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MILITARY SPENDING AND ECONOMIC GROWTH IN PAKISTAN: NEW EVIDENCE FROM ROLLING WINDOW APPROACH

Abstract

Purpose: This paper re-investigates causality between military spending and economic growth by applying autoregressive distributed lag model or ARDL bounds testing approach to cointegration. Furthermore, rolling window approach (RWA) to cointegration is also applied to confirm the established long run relation between the variables. The VECM Granger causality is used to detect the direction of causality between military spending and economic growth. Our empirical exercise indicated long run relationship between military spending and economic growth as confirmed by rolling window approach. Moreover, negative unidirectional causality is found running from defense spending to economic growth. This paper opens up new sights for policy-making authorities to sustain economic growth by curtailing defense spending.

Keywords: *Defence Spending, Growth, Cointegration, Causality*

1.INTRODUCTION

The aim of paper is to revisit the causal relationship between military spending and economic growth in case of Pakistan. The existing literature reveals two main channels of how defence spending affect economic growth. According to Keynesian view, military spending increases aggregate demand by stimulating output, employment and hence economic growth. Additionally, increase in human capital stock due to military spending through education and technological guidance seems to have spillover effects that increase expenditures on research and development for civilian. On the contrary, neoclassical model argues that increase in military spending means shift of resources from private sector at the cost of private spending. This crowds-out investment both by public and private sector and hence economic growth is declined (Sandler and Hartley, 1995). The public sector is less active and efficient as compared to private sector. For the reason that public or military firms use resources less efficiently while private firms are relatively concerned with low cost of production. It is empirically proved by Gupta et al. (2004) that low military spending are associated with high economic growth by raising capital formation.

The present study seems to be a good contribution in defence literature for three major reasons. Firstly, ARDL bounds testing approach to cointegration is applied to test cointegration between the variables. Secondly, the study uses most advanced Ng-Perron (2001) unit root test which is considered superior over the other traditional unit root test such as augmented Dickey-Fuller (ADF), Phillips and Perron (P-P) and Dickey-Fuller generalised least squared (DF-GLS). Finally, stability of ARDL findings is confirmed by applying Rolling Window Approach (RWA)

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to cointegration. The rest of study is organised as following: section-II describes the review of literature on the relationship between military spending and economic growth. Methodological framework is described in section-III while section-IV is about results interpretation. Finally, conclusion and policy implications are drawn in section-V.

2. REVIEW OF LITERATURE

The defence literature provides plethora of studies on relationship between military spending and economic growth with mixed results. The issue of causal relationship between military spending and economic growth had explored by Benoit's (1973, 1978) using data of 44 less developed countries (LDCs). The results indicated positive correlation between military spending and economic growth. Furthermore, he documented that spill-over effects of military spending are significant and thus affect the overall economy positively. Many studies supported the view by Benoit (1973, 1978) applying different approaches such as Kennedy, (1974); Deger, (1986); Sezgin, (1997); Chletsos and Kollias, (1995) and Yildirim et al. (2005). Apart from that, Halicioglu (2004) considered the relationship between military spending and economic growth including real interest rate and non-military expenditures in case of Turkey. The analysis showed a long run and positive association between military spending and economic growth while non-military spending boosts economic growth more than military spending. Atesoglu (2004) found a strong effect of military spending on economic growth but Cuaresma and Reitschuler (2003) documented an inverse relationship between military spending and economic growth for U. S economy. Similarly, Yildirim et al. (2005) investigated the affect of military spending on economic growth in Middle Eastern countries and Turkey. Their empirical results indicated positive impact of military spending on economic growth.

Dunne et al. (2002), Faini et al. (1984) and others rejected the hypothesis that military spending promote economic growth. For example, Lim (1983) documented the inverse effect of military spending on economic growth in case of African less developed economies. Similarly, Starr et al. (1984) argued that rise in military spending raises inflation which in resulting retards economic growth. This implies that military spending indirectly lowers the pace of economic growth. For the case of OECD countries, Cappelen et al. (1984) examined the association between defense spending and manufacturing output, investment and economic growth. Their results showed positive impact of military spending on manufacturing output. An inverse effect of military spending on investment and economic growth is also found. In case of China, Chen (1993) found that there is no cointegration between military spending and economic growth. Masih et al. (1997) re-examined the direction of causal relationship between military spending and economic growth in case of China since 1950. They concluded that military spending leads economic growth. Latter on, Wolde-Rufael (2001) rejected the previous findings and concluded that both variables are cointegrated while direction of causality is running from military spending to economic growth in case of Mainland China.

In recent wave of literature, Bas (2005) investigated the relationship between military spending and economic growth using nonparametric approach. The empirical evidence indicated that military spending has inverse effect on economic growth by declining investment spending. Mylonidis (2008) used data for European Union and found that economic growth is inversely caused by rise in military spending. For the case of United States, Smith and Tuttle, (2008) reinvestigated the relationship between military spending and economic performance borrowing model from Atesoglu, (2002) and noted inverse impact of military spending on aggregate output while findings are inconsistent with Atesoglu, (2002) for United States. Kalyoncu and Yucel (2006) conducted a study for Turkey and Greece to test relationship between military spending and economic growth. Their empirical exercise indicated unidirectional causal relation running from economic growth to defense spending in Turkey. Similarly, Sawhney et al. (2007) collected the data of globe military spending and economic growth to investigate the relationship between both the variables. The results pointed out that a rise in military spending of globe will decline economic growth. Apart from that Tang (2008) also examined the impact of military spending on economic growth for Malaysia and found inverse relation between military spending and economic growth. Similarly, Pieroni (2009) also found inverse association between military spending and economic growth. Keller et al. (2009) have pointed out very good issue on military draft and economic growth and concluded that military draft is associated with high recruitment of their army personals. The large size of military draft means high resources are required to meet their demand. This indicates the distortions of both human and physical capital resources. This big draft of military will lower aggregate demand and hence lower the output in OECD countries.

The attention has also paid in literature to examine the direction of causality between military spending and economic growth. For instance, Joerding (1986) found bidirectional causal relationship between military spending and economic growth and validating the feed-back effect. In case of Pakistan and India, Tahir (1995) examined causal relation between both variables and found bidirectional causality between both variables for both countries[3]. For the case of Egypt, Israel and Syria, Abu-Bader and Abu-Qarm (2003) used multivariate cointegration approach and variance decomposition method to check the causal relationship between macroeconomic variables. Their analysis revealed that military spending is inversely related with economic growth for Egypt, Israel and Syria. Similarly, Karagol and Palaz, (2004) tested the link between military spending and economic growth for case of Turkey using Johansen cointegration approach. Their empirical evidence found cointegration among the variables and reported that high military spending Granger causes economic growth negatively. Kollias et al. (2004) reported feedback hypothesis between military spending and economic growth in case of Cyprus. Yildirim and Ocal (2006) conducted a study to investigate relationship between arms race and economic growth. They showed the causality between military expenditures of Pakistan and India. Furthermore, aggression is main cause of arms race between India and Pakistan which is detrimental for economic growth of both countries. Using panel data set

3 Choudhury (1991) do seem to explore any causal relationship betwen militray spending and econmic growth but inverse impact of militray spending on economic growth is found. He documents that results vary due socioeconomic struture and size of government for each country.

for European Union, Kollias et al. (2007) also found bidirectional causality between military spending and economic growth.

In the case of, Karagianni and Pempetzoglu (2009) explored the relationship between military spending and economic growth using linear and non-linear causality approaches. Their results showed unidirectional causal relation running from military spending to economic growth while economic growth Granger is caused non-proportionately by shock in military spending in Sri Lanka confirmed by non-linear causality. Hirnissa et al. (2009) also tested the direction of causality between military spending and economic growth in case of ASEAN countries by applying ARDL bounds testing approach to cointegration. Their findings indicated that there is cointegration between military spending and economic growth in Indonesia, Thailand and Singapore. The military sepnding and economic growth Granger cause each other in case of Singapore while military spending Granger causes economic growth in case of Indonesia and Thailand[4]. Dunne and Vougas (1999) investigated the causal relationship between military spending and economic growth in case of South Africa. The findings showed cointegration between both variables and unidirectional causality is found running from military spending to economic growth. Reitschuler and Loening (2005) explored relationship between military spending and economic growth in case of Guatemala. Their findings suggested an inverted-U shaped relationship between military spending and economic growth. But Pieroni (2009) found insignificant U-shaped link between military spending and economic growth using non-parametric approach. Finally, Na (2010) examined the reasons of arms race between India and Pakistan by applying Richardson action-reaction approach. The empirical evidence pointed out that military spending in India is determined by income, political status and external wars. In Pakistan and India, military spending are negatively linked with economic growth.

3. DATA AND METHODOLOGY

The study uses data over the period of 1971-2009. Economic Survey of Pakistan (various issues) is used to attain data for real military spending and real GDP. The data has been converted in log-form[5]. The Table-1 reveals the descriptive statistics and correlation matrix. There is negative and significant correlation between military spending and economic growth in case of Pakistan.

Table 1: Descriptive Statistics and Correlation Matrix

Variables	Mean	Median	Maximum	Minimum	$LRGDP_t$	$LRDEXP_t$
$LRGDP_t$	10.9017	11.0148	11.5805	10.5050	1.0000	-0.7853
$LRDEXP_t$	6.9687	7.2005	7.4830	6.0189	-0.7853	1.0000

Source: Author calculation

4 Military sending and economic growth does not cause each other for Malaysian and Philippines' economies.
5 Bowers et al., (1975) suggest that Ehrlich's (1975) log-linear specification is sensitive to the functional form. Ehrlich (1977) and Layson (1983) argue that the log linear specification produces better empirical outcome.

Ng-Perron (2001) developed a test statistics wherein GLS is applied to de-trend the series D_t^d. The critical values of the tests are based on those of Philip-Perron (1988) Z_a and Z_t statistics, Bhargava (1986) R_1 statistics, and Elliot, Rotherberg and Stock (1996). The following annotations are used:

$$k = \sum_{t=2}^{T} (D_{t-1}^d)^2 / T^2 \tag{1}$$

The de-trended GLS tailored statistics is given by:

$$MZ_a^d = (T^{-1}(D_T^d)^2 - f_\circ)/(2k)$$
$$MZ_t^d = MZ_a \times MSB$$
$$MSB^d = (k / f_\circ)^{1/2}$$
$$MP_T^d = \left\{ (\bar{c}^{-2} k - \bar{c} T^{-1}(D_T^d)^2 / f_\circ, and, (\bar{c}^{-2} k + (1-\bar{c}) T^{-1}(D_T^d)^2 / f_\circ \cdots \right. \tag{2}$$

The generalized Dickey-Fuller type regression is used to calculate F-statistics or Wald statistics. The significance of variables is checked by using unrestricted conditional equilibrium error correction model (Pesaran et al. 2001). This approach involves estimating the conditional error correction version of the ARDL model for variable under estimation. The Augmented ARDL (p, q_1, q_2, …… q_k) is given by the following equation (Pesaran et al. 2001):

$$\alpha(L,p) y_t = \alpha_\circ + \sum_{i=1}^{k} \beta_i(L,p) x_{it} + \lambda' w_t + \varepsilon_t$$
$$\forall t = 1, \ldots\ldots, n \tag{3}$$

where

$$\alpha(L,p) = 1 - \alpha_1 L - \alpha_2 L^2 - \ldots\ldots - \alpha_p L^p$$

$$\beta_i(L,q_i) = \beta_{i\circ} + \beta_{i1} L + \beta_{i2} L^2 + \ldots\ldots + \beta_{iq_i} L^{q_i} \forall_i = 1,2\ldots,k$$

y_t is an independent variable, α is the constant term, L is the lag operator such that $Ly_t = y_t - 1$, w_t is s ´ 1 vector of deterministic variables such as intercept term, time trend or exogenous variables with fixed lags.

The long run elasticities are estimated by:

$$\varphi_i = \frac{\hat{\beta}_i(1,\hat{q})}{\alpha(1,\hat{p})} = \frac{\hat{\beta}_{i\circ} + \hat{\beta}_{i1} + \ldots\ldots + \hat{\beta}_{i\hat{q}}}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \ldots - \hat{\alpha}_p} \quad \forall i = 1,2,\ldots,k \tag{4}$$

Where $\hat{p}$ and $\hat{q}_i$, i = 1, 2, …, k are the selected (estimated) values of $\hat{p}$ and $\hat{q}_i$, i = 1, 2, …, k. The long run coefficients are estimated by:

$$\pi = \frac{\hat{\lambda}(\hat{p}, \hat{q}_1, \hat{q}_2, \ldots, \hat{q}_k)}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \ldots - \hat{\alpha}_p} \tag{5}$$

Where, $\hat{\lambda}(\hat{p},\hat{q}_1,\hat{q}_2,....\hat{q}_k)$ denotes the OLS estimates of λ in equation (3) for the selected ARDL model. This study uses a more general formula of ECM with unrestricted intercept and unrestricted time trend (Pesaran et al. 2001):

$$\Delta y_t = c_\circ + \pi_{yy} y_{t-1} + \pi_{yx.x} x_{t-1} + \sum_{i=1}^{p-1} \psi'_i \Delta z_{t-1} + w' \Delta X_t + \mu_t \qquad (6)$$

where $c_0 \neq 0$ and $c_1 \neq 0$. The Wald test (F-statistics) for the null hypothesis $H_\circ^{\pi_{yy}} : \pi_{yy} = 0, H_\circ^{\pi_{yx.x}} : \pi_{yx.x} = 0'$, and alternative hypothesis $H_1^{\pi_{yy}} : \pi_{yy} \neq 0, H^{\pi_{yx.x}} : \pi_{yx.x} \neq 0'$. Hence the joint null hypothesis is given by: $H_\circ = H_\circ^{\pi_{yy}} \cap H_\circ^{\pi_{yx.x}}$, and alternative hypothesis is as: $H_\circ = H_1^{\pi_{yy}} \cap H_1^{\pi_{yx.x}}$. The UECM equation to calculate F-statistic is modelled as following:

$$\Delta LRDEXP_t = \alpha_\circ + \sum_{i=1}^{m} \alpha_2 \Delta LRDEXP_{t-i} + \sum_{i=0}^{m} \alpha_3 \Delta LRGDP_{t-i} + \alpha_4 LRDEXP_{t-1} + \alpha_5 LRGDP_{t-1} + \eta_i \qquad (7)$$

$$\Delta LRGDP_t = \beta_\circ + \sum_{i=1}^{m} \beta_2 \Delta LRGDP_{t-i} + \sum_{i=0}^{m} \beta_3 \Delta LRDEXP_{t-i} + \beta_4 LRGDP_{t-1} + \beta_5 LRDEXP_{t-1} + \mu_i \qquad (8)$$

Where, $LRDEXP_t$ and $LRGDP_t$ are real military spending and real GDP in natural logs and t is time trend variable. On the other hand, η and μ are error terms in the models. The first part of both equations with a_2, a_3 and β_2, β_3 represents the short-run dynamics of the models whereas the second part with a_4, a_5 and β_4, β_5 represent the long-run phenomenon. The null hypothesis in the equation (7) is $\alpha_4 = \alpha_5 = 0$, which indicates no existence of the long-run relationship and vice versa, while the null hypothesis in the equation (8) is $\beta_4 = \beta_5 = 0$, which means the non-existence of the long run relationship and vice versa.

The next step is to compare our computed F-statistic with critical bounds tabulated by Pesaran et al. (2001). If the F-statistic exceeds upper critical bound, the null hypothesis of no long run relationship may be rejected regardless of whether the underlying orders of integration of the variables are I(0) or I(1). Similarly, if the F-statistic falls below the lower critical value, the null hypothesis is not rejected. However, if the sample F-statistic falls between these two bounds then result is inconclusive. The model can be selected using the lag length criteria like Schwartz-Bayesian Criteria (SBC) and Hannan-Quinn (HQ) information criterion.

The third stage includes conducting standard Granger causality tests augmented with a lagged error-correction term. The Granger representation theorem suggests that there will be Granger causality in at least one direction if there exists cointegration relationship among the variables provided the variables are integrated order of one. Engle-Granger (1987) cautioned that if the Granger causality test is conducted at first difference through vector auto regression (VAR) method than it will be misleading in the presence of co-integration. Therefore, an inclusion of an additional variable to the VAR method such as the error-correction term would help us to capture the long-run relationship. To this end, an augmented form of Granger causality test is involved to the error-correction term and it is formulated in a bi-variate pth order vector error-correction model (VECM) which is as follows:

$$\begin{bmatrix} \Delta LRGDP_t \\ \Delta LRDEXP_t \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \end{bmatrix} + \sum_{j=1}^{p} \begin{bmatrix} d_{11}(L) & d_{12}(L) \\ d_{21}(L) & d_{22}(L) \end{bmatrix} \times \begin{bmatrix} \Delta LRGDP_{t-j} \\ \Delta LDREXP_{t-j} \end{bmatrix} + \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} \times \begin{bmatrix} ECT_{t-1} \\ ECT_{t-1} \end{bmatrix} + \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} \quad (9)$$

Where D is a difference operator, ECT representing the error correction term derived from long run cointegrating relationship via ARDL model, C (i = 1, 2) is constant and h(i = 1, 2) are serially uncorrelated random disturbance term with zero mean. Through the ECT, the VECM provides new directions for Granger causality to appear. Long-run causality can be revealed through the significance of the lagged ECTs by t test, while F-statistic or Wald test investigate short-run causality through the significance of joint test with an application of sum of lags of explanatory variables.

3. EMPIRICAL RESULTS

The main objective of paper is to re-investigate the causal relationship between military spending and economic growth. There are many techniques such as Engle and Granger (1969), Johansen (1991, 1992) and Johansen and Juselius (1990) and, Stock and Watson (1993) are available to find out long run relationship between the variables[6]. The prerequisite of these tests for cointegration is that all variables in the model must have same order of integration.

The ARDL bounds testing approach for cointegration is more appropriate and flexible as compared to other traditional cointegration approaches. The autoregressive ditributive lag model can be applicable whether variables are integrated at I (0) or I(1) or I(1) / I(0). İt shows that there is no need to find out order of integration of variables to apply ARDL bounds testing. But, İt is pointed out by Ouattara (2004) that there is need to have informtaion about order of integration of variables. The main assumption of ARDL model is that the variables are inetgrated at I(1) or I(0) and no variable sholud be stationary beyond that integrating orders. İf any variable in model is integrated at I(2) then whole computation of F-statistic for cointegartion becomes useless. Therefore to apply ARDL bounds testing approach to cointegration, it is necessary to have information about the order of integration of the variables.

Table 2: Ng-Perron Unit Root Test

Ng-Perron at Level with Intercept and Trend				
Variables	MZa	MZt	MSB	MPT
$LRGDP_t$	-4.20307	-1.3811	0.3285	20.9802
$LRDEXP_t$	-3.2154	-1.2052	0.3748	26.9661
Ng-Perron at 1st Difference with Intercept and Trend				
$\Delta LRGDP_t$	-24.1666*	-3.4679	0.1435	3.8189
$\Delta LRDEXP_t$	-30.8187 *	-3.8964	0.1264	3.1208

Source: Author calculation

Note: * shows significnce at 1% significnce level.

6 Engle–Granger's approach seems to produce less satisfactory when one cointegrating vector is present in multivariate case (Seddighi et al. 2006).

In doing so, Ng-Perron uni root test is applied. The empirical evidence shows that military spending and economic growth are integrated at I(1). This implies that variables have unique order of integration. In such circumstances, we can apply ARDL bounds testing approach to cointegration. It is necessary to select lag length of variables by estimating 1st differenced of the conditional error correction version of ARDL. In doing so, minimum value of Akaike Information Criteria (AIC) is used to select appropriate lag length. The VAR results show that lag order 2 is appropriate. The results are shown in Table-3.

Table 3: Lag Length Criteria

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-6.411524	NA	0.005708	0.509789	0.600487	0.540306
1	119.1799	228.3480*	3.60e-06	-6.859385	-6.587293*	-6.767835*
2	124.1340	8.407018	3.41e-06*	-6.917212*	-6.463725	-6.764627
3	127.5878	5.442397	3.56e-06	-6.884110	-6.249228	-6.670492

Source: Author calculation

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 4: ARDL Cointegration for Long Run Relation

Model for Estimation	*F*-Statistics		Lag
$F_{RDEXP}(LRDEXP_t / LRGDP_t)$	0.8974		2
$F_{RGDP}(LRGDP_t / LRDEXP_t)$	4.6890**		2
Critical Values	Pesaran et al. (2001)		
Significance Level	Lower Critical Bound	Upper Critical Bound	
1%	5.150	6.360	
5%	3.790	4.850	
10%	3.170	4.140	

Source: Author calculation

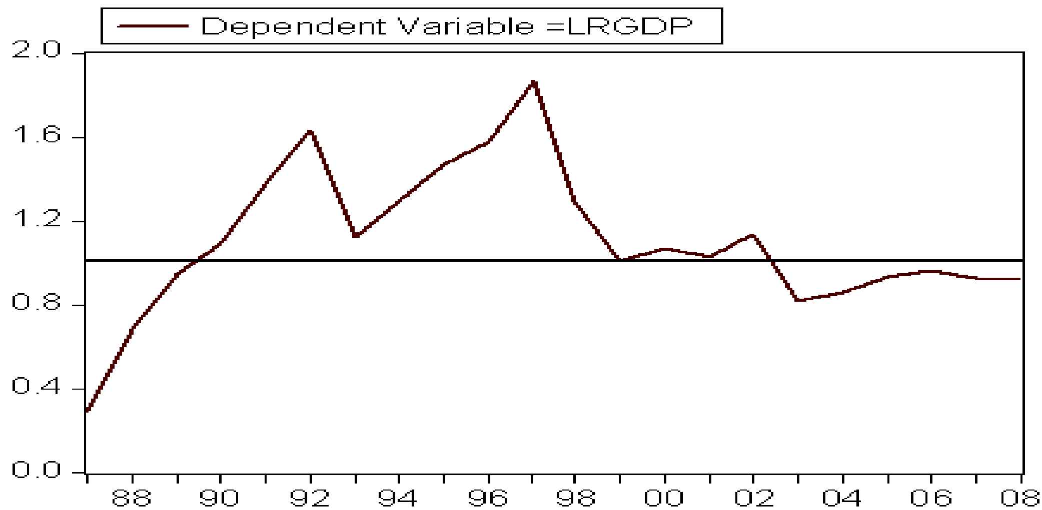
Note: Critical values obtained from Pesaran et al. (2001) following unrestricted intercept and no trend. The lag selection is based on AIC and SBC. ** denotes cointegration exists at 10% level of significance.

The Table-4 reveals the results of PSS (2001) calculated F-statistic to cointegration between the variables. The empirical evidence indicates cointegration between military spending and economic growth when military spending. The reason is that calculated F-statistic is greater than upper bound at 10% significance level when military spending is forcing variable.

Rolling Window Approach (RWA) to Cointegration

This study also applies rolling window bounds testing approach to cointegration is to probe whether a cointegrating relation is stable or not. The theoretical and empirical literature does not seem to provide any confirmation to choose the rolling window size. In order to capture static and dynamic association between military spending and economic growth, we take 15-year observations as a window size. Thus if the normalized F-statistic is greater than one then cointegration exists and stable otherwise not. Our results for rolling window approach to ARDL cointegration show that moving window size is 15 and ARDL model with 2 lags is estimated for $LRGDP_t = f(LRDEXP_t)$ with unrestricted constant and no trend. The upper critical bound from Pesaran et al. (2001) is 4.140 with k-1 (regressor) having constant and no trend. The selection of the window size of 15-years is appropriate to justify that static and vibrant link between military spending and economic growth can be checked. The normalized F-statistic of $LRGDP_t = f(LRDEXP_t)$ for each window can be visualized by the thick and straight line mentioned in figure-1. It is stated above, if the normalized F-statistic is more than 1(more than thick and straight line) then there is stable cointegration between military spending and economic growth. The descriptive view of normalized F-statistic is reported in Table-5. Figure-1 indicates that cointegration relation between military spending and economic growth is instable before 1990 and after 2003.

Figure-1



----10 % normalised F-Statistic

Source: Author calculation

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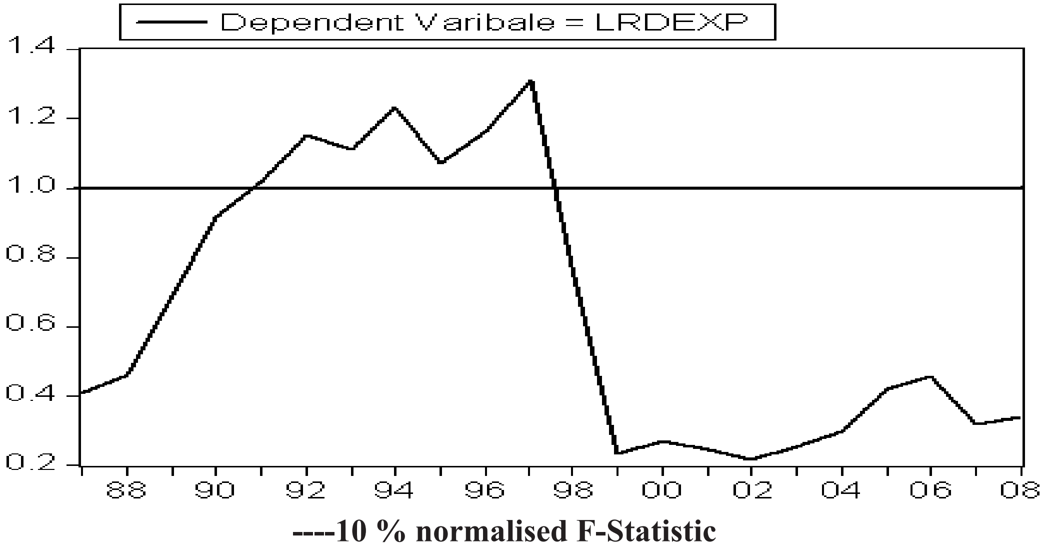
Figure-2



Source: Author calculation

Table-5 reveals that more than 1 normalized F-statistic is 68.43% while less than 1 is 32.58% which indicates overall stable long run association between the variables.

Table-5 Descriptive View of Normalized F-statistics for Rolling Approach to ARDL Cointegration Test

	Dependent Variable: LRGDP	
Less than 1	6	32.58%
More than 1	13	68.43%
Total	19	100
	Dependent Variable = LRDEXP	
Less than 1	12	63.17%
More than 1	7	36.84%
Total	19	100
Window Size = 15		

Source: Author calculation

The rolling window ARDL cointegration approach has also been applied to investigate the normalized F-statistic for $LRDEXP = f(LRGDP)$. The empirical evidence is reported in figure-2 and descriptive view in Table-5. It is noted that more than 1 normalised F-statistic 36.84% while less than 1 is 63.17%. Our results indicate that cointegration relation is stable when military spending is forcing variables and not vice versa. These findings are consistent with ARDL cointegration results reported in Table-4. This shows that long run results are robust.

The OLS regression results show negative relationship between military spending and economic growth and it is significant at 1% level shown by t-statistic in parenthesis. The results reveal that a 1 percent increase in military spending will decline economic growth by 0.50 percent. These findings are consistent with line of literature such Choudhury (1991), Abu-Bader and Abu-Qarm (2003), Cuaresma and Reitschuler (2003) and Atesoglu (2004) etc.

OLS Regression Results

$$L\hat{RGDP}_t = 14.3956 - 0.5013LRDEXP_t$$

(30.4105)* (-7.3968)*

R-squared = 0.6167 F-statistics = 54.7118

The Table-6 presents the results of VECM Granger causality. It is pointed by Groenewold et al. (2007) that causality test for long run and short run causality evidence is applicable if variables are cointegrated. The empirical evidence on direction of causal relation indicates unidirectional causality running from military spending to economic growth and it is significant at 5% level of significance. These results are contradictory with the findings of Tahir (1995) and Yildirim and Öcal (2006). This implies that military spending is detrimental for economic growth as argued in neoclassical model. The neoclassical model reveals that an increase in military spending means shift of resources from private sector at the cost of private spending. This crowds-out investment both by public and private sector. This crowds-out in investment declines the pace of economic growth.

Table 6: Granger Causality Analysis and Sensitivity

Variables	Short Run		Long Run		Sensitivity	
	ΔLRGDP	ΔLRDEXP	ECT_{t-1}	R-Squared	Diagnostic Test	
ΔLRGDP	…..	3.1783** (0.0427)	-0.0666** (0.0224)	0.4784	J. B Test	0.1477 (0.9287)
					LM Test	0.6015 (0.5560)
					ARCH Test	0.8064 (0.3763)
					W. Hetro	0.6860 (0.7459)
					Ramsey Test	0.5928 (0.4485)
ΔLRDEXP	1.7532 (0.1851)	…..	-0.0267 (0.5885)	0.2452	J. B Test	2.3733 (0.3052)
					LM Test	2.6321 (0.0741)
					ARCH Test	0.2472 (0.6226)
					W. Hetro	0.9179 (0.5473)
					Ramsey Test	1.8913 (0.1812)

Source: Author calculation

Note: ** shows significance at 5% level of significance. In parenthesis, probability values are given.

Table-6 presents the results of long and short runs granger causality, where maximum lag is 2 obtained following AIC. The appropriate lag length avoids the problem of spuriousness. The empirical evidence indicates that military spending granger cause economic growth both in short run and long run as indicated by significance of lagged error term. The results show that economic growth does not cause military spending in the both periods. The diagnostic tests reveal that error terms of both models are normally distributed, short run models are well specified. There is no evidence of autoregressive conditional heteroscedisticity and white heteroscedisticity. There is a problem of serial correlation when economic growth is forcing variable which does not seem to affect our findings.

4. CONCLUSIONS

In this study, the causal relationship has been reinvestigated between military spending and economic growth in case of Pakistan for the period 1971-2009. In doing so, Ng-Perron unit root test is applied to examine the integrating order and cointegration is found by using ARDL bounds testing approach. The VECM granger causality test has been applied to check the direction of causality between military spending and economic growth. The results revealed negative impact of military spending on economic growth. Furthermore, results reported that military spending is inversely Granger caused by economic growth. These findings are consistent with the line of literature such as Abu-Bader and Abu-Qarm (2003); Karagol and Palaz, (2004); Sawhney et al. (2007); Tang (2008); Smith and Tuttle, (2008) and many others.

The advent of the nuclear age has positioned Pakistan and India among the strategically important nuclear states of the twenty-first century. Both India and Pakistan are compelled to cooperate with each other in regards to the development of international trade and stability in the socio-political sphere of the South East Asia. According to a study conducted by Yildirim and Ocal (2006), there has been a bidirectional causal relation between military spending of Pakistan and India. Both the countries have been spending extensively on defence due to the persistent war threat and mutual mistrust between them, at the cost of the economy boosting programs and education. Furthermore, the large number of population and its increasing growth rate in both countries do not permit their governments to invest such a huge chunk of their annual budgets on their military. According to the International Institute of Strategic Studies (IISS), India has the 4th largest army in the world with 1.3 million army personnel while Pakistan is sustaining a huge number of armed forces comprising 6.13 million army personnel. The governments of Pakistan and India should initiate bilateral talks to develop a sense of mutual confidence and trust, harmonize their relationship, and work collectively on launching vocational training programs to fight against poverty. Poverty, illiteracy, unemployment and a large number of unskilled labour are the biggest economic challenges faced by these countries. In order to combat these evils, Pakistani governments in order to reduce their military expenditure and increase investment in developmental projects, which in turn will stimulate the pace of economic growth.

Moreover, our study has potential to reinvestigate the association between defence spending and economic growth by incorporating capital, interest rate, labour, trade openness, internal and external debt, government size etc. The directional of causal relationship between military spending and economic growth would help policy making authorities to curtail defence spending to sustain economic growth.

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VOJNA POTROŠNJA I EKONOMSKI RAST U PAKISTANU: NOVI DOKAZI DOBIVENI PRISTUPOM KLIZNOG PROZORA

Sažetak

Rad ponovno istražuje kauzalnost između vojne potrošnje i ekonomskog rasta primjenom autoregresijskog modela s distribuiranim vremenskim pomakom ili ARDL graničnog testiranja u pristupu kointegraciji. Nadalje, pristup kliznog prozora (RWA) kointegraciji je također primijenjen kako bi se uspostavila dugoročna veza međ varijablama. VECM Grangerova kauzalnost je korištena za otkrivanje smjera kauzalnosti između vojne potrošnje i ekonomskog rasta. Naša empirijska vježba ukazuje na dugoročnu vezu između vojne potrošnje i ekonomskog rasta kao što je potvrđeno pristupom kliznog prozora. Osim toga, nađena je negativna jednosmjerna kauzalnost koja ide od vojne potrošnje prema ekonomskom rastu. Ovaj rad daje nove uvide vlastima pri kreiranju politike koja bi podržala ekonomski rast obuzdavanjem vojne potrošnje.

Ključne riječi*: Vojna potrošnja, rast, kointegracija, kauzalnost*