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Public Defense Spending and Poverty in Pakistan*

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Summary

The principal attribute of this paper is to address the question that whether public defense spending is pro-poverty or anti-poverty in Pakistan? The empirical findings show that public spending on defense is increasing poverty in Pakistan and results are robust to various controls. This study proposes that government could allocate its resources more towards social sector development from defense expenditures on the one side and on the other side it could initiate a serious move towards the peace pacts with India for the sake of the betterment of people of the country.

Keywords: Pakistan; Public Defense spending, and poverty.

JEL Classification: H56, I32, C51.

1. Introduction

The volume of military expenditure depends on the geographical, political and strategic position of the country on the map. Geopolitical hostilities and domestic violence tend to affect defense expenditure. Other factors like security, technology, political affinity and priorities, geography and history determine defense expenditure Sahin and Muarat (2010) . Countries surrounded with threats cannot ignore military expenditure no matter what the stage of their development is. Collier and Hoeffler (2002a, 2002b) find that both

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external and internal threats influence the volume of military expenditure. Other factors pointed out by them are the enhanced political power of the military in non-democratic regimes, and the availability of financial resources to the government. Defense expenditure is generally considered burden on the economy as it utilises resources which could have been used on other development projects. The developing countries are rooted with poverty and heavy expenditure on military raises serious reservations in these countries. For example the South Asia is the most militarized region Hussain (2001) despite the fact that poverty is pervasive in the region. The arm race between in India and Pakistan is like a never ending struggle. According to the report by Stockholm International Peace Research Institute (2013), India is ranked nine among the top 15 countries with the highest defense budgets for the year 2013. India and Pakistan are ranked number one and seven in the world in terms of arms imports respectively falling in the list of World's largest arms importer countries in the year 2013 Stockholm International Peace Research Institute (2013) . Pakistan had to build a strong military base since its Independence mainly due to her strategic geographical situation. The disputed territory of Kashmir led Pakistan to face three wars with India. Consequently Pakistan has to spend a larger share of GDP on defense. For example, the defense expenditure as a percentage of GDP was 18.1% and 13.0% in 2001 and 2008 respectively Pakistan Economic Survey (2009-2010) . The military expenditure is justified on the basis of providing "National Security" to the country. From economic front Pakistan is ranked 145 out of 187 countries and territories by the UNDP (2011) in terms of Human Development Index. The multidimensional poverty index MPI (that was introduced in 2010) indicates multiple deprivations in the same households in education, health and standard of living. According to the UNDP report (2011) 49.4% of population in Pakistan suffers multiple deprivations while an additional 11.0% is vulnerable to multiple deprivations.

One of the biggest challenges especially to developing countries is to reallocate the resources from military expenditure to social development in order to reduce poverty, hunger and preventable diseases. An interesting question arises how a developing country like Pakistan where masses are subject to absolute poverty can afford such a heavy expenditure on defense? What impact the military expenditure exert on poverty? Is the military expenditure pro poverty or anti poverty? The paper examines the extent to which public defense spending or military expenditure is linked with poverty in Pakistan for the period 1976-2012. It is hypothesized that public defense spending or military expenditure is positively associated with poverty.

As customary the paper is organized into difference sections. Section II while highlighting the theoretical background discusses the arguments given in literature for the military expenditure. Section III highlights some facts related to poverty and military expenditure in Pakistan. Section IV narrates methodology, and data selection along with the development of a model to estimate the relationship between poverty and military expenditure along with some other key macro factors affecting poverty. Section V discusses the results. Finally, Section VI concludes the major findings of the paper and suggests some policy implications.

2. Theoretical Background and Literature Review

In macro economics the guns versus butter model demonstrates a relationship between a nation's investment in defense and civilian goods. A nation can buy either guns (invest in defense/military) or butter (invest in production of goods), or a combination of both. This can be seen as an analogy for choices between defense and civilian spending in more complex economies.

Butter and gun dilemma as mentioned in economic literature Debelko and McCarmick (1977) leads to the possibility of crowding out other forms of expenditure such as investment as military expenditure has opportunity costs. The government budget constraints require that an increase in defense expenditure be financed by: cuts in other public expenditure, increased taxes, increased borrowing, or expansion in money supply Dunne *et al*. (2005) . Ali (2011), theoretically and empirically tested the relationship between military spending and social spending in Egypt by using data from 1987-2005. The theoretical results show that the crowding-out of social spending is ambiguous, unless the government is fully allocating its tax receipts to the military. As far as crowding-out of social spending by military spending is concerned, it lacks theoretical and empirical justification.

Military expenditure may affect output through different channels broadly grouped into three; demand effects, supply effects and security effects. The demand effects operate through the level and composition of expenditure. An exogenous increase in military expenditure increases demand and through Keynesian multiplier increases employment and output subject to the available capacity of production. Supply effects operate through the availability of factors of production and technology. To the extent that military expenditure increases security it may increase output see for detailed discussion Dunne *et al*. (2005) . The literature is enriched with studies focusing on defense expenditure from different perspectives. Two thoughts are dominant in the literature. Some believe that the military expenditure has very strong positive relationship with the growth of the economy. Others argue that military expenditure is negatively related to the growth of the economy. Wolf (1981) opines that the military expenditure may stimulate technological progress and transfers and enhances industrial production. Fredericksen and Looney (1983) in their study show a positive relationship between defense expenditure and economic growth. The impact of defense expenditure on economic growth has been found negative in case of Pakistan in the study conducted by Khilji and Akhter (1997). The authors also explored the direction causality between defense expenditure and economic growth by applying Granger Causality test and found bi-directional causality between these two Khilji and Akhter (1997) .

Other studies suggesting a positive relationship between defense expenditure and economic growth are: Atesoglu (2002; 2004); Dunne *et al*. (2002); Narayan and Singh (2007); Pieroni *et al*. (2008); and Guillou *et al*. (2009) . Aizenman and Reuven (2006) estimated the growth equations for various cross-sections for the period from 1989-98 and identified the

presence of non-linear interaction between threats and military expenditure. They argued that in the presence of threats a larger share of military expenditure to GDP increases growth Aizenman and Reuven, (2006) . By taking the sample of 71 developing countries Landau (1983) tested the impact on growth of military expenditure and found a positive relationship between these two. On the other hand Sala-i-Martin *et al*. (2004) checked the impact of military expenditure on economic growth along with 67 other variables for 1960-1996 in a cross section of 88 countries. By using the Bayesian averaging, the share of military expenditure is ranked 45, with a probability of 2.1% in determining economic growth.

Anwar *et al*. (2012) by applying Johanson Cointegration and Granger Causality tests explored the relationship and causality between defense expenditure and economic growth for the period of 1980-2010 in case of Pakistan. The results show that military expenditure does not hurt economic growth and the relationship flows from economic growth to defense spending. Some studies argue that a nonlinear relationship between military expenditure and economic growth exists and if ignored leads to misspecification of the models resulting in biased empirical results Aiezenman and Reuven (2006) and Dunne and Perlo-Freeman (2003) . The relationship between military expenditure and economic growth has been found negative in advanced economies through its effect on investment Smith (1980) . For developing countries the likely impact of military expenditure on economic growth is also negative see Dunne (1996) and Hou (2009) . The military expenditure is also associated with the industrial production of the economy. The relationship between military expenditure and industrial production was tested by Sahin and Murat (2010) in the case of Turkey. They applied econometric techniques by using monthly data for January, 2004-December, 2008 and found a positive relationship between industrial production and defense expenditure Sahin and Murat (2010) . The relationship between military expenditure and savings has been tested by Looney (1989) and little evidence was found that military expenditures have reduced the savings below its already low level in Pakistan. Khilji and Akhtar (1997) however found a positive relationship between defense expenditure ratio and saving ratio for the period of 1972-1995 in Pakistan.

Another very important aspect; the reallocation of the public expenditure from military to social purpose was considered in some studies. Bayoumi *et al*. (1993) investigated the impact of 20 percent reduction in military expenditure on consumption and investment. His simulation results for Pakistan show that reduction in military expenditure increases consumption and investment in both the short-run and long-run. There is an increase in economic welfare by 113% of 1992 GDP compared with military spending cuts of 93% of 1992 GDP.

A survey by the International Monetary Fund (1999) showed that reductions in military spending in some countries have been accompanied by increased public expenditure on health and education. In a study by Freeman (2011), a serious concern has been shown on the rising military expenditure in Latin America that could have been otherwise spent on education and health. It is argued that increases in military expenditure are done at the expense of health and education expenditure. The findings of the study however do not find any ev-

idence of a tendency for military expenditure to crowd out health expenditure in Latin America Freeman (2011) . Yildirim and Selami (2002) investigated the possible trade off between Turkish defense spending and spending on health and education for the period of 1924-96 by applying the Seemingly Unrelated Regression technique. The findings of the study suggest that there is a trade off between defense spending and welfare spending. The trade off is found negative between defense and health and positive between defense and education see for details Yildirim and Selami (2002) . A nation with dire need to spend a higher proportion of public expenditure on education and health in fact trades off the poverty and military expenditure. The relationship between military expenditure and poverty is a complex one and other macroeconomic variables like economic growth and unemployment affect it Henderson (1998) . As far as poverty is concerned it is affected by many macroeconomic variables. Earlier many studies have been conducted in finding the relationship between poverty and key factors affecting it. For example, the trade is identified as an important factor reducing poverty in case of Pakistan Winter *et al*. (2004); Gilbert (2008); and Hassan and Siddiqi (2010) . Kalim and Shahbaz (2009) identified remittances, trade openness, GDP growth, inflation and urbanization and FDI as important determinants of poverty in Pakistan.

Pervez and Rizvi (2014) explored the determinants of poverty in Pakistan. They applied Ordinary Least Square and VECM for the sample period from 1980 to 2010. The study concluded that FDI has negative but insignificant impact on poverty in Pakistan. Moreover; Iiketoiminta *et al*. (2011) conducted study for 60 developing countries considering Nicaragua and the sample period roughly ranges from 2000 to 2009. The findings showed that FDI is not a good indicator to reduce poverty in the developing countries. Jamal (2006) considering food inflation and development expenditures on social services such as education and health as controlled variables found a significant relationship between poverty, economic growth and income inequality for a case of Pakistan. He used Ordinary Least Square method for the period from 1979 to 2002. The empirical results showed that economic growth and development expenditures on social services have negative and significant impact on poverty incidence. However; food inflation has found to have positive and significant impact on poverty in Pakistan.

Furthermore; the role of different sectors in economic growth and resultantly their impact on poverty alleviation has been also discussed by many researchers. For example, Joshi (2004) emphasized on the role of tertiary sector in employment and poverty alleviation during the analysis period of 1950-2000 in case of India. On the other hand Montalvo and Martin (2010) while examining the pattern of growth and poverty relationship found the primary sector growth a major contributor toward poverty reduction in China. The literature review suggests that no study has been done yet to explore the relationship between the military expenditure and poverty in Pakistan. The present paper touches this very important aspect to understand the nature and strength of the relationship between poverty and military expenditure in Pakistan. The present paper will also take into account some other key macroeconomic variables affecting poverty like FDI, development expenditure, inflation, growth of industrial sector and growth of service sector.

3. Pakistan Military Expenditure and Poverty: An Overview

Pakistan is ranked 9th among 117 countries in terms of military expenditure. The defense expenditure in Pakistan has remained the largest component of GDP throughout the history of Pakistan (Figure 1). Despite a slight decline in defense expenditure since the last decade the absolute size of the defense expenditure is still considered very high. Defense expenditure has the potential to rise sharply if tensions between the Pakistan and India are exacerbated.

According to the Stockholm International Peace Research Institute (2013), the average military expenditure during 2010-2012 in Pakistan was 6632 million US dollars (constant 2011 prices) while the average military expenditure was 48004.67 million dollars (constant 2011 price) during the same period in India. In F2002, for example, defense spending was higher than anticipated (2.52 billion US dollar as against the targeted 2.19 billion US dollar) as a result of the military standoff with India. The military expenditure as a percentage of total expenditure has been on average around the figure of 15.0. By the end of June 2010, the defense expenditure was expected to increase by 1.52 billion US dollar mainly because of the military operation against the militants and the increase in the salaries of military personnel (Pakistan Economic Survey 2012-13).

On the other hand looking at the poverty situation in Pakistan, the door-door survey carried out by Benazir Income Support Programme (BISP) depicts that 45.7% of the entire population is living under the poverty line Shah (2013) . Another report suggests that every third Pakistani is caught in the "poor bracket" and some 58.7 million out of total population of 180 million falls below the poverty line DAWN (2012) . The official records however underesti-

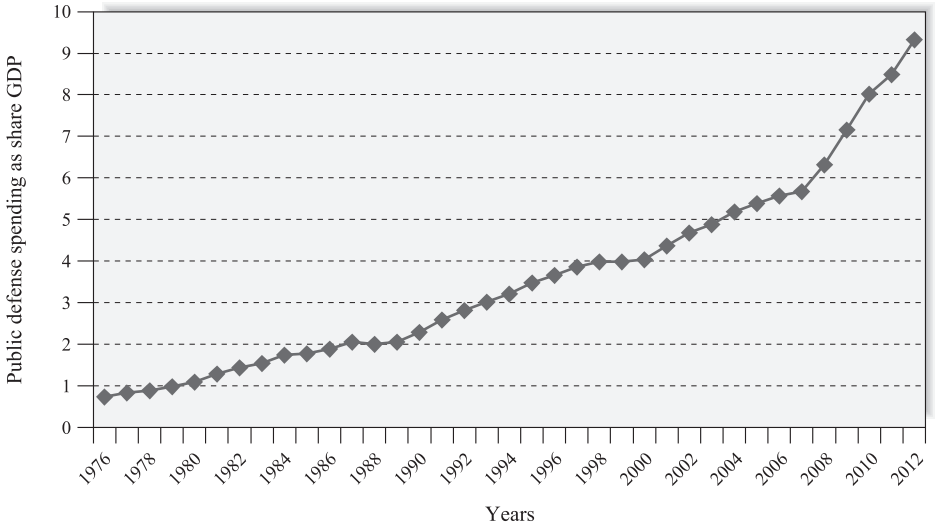

Figure 1. Public defense spending as percentage of GDP

mate the poverty figures. The report prepared by the Pakistan Social and Living Standards Measurement (PSLM) Survey 2010-2011 indicate the fall of incidence of poverty from 17.2% in 2008 to slightly over 12% in 2011. Experts however believe that a drop in poverty is impossible with the fact that there is average job growth of 2.6% for the last four years and against the requirement of 8% and inflation has stayed in double-digits for the fifth consecutive years Shah (2013) . Poverty in Pakistan is attributable to a number of factors like, sluggish GDP growth, low level of investment, poor governance, declining public development expenditure, debt burden etc. Other plausible reasons of Poverty are the low level of education, poor health facilities, job in informal sector, low access to infrastructure and the like. Education and health are the most neglected sectors in Pakistan. Study by Arif *et al*. (2000) indicates that those households whose heads had no formal education had about three times the incidence of poverty compared to those households whose heads had completed 10 years or more of schooling.

To provide a relief to the poor the development expenditure can play very important role. The development expenditure on social sector can mitigate the gap between rich and poor. The development expenditure of Pakistan as a percentage of GDP has been very low. The current development expenditure as a percentage of total expenditure has been 15.3%, 18.6% and 19.2% during 2001-02, 2007-08 and 2008-09 respectively Pakistan Economic Survey (2009-10) . In total public expenditures, current expenditures rose from 15.5 per cent of GDP in 2008-2009 to 16.3 percent of GDP in 2012-2013. On the other hand development expenditure declined to 3.5 percent of GDP in 2012-2013 against 3.7 percent of GDP in 2011-2012 Pakistan Economic Survey (2012-13) .

The development expenditure had restraints mainly because of the debt obligations and defense expenditure in Pakistan. From 1998 to 2000 the expenditure on these two heads remained over 90 percent of tax revenue. In the absence of political settlement with India, the government may have little flexibility in reducing defense expenditure.

Only sustainable economic growth can be helpful in poverty reduction and there are strong linkages between pro-poor growth on the one hand, and human development, good governance, and cross-cutting concerns such as private sector development and regional cooperation on the other Asian Development Bank (2002) .

After discussing the overview of the relationship between Public Defense Spending and Poverty in Pakistan, the subsequent sections of the study are devoted to the explanation of the possible data sources; model, methodology followed by the discussion on results.

4. Data Source and Methodological Framework

4.1. Data Source

The data on Poverty is taken from the study conducted by Jamal, (2006) [1] and the data on Public Defense Spending or Military Expenditures; Consumer Price Index, Industry Value

Added, Service Sector Value Added, and Foreign Direct Investment is obtained from the World Development Indicators (2013). However; the data on Development Expenditures[2] is obtained from Pakistan Economic Survey Various Volumes and Issues . The dataset ranges from 1976 to 2012 period. The data of all the variables excluding CPI and Head Count Ratio is in constant local currency units.

4.2. Methodological Framework

The following log linear models will be used for investigating the objectives of the present study:

$$LPOV_t = \alpha_C + \alpha_{ME_t} LME_t + \alpha_{FDI_t} LFDI_t + \alpha_{CPI_t} LCPI_t + \alpha_{SER_t} LSER_t + \alpha_{IND_t} LIND_t + \xi_{1t} \quad (4.1)$$

$$LPOV_t = \beta_C + \beta_{ME_t} LME_t + \beta_{DE_t} LDE_t + \beta_{CPI_t} LCPI_t + \beta_{SERt} LSER_t + \beta_{IND_t} LINDt + \xi 2t \quad (4.2)$$

Whereas;

$LPOV_t$ = Log Head Count Ratio as proxy for Poverty
LME_t = Log Military Expenditures / GDP as proxy for Public Defense Spending
$LFDI_t$ = Log Foreign Direct Investment (Net Inflows) / GDP as proxy for FDI
LDE_t = Log Total Development Expenditures / GDP as proxy for Development Expenditures
$LCPI_t$ = Log Consumer Price Index as a proxy for Inflation
$LSER_t$ = Log Service Sector Value Added / GDP as proxy for Service Sector Growth
$LIND_t$ = Log Industry Value Added / GDP as proxy for Industrialization

Literature on Log Linear Approach made by various researches such as Ehrlich (1977); Layson (1983), Bowers and Pierce (1975), Cameron (1994) and Ehrlich (1996) validated that empirical findings computed through Log Linear Approach are more consistent than that of Functional Form Approach. Log Linear model estimates coefficients in terms of elasticity which is comparable with coefficients of other countries for different data sets and for different time spans. Moreover; it removes the nonlinearity of the coefficients and hence supporting the BLUE property of OLS. A description of all the variables of the model is made below:

4.3. Variables and Hypothesis

4.3.1. *Head Count Ration as proxy for Poverty*

Poverty is measured by taking the ratio of the total number of people who are below the poverty line to the total population. The high magnitude of head count ratio shows higher incidence of poverty and vice versa.

4.3.2. *Public Defense Spending or Military Expenditures as share of GDP*

Public Defense Spending or Military Expenditures as Share of GDP are measured by dividing the Military Expenditures on the Real GDP. Basically in under developing economies resources are already scarce; therefore, government of these economies has to trade off between gun and butter. If government opt guns then it will have to bear rising poverty incidence in the country as an opportunity cost to guns.

4.3.3. *Foreign Direct Investment as share of GDP*

It is obtained by taking the ratio of net inflows of foreign direct investment to the real GDP. It is anticipated that the inflows in the country will be helpful to increase the market activities and hence will increase the income of the economy. It may speed up the process of industrialization and may help in reducing poverty.

4.3.4. *Public Development Expenditures as share of GDP*

It is measured by taking the ratio of government total development expenditures to the GDP. The development expenditures refer public spending on infrastructure and on social development etc. In under developing economies, the proportion of non-development expenditures is generally higher than that of proportion of development expenditures, which in turn becomes the reason of so many macroeconomic ills in the country and poverty is among one of those ills. It is expected that the higher the proportion of development expenditures in an economy; the lower the incidence of poverty. Therefore; development expenditures could be among the important factors of poverty which could be entertained as policy tool for the government.

4.3.5. Consumer Price Index

This reveals the variation in the expenditures made by the average household in order to attain the basket of goods and services which may be remained constant or may be changed at specified intervals, such as yearly basis. To compute Consumer Price Index; usually Laspeyres method is applied. The continues increase in the prices of goods and services tend to reduce power to purchase of the households in a country which resultantly spreads poverty in a country.

4.3.6. Service Sector Value Added as share of GDP

It contains value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education,

health care, and real estate services etc. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is gained by taking the ratio of Service Sector Value Added to the Real GDP. It is anticipated that by increasing the growth of the service sector, the earnings of the individuals in the country will increase, therefore, the proportion of the people would increase who would be able to access the basic needs. So, poverty may be alleviated from the country.

4.3.7. *Industry Value Added as share of GDP*

It comprises value added in mining; manufacturing, construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is obtained by taking the ratio of the Industry Value Added to the Real GDP. It is expected that industrialization will be helpful to bring poverty down in the country.

4.4. Estimation Technique

This article applies various econometric techniques to perform an analysis on the relationship between poverty and public defense spending for a case of Pakistan. In order to fulfill this objective; we would like to test unit root problem of the data series in the beginning, besides testing unit root problem, we will examine long run relationship between poverty and public defense spending, and afterwards we will investigate long term and short term coefficients respectively. We will follow the following steps in the study:

4.4.1. *Computing Stationarity*

We will be testing stationarity of the data series by applying Ng – Perron Unit root test. According to Ng – Perron (2001); the test is more robust for the data series which contains small number of observations. This test applies GLS de-trending method of ERS in order to develop more consistent and proficient versions of the updated Phillip Perron tests of Perron and Ng (1996). These highly proficient and efficient modified PP tests do not reveal the severe size distortions of the PP tests for errors with large negative MA or AR roots, and also, they could have significantly high power than that of Phillip Perron tests; in particular when the value of φ approaches to one. Using the GLS de-trended data y_t^d, the efficient modified PP tests are defined as:

$$\overline{MZ}_a = (T^{-1} y_T^d - \hat{\lambda}^2) \left[2T^{-2} \sum_{t=1}^{T} y_{t-1}^d \right]^{-1} \tag{4.3}$$

$$\overline{MSB} = \left[\frac{T^{-2} \sum_{t=1}^{T} y_{t-1}^d}{\hat{\lambda}^2} \right]^{1/2} \tag{4.4}$$

$$\overline{MZ}_t = \overline{MZ}_a \times \overline{MSB} \tag{4.5}$$

The statistics like $\overline{MZ}_a$ and $\overline{MZ}_t$ are more proficient and efficient versions of the Phillip Perron tests. In case of negative moving average errors; the magnitude of distortions in Phillip Perron Z_a and Z_t tests is quite meager. Ng – Perron derive the asymptotic distributions of these statistics under the local alternative

$$\varphi = \frac{1-c}{T} \text{ for } D_t = 1 \text{ and } D_t = (1,t).$$

Specifically; they demonstrate there is no difference in the asymptotic distribution of $\overline{MZ}_t$ and DF-GLS t-test. The statistic $\overline{MZ}_t$ can possibly be estimated by applying the method of function unit root which is named as "mpp".

4.4.1.1. *Computation of Long Term Variance* λ^2

Ng – Perron (2001) test highlight the fact that computation of the long term variance λ^2 plays a pivotal role for the implications of the proficient updated Phillip Perron (1988) test and as well as the finite sample behavior of the ERS point optimal test. The test also spotlight that the stable finite size of the sample can be obtained by using an autoregressive estimate of λ^2. Ng – Perron (2001) proposed that the variance λ^2 should be computed by using the equation of Augmented Dickey Fuller (1981) test based on the GLS de-trended dataset:

$$\hat{\lambda}_{AR} = \frac{\hat{\sigma}_p^2}{(1-\hat{\Psi}(1))^2} \tag{4.6}$$

Where

$$\hat{\Psi}(1) = \sum_{j=1}^{p} \hat{\Psi}_j \text{ and } \hat{\sigma}_p^2 = (T-P)^{-1} \sum_{T=p+1}^{T} \hat{\varepsilon}_t^2$$

and are found by using the equation of Augmented Dickey Fuller test.

4.4.2. *Finding Co-integration*

In order to investigate strength of relationship between public defense spending and poverty along with some controlled variables for long run period, we would like to apply ARDL bounds testing technique developed by Pesaran *et al*. (2001).

4.4.2.1. *ARDL Bounds Testing Approach for Co–Integration*

Besides finding unit root problem; we will also find out long run relationship between public defense spending and poverty by using ARDL Bounds Testing Approach. According

to Pesaran *et al*. (2001); this approach is more suitable for small set of data and it is also applicable on the data series which have mixed order of integration. The long term relationship between outcome and predictors will be confirmed if the estimated value of F – test will become larger than the Upper Critical Bound. The equations 4.7 and 4.8 will help us to estimate long term relationship and long term coefficients respectively and these equations are presented as below:

$$\Delta LPOV_t = \varphi_{C_{11}} + \varphi_{11} LPOV_{t-1} + \varphi_{12} LME_{t-1} + \varphi_{13} LFDI_{t-1} + \varphi_{14} LINF_{t-1} + \varphi_{15} LSER_{t-1} + \\ + \varphi_{16} LIND_{t-1} + \omega_{11} \sum_{i=1}^{P} \Delta LPOV_{t-1} + \omega_{12} \sum_{i=0}^{P} \Delta LME_{t-1} + \omega_{13} \sum_{i=0}^{P} \Delta LFDI_{t-1} + \omega_{14} \sum_{i=0}^{P} \Delta LINF_{t-1} + \\ + \omega_{15} \sum_{i=0}^{P} \Delta LSER_{t-1} + \omega_{16} \sum_{i=0}^{P} \Delta LIND_{t-1} + \eta_{16} \tag{4.7}$$

$$\Delta LPOV_t = \gamma_{C_{11}} + \gamma_{11} LPOV_{t-1} + \gamma_{12} LME_{t-1} + \gamma_{13} LDE_{t-1} + \gamma_{14} LINF_{t-1} + \gamma_{15} LSER_{t-1} + \\ + \gamma_{16} LIND_{t-1} + \lambda_{11} \sum_{i=1}^{P} \Delta LPOV_{t-1} + \lambda_{12} \sum_{i=0}^{P} \Delta LME_{t-1} + \lambda_{13} \sum_{i=0}^{P} \Delta LDE_{t-1} + \lambda_{14} \sum_{i=0}^{P} \Delta LINF_{t-1} + \\ + \lambda_{15} \sum_{i=0}^{P} \Delta LSER_{t-1} + \lambda_{16} \sum_{i=0}^{P} \Delta LIND_{t-1} + \eta_{21} \tag{4.8}$$

The estimates of Vector Auto Regression (VAR) are not consistent when it is applied on the data set which is transformed into first difference Engle and Granger (1987) . Therefore; in order to attain significant and efficient estimates, the first period lagged term of error term should be introduced in the equations of ARDL Engle and Granger (1987) . Following the same; the equations of ARDL 4.7 and 4.8 are modified into equations of Error Correction Model and these are given as below:

$$\Delta LPOV_t = \omega_{C_{11}} + \omega_{11} \sum_{i=1}^{P} \Delta LPOV_{t-1} + \omega_{12} \sum_{i=0}^{P} \Delta LME_{t-1} + \omega_{13} \sum_{i=0}^{P} \Delta LFDI_{t-1} + \\ + \omega_{14} \sum_{i=0}^{P} \Delta LINF_{t-1} + \omega_{15} \sum_{i=0}^{P} \Delta LSER_{t-1} + \omega_{16} \sum_{i=0}^{P} \Delta LIND_{t-1} + \delta_{11} ECM_{t-1} + \mu_{11} \tag{4.9}$$

$$\Delta LPOV_t = \lambda_{C_{11}} + \lambda_{11} \sum_{i=1}^{P} \Delta LPOV_{t-1} + \lambda_{12} \sum_{i=0}^{P} \Delta LME_{t-1} + \lambda_{13} \sum_{i=0}^{P} \Delta LDE_{t-1} + \\ + \lambda_{14} \sum_{i=0}^{P} \Delta LINF_{t-1} + \lambda_{15} \sum_{i=0}^{P} \Delta LSER_{t-1} + \lambda_{16} \sum_{i=0}^{P} \Delta LIND_{t-1} + \delta_{21} ECM_{t-1} + \mu_{21} \tag{4.10}$$

In the end; we would like to see whether poverty is caused by public defense spending; foreign direct investment, development expenditures, inflation, growth of service sector, and growth of industrial sector or not? This technique will resolve the issue of reverse causality. Since ARDL Bounds Testing Approach is single equation model, therefore, it does not take into account the reverse causality. This will also help us to know whether the conceptualized factors to poverty are strictly exogenous or any factor or all factors are endogenous? In order

to answer these questions; we will be applying ARDL Bounds Testing Approach by considering all the variables as dependent variable step by step and then through the calculated value of F – test, we would be concluding whether co-integration holds or not. Existence of co-integration will confirm the existence of reverse causality running from all the explanatory variables to the dependent variable into that particular model and vice versa if there does not hold any co-integration. Besides the section of methodology; now we would like to discuss the empirical results and their discussion in the following section:

5. Empirical Estimation and Interpretation of Results

Initially, we begin with descriptive statistics. The results could be seen in the following Table 1.

Table 1
DESCRIPTIVE STATISTICS

	LPOV	*LME*	*LFDI*	*LDE*	*LINF*	*LSER*	*LIND*
Mean	3.200595	–1.054470	1.176646	1.669886	3.859662	3.838601	3.061349
Median	3.144152	–1.150706	1.421699	1.648531	3.887930	3.826711	3.074199
Maximum	3.626451	0.320571	4.231154	2.360305	5.464172	3.934887	3.218372
Minimum	3.005683	–2.256439	–2.604387	0.757567	2.453557	3.759013	2.864222
Standard Deviation	0.164936	0.699982	1.797017	0.430674	0.852579	0.049149	0.104957
Skewness	0.993073	0.258180	–0.185349	–0.271239	0.082672	0.359905	–0.140853
Kurtosis	3.020043	2.152902	2.169008	2.139889	1.903539	2.212354	2.166812
Jarque-Bera	6.082143	1.517313	1.276447	1.594196	1.895581	1.755206	1.192573
Probability	0.047784	0.468295	0.528230	0.450635	0.387597	0.415778	0.550853
Sum	118.4220	–39.01540	43.53590	61.78577	142.8075	142.0282	113.2699
Sum Squared Deviation	0.979339	17.63911	116.2538	6.677282	26.16810	0.086963	0.396573
Observations	37	37	37	37	37	37	37

The results of descriptive stats are reported in the Table 1 which demonstrates that Skewness for all the variables is almost near to zero, Kurtosis for all the variables is approximately near to three and probability value of Jarque Bera test is almost insignificant for all the variables except poverty. All this reports that the data series for all the variables is normally distributed. Besides Descriptive Statistics; now we would like to test unit root problem by using Ng – Perron (2001) unit root test. This test is robust for small data series and the null hypothesis of the test states that data series is non stationary and vice versa for alternate hypothesis. The results computed into Table 2 demonstrate that poverty and inflation have found to be stationary at level as the calculated value of MZa for both variables is larger than its corresponding critical value, whereas all the factors other than these two factors are non-stationary at level. Afterwards; we have tested the same variables at first difference and we have found that all data series have become stationary at first difference. Therefore; we may conclude from the results of Table 2 that data series has mixed order of integration:

I (0) and I (1). The results for Ng – Perron (2001) for the sample period from 1976-2012 are exposed into Table 2 which is given as below:

Table 2
NG-PERRON UNIT ROOT TEST

Variables	At Level I(0)				Variables	At 1st Difference I(1)			
	MZ_a	MZ_t	*MSB*	*MPT*		MZ_a	MZ_t	*MSB*	*MPT*
$LPOV_t$	–6.0476*	–1.6567	0.2740	4.3059	$\Delta LPOV_t$	–10.4808**	–2.2881	0.2183	2.3420
LME_t	0.1152	0.0564	0.4897	18.9381	ΔLME_t	–16.6405***	–2.8838	0.1733	1.4747
$LFDI_t$	–0.5811	–0.3508	0.6037	21.7833	$\Delta LFDI_t$	–31.8177***	–3.9425	0.1239	0.9088
LDE_t	–1.7217	–0.8642	0.5020	13.2477	ΔLDE_t	–21.2141***	–3.2511	0.1533	1.1750
$LCPI_t$	–15.9445***	–2.6199	0.1643	2.2697	$\Delta LCPI_t$	–6.5248*	–1.6323	0.2502	4.3141
$LSER_t$	1.6684	1.1813	0.7081	42.772	$\Delta LSER_t$	–14.2784***	–2.6635	0.1865	1.7479
$LIND_t$	0.8413	0.6618	0.7866	44.2176	$\Delta LIND_t$	–25.8878***	–3.5978	0.1390	0.9464

Note: *** & **&* indicate significance at 1% & 5% and 10% level.

Besides estimating unit root problem; now we would like to apply ARDL Bounds testing approach in order to find long run relationship between poverty and public defense spending in the light of some controlled variables. The results are given in the Table 3 as below:

Table 3
ARDL BOUNDS TESTING APPROACH

Estimated Models	Specification 1	Specification 2
	$POV_t = f(ME_t, FDI_t, INF_t, SER_t, IND_t)$	$POV_t = f(ME_t, DE_t, INF_t, SER_t, IND_t)$
Optimal lags	(1,0,1,1,1,0)	(1,0,1,0,1,0)
F – statistics	4.7073**	5.9979**
W – statistics	28.2436**	35.9875**
	Diagnostics	
R^2	0.9370	0.9409
Adjusted - R^2	0.9152	0.9234
F – Statistics [P – Value]	42.9660 0.000	53.7637 0.000
DW – Statistic	2.3030	2.0271
Durbin's H – Statistic	–1.2092 0.227	–0.1033 0.918
Serial Correlation	1.6598 0.198	0.0154 0.901
Functional Form	0.0003 0.986	0.5957 0.440
Normality	0.4836 0.785	0.2473 0.884
Heteroscedasticity	0.3287 0.566	0.0107 0.918

;, and *** demonstrates significance level at 10%; 5% and 1% respectively.*
Also the values within [] represents Probability Values.

In the above Table 3, results for ARDL are reported for two specifications, and in the both specifications the estimated value of F – statistics Specification 1: 4.7073 and Specifi-

cation 2: 5.9979 is greater than the upper critical bound reported in Table 4.3 4.3919 at 5% level of significance respectively indicating that poverty and public defense spending have long run relationship with each other in the both specifications respectively. However; all the diagnostics like normality, heteroscedasticity, serial correlation and functional form tests report that the both specifications are independent of these issues respectively. Moreover; the critical values for F – statistic and W – statistic are reported in the below Table 4:

Table 4
CRITICAL VALUES FOR ARDL. BOUNDS TESTING APPROACH

Significance Level	Critical Bounds For F – Statistics		Critical Bounds For W – Statistics	
	Lower Critical Bound	Upper Critical Bound	Lower Critical Bound	Upper Critical Bound
5 per cent	3.0647	4.3919	18.3884	26.3515
10 per cent	2.5355	3.7211	15.2129	22.3266

The estimates of both Ng–Perron (2001) and ARDL Bounds Testing Approach are more robust to small sample size. After finding long run relationship between public defense spending and poverty; now we intend to investigate the impact of public defense spending on poverty along with controlled variables for two specifications in the long run and results are shown in the below Table 5:

Table 5
ESTIMATED LONG TERM COEFFICIENTS USING THE ARDL APPROACH

Dependant Variable: $LPOV_t$		
Variable	Specification 1	Specification 2
	Coefficients	Coefficients
LME_t	0.9746 0.000 ***	0.9528 0.000 ***
$LFDI_t$	–0.0231 0.532	–
LDE_t	–	–0.2373 0.000 ***
$LINF_t$	1.1270 0.000 ***	0.8900 0.000 ***
$KSER_t$	–2.2332 0.088 *	–1.4968 0.197
$LIND_t$	–1.7147 0.033 **	–1.7592 0.009 ***
C	13.8296 0.009 ***	12.2746 0.011 **

*, **, *** indicate significance of the variable at 10 percent, 5 percent, and 1 percent level of significance respectively.

The results reported in the above Table 5 demonstrate that public defense spending has significant and positive impact on poverty in both specifications in the long run. For example; one percent increase in public defense spending will significantly increase poverty almost by 0.98 percent in specification 1 and it will significantly increase poverty almost by 0.95 percent in specification 2 respectively. The inherent justification may be that the public defense spending in Pakistan are possibly made by curtailing the proportion of development expenditures which in turn may affect poverty via its impact on economic growth.

From economic theorizing perspective; the opportunity cost of producing guns is a reduction in social development expenditure in a country. There is hardly any study in the literature explaining the direct impact of public defense spending on poverty. However; the evidence of indirect effect of public defense expenditure on poverty through the channel of economic growth has been found. For example; Smith (1980) and Dunne (1996) have shown the negative relationship between military expenditure and economic growth in case of developing countries. The similar results have been found by Khilji and Akhter (1997) in case of Pakistan. Moreover; Romer and Gugerty (1997), Bigsten and Levin (2000), and Fosu (2010) have investigated that economic growth has negative and significant impact on poverty.

Besides capturing the effect of public defense spending on poverty; now we would like to see how changes in the control variables like foreign direct investment; development expenditures, inflation, growth of service sector, and growth of industrial sector will have an impact on poverty in the long run in both specifications of the model. The empirical results have shown that foreign direct investment has negative but insignificant impact on poverty in the specification 1 in long run. Earlier, Pervez and Rizvi (2014) also found negative and insignificant impact of FDI on poverty reduction in Pakistan. However; this finding is contradicting with the study like Kalim and Shahbaz (2009) who found negative but significant impact of FDI on Poverty in Pakistan. The inclusion of FDI as share of GDP in our specification I has allowed growth of service sector to be significant. However; when we drop FDI from the specification I, it turns growth of service sector to be insignificant. The volume of net FDI inflows as share of GDP is very small and net FDI inflows as share of GDP are mainly seen in the telecommunication sector but not in the production sector; therefore, the coefficient of FDI has found to be insignificant in this study.

After discussing foreign direct investment; the impact of development expenditures has found to be negative and significant in the long run in specification 2. The increase in development expenditures represents more infrastructure development; more production, more employment, and more purchasing power. This result is in consistent with Jamal's (2006) who earlier found that government expenditures on social services like health and education have negative and significant impact in reducing poverty in Pakistan. Moreover; if the public spending is done more on health and education, that may be helpful in alleviating poverty. Yildirim and Selami (2002) found a negative relationship between military expenditure and public health expenditure in their study. This reveals trade off between public defense spending and development expenditures.

Afterwards; we have also found that CPI has positive and significant impact on poverty in the long run in both specifications of the model. The relationship is quite obvious as Increase in CPI (a proxy for inflation) always erodes the standard of living of common people and increases their miseries. Poor people are more prone to inflationary pressures than the rich class. This finding is supported by the studies of Hassan and Siddiqi (2010); Kalim and Shahbaz (2009) and Jamal (2006). Additionally; the empirical findings reveal that service sector value added has negative and significant impact on poverty in specification 1 whereas it has been found to have negative but insignificant impact on poverty in specification 2 Joshi

(2004) for example, emphasized on the role of tertiary sector in employment and poverty alleviation during the analysis period of 1950-2000 in case of India. The findings further demonstrate that industrial sector growth has found to be significant factor to alleviate poverty in Pakistan for both specifications respectively. Other researchers have also made an effort to explore the relationship between different sector's growth and poverty. For example, Montalvo and Martin (2010) in their study found the primary sector as a major contributor towards poverty reduction in China. After investigating long term coefficients using ARDL approach, now will apply Error Correction Model for the selected ARDL Model to estimate short run coefficients for the proposed two specifications and results are represented in the Table 6. The findings reveal that public defense spending is significantly accelerating poverty in both specifications respectively. Afterwards; the impact of industrial value added has found to be negative and significant in the both specifications respectively. Moreover; the impact of inflation on poverty has also found to be positive and significant in the specification 2.

Lastly; the first period lagged term of ECM shows speed of adjustment to attain long run and stable equilibrium and Bannerjee *et al*. (1998) proposed that the first period lagged term of ECM should be negative and significant in order to converge towards long run and stable equilibrium. The results for both specifications reported in Table 6 demonstrate that the coefficient of first period lagged term of ECM has found to be negative and significant; therefore, convergence hypothesis prevails in this study. Also the speed of adjustment to achieve long run equilibrium has found to almost 48 percent in specification 1 and is almost 49 percent in specification 2 respectively. The results reported in Table 6 are presented as below:

Table 6
ERROR CORRECTION REPRESENTATION FOR THE SELECTED ARDL MODEL

Dependant Variable: $\Delta LPOV_t$		
Variable	**Specification 1**	**Specification 2**
	Coefficients	**Coefficients**
ΔLME_t	0.4640 0.005 ***	0.4645 0.002 ***
$\Delta LFDI_t$	0.0325 0.133	–
ΔLDE_t	–	0.0484 0.356
$\Delta LINF_t$	–0.2807 0.248	0.4339 0.000 ***
$\Delta LSER_t$	–0.1146 0.832	0.6121 0.267
$\Delta LIND_t$	–0.8165 0.053 *	–0.8577 0.019 **
ECM_{t-1}	–0.4762 0.000 ***	–0.4875 0.000 ***
	Diagnostics	
R-squared	0.5762	0.6027
Adjusted R-squared	0.4296	0.4850
S.D. Dependent Variable	0.0580	0.0580
S.E. of Regression	0.0438	0.0417
Akaike Information Criterion	57.3605	59.5211
Schwarz Bayesian Criterion	49.4429	52.3953
F-statistic [Prob. Value]	5.8925 0.000	6.8264 0.000
Durbin-Watson Stat	2.3030	2.0271

*, **, *** indicate significance of the variable at 10 percent, 5 percent, and 1 percent level of significance respectively.

After findings short run coefficients; now we would like to examine whether poverty reverse causes to its factors which are conceptualized in the equation (1) and equation (2) respectively. The results are mentioned in the below Table 7:

Table 7
TESTING REVERSE CAUSALITY FOR THE SELECTED ARDL MODEL

Model	Lag Order	F – Test [Wald Test]	Outcome
Specification – 1			
$\Delta ME\{F_{ME}(ME/POV, FDI, INF, SER, IND)\}$	(1,0,0,0,0,0)	3.0162	No Co-Integration
$\Delta FDI\{F_{FDI}(FDI/POV, ME, INF, SER, IND)\}$	(1,0,0,0,0,0)	1.1541	No Co-Integration
$\Delta INF\{F_{INF}(INF/POV, ME, FDI, SER, IND)\}$	(1,0,1,0,0,0)	2.8974	No Co-Integration
$\Delta SER\{F_{SER}(SER/POV, ME, FDI, INF, IND)\}$	(1,0,0,0,0,0)	1.7947	No Co-Integration
$\Delta IND\{F_{IND}(IND/POV, ME, FDI, INF, SER)\}$	(1,0,0,0,0,0)	1.7762	No Co-Integration
Specification – 2			
$\Delta ME\{F_{ME}(ME/POV, DE, INF, SER, IND)\}$	(1,0,0,0,0,0)	3.0132	No Co-Integration
$\Delta DE\{F_{DE}(DE/POV, ME, INF, SER, IND)\}$	(1,0,0,0,0,0)	0.9677	No Co-Integration
$\Delta INF\{F_{INF}(INF/POV, ME, DE, SER, IND)\}$	(1,0,1,0,0,1)	3.5319	No Co-Integration
$\Delta SER\{F_{SER}(SER/POV, ME, DE, INF, IND)\}$	(1,0,0,1,0,0)	1.9574	No Co-Integration
$\Delta IND\{F_{IND}(IND/POV, ME, DE, INF, SER)\}$	(1,0,0,1,0,0)	1.9830	No Co-Integration

Note: Lower Critical Bound = 3.0647 (5 Percent significance level) and 2.5355 (At 10 Percent significance level). Whereas, Upper Critical Bound = 4.3919 (5 Percent significance level) and 3.7211 (10 Percent significance level).

As we have found in the Table 2 that the data series within the selected sample period have mixed order of integration I(0) and I(1); therefore, we would like to test reverse causality by using ARDL bounds testing approach. We have taken one by one all the explanatory factors of poverty of equation (1) and (2) as dependent variable and then we tested whether long run co-integration holds or not? The existence of co-integration will confirm that poverty along with other variables is causing the dependent variable. The existence of long run relationship will be confirmed if the calculated F – Test becomes larger than the upper critical bound. The estimated results are reported in the Table 7. The results show that in the both specifications (1 and 2); the calculated value of F – Test has found to be less than the corresponding upper critical bound, hence there does not exist any co-integration in both specifications respectively. Therefore; we may conclude that into both specifications (1 and 2); only public defense spending or military expenditures cause poverty whereas, poverty does not cause public defense spending in Pakistan. Moreover; the findings also state that all the explanatory factors framed in equation (1) and equation (2) in Section – IV could now be considered as exogenous factors and poverty is now said to be as endogenous variable in this study.

6. Conclusion and policy implications

This paper investigated the impact of public defense spending on poverty using ARDL Bounds Testing Approach for the period from 1976-2012 by considering foreign direct in-

vestment, development expenditures, inflation, service sector, and industrial sector as controlled variables. The findings reveal that public defense spending has significant and accelerating impact on poverty into both long run and short run in both specifications respectively in Pakistan. Therefore; we have come to the conclusion that public defense spending is pro – poverty in Pakistan. The empirical results also conclude that inflation has positive and significant impact on poverty in the long run in both specifications respectively; whereas, the same finding is witnessed for short run only in specification 2. Besides this finding; industrial sector value added has found to have significant impact on poverty reduction in long run as well as in short run in both specifications respectively. Furthermore; development expenditures and service sector value added are significantly reducing poverty in the long run in Pakistan.

The findings suggest that the public defense spending is increasing poverty in Pakistan and the results are robust to different controls. Therefore; the need of time is to decrease defense spending and divert these funds to poverty alleviating programs. However; the caution that requires to be considered is the proper and efficient reallocation of resources. To combat geographical threats and dangers, a serious move can be initiated towards the peace pacts with India for the sake of betterment of the people of the country.

Notes

1. The data from 1976-2003 is obtained from the study conducted by Jamal (2006) and data for the years from 2004-2012 is obtained from for the various volumes and issues of Economic Survey of Pakistan.
2. The data from 1991-2005 is obtained from Pakistan Economic Survey (2006) and the data from 2006-2012 is obtained from Pakistan Economic Survey (2013). The remaining data has been obtained from the previous volumes and issues of Pakistan Economic Survey.

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Resumen

El atributo principal de este estudio es abordar la cuestión de si el gasto público en defensa es pro-pobreza o anti-pobreza en Pakistán. Los hallazgos empíricos muestran que el gasto público en defensa es pro-pobreza en Pakistán. Este estudio propone que el gobierno podría, por un lado, distribuir sus recursos más hacia el desarrollo del sector social desde el gasto en defensa y, por otro lado, podría iniciar un movimiento serio hacia los pactos de paz con India en aras de la mejora de la gente del país.

Palabras clave: Pakistán, gasto público en defensa, pobreza.

Clasificación JEL: H56, I32, C51.