

# The Macroeconomic Impact of Defense Expenditure on Economic Growth of Pakistan: An Econometric Approach

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## Abstract

The broad objective of the present study is to examine whether a long run relationship between defense expenditure and economic growth of Pakistan exist. For empirical investigation, an annual time series data over the period from 1980-2013, and ARDL was used. The empirical results support the existence of long run negative relationship between defense expenditure and economic growth. The results for long run negative relationship between defense expenditure and economic growth was suggested just in case Pakistan MKH does not hold during the period under study. The findings further suggested that the policy makers need to formulate appropriate policy to encourage and not to discourage the economic growth and development of Pakistan.

**Keywords:** defense expenditure, economic growth, ARDL, Pakistan

## 1. Introduction

The relationship between defense expenditure and economic growth has attracted considerable interest which has been highly debated among researchers. The military spending is a global issue and the purpose of increasing defense expenditure is mainly to cooperate with local insecurity and arm race. Moreover, developed countries have focus on the point about possible harmful effects of unfettered military expenditure in developing countries. It was argued that military expenditures may lead to problem of balance of payment deficit, decrease in economic growth, and as a result important social and economic expenditure may crowd out. In general, results of previous studies were inconsistent and mix. Hassan et al. (2003) stated that defense expenditure can affect positively through an increase in security or expansion of aggregate demand and affect negatively through crowd out investment. In case of developed countries, increase defense spending is negatively related with economic growth, employment and investment (Ram, 1995; Wilkins, 2004; Pradhan, 2010). In case of developing countries, the situation is unclear and complex. What is the effect of defense expenditure on development? There have been numerous attempted to answer this question since the seminal work of the Benoit (1978). Before the study of Benoit (1978) about "Growth and defense in developing countries", the issue of defense spending in developing countries was not highly debatable among the researchers. Hence, there is a common presumption that the defense expenditure is a burden on the economy and is negatively related to the economic growth. As a classical example, the pioneer study by Benoit (1978) entitled "Bread vs. Guns" can be considered. Benoit (1978) argued that "countries with heavy defense burden show high growth rate and countries with low defense burden show low growth rate". His argument is based on a cross sectional study of 44 developing countries. Therefore, the study stimulated the researchers to further investigate and find out the relationship between military spending and economic growth.

Pakistan needs to acquire and maintain a high GDP growth by spending more on development. The data shows that during 1980-2012, average GDP was estimated at 5.06 which is very low as compare to other Asian countries, such as Malaysia, Singapore, Thailand, Iran and India. The highest GDP growth (9.0 percent) was recorded in 2005, while the lowest GDP growth (1.7 percent) was recorded in 2009 (Economic Survey of Pakistan, 2012, 2013). Despite of facing high inflation, extreme poverty rate, more unemployment, energy crises, debt burden and many other major socio-economic issues, Pakistan spent huge amount on defense as an effort to

maintain credibility. Researchers claim that Pakistan spent more on non-developmental projects as compared to developmental projects. Government of Pakistan spent during 1980-2012 on average at 0.75 percent on health, 0.54 percent on education, 4.30 percent on development and 4.88 percent on defense (Economic Survey of Pakistan, 2012, 2013). Figure 1 shows the trend of defense, development and health expenditure of Pakistan. Pakistan is one of those countries who have spent major part of their budget on defense since independence.

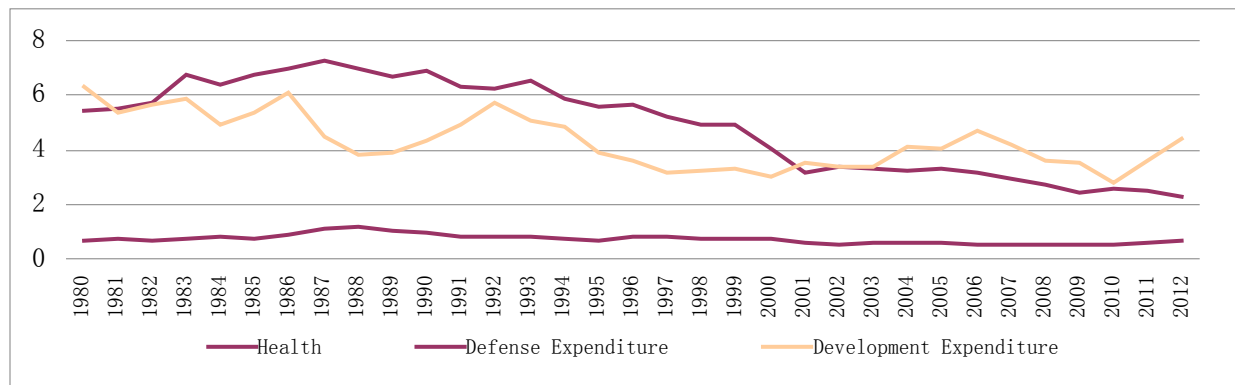


Figure 1. Defense expenditure, development expenditure and health expenditure (percentage of GDP)

Source: Economic Survey of Pakistan (various issues)

Another important point that can be raised from Figure 1 is the ratio of development expenditure. Researchers claim that highly declining in development expenditure over the last fifteen years is due to high spending on defense.

As compare to health, education and development expenditure, the percentage of defense expenditure shows relatively a high trend. During 1980-2012 GDP growth on average at 5.06 percent, saving 15.11 percent and inflation 8.80 percent (Economic Survey of Pakistan, 2012, 2013) was measured. As shown in Figure 1, from 1980-2010 defense expenditure was high as compared with development expenditure and health expenditure. Broadly speaking in the presence of low literacy rate, high deficiency of medical facilities and other basic necessities, Pakistan spent 4.88 percent (on average, 1980-2012) on defense which is almost 10 times higher than health and education expenditure. In 2012, health expenditure on per person per annum was RS 514 or USD 5.3, which was very low as a result of 10.84 percent inflation.

The rest of the paper is structured as: section 2 deals with the review of literature. Section 3 presents theoretical underpinning, methodology, model specification and data sources. Section 4 explains the empirical results and finally, section 5 reports the conclusion and policy implication.

## 2. Review of Literature

The relationship between defense expenditure and economic growth is a highly debatable issue among the researchers. Different econometric models were applied with the specification of different empirical as well as theoretical perspective, to examine the relationship between defense expenditure and economic growth. By using different models and variables, researchers have found different results on the basis of strong evidence and analysis. The literature on the effect of military expenditure on economic growth show positive, negative and insignificant results. As shown in the results above, for convince and better understanding, it will be discussed in three separate sections.

### 2.1 Positive Effects of Defense Expenditure on Economic Growth

Various previous studies suggested positive relationship between military spending and economic growth. For example, Khan (2004) finds out relationship between military spending and economic growth in case of Pakistan. This study used co-integration techniques and Vector Error Correction Model (VECM). By using annual time series data from 1951-2003, we discovered a long run positive relationship between defense expenditure and economic growth taking a case study of Pakistan. In addition, Cuaresma et al. (2004) examine the non-linear effect of defense spending on economic growth for USA from 1929 -1999. The paper empirically investigated the defense-growth nexus using annual time series data and applies econometric technique of threshold regression. The study found empirical evidences for USA, that the military expenditures do have a level-effect on economic growth. Defense spending have a positive externality effect on economic growth, but prevails for a

higher level of defense spending at lower levels of this expenditure and a negative externality. The study was also suggested with a cross country analysis to find a non-linear effect of the defense spending on economic growth. The main argument of these researchers demand is affected based on the Keynesian Multiplier effects. An exogenous increase in military spending is caused by an increase in demand, if and only if demand increases utilization, thus growth, employment and purchasing power also increases. As a result, poverty decrease, saving increase, investment increase and finally, economic growth increase.

Rashid and Arif (2012) investigated the casual relationship using unit root test and panel co-integration in 14 developing countries from the period 1981-2006. The result suggested that military expenditure is an exogenous variable and it may affect economic activities in these countries. One of the most important arguments of those researchers who find positive relationship between defense expenditure and economic growth is the engagement of military into Research and Development (R&D). In a study, Anwar et al. (2012) used granger causality and Johansen co-integration tests on time series data from the period 1980-2010 for Pakistan. The results were witnessed for long run positive relationship between defense expenditure and economic growth.

### *2.2 Negative Effects of Defense Expenditure on Economic Growth*

Most researchers argued that if low income country have high defense burden, it must be financed by borrowing, issuing of new notes, and cutting down on other public expenditures. This situation causes the inflation which decreases savings, investment and further affects the economic growth. Dunne et al. (2002) studied the panel of 11 small industrialized economies by using co-integration techniques followed by VECM, and an annual time series data from 1951 to 2003. The study found that military expenditure have positive impact on external debt, but in real sense, military expenditure have negative impact on the economic growth because most developing countries which already face external debt import arms by loan. Therefore, their external debt increases more which further affect the GDP growth. However, Smaldone (2006) suggested in his study of Africa that the relationship between defense expenditure and economic growth will be heterogeneous, complex and elusive, but think that variation can be explained by intervening variables. Heterogeneous means effect may be negative, positive or insignificant. It depends on the geopolitical, geographical and geo economic conditions of any country, but in the case of Africa, negative effect tend to be deeper and wider because Africa faces legitimacy problem, security crises and economic budgetary constraints. Furthermore, Dunne (2012) contribute to the debate on the economic effects of military spending using a large cross-country panel data-set for 1988-2006. As well as providing a relatively up to date analysis, sub-groups are created that allow the analysis to focus on groups of countries at different income levels and Sub-Saharan Africa (SSA), an area which has seen a large number of damaging conflicts. Estimating the empirical growth model gives results that show variation across the sub-groups, with the general picture of significant negative short-run effect and insignificant long-run effect of military burden on per capita GDP growth, not consistent across the different income groups. In addition, breaking down the SSA group into those involved in conflict and those that are not, provides some further intriguing findings that suggest the value of further work on the impact of conflict on growth. Shahbaz et al. (2011) discovered a long run negative relationship between defense spending and economic growth in 1972-2009 for Pakistan. In another study, Shahbaz and Shabbir (2012) study the relationship between military expenditure and economic growth in case if Pakistan. They conclude that there is long run negative relationship between these two variables during the period 1971-2009. In addition, these points refer that; the defense expenditure is an opportunity cost, and the government budget constraints required that an increase in military expenditure will be financed by the cutting down of other public expenditures.

### *2.3 Insignificant Effects of Defense Expenditure on Economic Growth*

Dunne and Uye (2009) studied the impact of defense spending on economic growth for 103 countries, which was almost 39 percent of the whole world and the results were divided into three different categories. They studied 63 cross countries in which 19 percent shows a positive impact, 38 percent displays a negative impact and 43 percent shows an insignificant results. So, the most dominated part shows an insignificant result. Therefore, the study of the rest 40 countries which refers to single or small group of countries found that 20 percent countries show positive, 37 percent show negative and 45 percent show an insignificant impacts, thus in conclusion of all 103 countries, 20 percent show positive, 37 percent show negative and 44 percent show an insignificant results. Meanwhile, Habibullah et al. (2008) used ADF unit root test for stationary, ARDL test for co-integration to find out relationship between defense expenditure and economic growth in Asian countries from the period 1989-2002. In case of Pakistan they found defense spending and GDP are integrated with unit root test and ARDL test shows the long run relationship between the two variables. In addition, Tahir and Sajid (1999) investigated the relationship between defense spending and economic growth in LDCs and Pakistan by using granger causality test from the period 1996 to 1997. They suggested a feedback relationship in the case of

Pakistan, India and Iran. Meanwhile, Khan (2012) found that militarization in Pakistan is in-efficient and crowds out private sector activities. Furthermore, this study suggested that there is no evidence to support the claim that military is more administrative, competent and less corrupt.

Therefore, this present study intends to contribute to the existing literature in four different ways. Firstly, the study uses ARDL technique which does not impose a priori restriction of exogenous variable, and of single co-integration relation inherited in Granger causality approach used in earlier studies (Note 1). Secondly, the study incorporates a whole section to analyze historical changes and the possible determining factors of defense spending in Pakistan. The study also takes into account development expenditure not only to understand underlying long-run relation, if any, with the defense expenditure, but also its dynamics with GDP growth. Thirdly, study uses the most recent annual time series data and fourthly, it uses a more different control variable as compared to other studies on Pakistan.

### 3. Theoretical Underpinning

Military Keynesianism' which focuses on defense spending as a component of aggregate demand and on spillover effect of these spending also explains the economic effect of defense expenditure. Increased aggregate demand due to high defense spending will add to the economy's output and generate employment. Benoit (1978) suggests that this Keynesian effective demand can enhance the productivity by lowering the resource cost, reducing unemployment, and increasing profit. Thus, this will lift the investment rate which result in growth with a multiplier effect.

#### 3.1 Methodology

To verify the relationship between defense expenditure and growth, the following regression model is used:

$$GDP = \alpha_0 + \alpha_1 DF + \alpha_2 DV + \alpha_3 INF + \alpha_4 SAV + \varepsilon \quad (1)$$

Where GDP = Gross Domestic Product, DF = Defense Expenditure, DV = Development Expenditure INF = inflation, SAV = saving and  $\varepsilon$  = error term. Moreover, Time series method has been used in the empirical analysis. The standard procedure of the time series method involves the implementation of unit root test and the estimation of long run relationship.

*First:* Unit root test is used to confirm whether a variable is stationary,  $I_{(0)}$  or non-stationary,  $I_{(1)}$ . There are two main methods for testing the stationary of each variable; Augmented Dickey-Fuller Test (ADF) and Phillips Person Test (PP). In this study, ADF method has been employed because this method is considered more useful as compared to DF and PP test. DF test may create problem of autocorrelation. Therefore, to tackle autocorrelation problem, Dickey and Fuller (1981) developed another test called ADF test.

*Second:* in second step study analyze co-integration; there are different methods of analyzing long run relationship among the variables. Over the past decade, considerable attention has been paid in empirical economics to test for the existence of long-run relationship, which uses co-integration techniques majorly. The most reliable test to explore the long run relationship is Auto Regressive Distributed Lag (ARDL) model popularize by Pesaran et al. (1999). This inevitably involves a certain degree of pre-testing, thus introducing a further degree of uncertainty into the analysis of long-run relations. But third testing procedure suitable for both order  $I_{(0)}$  or  $I_{(1)}$ . In order to test for the long run relationship between military expenditure and economic growth in this study, ARDL testing approach has been employed. This method is recently used by Hirmissa et al. (2009). In fact, the procedure allows for different long-run relationships and short-run dynamics and this is important for the estimation of the equilibrium conditions. Thus, ARDL has various advantages. First, this technique is able to examine the presence of short run as well as long run relationship between dependent and independent variable. Second, it takes a sufficient numbers of lags to capture the data generating process in a general to specific modeling framework. Third, it provides robust result in a small sample size. Since the sample size of this study is based on 35 observations, hence this provides more motivation to adopt this model.

*Third:* In third step, studies apply bound testing procedure which involves three stages. The first stage is to establish the existence of a long run relationship. This is based on Estimating Error Correction (ECM) models by taking GDP as an independent variable and thus the following unrestricted ECM model is constructed.

$$\Delta Y_t = \beta_0 + \delta_{yy} Y_{t-1} + \delta_{xx} Y_{t-1} + \sum_{i=1}^{\rho-1} \phi_i \Delta Y_{t-1} + \sum_{i=0}^{\rho-1} \phi_i \Delta Y_{t-1} + \varepsilon \quad (2)$$

The second step is to compute the  $F$ -test for testing the existence of a long run relationship. The  $H_0$  for no co-integration amongst the variables in Equation (2) is:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5$$

Against the alternative hypothesis that not all of these coefficients are equal to zero:

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$$

Pesaran (1999) provided two sets of critical values of bound; one set assuming that all the regressors are  $I_{(1)}$ , and another set assuming that they all are  $I_{(0)}$ . The  $H_0$  of co-integration is rejected if the calculated  $F$ -test falls above the upper bound. If the computed  $F$ -test falls below the lower bound, then the  $H_0$  of co-integration cannot be rejected. Finally, the result is inconclusive if it falls in between the lower and upper bound. In such an inconclusive case, the order of integration,  $I_{(d)}$  for the explanatory variables must be known before any conclusion can be drawn (Pesaran, 1999).

The third step is to compare the computed  $F$ -values in the second step with all upper and lower 90, 95 or 99 percent critical values bounds.

*Fourth:* In step four, studies apply long run relationship test. Considered GDP and DV are two variables a mixture of  $I_{(0)}$  and  $I_{(1)}$ . To estimate the ARDL bounds testing approach, first do check if there is long run relation between these variables by applying joint significant on  $\beta_1$  and  $\beta_2$  in the Equation (3)

$$\Delta YGDP_t = \alpha + \sum_{i=1}^K \lambda_j \Delta GDP_{t-i} + \sum_{j=0}^i \rho_j \Delta GDP_{t-j} + \beta_1 GDP_{t-1} + \beta_2 DE_{t-1} + \varepsilon \quad (3)$$

Here  $k$  and  $i$  are calculated from AIC and SIC method.

Compare the  $F$ -Statistic value with the critical values provided by Pesaran (1999). If the calculated  $F$ -statistic is greater than the upper bound critical value at provided independent variables and the specification of the long run relation, it means there is long run relation between these variables. If the calculated  $F$ -statistic is lower than the lower bound, then there is no co-integration. If  $F$ -statistics value is in between lower and upper bound, then the results are inconclusive. Therefore, if there is co-integration, then long run relation and short run relation using Equation [4] and [5] are:

$$GDP_t = \alpha + \sum_{i=1}^K \lambda_j \Delta GDP + \sum_{j=0}^i \rho_j DE_{t-j} + \varepsilon \quad (4)$$

$$\Delta GDP_t = \alpha + \sum_{i=1}^K \lambda_j \Delta GDP_{t-i} + \sum_{j=0}^i \rho_j DE_{t-j} + \pi \varepsilon_{t-1} + \gamma_t \quad (5)$$

Here  $0 > \pi > -1$  and are statistically significant, otherwise this equilibrium will not have convergence.

*Fifth:* In step five, studies apply CUSUM test which is used to check if there is an issue of recursive residuals in this model.

### 3.2 Data

This study is based on time series secondary data ranging from the period from 1975 to 2010. The data have been taken from Handbook of Statistics on Pakistan Economy, a document published by the State Bank of Pakistan with the help of Federal Bureau of Statistic (FBS) and Federal Bureau of Revenue (FBR), and also the Economic Survey of Pakistan ( various issues) respectively.

## 4. Empirical Results

### 4.1 Descriptive Statistics

Results show that in the period of 1975-2012 maximum GDP 9.00 percent, defense expenditure 7.22 percent,

development expenditure 8.43 percent, inflation 20.80 percent and savings 20.78 percent were recorded. Meanwhile, minimum GDP 1.70 percent, defense expenditure 2.3 percent, development expenditure 0.87 percent inflation 3.10 and savings 9.66 percent were also recorded.

Table 1. Descriptive statistic of the variables

Variable	Mean	Median	Maximum	Minimum	S.D
GDP	5.21	5.15	9.00	1.60	2.01
DE	5.06	5.40	7.22	2.44	1.47
DEV	4.05	4.11	8.43	0.87	2.29
INF	8.54	8.38	20.80	3.10	3.68
SAV	14.71	14.29	20.78	9.66	2.39

#### 4.2 Unit Root Test

ADF tests are reported in Table 2; with series in level are run with constant and trend, while series in first difference also run with constant and trend. All the test of unit root of these variables  $t$ -statistics corresponding to the parameter  $\rho = 0$ , the calculated  $t$  values are compared with tabulated- $t$  values. The statistics shows that all the variables are stationary. At level GDP, INF and SAV are stationary  $I(0)$  at 5% significance while DE and DV are non-stationary but becomes stationary  $I(1)$  in first difference at 5% significance value.

Table 2. Results of ADF unit root test

Variable	Level		First Difference		Decision
	Intercept	Intercept and trend	Intercept	Intercept and trend	
GDP	-4.49*	-4.45	-5.93	-6.01	$I(0)$
DE	0.06	-2.30	-6.18**	-6.73	$I(1)$
DV	-1.36	-2.92	-5.46**	-5.41	$I(1)$
INF	-3.00*	-2.99	-7.16	-7.05	$I(0)$
SAV	-3.44*	-3.37	-7.59	-7.64	$I(0)$

Note: \* Stationary at level and 5% critical value (-2.95)

\*\* Stationary at first difference and 5% critical value (-2.95)

#### 4.3 Optimal ARDL Model

After performing unit root test, ARDL model was run to choose an optimal model of economic growth. The optimal model is chosen based on the lowest values of AIC and SBC. After running a couple of tentative ARDL models, the ARDL (2, 3, 0, 4, 4) model has been chosen because it has the lowest AIC (-51.174) and SBC (-65.098) values. The estimation results of the optimal ARDL model are shown in Table 3.

Table 3. Optimal ARDL (2, 3, 0, 4, 4) estimation results

Regressor	Coefficient	Standard Error	T-Ratio	Probability
GDP(-1)	0.115	0.159	0.720	0.484
GDP(-2)	-0.766	0.189	-4.043	0.001
DV	0.226	0.535	0.421	0.680
DV(-1)	-0.810	0.634	-1.276	0.224
DV(-2)	1.486	0.727	2.041	0.062
DV(-3)	-1.176	0.581	-2.023	0.064
DE	-0.941	0.303	-3.101	0.008
INF	-0.249	0.081	-3.048	0.009
INF(-1)	0.260	0.092	2.822	0.014
INF(-2)	-0.177	0.116	-1.516	0.153

Regressor	Coefficient	Standard Error	T-Ratio	Probability
INF(-3)	0.235	0.115	2.051	0.061
INF(-4)	-0.231	0.111	-2.073	0.059
SAV	0.011	0.155	0.075	0.941
SAV(-1)	-0.055	0.155	-0.359	0.725
SAV(-2)	0.445	0.147	3.014	0.010
SAV(-3)	0.088	0.148	0.597	0.560
SAV(-4)	0.727	0.159	4.554	0.001
C	7.189	6.659	1.079	0.300
T	-0.439	0.148	-2.968	0.011
R-Squared	0.887	R-Bar-Squared	0.731	
S.E. of Regression	1.037	F-stat. F(18, 13)	5.682	0.001
Mean of Dependent	5.309	S.D. of Dependent	2.009	
Residual Sum of Squares	13.995	Equation Log-likelihood		-32.73
Akaike Info. Criterion	-51.173	Schwarz Bayesian Criterion		-65.098
DW-statistic	2.758			

#### 4.4 ARDL Bound Test Results

The  $F$ -test has a non-standard distribution which depends upon whether variables included in the ARDL model are  $I_{(0)}$  or  $I_{(1)}$ , and the number of regressors. Pesaran (1999) provides two sets of critical value bound; one set assuming that all regressors are  $I_{(1)}$  and the other are all  $I_{(0)}$ . Table 4 shows the upper and lower 90, 95 and 99 percent critical value bound.

Table 4. Critical value bound

K**	90%		95%		99%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
4						
Critical values*	2.65	3.71	3.70	4.19	3.46	4.65

\*The critical value bounds are from Table  $F$ , restricted intercept and no trend in Pesaran, 1999;

\*\*No. of regressors.

The null hypothesis of no cointegration is rejected if the calculated  $F$ -test falls above the upper bound. If the computed  $F$ -test falls below the lower bound, then the null hypothesis of no co-integration cannot be rejected. Finally, the result is inconclusive if it falls in between the lower and upper bound. The calculated  $F$ -tests are reported in Table 3. It shows that all  $F$ -values are higher than upper bound critical values at the 10 percent significance level. Thus, the null hypothesis of no co-integration is rejected. Therefore, it means all variables are co-integrated to each other.

Table 5. F-tests for cointegration

Test	$F$ -statistic	Lag selection
$F(GDP/DE, DV, INF, SAV)$	5.6822	2, 3, 0, 4, 4
$F(DE/GDP, DV, INF, SAV)$	105.1731	2, 2, 0, 1, 2
$F(DV/GDP, DE, INF, SAV)$	72.8671	1, 0, 0, 1, 0
$F(INF/GDP, DE, DV, SAV)$	4.9719	1, 1, 0, 1, 2
$F(SAV/GDP, DE, DV, INF)$	3.8044	0, 0, 0, 0, 0

#### 4.5 Diagnostic Test

The robustness of the model has been confirmed by diagnostic tests for serial correlation, function form, normality, heteroscedasticity and structural stability for the model. As shown in the Table 6, it generally passes all the diagnostic tests. These tests show that there is no evidence of autocorrelation in the disturbance of error term. The ARCH test suggests the errors are homoscedasticity. The model passes the Jarque-Bera normality test suggesting that the errors are normally distributed. However, in the absence of model misspecification hypothesis, it fails at 5 percent level in the model. Pesaran et al. (1999) also face a similar problem. They argued that it may be linked to the presence of some non-linear effects or asymmetric in the adjustment of the regress, and that their linear specification is incapable of taking it into account. Hence, one possibility would be to switch to a non-linear model.

Table 6. Diagnostic test

ARDL (2, 3, 0, 4, 4)				
Test	H <sub>0</sub>	Statistic	p-value	Decision
SC	There is no serial correlation in the residual	$\chi^2 = 8.1004$	0.067	Fail to reject H <sub>0</sub>
HE	There is no autoregressive conditional heteroscedasticity.	$\chi^2 = 0.35823$	0.719	Fail to reject H <sub>0</sub>
NO	Normal distribution	JB = 0.58067	0.748	Fail to reject H <sub>0</sub>
FF	Absence of model misspecification	$\chi^2 = 0.073910$	0.794	Fail to reject H <sub>0</sub>

#### 4.6 Results of Long Run Relationship

The primary focus of this study is on the long run effects of defense expenditure on economic growth. Thus, it is axiomatic task to test for the co-integration of variables. Co-integration of a set of time series implies that long run stationary relationship existed among the component of non-stationary series. The co-integration technique pioneered by (Hendry, 1986; Granger, 1986; Engle & Granger, 1987) provides an axiomatic foundation of the methodology. Thus, the empirical results for this model reported in Table 7, obtained the depending GDP(Y) as the depending variable.

Table 7. The estimated long-run coefficients results

ARDL(2, 3, 0, 4, 4)		
Regressor	Coefficient	t-Ratio
C	0.435	1.125
DF <sub>t</sub>	-0.570	-3.090*
DV <sub>t</sub>	-0.166	-0.402
INF <sub>t</sub>	-.097	-.0959
SAV <sub>t</sub>	0.737	5.120**

Note: \*Negatively significant with respect *t*-value (-1.96);

\*\* Positively significant with respect to *t*-value (+1.96).

The results of table 7 above indicate that two variables out of four are significant. It means Pakistan defense expenditure is negatively related with GDP growth, but saving is positively related with GDP growth. In addition, this results show that for 1 percent increase in defense expenditure, there is a decrease in the GDP by 0.57 percent, and a one percent increase in saving, leads to an increase in the GDP by 0.73 percent.

The results are similar to the finding of Looney (1995), Tahir & Sajid (1999) and Habibullah et al. (2008) that defense spending negatively impact to the economic growth, but also cannot be used as macroeconomic



stabilizer. Thus, the finding of Khan (2004) and Aslam (2007) illustrated that defense spending do not negatively impact to the economic growth. Those results are proof that there is long run relationship between defense expenditure and economic growth, and Pakistan defense spending, negatively impact to the economic growth. In addition, it is also proof that the national saving has a positive impact on economic growth and the other two variables development expenditure and inflation does not have a considerable impact either negative or positive on economic growth.

4.7 Stability Test

The cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) graphical are presented in Figure 2. This figure indicates the absence of any instability of the coefficients because the plots of these statistic remains within the critical bound of the 5 percent significant level. Hence, these statistics confirm the stability of long-run coefficient of the GDP function in the model.

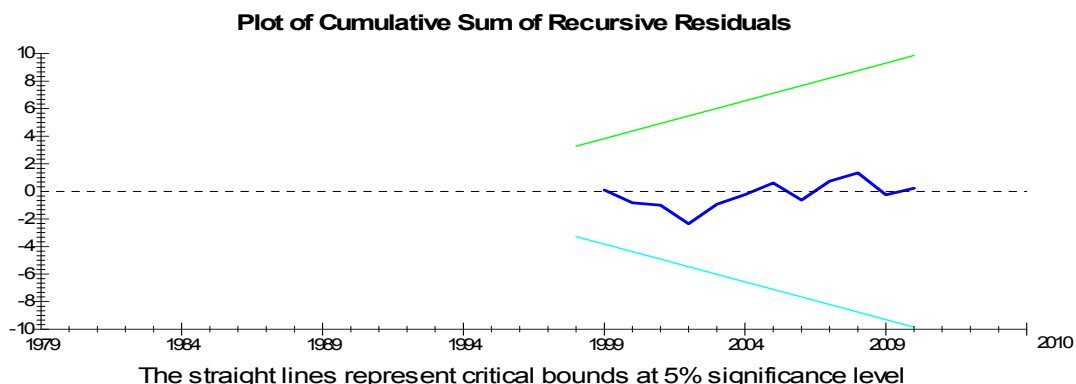


Figure 2(a). Plot of cumulative sum of recursive residual

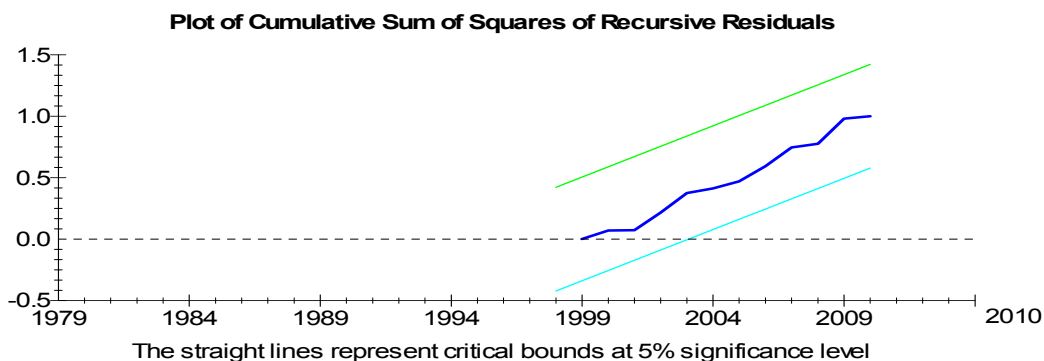


Figure 2(b). Plot of cumulative sum of recursive residual

Therefore, the result of this study is obtained through the empirical investigation of the model. Mainly, empirical investigation is based on ARDL model but some preliminary tests are also done to fulfill the assumptions of ARDL. Before applying ARDL, find out the order of integration whether the variables are stationary or not and furthermore, find out the variables stationary at level  $I_{(0)}$  or at first difference  $I_{(1)}$ . Variables are achieved stationary, but GDP, INF and SAV are stationary in level at five percent significant level and DE, DV are non-stationary at level and become stationary after first difference at five percent significant level. These results were obtained by utilizing ADF unit root test. In addition, the results of co-integration ( $F$ -test) were shown that all  $F$ -values are greater than upper bound value at 10 percent significant level, and this signifies that there is co-integration among all variable and the null hypothesis of no co-integration is rejected. The existence of co-integration opens up for further investigation because if at that point there is no co-integration, then this model cannot be further investigated. For further investigation to achieve the ultimate goal which is to find out the long run relationship at this stage, we need to apply same test to confirm the heteroscedasticity, structural

stability, serial correlation and normality in the data. Results of this study show that all variables passes test through the diagnostic test. Results of long-run coefficient show that out of five variables (GDP, DE, DV, INF, and SAV); two variables DE and GDP are statistically significant and have long run relationship. It explains that defense expenditure negatively impact on economic growth, whereas saving positively impact on economic growth. Therefore, one (1) percent increases in defense expenditure cause 0.57 percent decrease in economic growth and one percent increase in saving cause 0.73 percent increases in economic growth. Finally, the result of cumulative sum of recursive residual (CUSUM) test shows that there is no problem of recursive residual, which means that the data is stable.

### 5. Conclusion and Policy Implication

The main objective of this paper is to examine whether there is long run relationship between defense expenditure and economic growth. To accomplish this, study used annual time series data from 1980 to 2012. The ARDL approach is used for estimation purpose. The results indicate the presence of long run relationship; thus variables are stationary, co-integrated and model is significant. Moreover, Pakistan defense expenditure is negative and saving is positively related with GDP growth. Furthermore, there is no significant long run relationship between defense expenditure, development expenditure and inflation. Thus, this evidence rejects the common perception that the increase in defense expenditure causes a decrease in development expenditure.

The results of the present study suggest that the popular perception that defense expenditure hurts economic growth seem to hold over the estimation period, but MKH does not hold in case of Pakistan. Furthermore, the results of this study support the arguments that “defense expenditure is an opportunity cost”. No doubt defense is a vital element of national security; however, policy makers should consider for economic, social, energy and other elements of national security.

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## Note

Note 1. For example Tahir and Sajid (1999) and Anwar et al. (2012)

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