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Asymmetric Effect of Military Expenditures on Economic Growth in Pakistan: A Nonlinear-ARDL Approach

Li Lanrui [1], Zia Ur Rahman[1], Shoukat Iqbal Khattak[2*], Mohammad Maruf Hasan[3]**

[1]*Researh School for Southeast Asian Studies, Xiamen University*
Siming campus 422, Siming South Road, Xiamen,:Fujian 361005, China
E-mail. 435323578@qq.com, zrahman915@yahoo.com

[2*]*School of Business Administration, Jimei University*
Jimei District, Xiamen, Fujian 361021, China
*E-mail. 201961000012@jmu.edu.cn; *Corresponding author*

[3 **]*School of international studies, Sichuan University*
Chengdu, Sichuan, China- 610065
*E-mail. marufpc@yahoo.com; **Corresponding author*

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The nexus between military expenditure and economic growth has been analyzed using different methods and techniques in the economic growth literature, but most previous findings are indecisive, i.e., non-significant, positive, or negative. The primary purpose of this article was to explain the military expenditure-economic growth nexus in Pakistan by capturing the asymmetrical effects of military expenditures on economic growth using the non-linear autoregressive distribution lag-NARDL technique. Data were analyzed from 1972–2018. The results indicated that a decrease in military spending (adverse shocks) enhanced economic growth in the long term. An increase in military spending (positive shocks) had an insignificant effect on economic growth in Pakistan, suggesting that a focus on cost reduction in military expenditure may benefit economic growth. More so, the Wald test validated the asymmetries both in the long- and short term. Capital formation and labor force, as a control variable, positively affected economic growth in the long run. Based on these findings, the paper offers some critical suggestions for policymakers.

Keywords: *Military Spending; Capital; Economic Growth; NARDL Model; Pakistan.*

Introduction

Academics and politicians have extensively debated the relationship between military spending and economic growth. Yet, the question persists whether [or not] military spending is favorable for economic growth? Previous findings show mixed results, i.e., adverse or insignificant. Military expenditures often account for a significant share of the GDP in some developed and developing economies. For instance, military spending exceeds education and health expenditures in developing countries, e.g., Pakistan and India (Financial Stability Oversight Report, Koc Group, 2018). Since its independence in 1947, the defense budget of Pakistan has represented a significant portion of the total government spending for maintaining a robust military presence, reliable deterrence systems against India, and sustaining its strategic and geopolitical role in Afghanistan's wars and counter-terrorism operations (Anwar, Rafique & Joiya, 2012). Figure 1 depicts the share of military expenditure as a percentage of GDP from 1972 to 2018. From 1988–1992, Pakistan ranked 10th among the top arm-importing countries; at the same time, it was 129th on the Global Poverty Alleviation Index in South Asia (Soherwordi, 2005).

Aizenman and Glick (2006) considered military spending the single and most direct threat to poverty alleviation and economic development. Many experts believe that high military spending undermines developmental projects, production, human lives, and education. In parallel, some studies have shown that military spending has uplifted the GDP growth by creating more jobs, improving infrastructure, and attracting investments in Pakistan (cf. Ali Amjad; Ather, 2014; Waheed, 2017). Aizenman and Glick (2006) explained that military spending could enhance growth if there are threats to a country. Indeed, Pakistan has faced several threats, e.g., terrorism due to spillovers from the US-Afghan War

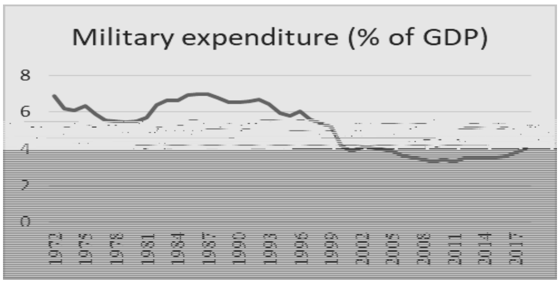

Figure 1. Military expenditure % of GDP. *Source World Bank*

Theoretically, the economic growth literature remains largely deficient in empirical studies that examine the asymmetrical effects of military expenditure on GDP growth (Aizenman & Glick, 2006), especially in the context of Pakistan. As most previous studies have used linear relationship models, it is rational to assume that the negative [or insignificant] effects of military spending on GDP growth in previous findings could have originated from omitted variable biases or nonlinear models. Thus, this study estimated the interaction between military expenditure and GDP growth for Pakistan from 1975–2018 using a nonlinear autoregressive distributed lag (NARDL). This approach allowed for capturing nonlinear interactions between the selected variables through multiple structural break tests.

Literature Review

From a theoretical perspective, defense economics explains how defense expenditures are managed in times of peace and war. It also explains the effect of such spendings on other sectors of the economy. Defense spending is generally seen as an economy's public benefit expenditure (Anwar, Rafique, and Joiya 2012). The complex relationship between military spending and economic growth has been extensively studied across different schools of thought. For instance, proponents of the first school of thought propose that military spending diverts funds away from more effective government functions, such as health and education (Lim, 1983). This perspective follows the classical economic school of thought that considers the military a non-productive sector (Al-Hamdi & Alawin, 2017). The second school of thought believes that the association between military spending and economic growth is bi-directional, where high defense spending leads to increased economic growth and vice versa. The third school persists that no association exists between military spending and economic development (Al-Hamdi and Alawin, 2017). Benoit (1973&1978), however, challenged the classical norms. The author triggered many debates by demonstrating that developing economies have benefited from increased military spending (Al-Hamdi & Alawin 2017).

Since Benoit (1973), several attempts have been made to investigate the influence of military expenses on GDP growth. Most previous studies reflect mixed findings and inconclusive results. To begin with, Ali and Ather (2015) adopted the 2SLS method to test the relationship between military expenses and GDP growth in Pakistan from 1980-2013. Data showed an adverse effect of defense expenses on GDP growth and savings, where the defense burden accrued an opportunity cost (in terms of foregone savings). These savings led to low investment and depleted development. Shahbaz, Afza, and Shabbir (2013) used the Keynesian model and the ARDL method to examine the association between defense spending and GDP growth in Pakistan. The results demonstrated that a rise in defense expenses decreased the speed of GDP growth. The estimates also showed a one-way causal relationship between defense spending and GDP growth. In another study, Anwar, Rafique, and Joiya (2012) studied the link between defense expenses and GDP growth from 1980-2010. The authors established GDP Granger-caused defense expenditure for Pakistan, yet no Granger-causality was reported for Turkey (Yağcıbaş and Karaoğlan 2017). By observing the positive and negative components of the data (shocks) within specific periods, it appears that there is asymmetric causality: from positive shocks of per capita GDP to positive shocks of military spending.

For China, Ali and Dimitraki (2014) employed a two-stage Markov-switching approach to test the same relationship from 1953–2010. The results showed that military expenditure varied with growth, i.e., inversely in a slower growth–higher variance state and positively in faster growth–lower variance state. In another study, Utrero-González, Hromcová, and Callado-Munoz (2017) analyzed the effects of military participation on the relationship between defense expenses and economic growth. The results established that military spending positively affected GDP growth in the alliance partners or members of the North Atlantic Treaty Organization (NATO) member countries. These countries also benefited from increased stability and security due to military collaborations strengthened GDP growth. Using the ARDL techniques, Khalid, Masoud Ali, and Razaq (2015) found a significant negative impact of military expenses on growth in the US from 1970–2011. Aizenman and Glick (2006) contradicted prior findings by establishing that military expenditures in the existence of threats could increase GDP growth.

Alternatively, Zhong, Chang, Goswami, Gupta, and Lou (2017) studied the causal relationships between military expenses and GDP growth in the US and BRICS economies from 1982 to 2012. The results indicated a one-way causal flow from military expenditures to GDP growth in the US, a one-way causal flow from GDP growth to military expenses in India and Brazil, a two-way causality in Russia, and no causal relationships in South Africa and China. In another study, Arshad, Syed, and Shabbir (2018) employed a Solow model and used panel data of sixty-one nations from 1988-2015. The fixed effect estimator showed that the imports of arms and military expenses had a significant adverse impact on GDP per capita. Yolcu Karadam, Yildirim, and Öcal (2017) supported a nonlinear relationship between military expenses and GDP growth for Middle-East countries and Turkey. The authors argued that the economic situation might help to explain the complex nexus between military expenditure and growth.

Furthermore, Zhang, Liu, Xu, and Wang (2017) examined the impacts of military expenses on social welfare input and output in two study groups: i) G7 (i.e., Japan, France, Canada, Italy, the US, Germany, and the UK; ii) BRICS nations. The results for BRICS nations were inconclusive, yet military expenses positively affected social welfare spending in G7 nations. Through a Solow and Feder-Ram model, Augier, McNab, Guo, and Karber (2017) investigated the potential impact of military expenditure on growth in China from 1952-2012. The Feder-Ram model failed, yet the Solow model revealed that growth increased by 0.15-0.19 percent with a one percent rise in defense expenditure. Using various panel groups, d'Agostino, Dunne, and Pieroni (2017) estimated the long-term associations between military spending and GDP growth from 1970-2014. The restrictive dynamic fixed-effect method results indicated a significant negative impact of military expenses on GDP growth. Furuoka, Oishi, and Karim (2016) also found a long-term association between military spending and GDP growth in China. The Granger Causality indicated a unidirectional causal flow from GDP growth to military expenditure. In another study, Zhao, Zhao, and Chen (2017) investigated the associations between public spending, military spending, and economic growth in China from 1952 to 2012. The Granger causality showed that a one-way Granger caused an adverse effect between military expenditure and economic development. In another study, Su, Xu, Chang, Lobont, and

Liu (2018) employed the bootstrap Granger full-sample causality and the rolling window procedure for China. The first method indicated a two-way causal relationship between growth and military spending. The second procedure suggested that causality changed over time, depending on the economic state. The rolling window procedure also indicated a short-term positive causality run from growth to military spending. Phiri (2017) used the logistic smooth transition regression (LSTR) method to analyze the association between military expenditure and growth in South Africa. The authors observed an inverted U-shaped association existed between the variables. The results implied that high military spending is harmful for the economic growth, so government should allocate resources to productive sectors other than military. Ahad and Dar (2017) investigated the nonlinear impact of military expenses on economic growth for the US, Russia, and the UK. The results validated the significant negative influence of military expenses on economic growth in both countries, but the effect of military spending on growth was significant and positive for Russia.

Kyriakos and Christos (2021) developed a discrete-time model by combining Keynesian and monetary theory for Turkey. Their result implying that military budget surges can only have a short-term influence on revenue, as their long-term impact on the economy will be entirely inflationary. Using quantile ARDL model, Luqman and Antonakakis (2021) revealed that military spending has a negative influence on economic growth and human development in Palistan. However, for the panel of Pakistan, India, and China according to (Syed, A. A. 2021), the positive and negative impact of military spending has a statistically significant influence on growth in the long-term for India and China; though, only the positive effect favours economic growth in the short term. Furthermore, Maher and Zhao (2021) examined the long- and short-term effects of military spending and political instability on Egypt's economic growth. By assuming that military spending has a negligible impact on growth, especially over time. Tao et al. (2020) investigated the causality link between economic growth and and military spending for Romania, while found adverse impact of of military outlay on growth between 1996–1999 and 2002–2004. On the contrary (Saba & Ngepah, 2020) for a panel of 35 African nations the results revealed no evidence of convergence in military spending and growth. Furthermore, (Lobont *et al.,* 2019) looked at the impact of military spending on growth in Romania, using annual data from 1991 to 2016. The findings show that military spending and GDP have a bidirectional relationship in the long term. (Saba & Ngepah, 2019) found that military spending has a negative impact on growth for 34 African nations, with large regional economic level inequalities, and that this effect is driven by state fragility. For Malaysia, empirical research of (Saudi et al., 2019) indicated a negative link between military spending and GDP. (Shaaba & Nicholas, 2019) causality test proposed that industrialisation and growth causes military spending in the long-run and short-run. Using asymmetric causality tests, Hatemi-J (2018) reviewed the military spendings nexus for the world's top six defence spenders from 1988 to 2013. The military expenditure-led hypothesis appears to be sustained in Japan China, according to empirical findings. The growth-led hypothesis, on the other hand, is valid in four nations: France, Saudi Arabia, Russia, and the United States. (Zhong *et al.,* 2017) in their empirical note re-examines the causal linkages between military expenditures and economic growth for the BRICS and the U.S. Outcomes of Granger causality tests display that military expenses effect growth in the U.S, economic growth effects military expenses in both India and Brazil, a feedback effect between military expenses and e growth in Russia, and no causality between military expenses and growth in South Africa and China. (Tongur & Elveren, 2017) in their over-all result confiremed that military expenses have a negative influence on economic growth for 82 nations. (Topcu & Aras, 2017) findings showed that in the long term, growth and military spending do not move, and that in the short-run, causality flows from growth to military expenses.

Retrospectively, the literature review demonstrates mixed findings and beliefs about the relationship between military spending and economic growth, especially in Pakistan. Even though extant works support the effects of military expenditure on economic growth to be linear, insignificant, positive, or negative, there is less known about the nonlinear aspects of this relationship. This study is a step in the same direction.

Material and Methods

Data and Variables

This study used annual data for the period 1972–2018. D ata were collected from the World Development Indicators (available at the link: https://datacatalog.worldbank.org/datas et/). Real GDP (@Constant 2010 USD) was used as a depen dent variable, military expenditure (@Current USD) as an ex planatory variable, and gross capital formation (@Constant 2 010 USD) as a control variable. Population was used as a pro xy for labor force due to unavailability of labor data, a metho d consistent with previous studies (cf. Arshad *et al.,* 2018; A ugier *et al.,* 2017; Durusu-Ciftci, Ispir, & Yetkiner, 2017; S. Hyder *et al.,* 2015; Kumar, Stauvermann, & Patel, 2017; Yol cu Karadam *et al.,* 2017). Following Rahman et al. (2020), al l data were converted into a logarithmic form to get robust re sults and avoid heteroskedasticity problems. Table 1 shows t he descriptive statistics.

Table 1

Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
EG	47	25.232	0.6511	24.042	26.26
ME	47	21.796	0.8052	19.984	23.16
CF	47	23.562	0.5319	22.531	24.47
LF	47	18.602	0.3772	17.932	19.17

Note: all the variables are in log form. EG=economic growth; ME military expenditure; CF= capital formation; LF= Population (proxy for labor force).

Methodology and Model

The current theoretical framework is based on a growth model used in earlier studies (cf. Amna, Syed, & Shabir, 2018; Augier *et al.,* 2017). Below, Eq. (1) presents the basic linear regression equation used in this study by including military expenditures:

$$EG_t = f(ME_t, CF_t LF_t) \quad (1)$$

Where, EG= real GDP (a proxy for economic growth); t= the annual time period; ME= military expenditure, CF= capital formation, and LF= population proxy for labor force.

Methodology

The cointegration relationships were analyzed using the NARDL techniques. Following Shin, Yu, and Greenwood-Nimmo (2014), this approach was applied to examine asymmetries in the data caused by negative and positive shocks. Many researchers agree that (e.g., Mensi, Hussain Shahzad, Hammoudeh, & Al-Yahyaee, 2018) NARDL method is superior to Pesaran, Shin, and Smith's (2001) linear ARDL model in capturing asymmetries caused by shocks in macroeconomic variables. Besides, the NARDL method has proven its effectiveness against traditional methods in overcoming possible methodical discrepancies (cf. M. Ahmad, Khan, Ur Rahman, & Khan, 2018; Rahman & Ahmad, 2019; Sifat & Mohamad, 2018; Tugcu & Topcu, 2018). The NARDL method does not apply to I (2). It allows for I(1), I(0), or mixed order of integration and small sample sizes (Ahmad et al., 2018). Following Shin et al. (2014), Eq. (2), a modified form of Eq. (1), represents the asymmetries in military expenditure:

$$EG_t = \alpha_0 + \alpha_1 ME_t^+ + \alpha_2 ME_t^- + \alpha_3 CF_t + \alpha_4 LF_t + \varepsilon_t \quad (2)$$

Where, ME_t^+= the partial sums of the positive shocks of military expenditures; ME_t^-= the partial sums of the adverse shocks of military expenditures; ε= the error terms. Eq. (3) and Eq. (4) represent these changes.

$$ME_t^+ = \sum_{i=1}^{t} \Delta ME_i^+ = \sum_{i=1}^{t} max\,(\Delta ME_i^+, 0) \quad (3)$$

$$ME_t^- = \sum_{i=1}^{t} \Delta ME_i^- = \sum_{i=1}^{t} min\,(\Delta ME_i^-, 0) \quad (4)$$

Eq. (1) was written in the following ARDL form to derive the NARDL equation:

$$\Delta EG_t = \alpha_0 + \sum_{i=1}^{p} \beta_1\, \Delta EG_{t-1} + \sum_{i=1}^{q} \beta_2\, \Delta ME_{t-1} + \sum_{i=1}^{m} \beta_3\, \Delta CF_{t-1} + \sum_{i=1}^{r} \beta_4\, \Delta LF_{t-1} + \delta_0 PCI_t + \delta_1 ME_{t-1} + \delta_2 CF_{t-1} + \delta_3 LF_{t-1} + \varepsilon_t \quad (5)$$

The short-term dynamics and the stability of the long-term parameters were tested using the following ECM equation:

$$\Delta EG_t = \alpha_0 + \sum_{i=1}^{p} \beta_1\, \Delta EG_{t-1} + \sum_{i=1}^{q} \beta_2\, \Delta ME_{t-1} + \sum_{i=1}^{m} \beta_3\, \Delta CF_{t-1} + \sum_{i=1}^{r} \beta_4\, \Delta LF_{t-1} + \gamma_0 ECT_{t-1} + \varepsilon_t \quad (6)$$

In Eq. (5) and Eq. (6), β_1, β_2, β_3, and β_4= short-term coefficients; 'Δ'= difference operators that capture short-term dynamics; δ_1, δ_2, δ_3, and δ_4 represent the coefficients of the long-term association; ε signifies the error term. The alternative hypothesis for the presence of long-term association is represented as ($\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$). The Wald-test can be used for long-run coefficients. The F-statistic can be compared with the upper and lower bound critical values (cf. Pesaran et al. 2001).

Next, the NARDL equation was obtained by replacing the partial sums of military expenditure (ME) in Eq. (7) and Eq. (8), as follows:

$$\Delta EG_t = \alpha_0 + \sum_{i=1}^{p} \beta_1\, \Delta EG_{t-1} + \sum_{i=1}^{q} \beta_2\, \Delta ME_{t-1}^+ + \sum_{i=1}^{q} \beta_3\, \Delta ME_{t-1}^- + \sum_{i=i}^{n} \beta_4\, \Delta CF_{t-1} + \sum_{i=1}^{r} \beta_6\, \Delta LF_{t-1} + \delta_1 ME_{t-1}^+ + \delta_2 ME_{t-1}^- + \delta_3 CF_{t-1} + \delta_4 LF_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta EG_t = \alpha_0 + \sum_{i=1}^{p} \beta_1\, \Delta EG_{t-1} + \sum_{i=1}^{q} \beta_2\, \Delta ME_{t-1}^+ + \sum_{i=1}^{q} \beta_3\, \Delta ME_{t-1}^- + \sum_{i=i}^{n} \beta_4\, \Delta CF_{t-1} + \sum_{i=1}^{r} \beta_5\, \Delta LF_{t-1} + \gamma_0 ECT_{t-1} + \varepsilon_t \quad (8)$$

A Wald test was conducted to inspect the nature of asymmetries. The rejection of the null hypothesis was estimated through [$(-\beta_2/\beta_1 = -\beta_3/\beta_1)$ and $-\beta_4/\beta_1 = -\beta_5/\beta_1$)]. [$(-\delta_1/\delta_0 = -\delta_2/\beta\delta_{0_1})$ and $(-\delta_3/\delta_0 = -\delta_4/\delta_0)$] were used to explain potential short-term and long-term asymmetries.

Results and Findings

Unit-Root Tests

Table 2 presents the results of the BDS nonlinearity test used to capture the presence of nonlinearity in the series (see for review, Broock, Scheinkman *et al.,* 1996).

Table 2

Nonlinearity BDS Test Results

	Dimension				
Variable	m=2	m=3	m=4	m=5	m=6
EG	0.2039*	0.3452*	0.4449*	0.5178*	0.5719*
ME	0.1876*	0.3104*	0.4057*	0.4761*	0.5309*
CF	0.1979*	0.3347*	0.4338*	0.5058*	0.5603
LF	0.2050*	0.3466*	0.4469*	0.5198*	0.5742*

*Note: Results reveal the presence of non-linearity for all variables based on residual values determined through the BDS test within VAR with m dimension. * represents 1 % level of significance.*

Traditional unit root tests may generate biased results by ignoring potential structural breaks in the series, i.e., high R-Square or a low Durbin–Watson statistics value. Elliott–Rothenberg–Stock DF-GLS (1996) test was applied to address such issues. The test results reported in Table 3 showed that all variables became stationary after taking the unit root test. Though the nonlinearity BDS test (Table 2) showed the same order of integration, the values were not higher than I (1).

Table 3

Elliott–Rothenberg–Stock DF-GLS Unit-Root Test

Variables	Level	First Differences
EG	0.8489	-3.956*
ME	0.0885	-3.7797*
CF	0.9133	-5.3488*
LF	-0.7350	-1.8499*
Partial Sums		
ME+	0.8888	-2.4487*
ME-	0.8888	-2.4487*

*Note: *, **, *** stand for 1 %, 5 %, and 10 % level of significance, respectively.*

Unit-root Tests (with Structural Breaks)

Zivot and Andrews (1992) (ZA) structural break test was employed to allow for structural breaks in the data series and address concerns about earlier methods, e.g., Elliott–Rothenberg–Stock test. The results of the ZA test are reported in Table 4. The results indicated multiple structural breaks in the series. The break dates were incorporated through dummies, i.e., taking the value of 1 and otherwise 0. The break years represented important economic and political events in Pakistan. After 1991, the ties between the US and Pakistan suffered as the State Department decided to suspend military aid and imposed economic sanctions (Gedda, AP News, 2 January 1993).

Table 4

Zivot and Andrews Break Unit-Root Test

Variables	Level	First Differences
Allowing for breaks in intercept		
EG	-3.972 (1980)	-5.880 (1993)
ME	-5.769 (1996)	-7.292 (2002)
LF	-0.219 (1993)	-4.277 (1997)
CF	-4.081 (1982)	-5.575 (1993)

Note: Critical values: 1 %: -5.34 5 %: -4.80 10 %: -4.58

Cointegration Tests: F-bound Tests and Wald Test

The Wald test was conducted by incorporating breaks in the model for testing the short- and long-term asymmetries hypothesis (see Table 5 below). The long- and short-term null hypothesis of no asymmetries was rejected at a five percent significance level. Moreover, the F-test value (higher than the critical value at the one percent significance level) confirmed the cointegration relationship. Figures 2 and 3 show the impact of alternate shocks in military expenditures against economic growth. Figure 4 is the dynamic multiplier graph to explain these asymmetries.

Table 5

F-Bound and Wald Asymmetries Test

Variables	Wald-statistic	
	Short run	**Long-run**
ME	-2.5248**	2.2486**
F-Bound test	45.931*	
	I (0)	I (1)
1 %	3.06	4.15
5 %	2.04	2.08
10 %	1.80	2.80

*Note: * and ** stand for 10 % and 5 %, level of significance, respectively*

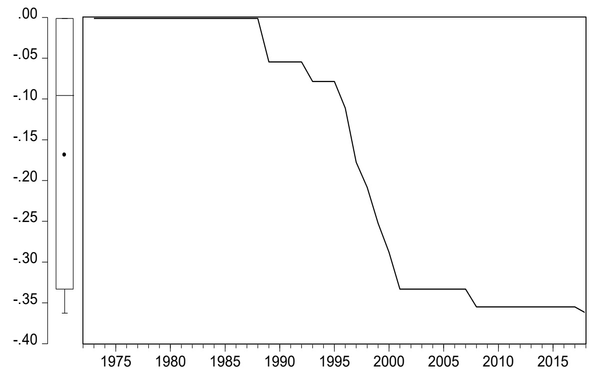

Figure 2. Negative Shock in Military Expenditure

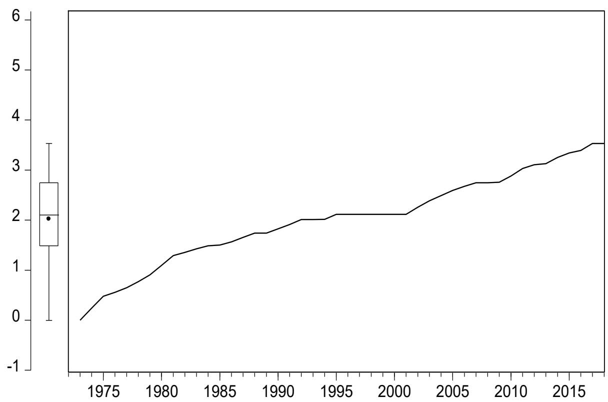

Figure 3. Positive Shocks in military Expenditure

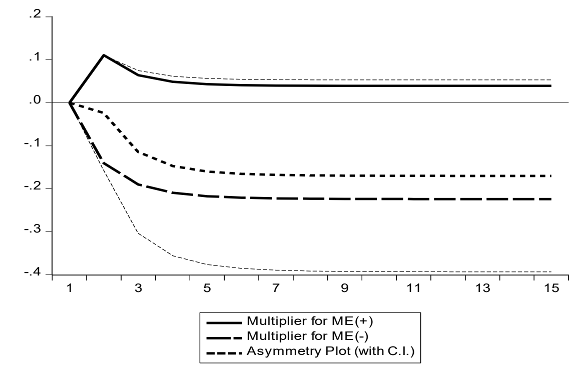

Figure 4. Multiplier Graph of Military Expenditure

Short-Term and Long-Term Estimates of the NARDL Model

Table 6 present the summary of short-term estimations of the NARDL model. The results showed that an increase in positive sums of the military expenditure (positive shocks) positively affected economic growth. A one percent rise in military expenditure increased GDP growth by 0.1093 percent. The coefficients of capital formation and labor growth (control variables) were positive, where a one percent rise in capital formation and labor enhanced GDP growth by 0.156 and 0848 percent, respectively. The negative and significant error correction terms (-0.618) also validated this long-term cointegration relationship.

Table 6

Short-term NARDL Estimations

Variables	Coefficient	t-statistic	Prob.
Constant	-3.8837**	-2.2517	0.0305
EG (-1)*	-0.6186*	5.5591	0.0000
ME^{+}(-1)	0.0243	1.2321	0.2259
ME^{-}	0.1367***	1.9489	0.0591
D. ME^{+}	0.10931*	3.3295	0.0020
CF	0.1567*	4.6373	0.0000
LF	0.8486*	4.1472	0.0002
ECT (-1)	-0.6186*	19.367	0.0000

Note: *, ** and *** represent 1 %, 5 % and 10 % significance level. Selected model based on Akaike criterion (1, 1, 0, 0, 0, 1), with restricted constant and no trend. ME+ & ME- represent the positive and negative in military expenditure, respectively.

Table 7 shows the summary of long-term estimations of the NARDL model. The results demonstrated that a one percent rise in military expenditure positively affected economic growth by 0.0394 percent, but this effect was statistically insignificant. Thus, it is safe to assume that increased military expenditure is less likely to play a significant positive role in improving long-term GDP growth in Pakistan. More so, the results showed that a reduction in military expenditure has positively affected economic growth in Pakistan, where a one percent decrease in military expenditure enhanced GDP growth by 0.221 percent. These findings implied that lessening the military budget might have favorable impacts on economic growth in the long run.

Furthermore, the result showed that labor force and capital formation have positively contributed to GDP growth. For instance, an increase in population (a proxy for labor force) positively affected GDP growth, a view consistent with previous findings (Mirza, Jaspal, & Malik, 2015). More so, a one percent upsurge in capital formation led to an increase in GDP growth by 0.2533 percent. This result implied that policymakers should prioritize capital formation for economic growth. Previous studies have also found that capital formation improved standards of living in South Africa (Ncanywa & Makhenyane, 2016) and facilitated long-term investment in infrastructure development in India (Muhammad Shahbaz, Hoang, Mahalik, & Roubaud, 2017), sixty-one developing economies (Arshad *et al.,* 2018), and oil-exporting countries in Eurasia (Apergis & Payne, 2010; Kahia, Ben Aissa, & Charfeddine, 2016).

Table 7

Long-Term NARDL Estimations

Variables	Coefficient	t-statistic	Prob.
ME^{+}	0.0394	1.1370	0.2630
ME^{-}	0.2210**	2.2406	0.0313
CF	0.2533*	6.2554	0.0000
LF	1.3717*	10.040	0.0000
Dum	-0.0474**	-2.5152	0.0165
Constant	-10.898*	-6.0399	0.0000

Note: *, ** and *** represent 1 %, 5% and 10% significance level. Dum indicates dummies for breaks.

Diagnostics Tests

Table 8 presents the results of different diagnostic tests conducted to assess possible econometric issues in the model related to normality, serial correlation, functional form, and heteroskedasticity. These tests demonstrated no evidence for the occurrence of violation in the regressed model. As seen below, all probability values were higher than 0.05 percent. The CUSUM (Cumulative Sum) (Figure 5) and the squares of CUSUMSQ (Figure 6) tests also validated the stability of the model.

Table 8

Diagnostics Tests

Diagnostic Test	F-statistic	Prob.
Jarque-Bera	0.7984	0.6708
Ramsey RESET	0.9027	0.3728
Heteroskedasticity	0.4824	0.9701
Serial Correlation LM	0.0304	0.8433

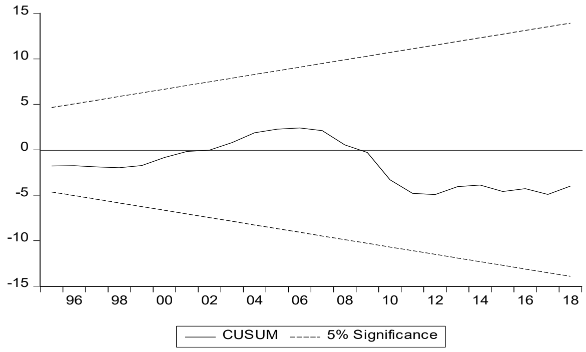

Figure 5. CUSUM

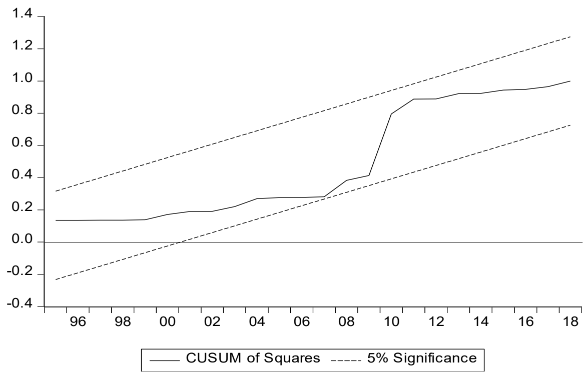

Figure 6. CUSUMSQ

Discussion

The current analysis on the military expenditure-economic growth nexus in Pakistan revealed that high military expenditures (positive shocks) have insignificantly contributed to economic growth in the long run, a view contrary to previous findings for developing nations (Benoit, 1973&1978). In addition, the present estimates confirmed that reductions in military expenditures (adverse shocks) have significantly enhanced long-term economic growth in Pakistan, a view consistent with the contemporary perspectives on the topic (cf. Ali Amjad; Ather, 2014; Muhammad Shahbaz *et al.,* 2013). Experts (e.g., Khilji, Mahmood, and Siddiqui, 1997) agree that the nexus between military expenditure and GDP growth in Pakistan could not be conceptualized merely as a "Guns and Butter" issue with a mandatory inverse compromise between the two. When examining the impact of military expenditure on economic growth, one must recognize the role of specific antecedents to military spending, the state of political instability or stability, endogenizing budget considerations of neighboring enemy states, and other geostrategic issues. If reducing the military expenditure is not an option, the military can participate in education, training, new technology, R&D, skill development, and rural labor organization (as soldiers) for serving civilian needs (Benoit, 1973). With the capital formation and labor showing long-run positive economic impact, an upsurge in military expenditure could be used to enhance aggregate demand of defense spending to boost employment of labor and capital stock utilization (via multiplier effects); consequently, increasing the profit rates (e.g., Khilji *et al.,* 1997). By mobilizing or creating new resources, the military could contribute to GDP growth. Inflation is one possible scenario through which such may happen. Forced savings, led by inflation, may lead to an upsurge of new resources attracted by an expansion in profitability or prices that motivate greater investment opportunities. That said, it is plausible that the anticipated rise and continuation of inflation may enhance consumption spendings and attract investments in industries with less growth potential.

Conclusion

This study revisited the complex interaction between military expenditure and economic growth in a developing economy (Pakistan) using a robust NARDL model. Even though past estimates are based on linear models, panel data, and the Granger causality test, this study accounted for the impact of positive and negative shocks in military expenditures on economic growth. More so, the paper tested the order of the variables through the DG-FLS test and ZA structural breaks test to uncover structural breaks in the series.

Using the NARDL technique, the results indicated that a decrease (negative shocks) in military expenditures has favorably affected economic growth, but an increase in military expenditures had insignificantly impacted growth in the long term. Defense is undoubtedly essential, but policymakers should also consider social, economic, energy, and other aspects of national security. Defense spending is considered an undesired expenditure and a burden on an economy because it diverts resources from economic initiatives. Thus, policymakers are expected to articulate national policies that simultaneously account for social, economic, development, and security concerns. To accelerate development and alleviate poverty, Pakistan must achieve and maintain a high GDP growth rate. Poverty, at its current high level, poses a threat to state and national integration by fueling social conflict (Anwar, Rafique & Joiya, 2012).

With the current findings showing the positive impact of capital formation and labor force on economic growth, policymakers are encouraged to outline concrete policies and institutions to effectively mobilize the labor force to sustain capital formation for economic growth and avoid the looming threat of bankruptcy. Consequently, a significant policy challenge will be to achieve a balance between national security and development expenditures. More significantly, future national priority should be to promote employment opportunities and income equality to enhance economic growth in Pakistan.

Limitations

This study suffers from a few limitations. First, the article does not consider the role of FDI, financial development, political stability or instability, and other factors in the regression model. These critical variables should be considered in future research work for new insight. Second, this study is focused on Pakistan only. Future studies can examine other nations or panels of countries with high military expenditures.

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Authors' Biographies

Li Lanrui is currently doing PhD at the School of International Relations at Xiamen University (China).

Zia Ur Rahman received PhD in World Economics from the Research School for Southeast Asian studies. He has a Master's degree in Wolrd Economics (2017) from Beijing Normal University China. Zia has a more than dozen publications in the world's top peer-reviewed (SSCI/SCI) journals.

Shoukat Iqbal Khattak is a Professor at the School of Business Administration at Jimei University (China). He published many papers in various top SSCI/SCI journals.

Mohammad Maruf Hasan, PhD, is currently an Assistant Professor at the School of International Studies at Sichuan University (China). He received his PhD in Economics (2021) from Xiamen University (China) and M.Sc. degree in Economics (2016) from Northeast Normal University (China). He is a researcher and a trainer with diverse experience with national and international organizations. He has published research articles in Singapore Economic Review, Energy Strategy Reviews, Energy Reports, and other top journals in economics.

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