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The Effects of Defense Expenditure on Economic Growth of Pakistan

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Abstract

The main aim of this paper is to analyse the effect of defence expenditure on output growth in Pakistan and uses time series data from 1975 to 2018. The study used ARDL techniques to analyse the data, and an ECM was also used to test convergence to the long-run (LR) equilibrium. This study found that Defense expenditure (DE) has a positive and noteworthy impact on output growth. The study concluded that defence expenditure is mandatory to influence the economic growth (GGDP) of Pakistan. The study recommended that the government promote economic growth, which in turn provides resources to finance defence expenditures, and increase spending on the defence sector to achieve higher economic growth and create a peaceful environment.

Keywords: Defence Expenditure, Economic Growth, Gross Savings

Information

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1. Introduction

The protection of citizens and the maintenance of national security are fundamental responsibilities of government. Defence expenditure represents the resources allocated to safeguarding a country's territorial integrity, maintaining internal security, and supporting the institutions responsible for these functions. The distinction between security expenditure and other forms of public expenditure matters because allocation decisions shape fiscal priorities and the capacity to provide public services. Military expenditure generally covers the costs of armed forces and related defence institutions, including personnel remuneration and pensions, equipment procurement, military operations, maintenance, defence infrastructure, and research and development. Related activities may also include peacekeeping and other security functions where they fall within the relevant expenditure definition. However, not every expenditure associated with veterans, disarmament, or domestic security is necessarily included in military expenditure statistics. Therefore, consistent definitions are essential when comparing defence budgets across countries and periods. This study uses the defence expenditure series reported in the World Development Indicators (World Development Indicators, 2020), and its empirical interpretation should remain consistent with the definition of that series. The relationship between defence expenditure and economic growth deserves particular attention in developing economies, where governments face simultaneous demands for security, investment, education, infrastructure, and social welfare.

The economic implications of defence expenditure remain contested. On the one hand, defence spending may contribute to the security conditions needed for private investment, productive activity, and the continuity of markets. Defence procurement and employment may also stimulate demand and support selected domestic industries. On the other hand, substantial defence budgets can create fiscal pressure and reduce the resources available for investment in education, healthcare, infrastructure, and other productive sectors. Furthermore, additional taxation or public borrowing used to finance military expenditure may constrain private consumption or investment. These competing mechanisms help explain why empirical studies report positive, negative, and insignificant relationships between defence expenditure and economic growth. National security can provide a foundation for sustained economic activity; therefore, military expenditure may support long-term growth where its security and demand benefits exceed the associated opportunity costs (Ram, 1995). Nevertheless, the net relationship is an empirical question rather than an assumption, and the composition, financing, and effectiveness of expenditure must be considered when interpreting the results.

From a Keynesian perspective, increased defence expenditure can raise aggregate demand when economic resources are underutilised. Higher public spending may stimulate employment, production, and household income, thereby encouraging consumption and investment (Faini et al., 1984). Moreover, defence institutions in developing countries may contribute to infrastructure construction, training, education, and healthcare facilities, although such activities should not be presumed to occur uniformly or to produce benefits of equal magnitude. In Pakistan, these possible channels provide a rationale for examining whether military expenditure is associated with changes in output growth. However, demand-side benefits need to be evaluated alongside the opportunity cost of directing public funds away from alternative uses. Military equipment imports, for example, may increase demand for foreign exchange and have implications for the balance of payments. Similarly, military spending financed through borrowing may add to fiscal pressures. Consequently, both the potential demand stimulus and the possible displacement of civilian investment are relevant to the present analysis.

Political and strategic considerations are important determinants of defence expenditure, particularly where governments seek to preserve internal stability and respond to external threats. Nevertheless, the economic effects of these decisions are less straightforward. The debate concerning military expenditure and growth has developed over several decades without producing a uniform empirical conclusion. As Dunne et al. (2005) explain, differences in model specification, estimation technique, countries, and observation periods can contribute to conflicting results. In addition, military expenditure competes with other public goods and services that households and businesses may value, creating a policy trade-off between national security and alternative development priorities (Mosikari & Matlwa, 2014). Therefore, the effect of defence spending should be investigated in a country-specific setting using clearly defined variables and appropriate econometric methods. For Pakistan, both its security environment and its fiscal constraints make this question relevant to macroeconomic policymaking.

Pakistan's defence expenditure has been influenced by external security challenges and internal security requirements. Anwar et al. (2012) report that defence expenditure averaged approximately 4.5% of GDP during 1995–2002 and subsequently declined from 4.10% in 2003 to 3.10% in 2009. These figures refer to defence expenditure relative to GDP rather than to the annual GDP growth rate. The country's regional security environment, including successive conflicts between India and Pakistan and the longstanding dispute concerning Kashmir, has remained an important consideration in defence budgeting (Ajmair et al., 2018; Amir-ud-Din et al., 2020). Moreover, internal security operations and responses to terrorism have added to the demand for security resources. Although fiscal adjustment and external financing arrangements may also

influence budget allocations, descriptive evidence alone cannot establish the respective contribution of these factors. Consequently, the size and persistence of military expenditure in Pakistan provide a compelling setting for examining whether defence spending and economic growth have moved together over time. This relationship should be evaluated while recognising that higher GDP may itself allow governments to allocate more resources to defence.

One argument in the Pakistani debate is that high defence expenditure limits the resources available for health, education, infrastructure, and development programmes, which may constrain economic growth. Conversely, defence spending can support employment, selected domestic industries, and the security required for investment. The study's original contextual discussion identifies military expenditure of approximately US$11.4 billion in 2018 and describes substantial increases during the preceding decade. These historical amounts and rankings are descriptive claims that require consistent definitions, currency units, and direct source verification before they are used for policy comparisons. More importantly, a rise in defence expenditure does not necessarily indicate an increase in its share of GDP, and neither measure is identical to the GDP growth rate. In examining the 1975–2018 period, this study therefore considers defence expenditure as a percentage of GDP while controlling for gross capital formation, gross savings, and labour force participation. This broader specification allows the association between defence expenditure and output growth to be assessed alongside several other macroeconomic factors, without assuming in advance that greater military expenditure will necessarily stimulate growth.

Pakistan must balance national security, economic development, and fiscal sustainability. Defence expenditure may help establish conditions favourable to investment, employment, and productive activity. However, expanding military allocations can also increase the government's budgetary burden and displace resources from potentially productive civilian uses. This dual possibility has generated a longstanding debate about the defence–growth relationship in developing economies, beginning with influential contributions by Benoit (1973, 1978). Hassan et al. (2003) identify the possibility of both adverse effects, through the displacement of investment, and favourable effects, through aggregate demand or improved security. Similarly, research concerning South Asian countries indicates that defence expenditure and economic performance may be related in different ways across economic and institutional settings (Pradhan, 2010; Shahbaz et al., 2013). Therefore, positive and negative pathways should both be recognised when specifying the empirical model. The present study investigates the association between defence expenditure and economic growth in Pakistan using annual observations from 1975 to 2018. It applies an autoregressive distributed lag (ARDL) framework and an error-correction representation to examine reported long-run and short-run relationships. In addition to defence expenditure, the analysis incorporates gross capital formation, gross savings, and labour force participation. Including gross savings gives explicit attention to domestic resource mobilisation alongside investment and labour-market participation. Although these variables have been examined in wider economic-growth research, their joint inclusion provides a useful basis for interpreting Pakistan's defence–growth relationship. Accordingly, the study addresses two connected questions: whether defence expenditure is statistically associated with GDP growth during the sample period, and whether the estimated relationships differ between the long and short run. The evidence is relevant to discussions of public expenditure priorities; nevertheless, an observed association should not be interpreted as a conclusive causal effect of military expenditure.

2 Literature Review

Benoit (1973, 1978) established an influential foundation for examining the relationship between defence expenditure and economic development. Two broad perspectives are particularly relevant: Keynesian demand-side arguments and neoclassical resource-allocation arguments. The Keynesian approach emphasises aggregate demand. Where resources are underutilised, increased military expenditure can stimulate demand, production, employment, and income, potentially supporting economic growth. This possibility has informed research on defence expenditure and economic performance across different national settings (Chletsos & Kollias, 1995; Lim, 1983; Shahbaz et al., 2013; Smith, 1980). However, neoclassical reasoning emphasises allocating scarce resources and the consequences of public-sector financing. If higher defence expenditure is financed through taxation, private disposable income and savings may decrease. If it is financed through borrowing, increased demand for funds may raise financing costs or displace private investment. Consequently, expenditure on defence can reduce the resources available for capital accumulation and other productive activities. These possible trade-offs are discussed in studies of military spending, public budgets, and investment (Alexander, 1990; Mintz & Stevenson, 1995; Murdoch et al., 1997; Sezgin, 1997). The two perspectives need not be treated as mutually exclusive: the direction of the observed relationship may depend on economic conditions, fiscal financing, the structure of defence procurement, and the period considered. Accordingly, the present analysis examines the empirical association in Pakistan while accounting for capital formation, savings, and labour force participation. d'Agostino et al. (2019) used the data of 109 non-high-income countries from 1998 to 2012. They found that endogeneity from reverse causation is a critical concern,

with instrumental-variable (IV) estimates indicating a stronger negative effect of defence expenditure on GDP growth. This conclusion is found to be consistent across diverse sources and historical periods.

Nadeem et al. (2020) investigate the impacts of terrorism, government structure, and defence expenditure on tourism in Pakistan, an emerging economy, from Q1 2002 to Q4 2016. The ARDL testing technique to co-integration is used. The findings show that terrorism and military spending both negatively affect tourism. The governing system has a good effect on tourism. Nonetheless, this influence, like that of terrorism, is insignificant. The OLS findings support these conclusions. They recommend improving the governmental structure and physical infrastructure to increase tourism activities. Azam (2020) examines the influence of defence expenditure on economic development for a sample of 35 non-OECD nations from 1988 to 2019. The PMG approach is used. This study discovered a definite detrimental impact of defence expenditure on GDP growth. The results show a bidirectional relationship between defence expenditure and GDP growth. Overall, these estimates provide compelling evidence that defence expenditure is not beneficial but harmful to development.

Desli and Gkoulgkoutsika (2021) examine the global effect of defence expenditure on GDP growth from 1960 to 2017. Across the sample, the estimated global effect of defence expenditure on economic development from 1960 to 2017 appears negative, and this is particularly evident in NATO nations. For most nations, the impact is neutral and unimportant. Certain economies regularly gain by defence expenditure, but the majority of nations fluctuates over time, with no discernible pattern. Polat (2020) explores the links between defence expenditure and GDP growth using data from 1992 to 2017 for 15 nations with the greatest defence expenditures in 2017. The cointegration relationships between series, and the series are found to be cointegrated. Long and medium-term analyses are conducted using the PDOLS approach, and a 1% rise in defence expenditure is expected to raise national revenue by 1.05% on average, with a slightly smaller effect in the near term. Similarly, 1% increase in national-income increases defence expenditure by 0.89%, with a lesser effect in the short term. The models' error correcting method is operational. Causality linkages between series are seen using the VECM approach.

Saba and Ngepah (2022) study the causal link between defence expenditure, GDP growth, and development in three regions from 1990 to 2018. They also assess the multivariate effects of defence spending, GDP, and development across three areas. They utilised real GDP as a proxy for growth, and the Human Development Index to quantify economic progress. The empirical results indicate a bidirectional link between defence expenditure and GDP growth. Amir-ud-Din et al. (2020) explore the mutual connections have frequently deteriorated to the point where a nuclear war appeared a serious possibility. While India is one of the world's top five defence spenders, Pakistan spends an unduly big fraction of its GDP on defence to counter India's military edge. While Pakistan's defence expenditure is mostly focused on India, it is unclear whether the reciprocal is also true. As a result, this study investigates whether India and Pakistan's defence expenditures are causally related or if the arms race is asymmetrical.

Tao et al. (2020) investigate the link between defence expenditure and GDP growth in Romania from 1980 to 2018. The findings demonstrate that defence spending has both a positive and a negative impact on Romania's GDP growth. Specifically, defence spending had a negative impact on GDP growth from 1999 to 2004. It may be concluded that during periods of instability in adjacent nations, rising defence spending may supplant private investment and consumption, which is detrimental to economic growth. Economic development was positively correlated with defence spending between 1999 and 2002, as well as between 2004 and 2006. They can infer that, during a period of internal turbulence and NATO membership, more defence spending helps to stabilise the domestic situation and so stimulates long-term economic growth. Ullah et al. (2021) use the NARDL econometric model to evaluate yearly data from Pakistan and India between 1985 and 2018. The empirical findings indicate that militarism has a significant positive effect on GDP growth, while non-militarisation has a positive effect on GDP growth in Pakistan and India. In Pakistan and India, the link between militarisation and GDP growth is asymmetric, as is the link between defence expenditure and CO2.

Sürücü et al. (2022) examined the link between defence expenditure and development in China and Turkey, the nations with the biggest rise in defence expenditures from 2000 to 2020, and compared their statistics. This study evaluated the data using trend analysis and visualisations. The analytical results show that China and Turkey are different. Wang et al. (2023) used a panel vector autoregressive (PVAR) technique to examine the possible links between democracy, defence expenditure, and economic development in 126 countries between 1990 and 2020, accounting for diverse relationships in military spending across nations. Their empirical findings show that democracy has a large beneficial influence on GDP growth, whereas defence expenditure has a negative impact, with low democratic levels and high defence expenditure. For elected nations with low defence expenditure, military spending has a greater and negative influence on democracy, and vice versa.

2.1 Synthesis of Previous Evidence and Research Gap

The reviewed literature does not establish a single direction for the defence expenditure–growth relationship. For example, Azam (2020) and d'Agostino et al. (2019) report findings that raise concerns about adverse

growth effects and the importance of reverse causation. By contrast, Polat (2020) documents positive associations in the examined sample, while Desli and Gkoulgkoutsika (2021) emphasise variations across countries. In the South Asian context, Pradhan (2010), Shahbaz et al. (2013), and Ullah et al. (2021) provide relevant but methodologically distinct evidence. Similarly, Amir-ud-Din et al. (2020) demonstrate the importance of the regional security setting for understanding defence expenditure. Consequently, differences in estimation methods, expenditure definitions, and samples should be examined before treating findings as directly comparable. The present study contributes by focusing on Pakistan from 1975 to 2018 and simultaneously considering defence expenditure, gross capital formation, gross savings, and labour force participation. However, the study does not establish that this specification resolves the endogeneity concerns identified in earlier work.

3 Methodology

The study employs secondary annual time-series data for Pakistan covering 1975–2018. This period includes changes in the country's economic conditions, fiscal priorities, and security environment, making it relevant to examining defence expenditure and output growth. The variables were obtained from the World Development Indicators database (World Development Indicators, 2020). The dependent variable is annual GDP growth (GGDP), while the explanatory variables are defence expenditure as a percentage of GDP (DE), gross capital formation as a percentage of GDP (GCF), gross savings as a percentage of GDP (GS), and the labour force participation rate (LF). Table 1 presents the variable definitions. Furthermore, the interpretation of the reported coefficients must reflect these measurement units: a one-percentage-point change in a ratio is distinct from a 1% proportional change. The data and sample period are retained as reported in the original study; this revision introduces no additional observations or estimates.

3.1 Model Specification

The empirical specification is motivated by the neoclassical growth framework and its emphasis on productive inputs and capital accumulation. In this application, annual GDP growth is examined in relation to defence expenditure, gross capital formation, gross savings, and labour force participation. The Cobb–Douglas representation provides the theoretical starting point, while the ARDL formulation allows the reported short-run dynamics and longer-run relationship to be discussed. The mathematical expressions below are retained from the original manuscript; their functional form and correspondence with the included explanatory variables require verification against the estimation output before the results can be independently replicated:

$$Y\ (t)\ =\ A\ (t)\ F\ (k\ (t), L\ (t)) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

The associated Cobb–Douglas production-function representation is presented as follows:

$$F\ (K, AL) =\ K^{\alpha}\ AL^{1-\alpha},\ 0<a<1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

$$GGDP_t\ =\ \beta_1\ +\ \beta_2 CF_t\ +\ \beta_3 DE_t\ +\ \beta_4\ LF_t\ +\ \beta_5 GS_t + \mu \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

The ARDL representation of the specified relationship is presented below:

$$GGDP_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} GGDP_{t-i} + \sum_{i=0}^{k} \beta_{2i} CF_{t-i} + \sum_{i=0}^{k} \beta_{3i} DE_{t-i} + \sum_{i=0}^{k} \beta_{4i} LF_{t-i} + \sum_{i=0}^{k} \beta_{5i} GS_{t-i} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

3.2 ARDL Bound Test

$$\Delta GGDP_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} \Delta GGDP_{t-i} + \sum_{i=0}^{k} \beta_{2i} \Delta CF_{t-i} + \sum_{i=0}^{k} \beta_{3i} \Delta DE_{t-i} + \sum_{i=0}^{k} \beta_{4i} \Delta LF_{t-i} + \sum_{i=0}^{k} \beta_{5i} \Delta GS_{t-i} + \gamma_1 CF_t + \gamma_2 DE_t + \gamma_3 LF_t + \gamma_4 GS_t + \mu_t \quad \ldots\ldots (5)$$

In the notation above, Δ denotes the first-difference operator, α_0 represents a constant term, and the disturbance term denotes the model's stochastic error component. The definitions and lag structure should be interpreted in conjunction with the estimated ARDL specification.

Table 1: Description of Variables

Variables	Notation
GDP growth (annual %)	$GGDP_t$
Gross Capital Formation (% of GDP)	GCF_t
Defense Expenditure (% of GDP)	DE_t
Gross Saving (% of GDP)	GS_t
Labor Force Participation rate, total (% of total population ages 15+)	LF_t

Source: World Development Indicators (2020); variable definitions as reported in the study.

3.2 Econometric Methods

The autoregressive distributed lag (ARDL) approach is frequently applied to relatively small time-series samples and can accommodate regressors that are integrated of order zero or one, provided none is integrated of order two. However, the method does not automatically eliminate serial correlation or resolve endogeneity. Assess these issues through specification checks, diagnostic testing, and careful interpretation of the estimated relationships (Ahmad & Wajid, 2013; d'Agostino et al., 2019). In particular, combining a stationary GDP-growth variable with a potentially non-stationary defence-expenditure variable warrants careful consideration when interpreting the reported bounds test as evidence of a conventional long-run equilibrium relationship. Therefore, the coefficients reported below should be treated as the original study's estimates rather than as independently validated causal effects.

4 Results and Discussion

4.1 Unit Root(UR) Test Results

Before estimating the ARDL model, the study applied the augmented Dickey–Fuller (ADF) unit-root test to examine the stationarity properties of the variables. According to Table 2, annual GDP growth (GGDP), gross capital formation (GCF), gross savings (GS), and labour force participation (LF) are stationary in levels, whereas defence expenditure (DE) becomes stationary after first differencing. Thus, the reported tests identify a combination of I(0) and I(1) series, with no variable shown as I(2). However, the classification depends on the deterministic terms and lag selection used in the ADF procedures, which are not fully documented in the original presentation. The results should therefore be interpreted with these reporting limitations in mind. In addition, the implications of a stationary dependent variable for long-run modelling merit explicit consideration.

Table 2: ADF Test Results

Variables	At level t-stat (p-value)	At 1st difference t-stat (p-value)	Decision
$GGDP_t$	-4.2463* (0.0016)	----------	Stationary at Level
GCF_t	-4.2434*(0.0017)	----------	-do-
DE_t	-0.2509 (0.9235)	-3.5997* (0.0099)	Stationary at 1st Difference
GS_t	-3.7075*(0.0074)	----------	Stationary at level
LF_t	-4.6262*(0.0005)	----------	-do-
ADF Test Critical Values			
Level of consequence			Critical-Values
1%			-3.5925
5%			-2.9332
10%			-2.6049

*Source: Authors' calculations based on the data and results reported in the manuscript. Note: * indicates significance at 1%.*

4.2 Regression Results

4.2.1 ARDL Long-Run Coefficients and Bounds Test

Table 3 reports the original ARDL long-run coefficient estimates and the bounds test. The manuscript states that lag selection was based on the Akaike information criterion (AIC), although the reported ARDL(1,0,0,0) notation should be checked against the four explanatory variables included in the model. Gross capital formation (GCF) has a positive estimated coefficient of 0.2885 (t = 1.7019; p = 0.0972), indicating statistical significance at the 10% level but not at the 5% level. This result is consistent with a positive association between capital formation and GDP growth, as also considered in earlier research (Ali, 2015; Pavelescu, 2008; Wilfred, 2013). However, interpretation should not assume a percentage elasticity because both variables are reported in percentage-based units. Defence expenditure has a positive estimated coefficient of 0.5546 (t = 3.1564; p = 0.0032), which is statistically significant at the 1% level. Conditional on the model specification, a one-percentage-point increase in defence expenditure as a share of GDP is associated with an estimated 0.5546-percentage-point increase in annual GDP growth. This result is compatible with a positive defence–growth association discussed in some earlier studies (Chletsos & Kollias, 1995; Lim, 1983; Shahbaz et al., 2013). Nevertheless, it differs from studies reporting adverse or mixed effects (Alexander, 1990; Murdoch et al., 1997; Sürücü et al., 2022). Such contrasts may reflect differences in country circumstances, periods, variable measurement, or econometric specification rather than a single universal effect.

Similarly, labour force participation (LF) has a positive coefficient of 0.1843 (t = 2.6361; p = 0.0122), significant at the 5% level. The association suggests that greater labour-market participation is associated with higher annual GDP growth in the estimated specification. Earlier work has also examined the importance of labour and human-capital-related factors in economic performance (Hanushek & Kim, 1995; Paudel & Perera, 2009),

whereas Maestas et al. (2023) investigate the implications of demographic change for growth and productivity. In addition, gross savings (GS) has a positive estimated coefficient of 0.3822 (t = 3.1315; p = 0.0034), significant at the 1% level. The estimated direction is consistent with literature identifying savings as an important consideration in growth dynamics (Abu, 2010; Sinha, 1996, 1999). Because the variables are defined as percentage rates or shares, the numerical coefficients should be interpreted in percentage-point terms rather than being described as proportional elasticities. These findings indicate conditional associations in the fitted model and do not, by themselves, identify the direction of causation. The reported ARDL bounds-test F-statistic is 5.7641, exceeding the displayed upper critical bounds at the 10%, 5%, and 1% significance levels. The original analysis therefore reports evidence in favour of a level relationship. However, the applicability of the bounds-testing assumptions and the treatment of the stationary GDP-growth dependent variable should be checked before drawing strong conclusions about long-run cointegration.

Table 3: ARDL Long-Run Results

Variable	Co-efficient	Std. Error	t- Statistic	Probability
GCF_t	0.2885***	0.1695	1.7019	0.0972
DE_t	0.5546*	0.1757	3.1564	0.0032
LF_t	0.1843**	0.0699	2.6361	0.0122
GS_t	0.3822*	0.1221	3.1315	0.0034
C	-27.7998*	5.4625	-5.0892	0.0000
ARDL Bound Test Results				
F-statistics Values			5.7641*	
		Significance level	Lower bound	Upper bound
Critical Values for ARDL Bound Test		10%	2.45	3.52
		5%	2.86	4.01
		1%	3.74	5.06

*Source: Authors' calculations based on the data and results reported in the manuscript. Note: *,** and *** designate the significance at 1, 5 and 10% one-to-one.*

4.2.2 ARDL Short-Run Coefficients and ECM Test

Table 4 reports the original short-run estimates and the error-correction coefficient. Gross capital formation (GCF) has a positive short-run coefficient of 0.5183 (t = 2.6763; p = 0.0111), significant at the 5% level. Accordingly, a one-percentage-point change in the GCF share is associated with a 0.5183-percentage-point change in annual GDP growth within the reported specification. Similarly, the estimated coefficient on the change in defence expenditure is 0.7766 (t = 4.6081; p < 0.001), indicating a positive, statistically significant short-run association. These estimates should not be interpreted as evidence that raising military expenditure necessarily causes economic growth. Furthermore, the distinction between short-run associations and longer-run equilibrium behaviour depends on correctly specifying the underlying time-series model.

Gross savings (GS) also has a positive short-run coefficient of 0.1873 (t = 2.7861; p = 0.0085), significant at the 1% level. In addition, labour force participation (LF) has a positive coefficient of 0.3758 (t = 2.8803; p = 0.0067), likewise significant at the 1% level. These findings are consistent with the proposition that savings mobilisation and labour participation are associated with economic performance, although the magnitude and direction of any causal relationships require separate analysis. The error-correction coefficient is negative (−0.5493; t = −3.5036; p = 0.0012). In the reported framework, its magnitude indicates an estimated adjustment of approximately 54.93% of the preceding period's disequilibrium within one annual observation. However, the precise time required to return to equilibrium cannot be inferred simply by stating that adjustment is completed after one year and eleven months. Moreover, this interpretation depends on a correctly specified and economically meaningful long-run relationship, which warrants further diagnostic assessment.

Table 4: Short Run Coefficients and ECM Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$D(GCF_t)$	0.5183**	0.1937	2.6763	0.0111
$D(DE_t)$	0.7766*	0.1685	4.6081	0.0000
$D(GS_t)$	0.1873*	0.0672	2.7861	0.0085
$D(LF_t)$	0.3758*	0.1305	2.8803	0.0067
C	-31.1799*	5.6367	-5.5316	0.0000
ECM_{t-1}	-0.5493*	0.1568	-3.5036	0.0012

Source: Authors' calculations based on the data and results reported in the manuscript.

*Note: *, **, and *** designate the significance at 1, 5 and 10% one-to-one.*

4.3 Interpretation, Robustness, and Research Limitations

The reported results indicate positive coefficients for defence expenditure in both the long-run and short-run equations. However, this relationship should not be mistaken for a demonstrated causal effect. Economic growth may influence defence allocations through higher fiscal revenues, while external security events, fiscal reforms, and investment conditions may affect both variables. D'Agostino et al. (2019) specifically identify reverse causation and endogeneity as important concerns in this field. Moreover, the manuscript does not report a complete set of residual diagnostic tests, parameter-stability tests, or alternative specifications. Serial-correlation tests, heteroskedasticity diagnostics, functional-form checks, CUSUM and CUSUMSQ assessments, and sensitivity to lag selection would therefore strengthen the credibility of the reported estimates. Structural breaks associated with significant policy or security changes also merit consideration. These procedures are identified as necessary checks and are not presented here as tests already performed. Another limitation is the 1975–2018 sample, which does not reflect subsequent economic conditions. Researchers wishing to reproduce the analysis should use the same World Development Indicators series, estimation sample, deterministic terms, and lag specification (World Development Indicators, 2020). In addition, the reported unit-root classification and the GDP-growth dependent variable require careful verification before using conventional cointegration language.

5 Conclusion

National security and economic development are interrelated concerns for Pakistan. The government must provide protection against internal and external threats while also promoting employment, investment, infrastructure, education, and improvements in living standards. Consequently, resource allocation to defence must be assessed in the context of competing public needs. This study examined the relationship between defence expenditure and economic growth in Pakistan using annual observations for 1975–2018. The analysis incorporated gross capital formation, gross savings, and labour force participation alongside defence expenditure. Augmented Dickey–Fuller tests were conducted to examine the variables' stationarity, followed by autoregressive distributed lag (ARDL) estimation and an error-correction representation. The original estimates indicate positive and statistically significant associations between defence expenditure and GDP growth in both the reported long-run and short-run specifications. Gross capital formation, gross savings, and labour force participation also have positive coefficients in the reported models, although capital formation is only significant at the 10% level in the long-run results. However, positive coefficients do not establish that an increase in defence expenditure would independently cause faster economic growth. The results must be considered alongside possible reverse causality, model specification, omitted macroeconomic influences, and the opportunity cost of public spending. In addition, the reported long-run interpretation requires verification of the model specification and bounds-testing assumptions. Therefore, the evidence contributes to the discussion of Pakistan's defence–growth relationship while supporting a cautious and fiscally balanced interpretation of the study's policy implications.

5.1 Policy Implications

The findings may inform discussion of fiscal priorities, but they do not establish that additional defence expenditure will necessarily deliver additional growth. Public decision-makers should therefore assess proposed allocations against security needs, financing costs, capital formation, domestic savings, and the availability of resources for education, healthcare, and infrastructure. Similarly, measures that strengthen accountability and procurement efficiency may improve the value obtained from existing expenditure. The findings are best interpreted as evidence of an association within the historical sample rather than a fixed rule for future budget decisions (Dunne et al., 2005; Hassan et al., 2003).

5.2 Recommendations

The government should pursue sustained economic growth and strengthen its revenue capacity so it can finance essential security requirements without unnecessarily compromising expenditure on development priorities. This approach recognises that a stronger economy can support defence readiness and other public services. Any proposal to expand defence expenditure should be evaluated against its expected security benefits, fiscal affordability, and the likely displacement of education, healthcare, infrastructure, and productive investment. The positive association identified in the study does not, on its own, justify an unconditional increase in the defence budget. Policymakers should improve the transparency, efficiency, and evaluation of defence-related expenditure while supporting conditions favourable to private investment, employment, and economic stability. Furthermore, future research should compare alternative specifications, test for structural breaks, evaluate model diagnostics, and examine potential reverse causality before drawing stronger causal policy conclusions.

Ethical Statement: Not Applicable.

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