employment 1980-2008 in Tanzania. According to Dunne and Smith (1990), military spending does not show a significant effect on the unemployment rate using sample dynamic reduced form regression analysis for the US and the UK, and pooled post-war data for 11 OECD countries. Zeb et al. (2014) showed that FDI, inflation and population growth are the main factors of unemployment for Pakistan during 1991-2008. Another research with panel DOLS investigated the short and long run relationship between military expenditure and unemployment rate in South Asian Association for Regional Cooperation (SAARC) countries. In fact, it has been found that military expenditure contributed to increase the level of employment. Additionally, energy consumption, GDP per capita and incoming FDI substantially reduced unemployment rate. In the short run, the unemployment was negatively influenced by energy consumption, GDP per capita and population growth, while no relationship was found in the case military expenditure with other factors. However, no long-run causality between variables was found (Azam et al., 2016).

Arouri et al. (2014) concluded that employment and energy consumption were closely linked in 16 African countries during 1991-2010. The result also indicates bidirectional causality for Algeria, Benin, Kenya, Mozambique and Tanzania. Similarly, the study found unidirectional causality running from energy consumption to employment in the Democratic Republic of Congo and Egypt. But there was no empirical evidence of causality in South Africa, Nigeria, Morocco, Ghana, and Senegal. A similar study investigated the causality and linkage among military expenditure, crude oil export, and crude oil prices by the panel Granger causality, from 1980 to 2016 for seven OPEC countries. It reflected the granger causality from crude oil export and crude oil prices to military expenditure, from crude oil export and military expenditure to crude oil prices, and from military expenditures and crude oil prices to crude oil exports, according to the trivariate analysis (Bakirtas & Akpolat, 2020). A study on G7 countries found on the one hand, unidirectional causality from military expenditure to unemployment for Japan, USA, and Canada and, on the other hand, from unemployment to defence expenditure for Germany and France. On the contrary, a bidirectional Granger causality was found for Italy and UK (Zhong et al., 2015). Similarly, by using Bootstrap Panel Causality, another study on 18 countries examined the relationship between defence spending and unemployment during 1991-2018. A unidirectional causality from military expenditure to employment was found for 5 out of 18 countries, while for 3 other countries the causality ran from employment to defence spending (Özşahin & Üçler, 2021).

Some studies have found that military spending has a reverse impact on employment. Chowdhury (2014) suggests that inflation has a positive impact on unemployment, while GDP and the exchange rate have negative impacts, using an ordinary least squares method for Bangladesh during 2000 to 2011. Malizard (2014) examined the impact of GDP, defence and non-defence spending on unemployment using an ARDL approach and found a negative impact on unemployment for France during 1975-2008. Brincikova and Darmo (2014) found no significant effect of FDI inflows on employment, but a positive effect for GDP in the Slovak Republic, the Czech Republic, Hungary, and Poland during 1993-2012. Trade liberalization also increased economic growth (Siddika & Ahmad, 2022), indirectly by promoting employment. Maqbool et al. (2013) found population, FDI, GDP, and inflation as main determinants of unemployment, excluding external debt, using ARDL model for the period of 1976 to 2012 in Pakistan. According to George & Oseni (2012), inadequate and unstable power supply was the main cause of unemployment in Nigeria during 1970-2005. Eita & Ashipala (2010) concluded that inflation and investment had a negative impact on unemployment in Namibia during 1971-2007 using an Error Correction model. Hooker & Knetter (1994) found a positive association between unemployment and real military contracts per capita in US during 1963-1992 using an OLS quintiles approach.

In view of the above review, it appears that, on the one hand, the existing literature is scant, and on the other hand, no notable study has thus far dealt with the Bangladesh case. Besides, the existing literature provides conflicting results. Also, there are some methodological issues. This study attempts to address the shortcomings of the literature by explicitly examining the impact of military expenditure on unemployment in Bangladesh applying the ARDL bounds testing approach.

Theoretical Framework

There is no general agreement on how and in what respects military expenditure affects economic growth. The relationship between economic growth and job creation is a matter of debate among economists. This is another important issue related to the effects of military expenditure on employment. There are alternative views on the employment effects of military expenditure. Conservatives argue, for example, that the growth of military expenditure would create more jobs because it creates employment either directly or indirectly. On the other hand, liberals argue that militarily expenditure is often associated with waste, inefficiency, procurement fraud, crowding out of the private sector, and trade-offs with social spending. Therefore, they contend that increasing military expenditure can lead to job cuts. The radical approach states that large scale military spending helps recover the economy out of depressions. The defence-led economic growth leads to an increase in aggregate demand if the share of personnel and maintenance of a large army make up the majority of defence expenditures that may create employment. Moreover, it is expected that the relationship of military spending and employment may differ depending on whether a country produces or imports arms.

Also, there are several channels through which military expenditure may affect employment. The first one is productivity improving effects. Increased military spending may improve labor productivity through technology spillovers from the military to the private, for example, when building of military infrastructure also benefits civilians. Another channel is the tax distortion effects. To finance in military spending, an increase in taxes may be necessary. As a result of the tax burden labor demand is reduced. Furthermore, if the government is inefficient or corrupt, such tax burden may be quite substantial. Additionally, there may be 'reallocation effects. The building of military infrastructure may induce workers to move from the military to the private sector. This reallocation may not be smooth, and this leads frictional unemployment.

These views are reflected by the CES (Constant Elasticity of Substitution) production function.

$$Y = [\alpha L^{\rho} + (1-\alpha)K^{\rho}]^{1/\rho}$$

Where Y indicates output, L represents the quantity of labor, and K the quantity of capital. α is the distribution of the parameter when ρ is the substitution parameter. In this case, $0<\alpha<1$, $-\infty \leq \rho \leq 1$

With the first order partial derivative of labor, the marginal product of labor is

$$MPL=\alpha L\rho\text{-}1\ Y^{1-\rho}$$

Rearranging the marginal product of labor to real wage (w/p) yields

$$A\ (Y/L)^{1-\rho} = w/p$$

After rearranging,

$$\log L = A - (1/1\text{-}^{\rho}) \log w/p + \log y$$

Where A denotes the time trend, which can be added allow for Hicks-Neutral technical progress to obtain the following estimating equation.

$$\log L = \alpha_0 + \alpha_1 \log (w/p) + \alpha_2 \log Y + \alpha_3 t$$

It is assumed, a priori, that there would be a negative nexus between real wage and employment, but a positive relationship between employment and output. Furthermore, it is considered generally that technical progress would be the existence of labor savings. In this regard, to analyze the relationship between military expenditure and employment, it is assumed that military expenditure is a fraction of the income. So,

$$M = kY$$

Where M is the military expenditure and k denotes a constant such as $0<k<1$.

Substituting the equation into labor demand:

$$\log L = ß_0 + ß_1 \log (w/p) + ß_2 \log M + ß_3 t$$

According to this equation, positive military expenditure would increase economic growth. As a result, employment would be enhanced. Conversely, negative effects could arise from the wastage of resources in an inefficient sector or from a high military expenditure to capital-intensive ratio that would reduce labor. Finally, taking positive or negative effects into account we may conclude that there is no clear-cut forecast about how unemployment should respond to changes in military expenditure (Chester, 1978).

DATA AND METHODOLOGY

Data

The data for this study were collected from various sources, primarily from the World Development Indicators (World Bank, 2019) and Bangladesh Bank. The data consists of a yearly time series from 1990 to 2018.

The dependent variable of this study is unemployment, while the main independent variable is military expenditure. Foreign direct investment (FDI) is used as a control variable.

Unemployment is measured as a percentage of total labor force, military expenditure is measured as percentage of GDP and foreign direct investment (FDI) is measured as net inflows as percentage of GDP.

Empirical Strategies

Stationarity Tests

When a study is conducted with time series data, it's necessary to check whether the data is stationary or not. A given random variable y_t is said to be stationary[1] when its moments are time invariant. In other words,

i. Its expected value or mean is constant over time i.e. $E(y_t) = u$

ii. Its variance is constant over time i.e. $Var\ (y_t) = \delta^2$

iii. The value of covariance between two time periods depends only on the distance between them and not on the actual time at which the covariance is computed (t) i.e. $Cov\ (y_t, y_{t+h}) = \delta_h^2$

A variable is said to be integrated of order zero if it is level stationary, symbolically denoted as $y_t \sim I\ (0)$.

A variable which becomes stationary after first differencing, $\Delta y_t = y_t - y_{t-1}$, it is referred to as integrated of order one, I (1). In the same fashion, a variable that becomes stationary after the second difference is denoted as I (2).

Most economic variables in practice are not stationary in level. Regressing one non-stationary time series on another non-stationary time series can result in spurious relationships, as first observed by Yule (1926). This type of regression often yields a high R^2 and significant relationship even if there is no meaningful relationship between the variables. Problem of serial correlation can also arise from non-stationary time series. There are many ways to check the stationarity of a given time series. The standard approach is the unit root test. Several methods have been developed to perform the unit root test. The Augmented Dickey-Fuller test (ADF) (Dickey & Fuller, 1979) is used widely. The Phillips-Perron (PP) unit root test, named after Peter C. B. Phillips and Pierre Perron, is an alternative to the ADF.

1 This type of stationarity known as covariance or weak stationarity. In a strict stationary process, all moments of the variables are time invariant. A weak stationary process is said to be a strict stationary if the stationary process is normally distributed.

Kwiatkowski-Phillips-Schmidt-Shin (KPSS) is another alternative method to test stationarity based on the null hypothesis of stationarity. We use the ADF test in this study.

This process can be written as follows:

$$\Delta y_t = \beta_1 + \beta_2 t + \delta\, y_{t-1} + \sum_{i=1}^{m} \alpha_i\, \Delta y_{t-i} + \varepsilon_t \qquad [1]$$

Where, ε_t is a pure white noise error term, t is the time or trend variable and $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$, $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$, etc.

The hypotheses are:

Null hypothesis, H_0: $\delta = 0$ (There is a unit root or the series is non-stationary)
Alternative hypothesis, H_A: $\delta < 0$ (the time series is stationary)[2]

Choosing the optimal lag m is crucial as it can significantly impact the model. Some well-established criteria such as the Akaike Information Criterion (AIC) and the Schwarz Information Criterion are used to determine the lag length m.

ARDL Bounds Testing Approach

To examine the impact of military expenditure on unemployment in Bangladesh the Autoregressive Distributed Lag (ARDL) bounds testing approach was used. The ARDL modelling approach was originally introduced and developed by Pesaran and Shin (1998) and later extended by Pesaran et al. (2001) which doesn't require the variables to be integrated in the same order. This method is based on the estimation of an Unrestricted Error Correction Model (UECM) which has the following advantages over traditional statistical methods of cointegration for the assessment of long/short-run relationships.

i. The ARDL method can be applied to small sample sizes (Pesaran et al., 2001) and therefore it will be appropriate for the present study.

ii. The short and long-run dynamics of the model can be estimated simultaneously, removing problems associated with autocorrelation and omitted variables.

2 For stationarity ρ must be less than one because $\delta = (\rho - 1)$. For this to happen δ must be negative.

iii. ARDL can be used to examine the level of relationship for variables that are either I(0) or I(1) as well as for a mix of I(0) and I(1) as opposed to conventional methods such as Johansen's tests (Johansen, 1991), the Granger/ Engle causality test (Engle & Granger, 1987) and Vector Autoregression (VAR). However, ARDL doesn't work with variables integrated of order 2, I(2).

iv. The short-run as well as long-run parameters of the model can be estimated separately.

v.ARDL allows for the determination of different lags for each variable in the model, unlike other cointegration tests, which makes the model more flexible (Pesaran et al., 2001).
Due to the above advantages and as none of the series are I (2), we employed the ARDL approach to examine the short-run and long-run relationship among the variables in question.

The ARDL bounds testing approach involves the following steps:

First, conventional testing methods such as ADF and PP are used to check the order of integration of the variables. The bound testing approach can be applied with I(1) and/or I(0) variables. However, it is necessary to check that none of the time series are I(2) as the method doesn't work with I(2) variables.

Second, the formulation of the following Unrestricted Error Correction Model (UECM) with the variables of present study.

$$\Delta UNEM_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta UNEM_{t-i} + \sum_{j=0}^{q_1} \phi_j \Delta MEXP_{t-j} + \sum_{k=0}^{q_2} \varphi_k \Delta FDI_{t-k} + \delta_0 UNEM_{t-1} + \delta_1 MEXP_{t-1} + \delta_2 FDI_{t-1} + \varepsilon_t \quad [2]$$

Where UNEM, MEXP and FDI are unemployment, military expenditure, and foreign direct investment respectively; Δ denotes a first difference operator; β_0 is an intercept and ε_t is a white noise error term.

Third, determining the appropriate lag structure, we estimate the model specified in Equation (2) above.

Fourth, one of the key assumptions of ARDL bound testing is that the errors of Equation (2) must be serially independent. Therefore, we use the LM test to check for the serial correlation of the errors after estimating the suitable version of Equation (2).

Fifth, this step involves checking the dynamic stability of the ARDL model before proceeding with the bound testing approach. All inverse roots of the characteristic equation associated with our model lie strictly inside the unit circle.

Sixth, we perform the F-test or Wald test to find evidence of a long-run relationship among the variable under the null hypothesis, H_0: $\delta_0 = \delta_1 = \delta_2 = 0$, against the alternative that H_0 is not true. However, the asymptotic distributions of the test (F-test) statistics are non-standard. Thus, we can't use the exact critical values from the standard F distribution. However, Pesaran et al. (2001) supply bounds on the critical values for the asymototic distribution of the F-statistic. The upper bound is constructed under the situation when all the variables are I (1), and the lower bound when they are all purely I (0). If the computed F-statistic falls below the lower bound we would conclude that the variables are I (0), which indicates that no cointegration is possible. If the calculated F-test statistic exceeds the upper critical bound, we conclude that we have cointegration. However, the results will be inconclusive if the F-test statistics falls between the upper and lower critical bounds.

Seventh, if the bound test leads to conclude that cointegration is possible, we can estimate the long-run equilibrium relationship among the variables:

$$UNEM_t = \alpha_0 + \alpha_1 MEXP_t + \alpha_2 FDI_t + v_t \qquad [3]$$

From Equation (3) we can construct the residual series, ECT_t, and as well as the restricted ECM:

$$\begin{aligned}\Delta UNEM_t = \beta_0 & \\ & + \sum_{i=1}^{p} \beta_i \Delta UNEM_{t-i} \\ & + \sum_{j=0}^{q_1} \phi_j \Delta MEXP_{t-j} + \sum_{k=0}^{q_2} \varphi_k \Delta FDI_{t-k} + \eta ECT_{t-1} + \varepsilon_t \qquad [4]\end{aligned}$$

Where, $ECT_{t-1} = (UNEM_{t-1} - a_0 - a_1MEXP_{t-1} - a_2FDI_{t-1})$ and a's are the OLS estimates of the α's in Equation (3).

Finally, we measure the long run effects from the unrestricted ECM; from Equation (2), the long run coefficients for MEXP and FDI can be obtained. We also conclude the short run dynamics and form the final restricted ECM specified in Equation (4).

EMPIRICAL RESULTS

Data Description

This part presents the statistical description of three variables: unemployment, military expenditure, and foreign direct investment. A detailed description of the raw data set is provided in the form of descriptive statistics in Table 2. The time series data consists of 29 observations spanning from 1990 to 2018. The table displays the observation's mean value, standard deviation, maximum value, minimum value, and corresponding probability value of Jarque-Bera.

Table 2.

Descriptive Statistics of Regression Variables

	UNEM	MEXP	FDI
Mean	3.573256	1.319932	0.664877
Median	3.743000	1.337695	0.662565
Maximum	5.000000	1.584834	1.735419
Minimum	2.200000	1.059530	0.004491
Std. Dev.	0.834515	0.158375	0.537796
Skewness	-0.309411	0.141465	0.234690
Kurtosis	1.704716	2.029524	1.805489
Jarque-Bera	2.575877	1.277340	2.058967
Probability	0.275839	0.527994	0.357191
Sum	107.1977	39.59796	19.94632
Sum Sq. Dev.	20.19602	0.727394	8.387524
Observations	29	29	29

Source: Authors' calculation and data from the World Bank database. Note: All data are in percentage form.

Results of Stationary Tests

We use the Augmented Dickey Fuller (ADF) unit root test to examine whether the time series variables are stationary or not. The results are presented in Table 3.

Table 3.

Results of ADF Unit Root Test

Variables	Level		First Difference		Decision
	Intercept	Inter. + Trend	Intercept	Inter. + Trend	
Unem	-1.49285	-2.877377	-6.617664***	-4.891807***	I(1)
Mexp	-1.97427	-1.422651	-3.395198**	-3.335536*	I(1)
FDI	-1.65052	-3.230466*	-4.681951***	-4.914163***	I(1)

Note: The critical values for ADF tests with constant (c) and with constant & trend (C&T) at 1%, 5% and 10% levels of significance are -3.699871, -2.976263, -2.627420, respectively.

Source: Author's calculation.

Based on the Equation (1), three specifications of ADF models can be possible. These are:

i. A model with intercept (β_1) and but without trend ($\beta_2 t$).

ii. A model with both intercept (β_1) and trend ($\beta_2 t$).

iii. A model without intercept (β_1) and trend ($\beta_2 t$).

However, Model (iii) is not relevant in this case as all the variables in descriptive statistics have deterministic components. Besides, most of the researchers prefer the first two models. Before running the model, it is necessary to determine the optimal lag length. Fortunately, the optimal lag is selected automatically by EViews for a given selection criteria such as AIC, SC etc.

From Table 2 clearly shows that the variables used in this study are stationary after first differencing. In other words, the variables are integrated of order 1, I (1). None of the variables are integrated at I (2) which means that the ARDL bounds testing approach can be applied and we can proceed with the calculations.

Estimation Results of ARDL Model

As the variables under consideration are not integrated of order 2, I(2) or above and the size of the samples are small, the most appropriate method is the ARDL model. We used EViews 9 to estimate the model, with UENM (Unemployment) as the dependant variable, and MEXP (Military Expenditure) and FDI (Foreign Direct Investment) as independent variables or dynamic regressors. As our data series is annual, we set two (2) as the maximum lag length to account for all possible lag effects. The optimal lag length is selected based on Akaike Information Criterion (AIC). EViews 9 selects the best model automatically with lower AIC value. After evaluating 18 models, the final model is found to be ARDL (1, 2, 1). The result of the estimated model is given in Table 4.

Table 4.

Results of the ARDL Model Estimation

Variables	Coefficient	t-Statistic	Prob.
D(MEXP)	-1.905213	-2.097941	0.0488
D(MEXP (-1))	-1.412930	-1.351260	0.1917
D(FDI)	0.151936	0.569139	0.5756
C	2.754835	2.525953	0.0201
UNEM(-1)	-0.585679	-3.702052	0.0014
MEXP(-1)	-0.730123	-1.249154	0.2260
FDI (-1)	0.589149	2.582904	0.0178
R-squared	0.509697		
Adj. R-squared	0.362606		
D-W stat	2.260213		
Prob (F-statistic)	0.016367		

Source: Dependent variable: D(UNEM)

Model Checking and Diagnostic Analysis

Serial Correlation Test

It is imperative to check for serial correlation and model stability if we want to proceed with the ARDL model estimation. When the residuals are correlated there is serial correlation and the estimates will be biased and inconsistent. The Breusch-Godfrey or Langrage Multiplier (LM) test is applied in this study to test serial correlation. The LM test assumes a null hypothesis of no serial correlation. Table 5 shows the results of LM test. The the p-value of the LM statistic assigns a probability of rejecting null hypothesis of about 58%. It means that we cannot reject the null hypothesis of no serial correlation. Thus, the model is free from serial correlation problem.

Table 5.

Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-Statistic	0.562881	Prob. F (2,18)	0.5793
Obs*R-squared	1.589247	Prob. Chi-Square (2)	0.4518

To further test that the residuals are serially independent we also apply the correlogram Q-statistic. Though the p-value is approximate, the results strongly suggest that there is no autocorrelation. The results are shown in Table 6.

Table 6.

Correlogram of Residuals

Date: 06/27/20 Time: 15:38
Sample: 1990 2018
Included observations: 27
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.151	-0.151	0.6857	0.408
		2	-0.060	-0.085	0.7987	0.671
		3	-0.456	-0.493	7.5858	0.055
		4	0.169	-0.012	8.5626	0.073
		5	0.000	-0.098	8.5626	0.128
		6	0.157	-0.079	9.4760	0.149
		7	-0.095	-0.012	9.8305	0.198
		8	0.047	0.013	9.9203	0.271
		9	0.090	0.208	10.271	0.329
		10	0.066	0.139	10.472	0.400
		11	-0.278	-0.219	14.249	0.220
		12	-0.102	-0.081	14.791	0.253

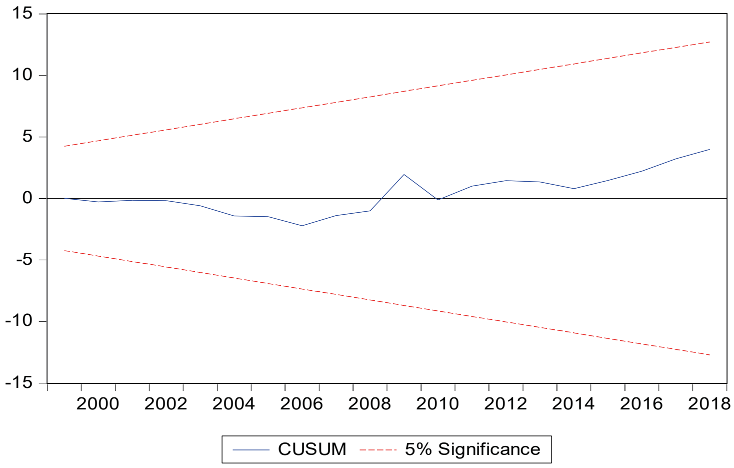
*Probabilities may not be valid for this equation specification.

Stability Test

When the parameters remain constant over time there is stability. The CUSUM and CUSUM of square test is used to evaluate the stability of the model on the recursive residuals. While the CUSUM test detects the systemic changes from the coefficients of regression, the CUSUM of square test identifies sudden changes from the constancy of regression coefficients. The results of both tests are shown in Figures 2 and 3. The results reveal that the statistics of both tests lie within the red lines at a 5% confidence interval. Therefore, we can conclude that the model is stable.

Figure 2.

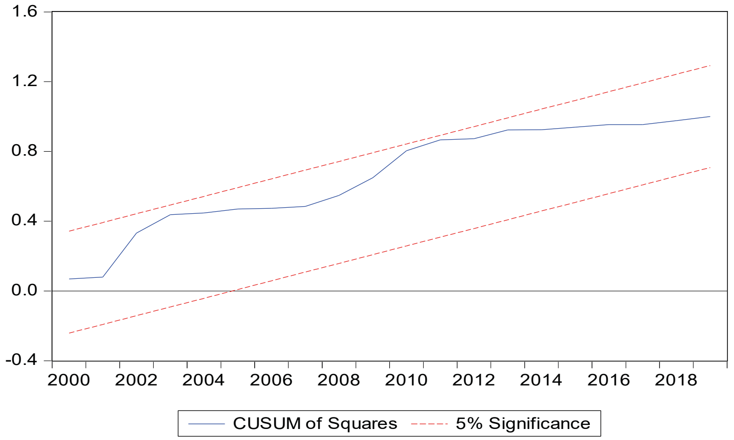
Plot of cumulative sum of recursive residuals. The straight lines represent critical bounds at 5% significance level



Source: Authors.

Figure 3.

Plot of cumulative sum of squares of recursive residuals. The straight lines represent critical bounds at 5% significance level



Normality Test

If the residual distribution is not normal, then the estimated coefficients may appear significant but the inference may not be valid. The null hypothesis of this test is that the residual series is normally distributed, and the alternative hypothesis is that the residual series is not normally distributed. The results of the normality test for the residuals of the ARDL model are presented in Table 7. The appropriate test statistic of the normality test is the Jarque-Bera (JB) test statistic.

Table 7.

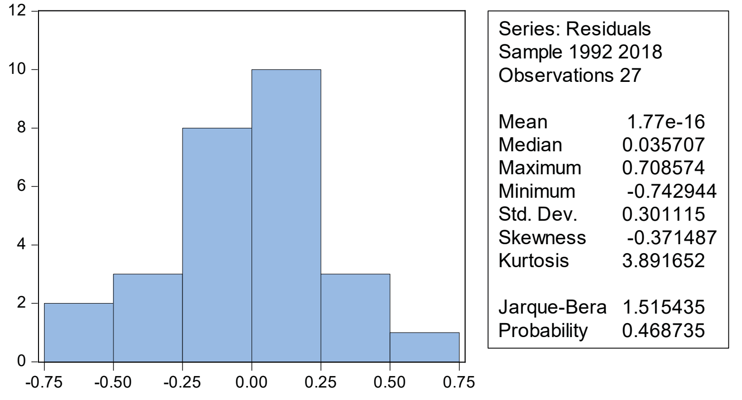
Result of the Normality Test

Normality Test: Jarque-Bera	
Jarque-Bera	1.515435
Probability	0.468735

The null hypothesis cannot be rejected if the value of the Jarque-Bera statistic is greater than 5%. Otherwise, the null hypothesis would be rejected. In our case, the null hypothesis cannot be rejected at 5% level of significance according to the Jarque-Bera statistic. So, the residuals of ARDL model are normally distributed over the study period. This confirms the validity of the ARDL model. The figure of Normality test is presented in the figure 4.

Figure 4.

Normality Test



Cointegration Analysis: Bounds Testing Approach

The bounds testing approach is based on F-statistics and two critical values: the I (0) and I (1) bounds. The variables are considered cointegrated if the F-statistic is greater than the I (1) bound. On the other hand, if the F-statistic is less than I (0) bound, the variables are not cointegrated. The result will be inconclusive if it falls between the two bounds. From Table 8 it can be seen that the variables are cointegrated at 10% level of significance, indicating that there is a long run relationship among variables.

Table 8.

Critical Values Generated by Pesaran et al. (2001)

Significance level	Lower bound	Upper bound	F-Statistic
1%	5.15	6.36	4.712033
2.5%	4.41	5.52	
5%	3.79	4.85	
10%	3.17	4.14	

Analysis of Long-run Dynamics

As indicated above there is a long run relationship among the variables under consideration. Table 9 reveals that FDI influences unemployment positively and is statistically significant. On the other hand, military expenditure has a negative but insignificant impact on unemployment. Specifically, in the long-run, a one percent point increase in FDI leads to a 1.006 percent point increase in unemployment.

Table 9.

Long-Run Coefficients

Variables	Coefficient	t-Statistic	Prob.
C	4.703661	3.637569	0.0016
MEXP	-1.246626	-1.379000	0.1831
FDI	1.005924	3.852923	0.0010

Dependent variable: UNEM

Cointegrating Equation: UNEM= 4.7037-1.2466*MEXP + 1.0059*FDI

Analysis of Short-run Dynamics

It is evident from Table 10 that military expenditure negatively affects unemployment, and it is found to be statistically significant. FDI, on the other hand, has a positive but insignificant impact on unemployment. This means that FDI is completely ineffective to reduce unemployment in the short run. In the short-run, one percent point increase in the change in military expenditure leads to a 1.91 percent point decrease in unemployment.

Table 10.

Short-Run Coefficients

Variables	Coefficient	t-Statistic	Prob.
D (MEXP)	-1.905213	-2.097941	0.0488
D (FDI)	0.151936	0.569139	0.5756
ECT (-1)	-0.585679	-3.702052	0.0014

Dependent variable: *D(UNEM)*

Speed of Adjustment

To find the coefficient of error correction term, first we derive the residuals from the long run model by running OLS. Using the residual series, we estimate a restricted error correction model. The coefficient of the error correction term is negative as expected and statistically significant, which confirms the valid cointegration among the variables of interest. The coefficient of the error term is -0.585679. It suggests that about 59% of the disequilibrium in unemployment of the previous year's shock adjust back to the long-run equilibrium in the current year.

Discussion

The empirical result of the ARDL bound test shed light on the long- and short-term relationship between military expenditure and unemployment in Bangladesh. The results reveal a short-run relationship between unemployment and military expenditure, but a long-run nexus between FDI and unemployment. Specifically, an increase in military expenditure reduces unemployment in the short run, but in the long run, the relationship is insignificant. These findings suggest that military expenditure is not conducive to increased employment in the long run. In general, defence spending occurs in non-productive sectors that generate fewer employment opportunities. This result is consistent with the study on SAARC countries (Azam et al., 2016), because these are neighbouring countries of Bangladesh and share common economic and social values. Similarly, the impact of military expenditure on economic growth in India has been found to be negative in the long run, while it shows only a positive effect in the short run (Aijaz Syed, 2021). The result indicates a symmetric effect in the short run, but an asymmetric output in the long run, suggesting that military spending does not promote sustainable development in the economy or employment growth in the long run. This result is supported by a similar study on the same group of countries (Raju & Ahmed, 2019). On the other hand, the study found that FDI has a positive impact on employment in Bangladesh, both in short-run and long-run. However, it found an insignificant impact on unemployment in the short run.

CONCLUSIONS

This study has examined empirically the impact of military spending on unemployment in Bangladesh using annual time series data from 1990 to 2018. FDI was used as a control variable. The variables selected for this study were I (1) or, in other words, non-stationary variables at levels and achieved stationarity only after first differencing. The autoregressive distributed lag (ARDL) bounds testing procedure was employed to investigate the long-run association among unemployment, military expenditure, and foreign direct investment. The ARDL bounds testing approach confirmed the existence of a long-run relationship among unemployment, military expenditure and FDI. The results indicate that an increase in military expenditure significantly reduces unemployment in the short run, while FDI has a positive but insignificant impact on unemployment in the case of Bangladesh. In the long run, the rise in military expenditure does not reflect any significant positive impact on employment, whereas FDI has positive significant impact on unemployment.

The empirical results of the study are theoretically and statistically acceptable and have policy implications. The study finds that increased military spending tends to reduce unemployment in the short run. Policymakers should consider this benefit when deciding to allocate resources for defence. The government should create an investment friendly environment to attract more FDI and make the existing infrastructure and system more conducive to the utilization of FDI for productive and developing purposes. The policymakers of Bangladesh should also devise policies that promote FDI in labor-intensive industries instead of capital-intensive sectors. Though the study presents comprehensive research with solid econometric methodology, the area of study was limited to Bangladesh. So, it is one of the limitations of this study. Moreover, the study reached its conclusions using data from 1990 to 2018. The policy recommendations may vary with time variations, even though the data duration is sufficient. For future research, we propose a study of the relationship between military expenditure and unemployment using quarterly data and taking more control variables into account.

DECLARATIONS:

Availability of data and material

The authors confirm that the data used for these findings is available in the World Bank database.

Competing interests

On behalf of all authors, I, Muhammad Salah Uddin, as the corresponding author, state that there is no conflict of interest.

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