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The Impact of Military Expenditures on Economic Growth of Pakistan

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Abstract

The purpose of this research paper is to examine the long run relationship between military expenditure, number of persons in military and economic growth. To fulfill this, the study used ARDL approach for annual time series data from 1990 to 2015. The results show that Pakistan military expenditures are insignificant (military burden for the country is statically insignificant) and number of persons in military are positively and significantly related with GDP growth in long run. The error correction term is negative and significant which shows that short run relationship exists among economic growth, military expenditures and number of army persons. In short run military expenditure and number of persons in military are positively and significantly related with GDP growth but in long run only number of military persons affects economic growth positively and significantly.

Keywords: military expenditure, economic growth, ARDL, error correction term

1. Introduction

Study of relationship between defense spending and growth rate of economy has attracted lot of attraction in recent economic literature (Wijeweera and Webb, 2009; Özsoy, 2008; Kollias et al., 2007; Lee and Chen, 2007; Bas, 2005; Yildirim et al., 2005; Cuaresma and Reitschuler, 2004; Halicioglu, 2004; Abu-Qarm, 2003; Atesoglu, 2002; Dunne et al., 2002; Abu-Bader and Sezgin, 2001; Dakurah et al., 2001; Chowdhury, 1991). This all started with the seminal work by Beniot (1973). Available literature discusses two main channels in which defense expenditure may affect growth rate of economy i.e. Keynesian Approach and Neoclassical Approach. Keynesian approach relies on primary role of aggregate demand. According to Keynesian approach, with increase in defense expenditures aggregate demand will increase and this increase in demand will cause output and employment to grow. Hence, defense spending brings positive effects on growth of economies. A number of studies have adopted this approach (Shahbaz et al., 2013; Chletsos and Kollias, 1995; Lim, 1983; Smith, 1980).

On the other hand, neoclassical approach relies on primary role of aggregate supply. According to Neoclassical approach, increase in defense expenditure will cause increase in government expenditure which will crowd-out private investment. Private investment will be crowded out because if defense expenditures are financed by increase in taxes it will lower private savings and hence it will increase domestic interest rate which will crowd out private investment. And if, alternatively defense expenditures are financed by taking loan this too will cause increase in domestic interest rate as demand for domestic funds will increase for given supply of domestic funds. This crowding out of private investment will cause aggregate supply to reduce and hence a reduction in employment and output. So, neoclassical model predicts negative effects of defense expenditures on the growth of economy. A number of studies have adopted this approach (Murdoch et al, 1997; Sezgin, 1996; Mintz and Stevenson, 1995; Alexander, 1990).

Defense spending remained high in Pakistan. From 1995 to 2009 Pakistan spent as high as average of 4.5% of its Gross Domestic Product (GDP) on defense. Though, they have decreased from 4.1% in 2003 to 3.1% of GDP in 2009 (Anwar et al, 2012). This reduction in defense expenditures is partly due to reception of international military aid to Pakistan (IMF, 2000). Defense expenditures always remained high in Pakistan due to its longstanding conflict with India since its inception and then from 2001 due to war on terrorism. Pakistan and India fought four major wars in 1947-48, 1965, 1971 and 1999. This led to arm race between these two neighbors (Dunne et al. 1999). And there is bidirectional causality between defense expenditure of India and Pakistan (Yildrim and Ocal, 2006).

Now, since heavy defense expenditures are financed out of already scarce resources of Pakistan it becomes very

important to explore the relationship between these two variables in Pakistan. This study is intended to find how defense expenditures and economic growth are related in short run as well as in long run in Pakistan. And if there exists any relationship between these two variables which of these two is causing the other. For this purpose, this study applies autoregressive distributive lag (ARDL) bound testing to test long run relationship between defense spending and economic growth and uses error correction model (ECM) to test the short run relationship and causality between them. This will enable policy makers to devise policy which will help increase the economic growth.

2. Review of Past Studies

Different studies analyzing relationship between defense spending and economic growth have reached markedly different conclusions depending upon country(s) of selection, sample of study or choice of methodology. Some of them are presented below.

2.1 Defense Spending Affects Economic Growth Positively

Kentor and Kick (2008) found that increase in military expenditures per soldier increases GDP per capita. Further, they found positive impact of arm imports on GDP growth rate. Ando (2009) in a much comprehensive study took data of 109 economies including 30 from OECD countries and found economies to grow with increase in defense expenditures. Lai et al. (2002) used endogenous growth model to study the relationship between defense expenditures and economic growth. They also found positive effect of defense expenditure on economic growth. Yildrim and Sezgin (2005) conducted a comprehensive study by taking panel data of 92 countries. They too found positive effects of defense expenditures on economic growth. Halicioglu (2004) studied nexus between defense spending and growth rate in Turkey. Study found long run relationship between defense expenditure and economic growth. And defense expenditure found to cause economy to grow. However, study found that non-military expenditure affects growth rate stronger than military expenditures. Masih et al. (1997) too has found positive effect of military expenditures on economic growth in China. For Asia and Latin America, Murdoch et al. (1997) found that defense expenditures positively affect economic growth. Many other studies have also found positive relationship between defense expenditures and economic growth (Lipow and Antinori, 1995; Ward and Davis 1992; Mintz and Huang, 1990; Deger, 1986; Deger and Smith, 1983).

2.2 Defense Spending Affects Economic Growth Negatively

Hou (2009) found negative effect of defense spending on economic growth in a panel data study of 36 less developed countries (LDCs). Faini et al. (1984) applied sub-groups estimation on the data of 69 LDCs and found negative effects of defense spending on investment and economic growth of these countries. Frederiksen and Looney (1983) in a cross sectional study of 44 LDCs have also found defense spending negatively affects growth rates. In another study Galvin (2003) used three equation models to study relationship between defense spending and economic growth. He also found negative impact of defense expenditures on economic growth. And this negative impact was found more severe for low income economies than middle income economies. Dunne, Nikolaidou and Roux (2000) have also used multiple equation model for South Africa and found military expenditures affect economic growth negatively both directly and indirectly. Klein (2004) in a study on Peru found net negative impact of defense burden on economic growth of the country. For African and Latin American countries, Stroup and Heckelman (2001), found non-linear negative impacts of defense burden on growth of the countries. Similar negative impact of defense expenditures on economic growth were found in many other studies as well (Abu-Qarn, 2010; Pieroni, 2009; Mylonidis, 2008; Smith and Tuttle, 2008; Karagol, 2006; Karagol and Palaz, 2004; Birdi and Dunne, 2002; Knight, Loayza and Villanueva 1996)

2.3 Defense Spending Does Not Affect Economic Growth Significantly

Biswas and Ram (1986) used subgroups cross sectional estimation on the data of 58 LDCs and found that defense spending does not significantly affect economic growth. In another study, Mintz and Stevenson (1995) using longitudinal estimates on the data of 103 countries have also found insignificant effect of defense expenditures on economic growth of these countries. Batchelor, Dunne and Saal (2000) have also found similar results for South Africa.

2.4 Causality Runs from Defense Spending to Economic Growth

Dunne and Vougas (1999) using Vector Autoregression Model found that causality runs from defense spending to economic growth in South African economy. Kollias et al. (2004) too used Vector Autoregression Model for Cyprus and found causality running from defense to economic growth. Similar results have been found by Lai et al (2005) for Chinese and Taiwani economy.

2.5 Causality Runs from Economic Growth to Defense Spending

Dakurah et al. (2001) in a 48 LCDs study used granger causality test and found that in 10 countries economic growth is causing defense spending. Chowdhury (1991) found that in 7 countries among 55 economic growth granger causes defense spending. Similarly, Karagianni and Pempetzoglu (2009) too in a study of Turkish economy found that growth linearly causes defense spending.

3. Methodology

3.1 The Model

Economic analysis indicates that there is a long-term relationship between the conditions set in the variables of the theory. This means that the long-term properties of the relationship are intact. In other words, the means and the deviations are constant and do not depend on time. However, most empirical studies have shown that the stability of the means and the deviations in the analysis of the time series variables are not fulfilled. In the case of solving this problem, most co-integration techniques are misapplied, and interpreted. One of these techniques is the Autoregressive Distributed Lag (ARDL) technique Co-integration or Co-Integration-related technology. We applied autoregressive distributed lag (ARDL) bound testing method of estimation by Pesaran and Shin (1999), Pesaran *et al.* (1996) and Pesaran (1997) to find out the relationship among specific variables. This method of estimation does not require testing of stationarity of variables, that means that the test on the existence of relationship among variables in levels is valid regardless of whether the fundamental regressors are purely I(0) and purely I(1).

Mostly, the ARDL bound testing method of estimation (Pesaran et al., 2001) consists of estimation of the conditional error correction (EC) version of the ARDL model for military expenditure effects on GDP.

$$\Delta \ln(GDP)_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta \ln(GDP)_{t-i} + \sum_{i=0}^{p} \theta_i \Delta \ln(MEXP)_{t-i} + \sum_{i=0}^{p} \lambda_i \Delta \ln(ARMY)_{t-i} +$$

$$+ \delta_1 \ln(GDP)_{t-1} + \delta_2 \ln(MEXP)_{t-1} + \delta_3 \ln(ARMY)_{t-1} + \upsilon_t$$

Where ln*(GDP),* ln(*MEXP) and* ln*(ARMY)* are gross domestic product, military expenditures and total arm force in log form, respectively, Δ is operator of first-difference and *p* is used for lag length.

The *F* test is applied to test the existence of long-run relationship. If there is long-run relationship is existing, *F* test shows that variable would be normalized. The null hypothesis for no co-integration among variables in equation (1) is H_0: $\delta_1 = \delta_2 = \delta_3 = 0$ against the alternative hypothesis H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq 0$.

Given a comparatively small sample size in this paper, the critical values used are as reported by Narayan (2004) that based on small sample size. If the *F* test statistic is greater than upper critical values, one can decide that long run relationship exists among variables. We then estimate the short-run relationship, if the error correction data is negative and significant; there is a short-run relationship between the dependent and independent variables.

3.2 The Data

Data was collected from world development indicators (CD ROM 2016) for GDP growth, military expenditures and number of armed persons. The data collected is annual for the time period 1990 to 2015. Annual growth rate of GDP is taken as proxy of economic growth. Armed forces employees are dynamic duty martial employees, plus revolutionary militaries if the training, association, equipment, and regulator propose they may be used to sustenance or substitute systematic martial services. Military expenditures facts from Stockholm International Peace Research Institute (SIPRI) are derivative from the NATO characterization, which comprises all contemporary and investment expenses on the armed services, including intermediation services; defense departments and other government interventions involved in protection schemes; revolutionary services, if these are arbitrated to be accomplished and fortified for martial actions; and military interplanetary events.

4. Results and Discussion

4.1 Unit Root Test

We applied stationarity tests through Augmented Dickey-Fuller (ADF) (see Table 1). As it has been mentioned above that there is no need to test the stationarity of variables, still we applied the unit root test on specific variables to check whether any variable is non-stationary. Table 1 indicates that variables are a mixture of I(0) and I(1) that is the pre condition of Autoregressive Distributed Lag (ARDL) bound testing. Variables, number of army persons (Larmy) and economic growth (Lgdp) are intercept and 'trend and intercept' stationary at level while variable military spending (Lexp) is intercept and 'trend and intercept' stationary at first difference. It is clear further that no variable is stationary at second difference. Hence, we can employ auto regressive distributed lag (ARDL) technique of estimation.

Table 1. Results of ADF Test

Variables	Level		First Difference	
	Intercept	Trend & intercept	Intercept	Trend & intercept
Larmy	-29.87 (0.00)*	-25.15	-9.90	-6.73
		(0.00)*	(0.00)*	(0.00)*
Lgdp	-3.636	-3.538	-6.443	-6.33
	(0.012)**	(0.057)***	(0.00)*	(0.00)*
Lexp	-1.240	-1.142	-4.587	-4.79
	(0.639)	(0.899)	(0.00)*	(0.00)*

Note:* 1% significance (0.01), **5%significance (0.05) & ***10% significance (0.10)

4.2 Estimation of Long Run Relationship

The next step is to find out the long run relationship among the variables where equation 1 is estimated. As recommended by Pesaran and Shin (1999) and Narayan (2004), as the data observations are annual, we took maximum order of lags 2 in Autoregressive Distributed Lag (ARDL) bound testing to estimate equation 1. Table 2 indicates the calculation of *F*-statistics. The critical values are also displayed in the same table given by Narayan (2004) in case of small sample size. The calculated *F*-statistic (*F*-statistic = 7.33) is greater than the upper bound critical value at 1 percent,5 percent and 10 percent level of significance, using restricted intercept and no trend. Therefore, we can move further to find out long run relationship among the variables.

Table 2. Results of F-Statistics of Co integration Relationship

Test statistics	Value	Lag	Significance at	Bound critical values	
				I(0)	I(1)
F-statistics	7.33	2	1 %	4.13	5.00
			5 %	3.10	3.87
			10 %	2.63	3.35

Results of the long-run model are given in Table 3. Significant variables that affect economic growth (GDP) are military expenditures and the number of persons in the military. Effect of military spending on economic growth is insignificant while the effect of number of persons in military have positive and significant effect on economic growth of Pakistan in long run.

Table 3. Long-run model

Dependent variable: LGDP	Independent variables	
	LMEXP	*LARMY*
	3.498	3.830
	(0.54)	(0.04)

Note: P values are in parentheses.

4.3 Estimation of Short Run Relationship (Error Correction Term)

Table 4 shows the short run results of the error correction model. The lag value of error correction term (ECT) is negative and statistically significant, showing that there is a short run relationship among the variables of interest. We applied a number of diagnostic tests of the error correction model. No evidence was found of a serial correlation, heteroskedasticity and ARCH (Autoregressive Conditional Heteroskedasticity) effect in the disturbances. The model was also passed through Jarque-Bera normality test that suggested errors are normally distributed.

The lagged error term (ECT_{t-1}) in our results is negative and significant at 1% level that implies the existence of short run relationship between explanatory variables (number of military persons and military spending) and dependent variable (economic growth). The coefficient of -0.82 indicates high rate of convergence to equilibrium.

Table 4. Results of Error Correction Model

Dependent Variable : d(LGDP)	
Independent variables	**Coefficients**
d(LGDP(-1),2)	-0.556(0.006)
d(LARMY,2)	4.237(0.005)
d(LARMY(1),2)	-2.060(0.133)
d(LARMY(2),2)	-6.000(0.000)
d(LARMY(3),2)	-4.676(0.004)
d(LMEXP,2)	3.345(0.029)
d(LMEXP(1),2)	1.600(0.416)
d(LMEXP(2),2)	3.478(0.036)
ECT_{t-1}	-0.82(0.00)
Diagnostic tests:	
Far	0.797*(0.487)*
Farch	*0.447(0.512)*
Fhet	*0.595(0.791)*
JBnormal	0.226(0.892)
R-square	0.81

Note: P values are in parentheses.

4. Conclusion and Recommendations

The purpose of this research is to examine the long run and short run relationship between military expenditure, number of person in military and economic growth. To fulfill this, study used annual time series data from1990 to 2015, by using the ARDL approach. The results show that Pakistan military expenditures insignificant (military burden for the country is statically insignificant) and number of person in military are positively and significantly related with GDP growth in long run. The error correction term is negative and significant which shows that short run relationship exists between dependent and independent variables. In short run military expenditure and number of person in military are positively and significantly related with GDP growth. We applied a series of diagnostic tests to the error correction model. No evidence was founf of serial correlation, heteroskedasticity and ARCH (Autoregressive Conditional Heteroskedasticity) effect in the disturbances. The model was also passed through the Jarque-Bera normality test that is suggesting that the errors are normally distributed. Military expenditures should be increased in short run according to the requirements of military. No need to increase military expenditures for long term defense planning as this study shows that long term increasing defense expenditures can threatens the economic growth.

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