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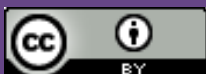
Fiscal Response to Terrorism in Pakistan: The Role of Institutions

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Abstract

This study empirically estimates the fiscal consequences of terrorism in Pakistan by using annual time series data from 1984 to 2016. By employing the autoregressive distributed lag (ARDL) technique, the study has gauged the impact of terrorist incidents on two important facets of fiscal policy, namely, tax revenue and defense spending. The results reveal that terrorism has detrimental ramifications for fiscal policy in Pakistan. Specifically, on the one hand, an increase in terrorist incidents tends to bring a fall in tax revenue while on the other hand, they induce a rise in defense outlays, thus deteriorating both fronts of the fiscal position. Notably, the moderating role of institutional quality appears significant and indicates that institutional quality has not only a significant direct impact on fiscal policy, but it also helps in completely mitigating (reducing) the harmful impact of terrorism on defense spending (tax revenue) in Pakistan. These findings suggest that there is a need to take appropriate steps for strengthening institutional setup to control the fallouts of terrorism on fiscal behavior of the government of Pakistan.

Keywords: terrorism; tax revenue; institutional quality; ARDL

JEL Classification: E62; H2; E02; H5; F35

1. Introduction

The conceptual and operational definitions of terrorism have been rehabilitated since the 9/11 incident due to the victimization of world economic leader, massive destructions, and

long lasting socio economic and political implications. The incident has led to change the geopolitical relations of world economic and political powers as it has compelled many countries to become allies directly or indirectly in eradicating the roots of terrorist activities at national and international levels.

Theoretically, terrorism is an act of violence to achieve various economic, political and ideological goals by means of threat and fear (Humphreys, 2006).[1] Hence, any non-state actor creating threat, using illegal forces (intimidation or oppression) to achieve economic and/or a non-economic gains such as political, social or religious is termed as terrorism (LaFree & Dugan, 2017). The major purpose of terrorist activities is to obtain several benefits by pressurizing governments, and creating political disruptions which further create uncertainty in political regimes and interruption in policies. This leads to reallocation of resources from productive to non-productive activities (Michael, 2007).

Over the course of time, the world has witnessed not only an increase in terrorist incidents but also an elevated severity attached to these episodes (Zakaria et al., 2019). Terrorism has various direct and indirect ramifications for victim countries. The direct consequences, for instance, include demolition of infrastructure, loss of human lives, and direct spending on armaments and security by the governments. The indirect implications, on the other hand, are hard to measure as terrorism hits economic activities by instigating uncertainty which then influences consumption and investment decisions, diverts government expenditures from development to non-development fronts such as maintaining law and order situation, improving security measures internally and externally.

Empirically, economic consequences of terrorism have widely been discussed widely. The evidence proclaims that it deteriorates economic growth by increasing uncertainty, shattering

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[1]The Global Terrorism Database (LaFree and Dugan, 2017) defines terrorism as "the threat or actual uses of illegal force and violence by a non-state actor to accomplish an economic, political, social or religious goal through oppression, fear and/or intimidation".

investors' confidence, deferring investment decision, reducing foreign direct investment and trembling stock market performance (Gaibulloev & Sandler, 2009; Gries et al., 2011; Freytag et al., 2011; Raza & Jawaid, 2013; Gaibulloev et al., 2013; Hyder et al., 2015; Estrada et al., 2015; Shahzad et al., 2016; Shah et al., 2016).

The recent surge in empirical literature is to examine not only the direct but also the indirect economic, social and political implications of terrorism through changing the composition of government expenditure. As terrorism forces governments to shift resources towards improving law and order enforcement and reconstruction of affected areas, it not only hinders the process of economic growth but also reduces governments' ability to generate revenue. In developing countries, this increase in non-developmental expenditures takes place at the expense of developmental expenditures (Michael, 2007). Gupta et al. (2004) conclude that persistent acts of terrorism lead to increase the share of military expenditures in total government outlays in low and middle income countries while the impact on tax revenue is reported as insignificant. Similarly, Gaibulloev and Sandler (2008) report that countries with a higher than median level of terrorism experience larger increase in military spending as compared to the countries with a lower than median level of terrorist incidents. They also show an insignificant impact of terrorism on tax revenue. Moreover, Drakos and Konstantinou (2014) contend that terrorism leads to higher government spending on defence while it reduces the expenditure on social safety net. On the other hand, it distorts the tax base and contracts government revenues thus putting pressure on fiscal management. Cevik and Ricco (2015) document that the adverse impact of terrorism on tax revenue is only marginal while a significant increase in military spending has been observed in response to the increasing terrorist activities. Yogo (2015) also reveals that terrorist activities create uncertainty in the conduct of fiscal policy in developing countries.

Pakistan constitutes a good case to be considered for examining fiscal response to terrorism as the country has remained a victim of extensive terrorist activities. It is an undeniable fact that Pakistan has been among those countries which are always at the

forefront of terrorist incidents due to various factors such as religious, geographical, ethnic, political, and economic- mainly unemployment and income inequality(Ismail & Amjad, 2014; Khan, et al., 2016; Syed et al., 2015). The incident of 9/11 has played a vital role in engorging terrorism in Pakistan. Terroris has trapped the country in social destruction, economic deterioration and political instability which is exerting huge pressure on government to manage this menace. For instance, studies such as (Hyder et al., 2015; Khan et al., 2016; Khan & Yusof, 2017; Mehmood, 2014; Shahbaz et al., 2013; Shahzad et al., 2016, Zakaria et al., 2019) conclude that the economic growth process is immensely deteriorated in Pakistan due to terrorism. In view of Farooq (2014) the cost of war against terrorism is much higher than its benefits to Pakistan. Moreover, the study shows that macroeconomic performance measured through various indicators has deteriorated due to terrorism while terrorism has increased government expenditure. Nasir and Shahbaz (2015) also report that terrorism Granger causes military expenditures in Pakistan. Shahzad et al. (2016) substantiate the claim that terrorism forces governments to redirect expenditure from developmental to non-developmental projects such as increasing security standards for improving law and order situation. More recently, Zakaria et al. (2019) have identified the impact of terrorism, internal and external conflict on economic growth, fiscal spending, FDI, and domestic investment. The study concludes that terrorism adversely affects macroeconomic performance and puts pressure on fiscal budget by increasing government expenditures on managing security affairs of the country. Other studies examine the impact of terrorism on tourism (Rauf et al., 2016) environmental pollution (Bildiricia & Gokmenoglu, 2020); education policy (Iqbal, 2019) and financial market performance (Gul et al., 2010) of Pakistan. These studies have unanimously concluded that terrorism has adverse effects on macroeconomic performance no matter what indicator is used to measure it.

To eradicate the menace of terrorism, an effective anti-terrorism campaign has been launched through Nation Action Plan, Zarb-e-Azb, and Operation Radd-ul- Fasaad in Pakistan. These initiatives have produced desired outcomes in reducing the number of terrorist attacks and severity of terrorism in Pakistan but at

massive financial and administrative costs (Government of Pakistan, 2017). Mubashra and Shafi (2018) also report that counter terrorism activities have short- and long-run effects on Pakistan's economy. On the one hand, the counter terrorism actions make fiscal position of government vulnerable due to higher defence and security spending, rehabilitation, and reconstruction. On the other hand, terrorism hampers economic activity, delays investment and consumption plans, discourages foreign direct investment, and reduces international trade; therefore, restricts government's ability to collect revenues through tax and non-tax sources. Hence, terrorist activities are like a double edged sword for a developing country like Pakistan.

Historically, defence spending has a major share in total outlays of the government of Pakistan because of various internal or external, and actual or perceived security concerns. It is observed that there are extreme fluctuations with an increasing trend in the defence spending (Government of Pakistan, 2017). Blomberg et al. (2004) describe that terrorism induces higher government spending to improve law and order, and security situation. On the contrary, the revenue side of the government of Pakistan does not exhibit an encouraging picture. For example, the tax revenue as percent of GDP has declined from a peak of 13.7 in 1997 to 9.2 in 2016 (Government of Pakistan, 2017). This is alarming as over the years defence spending is mounting due to increasing security pressures; however, the resources to meet these expenditures are not supportive. As explained by earlier literature, an increase in defence expenditure crowds out not only public development expenditure but also private investment (Blomberg et al., 2004; Gaibulloev & Sandler, 2008), hence, the revenue generating capacity of a government is certain to get squeezed.

Despite voluminous literature on examining the consequences of terrorism, the literature is relatively scant on investigating the fiscal consequences of terrorism, particularly, in countries which are not only major victims of terrorism but are also on the frontline in the war on terror. In this perspective, Pakistan makes a good case to be investigated, particularly, in the wake of the 9/11 incident as Pakistan has played significant role in

the national and global war on terror. The existing literature mostly reports the economic consequences of terrorism, however, terrorism related research lacks the fiscal dimension in Pakistan. There are two empirical studies which have examined the fiscal consequences of terrorism in Pakistan, namely (Nasir & Shahbaz, 2015; Zakaria et al., 2019). The former, by taking two variables model, concludes that terrorism Ganger causes military spending in Pakistan, while the later reports the impact of terrorism on overall public expenditures. These studies, thus, do not provide a detailed insight to the fiscal consequences of terrorism. Therefore, to abridge this gap in the existing literature, the purpose of the present study is to estimate fiscal response to terrorism in Pakistan. To this end, we have taken two important aspects of fiscal policy; tax revenue as percent of GDP, and defence spending as percent of GDP. The first measure shows the strength of fiscal accounts while the latter presents the proportion of government revenues allocated for the security and law and order maintenance. Hence, both measures portray important facets of fiscal position of Pakistan and the impact of terrorism on these indicators will help us draw important findings for researchers as well as for policy-makers. Furthermore, as mentioned above, few empirical studies have shown that terrorism creates disruption in fiscal policy by redirecting government expenditures towards defence spending and by reducing tax revenue, nonetheless, we have not come across any study which has gauged the role of factors which can mitigate/reduce the adverse impact of terrorism on fiscal position, specifically for Pakistan. Therefore, this study also aims to quantify the fiscal response to terrorism in Pakistan by incorporating the role of one such factor, namely, institutions. Institutions, as documented by North (1990) define the rules, explain the functioning of various sectors, and most importantly facilitate the transmission mechanism of stabilisation policies. In addition, by defining the rules and setting the parameters, institutions help in mitigating the menace of various shocks including terrorism. In the similar vein, Acemoglu and Robinson (2010) emphasize the significance of institutions for better economic and political performance. They argue that good institutions ensure accountability, transparency, and good governance, therefore, help in effective policy formulation as well

as proper implementation of these policies. Hence, this study aims to introduce the moderating role of institutional quality in terrorism-fiscal policy nexus of Pakistan. The moderating role of institutional quality is captured by introducing an interaction term of terrorism and institutional quality index. In doing so, we quantify not only the direct impact of terrorism on fiscal policy but also its conditional impact through institutional quality. Finally, the empirical analysis is conducted by employing the Autoregressive Distributive Lag (ARDL) technique over the period of 1984 to 2016. This technique enables the study to quantify the short run as well as the long run implications of terrorism for fiscal policy of Pakistan in the presence of institutional quality.

The rest of the study is structured as follows: section 2 contains the methodology, data and estimation technique; section 3 presents empirical findings followed by section 4 which concludes the study.

2. Analytical Framework

2.1. Model Specification and Data

There is a paucity of research work pertaining to fiscal response to terrorism. In existing body of relevant literature, we find the application of single equation models for executing the desired empirical task. For determining the fiscal behaviour of a government various economic, political and institutional factors play their roles. However, in an empirical investigation only selected macroeconomic determinants of fiscal actions are incorporated. To this end choice of explanatory variables depends upon the objectives of the study keeping in view the nature of fiscal action. As our study aims to estimate fiscal response to terrorism in the presence of institutional quality through gauging effect of terrorist incidents on tax revenue collection and defence spending in Pakistan, therefore, terrorism and institutional quality variables have been plugged into the standard econometric models of tax revenue and defence spending. Considering the relevance with our study, we prefer to use modified versions of regression models presented by (Maizels & Nissanke, 1986; Teera, 2003; Gupta et al., 2004; Cevik & Ricco, 2015; Chuku et al., 2019).

Thus, to conquer the basic aim of the study we specify the following econometric models:

$$TAX = f(TER, GDPGR, INF, GE, AID) \qquad (1)$$
$$TAX = f(TER, GDPGR, INF, GE, AID, INS, TER * INS) \qquad (2)$$
$$DFS = g(TER, GDPGR, TB, AID, DFSI) \qquad (3)$$
$$DFS = g(TER, GDPGR, TB, AID, DFSI, INS, TER * INS) \qquad (4)$$

The present study uses the annual time series data of Pakistan over the period 1984 to 2016[2]. In above models, TER refers to log of number of terrorist attacks (or incidents) reported in a year, TAX indicates tax revenue as percent of GDP, GDPGR indicates economic growth performance proxied by growth rate of real GDP, INF is inflation rate i.e. annual growth rate of consumer price index (CPI), GE refers to Gross public expenditure(as percent of GDP), AID refers to foreign aid i.e. foreign Loans and foreign Grants as percent of GDP, DFS indicates defence spending as percent of GDP, TB shows trade balance as percent of GDP, DFSI shows defense spending of India as percent of GDP, INS refers to Institutional quality index(composite index of five aspects relating to institutional quality namely bureaucratic quality; corruption; democratic accountability; ethnic tensions and law and order). We have constructed the institutional quality index by means of Principal Component Analysis (PCA) technique. These five indicators are converted into scale of 1-10 respectively for comparability purpose. TER*INS indicates interaction term of number of terrorist attacks and institutional quality index. The interaction term captures the impact of terrorism on each aspect of fiscal policy in presence of institutional quality. The coefficient of the interaction term will identify whether institutional quality in Pakistan is helpful in completely eliminating/minimizing the adverse impact of terrorism. Number of terrorist attacks variable is logarithmic throughout our estimation task. The details of data sources for each of these variables is given in table 1.

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[2]The selection of time period is based on the availability of data on institutional quality index which is available only from 1984-2016.

Table 1. Variables' Description and Data Source

Variable	Construction	Data Source
TAX	Tax revenue as percent of GDP	Government Financial Statistics published by IMF (2018)
GE	Gross public expenditure as percent of GDP	
GDPGR	Economic growth performance proxied by growth rate of GDP	World Development Indicators published by World Bank (2019)
INF	Inflation rate i.e. annual growth rate of consumer price index (CPI)	
AID	Foreign aid i.e. foreign loans and foreign grants as percent of GDP	
DFS	Defence spending as percent of GDP	
TB	Trade balance as percent of GDP	
DFSI	Defence spending of India as percent of GDP	
INS	Institutional quality index(composite index of five aspects relating to institutional quality)	International Country Risk Guide by PRS group (2013)
TER	Number of terrorist attacks reported in a year.	Global Terrorism Database (GTD) introduced by LaFree and Dugan (2017) and maintained by the University of Maryland.
TER*INS	Interaction term of number of terrorist attacks and institutional quality index	

In models (1) and (2) terrorism is expected to bring a decline in tax revenue collection due to its detrimental effect on economic activities and business (Gupta et. al., 2004). Growth rate of GDP has expected positive relation with tax revenue as increase in economic growth performance is likely to promote business activities and expand the size of the economy, leading to raise public revenue through taxes.Inflation is expected to cause a fall in tax revenue because rising trend of general price level means decrease in purchasing power of public which will certainly open the doors for tax evasion on the part of tax payers. Moreover, inflation will also lower the value of tax revenue collected by the government. Rise is government expenditure is expected to raise tax revenue as postulated by (Barro's, 1974; Peacock & Wiseman's, 1979) spend-revenue hypothesis. Aid-Taxation relationship may be positive or negative, depending upon the composition of aid, conditionalities attached with aid, existing tax system in a country and government behaviour (Gupta et al., 2004; Benedek et al., 2014). Good quality intuitional set up is more likely to create incentives for investment, technology adoption, and opportunity to accumulate human capital for workers, leading to create a very conducive environment for business and hence for enhancing tax collection (Hussain et al., 2016). The expected link of interaction term of terrorism and institutional quality to tax revenue is ambiguous as it is subject to the extent to which institutional quality succeeds in overcoming ill effects of terrorism on tax revenue.

As far as models (3) and (4) are concerned, it is expected that defence spending will increase with the occurrence of terrorist incidents as anti-terrorism actions require more expenditure on security. Economic growth has an expected positive association with defence spending because a growing economy has an enhanced capacity to increase its defence allocations (Dunne et al., 2003). The share of the trade balance in GDP reflects the openness of an economy and its nature of link with defence spending is ambiguous (Rosh, 1988; Dunne et al., 2003). Similarly, whether foreign aid hinders or promotes defence spending is also unclear (Kono & Montinola, 2013). Pakistan's defence spending is expected to respond India's defence allocations positively since

Pakistan has serious security threats from India (Chawla, 2001; Sheikh et al., 2013; Aslam et al., 2014). The institutional quality's relationship is likely to be negative with defence spending because countries with better institutional quality would have fewer chances of using military action to solve external and internal disputes (Desta, 2009). Finally, expected link of interaction term of terrorism and institutional quality with defence spending is ambiguous.

2.2. Estimation Technique

The selection of an estimation methodology relies on the nature of data set used in an estimation process. As the present study deals with time series data, therefore, the estimation begins with examining the unit root properties of all variables given in models (1) to (4). To this end, the study employs the renowned Augmented Dickey-Fuller (ADF)test[3]. This test is based on the null hypothesis that a given times series contains a unit root.

For estimation purpose of all the four models pertaining to the fiscal response to terrorism,the study has used the Autoregressive Distributed Lag (ARDL) cointegration technique developed by Pesaran et al. (2001).[4] This technique is considered quite useful in obtaining consistent parameter estimates whether the underlying regressors are I (0), I (1) or a combination of both. Moreover, it is capable enough to yield efficient and consistent empirical results for the small data size like ours. The ARDL representations of the equations (1) and (4) can be formulated as:

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[3]For robustness check, we have also employed an alternate unit root test namely PP test (Phillips-Perron) unitroot test.

[4]Other time series techniques are GMM-IV technique, VECM, FMOLS and DOLS techniques. However, these all require same order to integration or level of stationarity for all variables. ARDL is the only technique available which provides efficient estimates under different order of integration of regressors and I(1) for the dependent variable. Therefore, this study has used ARDL estimation technique for empirical estimation of all models.

$$\Delta TAX_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta TAX_{t-i}$$

$$+ \sum_{i=0}^{p} \alpha_2 \Delta TER_{t-i} + \sum_{i=0}^{p} \alpha_3 \Delta GDPGR_{t-i}$$

$$+ \sum_{i=0}^{p} \alpha_4 \Delta INF_{t-i} + \sum_{i=0}^{p} \alpha_5 \Delta GE_{t-i}$$

$$+ \sum_{i=o}^{p} \alpha_6 \Delta AID_{t-i} + \alpha_7 TAX_{t-1} + \alpha_8 TER_{t-1} + \alpha_9 GDPGR_{t-1}$$

$$+ \alpha_{10} INF_{t-1} + \alpha_{11} GE_{t-1} + \alpha_{12} AID_{t-1} + u_{1t}(5)$$

$$\Delta TAX_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta TAX_{t-i}$$

$$+ \sum_{i=0}^{p} \beta_2 \Delta TER_{t-i} + \sum_{i=0}^{p} \beta_3 \Delta GDPGR_{t-i}$$

$$+ \sum_{i=0}^{p} \beta_4 \Delta INF_{t-i} + \sum_{i=0}^{p} \beta_5 \Delta GE_{t-i} +$$

$$\sum_{i=0}^{p} \beta_6 \Delta AID_{t-i} + \sum_{i=0}^{p} \beta_7 \Delta INS_{t-i} + \sum_{i=0}^{p} \beta_8 \Delta (TER * INS)_{t-i} + \beta_9 TAX_{t-1} + \beta_{10} TER_{t-1} + \beta_{11} GDPGR_{t-1} +$$

$$\beta_{12} INF_{t-1} + \beta_{13} GE_{t-1} + \beta_{14} AID_{t-1} + \beta_{15} INS_{t-1} + \beta_{16} (TER * INS)_{t-1} + u_{2t}(6)$$

$$\Delta DFS_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 \Delta DFS_{t-i}$$

$$+ \sum_{i=0}^{p} \gamma_2 \Delta TER_{t-i} + \sum_{i=0}^{p} \gamma_3 \Delta GDPGR_{t-i}$$

$$+ \sum_{i=0}^{p} \gamma_4 \Delta TB_{t-i} + \sum_{i=0}^{p} \gamma_5 \Delta AID_{t-i}$$

$$+ \sum_{i=o}^{p} \gamma_6 \Delta DFSI_{t-i} + \gamma_7 DFS_{t-1} + \gamma_8 TER_{t-1} + \gamma_9 GDPGR_{t-1}$$

$$+ \gamma_{10} TB_{t-1} + \gamma_{11} AID_{t-1} + \gamma_{12} DFSI_{t-1}$$
$$+ u_{3t} \ (7) \Delta DFS_t$$
$$= \delta_0$$
$$+ \sum_{i=1}^{p} \delta_1 \Delta DFS_{t-i}$$
$$+ \sum_{i=0}^{p} \delta_2 \Delta TER_{t-i} + \sum_{i=0}^{p} \delta_3 \Delta GDPGR_{t-i}$$
$$+ \sum_{i=0}^{p} \delta_4 \Delta TB_{t-i} + \sum_{i=0}^{p} \delta_5 \Delta AID_{t-i} +$$
$$\sum_{i=0}^{p} \delta_6 \Delta DFSI_{t-i} + \sum_{i=0}^{p} \delta_7 \Delta INS_{t-i} + \sum_{i=0}^{p} \delta_8 \Delta (TER$$
$$* INS)_{t-i} + \delta_9 DFS_{t-1} + \delta_{10} TER_{t-1}$$
$$+ \delta_{11} GDPGR_{t-1} +$$
$$\delta_{12} TB_{t-1} + \delta_{13} AID_{t-1} + \delta_{14} DFSI_{t-1} + \delta_{15} INS_{t-1} + \delta_{16} (TER *$$
$$INS)_{t-1} + u_{4t} (8)$$

In equations (5) to (8), the coefficients attached with difference operators measure short run dynamics, whereas, the parameters attached with one period lagged variables capture the long run relationships. Notably, β_8 and β_{16} in equation 6 represent, respectively, the direct and conditional impact of terrorism on tax revenue as percent of GDP while δ_8 and δ_{16} in equation 8 capture, respectively, the direct and conditional impact of terrorism on defence spending as percent of GDP. For checking the existence of long run relationship between fiscal variables and all explanatory variables, we formulate four null hypotheses of no cointegration for equations (5) to (8) as follows:

$$\alpha_7 = \alpha_8 = \alpha_9 = \alpha_{10} = \alpha_{11} = \alpha_{12} = 0$$

$$\beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = 0$$

$$\gamma_7 = \gamma_8 = \gamma_9 = \gamma_{10} = \gamma_{11} = \gamma_{12} = 0$$

$$\delta_9 = \delta_{10} = \delta_{11} = \delta_{12} = \delta_{13} = \delta_{14} = \delta_{15} = \delta_{16} = 0$$

Equations (5) to (8) are representing four error correction models in which the lagged error correction term (ECT) in each case is obtained through the linear combination of lagged level variables. Pesaran et al. (2001) provide new critical values for the standard F test with a view to test null hypothesis of No cointegration. In this regard, an upper bound critical value is used when all regressors in a given model are integrated of order one i.e.I(1). A lower bound critical value is employed when all regressors are stationary at level i.e.I(0). However, theyestablish that the upper bound critical values are still valid in case some regressors are I(0) and some are I(1).

3. Discussion of Results

3.1. Unit Root and Cointegration Tests

As we are working with time series data, therefore, it seems essential to commence our empirical task by probing the stationarity properties of all the time series included in models (1) to (4) using ADF unit root test.Results displayed in table 2 show that all time series are integrated of order one i.e., I (1) except terrorism and foreign aid which are integrated of order zero i.e., I (0)[5]. The mixed order of integration of regressors makes a valid case to use the ARDL technique in the present study.

After selecting optimal lag using the Schwartz Bayesian Criteria, value of F-test statistic is estimated to test the null hypotheses of no cointegration in case of all the four models i.e. (5) to (8) as an initial crucial step.In table 3 we can see that acomparison between calculated value of F-test statistic with that of its critical counterpart as provided by Pesaran et. al. (2001) reveals that null hypotheses of no cointegration between fiscal variables and all the regressors are rejected in case of all the four

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[5]For robustness check, we have also employed an alternate unit root test namely PP test (Phillips-Perron) unitroot test. The estimates reports the mixed order of integration of selected variables and are listed in Appendix 1.

models i.e. (5) to (8). Hence, it turns out that selected fiscal variables forms a long run relationship with the explanatory variables given in models (5) to (8).

Table 2. Unit Root Test Results

Variable	Test Statistic		Mackinnon Critical Values (5% Level of Significance)	Order of Integration
	Level	1stDifference		
TAX	1.032	-6.678	-3.558	I(1)
TER	-4.079	-	-3.558	I(0)
GDPGR	-3.423	-7.118	-3.558	I(1)
INF	-2.307	-6.868	-3.558	I(1)
GE	-2.703	-5.947	-3.558	I(1)
AID	-4.003	-	-3.558	I(0)
INS	-1.282	-4.599	-3.558	I(1)
TER*INS	-1.920	-7.782	-3.558	I(1)
DFS	-0.829	-4.942	-3.558	I(1)
TB	-2.182	-6.314	-3.558	I(1)
DFSI	-1.224	-4.818	-3.558	I(1)

Table 3: Cointegration Test

Model	F-stat Value	F-statistic Critical Value (5% Significance Level)		Outcome
		I(0)	I(1)	
1	5.16	2.62	3.79	Cointegration
2	22.23	2.32	3.50	Cointegration
3	4.84	2.62	3.79	Cointegration
4	7.87	2.32	5.50	Cointegration

3.2. Descriptive Statistics

The descriptive statiscs are presented in table 4. These statistics indicate that the mean value of tax revenue and fiscal spending in Pakistan are higher than the standard deviation hence we may conclude that variation in these variables are not large.

Notably, the mean value of DFS is higher than the mean value of DFSI indicating that, on average, Pakistan defence expenditures(as percent of GDP) are higher than India. Similarly, it is bserved that standard deviations of DFS is higher than DFSI. On average Pakistan has expeienced 411 terrorist attacks with huge variation of 610. The maximum number of attacks experienced by the county is reported as 2214. On average Pakistan's trade balance emerged as negative with moderate standard deviation oevr the selected period of time.

Table 4. Descriptive Statistics

Variables	Obs	Mean	S.D	Min	Max
TAX	33	11.38	1.60	8.94	13.71
DFS	33	5.06	1.58	3.26	7.60
TER	33	411.61	610.52	0	2214
GDPGR	33	4.52	1.88	1.01	7.71
INF	33	8.18	3.97	2.54	20.28
GE	33	20.56	5.18	13.32	29.42
AID	33	3.94	1.61	1.28	7.23
TB	33	-5.35	3.56	-12.39	1.03
DFSI	33	2.91	0.401	2.39	3.95
INS	33	2.46	1.45	1	4.78

3.3. Tax Revenue and Terrorism: Role of Institutional Quality

As a next step, we focus on the outcomes of estimation endeavours of models (5) to (8) one by one. We take start with the interpretation of results of model 5 contained in table 5 which has three sections. In the upper section, long run estimates of tax to GDP ratio are presented. It can be seen that terrorism is significantly associated with tax revenue collection with a negative signin Pakistan. This finding is in accordance with theoretical prediction that terrorism adversely impacts tax collection efforts. The coefficient of terrorism carries the value-0.116 which implies that one percent increase in terrorist attacks leads to bring 0.116 percent decline in tax to GDP ratio in Pakistan. Since 1980s, terrorism has become endemic with recurrent attacks and extremely high fatalities in Pakistan. The incidence of terrorist attacks has significantly increased in wake of the USA attacks on Afghanistan in 2001. Domestic business and investment activities have severely affected from persistently occurring curse in the country which has adverse ramifications for tax collection.

Table 5. Tax Revenue and Terrorism

Dependent Variable: Tax Revenue		
Selected Model: ARDL(1,2,2,1,1,1)		
Regressor	Coefficient	t-value
TER	-0.116**	-2.513
GDPGR	0.262***	3.814
INF	-0.077**	-2.491
GE	0.497***	3.356
AID	-0.441**	-2.232
Error Correction Model: Short Run Estimates		
Regressor	Coefficient	t-value
Constant	6.011***	6.415
D(TER)	-0.254	-0.952
$D(TER)_{t-1}$	-0.381	-1.424
D(GDPGR)	0.143*	1.928
$D(GDPGR)_{t-1}$	0.367	1.133
D(INF)	-0.113**	-3.074
D(GE)	0.156***	5.742
D(AID)	-0.095**	-2.948
ECT_{t-1}	-0.781***	-6.944
Diagnostic Tests		
χ^2_{SC}= 0.312(0.656)		χ^2_{H}= 0.845(0.414)
χ^2_{FF} = 0.981(0.282)		χ^2_{N}= 1.312(0.461)

Note:***, **and * indicate significant at 1%, 5% and 10% levels respectively, $\chi\_SC^2, \chi\_H^2, \chi\_FF^2$ and χ_N^2 denote LM test for serial correlation, heteroscedasticity, functional form and normality respectively. The associated p values are in parentheses.

This finding substantiates the argument put forward by Gupta et al. (2004) that terrorism results in crumbling tax base through devastation of business firms and hampering the tax administration with net outcome of fall in tax revenue collection. Moreover, this outcome corroborates with what have been documented by (Gupta et al., 2004; Cevik & Ricco, 2015; Chuku et al., 2019).

Among other determinants of tax revenue, we find that economic growth performance and public spending are positively while inflation rate and foreign aid are negatively associated with

tax to GDP ratio in Pakistan. All these findings are in accordance with our expectations. Persistent and strong economic growth performance stimulates business activities and employment level in a country which helps to raise tax to GDP ratio. The positive impact of public spending on tax revenue with statistical significance validates the spend-revenue hypothesis developed by (Barro, 1974; Peacock & Wiseman, 1979). This hypothesis is based on the notion that variations in government expenditure lead to produce changes in tax revenue i.e. at first, a government spends and then it strives for covering the expenditures through taxes. The adverse influence of inflation on tax revenue can be explained through the loss of purchasing power caused by rising price level that may result in tax evasion by the tax payers and value of tax collected. Finally, foreign aid adversely impacts tax revenue implying that the persistent dependence on foreign economic assistance did not let our decision makers to take appropriate measures for expanding the tax base in the country. Furthermore, the successive governments intentionally avoided introducing certain essential reforms in taxation system in order to please business community, industrialists and big land holders in the country due to flows of foreign aid in Pakistan. On fiscal front it can safely be stated that foreign aid is one of the hurdles in the way of increasing tax to GDP ratio in the country.

However, in the short run, we find that terrorism has no role in shaping the behaviour of tax to GDP ratio in Pakistan (see middle section of table 5). This finding is justified on the ground that terrorist incidents do not spontaneously influence different sectors of an economy and business activities to a great extent and hence the tax generating capacity of a country like Pakistan is more likely to remain unaffected from the acts of terrorists. Rest of explanatory variables are found significant having expected impact akin to their long run effects.

The coefficient of lagged error correction term (ECT) carries a negative sign which signifies stability of long run equilibrium relationship between tax revenue as percent of GDP and all the explanatory variables of model (1). The coefficient value of lagged ECT is -0.781with significance at 1% level. It specifies that if the long run equilibrium between tax to GDP ratio

and all the regressors of model (1) is disturbed, in every short run period, almost 78% correction towards restoring the long run equilibrium will take place. At the lower section of table 4, four diagnostic tests are reported which clearly depict that the estimated model does not suffer from serial correction, heteroscedasticity, functional form and normality issues. These outcomes actually increase our confidence on the overall findings of the estimated model. Finally, CUSUM and CUSUM of Squares tests suggest stability of the parameter estimates of estimated model as their plots stay within 5% level of significance (see figure 1).

Figure 1. Plots of CUSUM and CUSUMSQ Tests
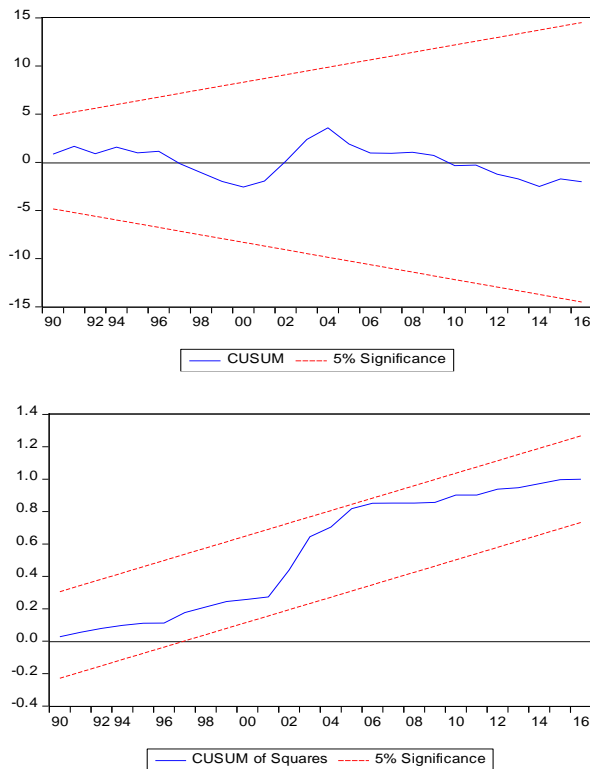
In the next step, we incorporatethe role of institutional quality in the analysis. As apparent from table 6, institutional quality is a significant determinant of tax to GDP ratio in the long run. Positive association between institutional quality and tax revenue implies

that a well-functioning institutional setup helps government for uplifting tax to GDP ratio. Coefficient of terrorist incidents again carries negative sign and its value is -0.151which suggests adverse consequence of terrorist activities for tax revenue efforts.

Table 6. Tax Revenue and Terrorism: Role of Institutions

Dependent Variable: TAX
Selected Model: ARDL(1,1,1,2,1,2,1,1)

Regressor	Coefficient	t-value
TER	-0.151**	-2.795
GDPGR	0.319**	2.593
INF	-0.150***	-3.924
E	0.401*	1.833
AID	-0.277**	-2.035
INS	0.299**	2.324
TER*INS	-0.067**	-2.523

Error Correction Model: Short Run Estimates
Dependent Variable: D(TAX)

Regressor	Coefficient	t-value
Constant	3.180***	7.873
D(TER)	-0.043	0.742
D(GDPGR)	0.026	0.314
D(INF)	-0.134	-0.412
D(INF)$_{t-1}$	0.028	0.723
D(GE)	0.121***	6.893
D(AID)	-0.097***	-3.554
D(AID)$_{t-1}$	-0.036	-1.338
D(INS)	0.146***	9.244
D(TER*INS)	0.058***	4.077
ECT$_{t-1}$	-0.482***	-17.781

Diagnostic Tests	
χ^2_{SC}= 0.642(0.420)	χ^2_H= 0.994(0.242)
χ^2_{FF} = 0.728(0.385)	χ^2_N= 2.421(0.262)

Note:***, **and * indicate significant at 1%, 5% and 10% levels respectively.χ^2_{SC},χ^2_H,$\chi^2_{FF}$and χ^2_N denote LM test for serial correlation,heteroscedasticity, functional form and normality respectively. The associated p values are in parentheses.

The coefficient of interaction term (β_{16}), capturing the conditional/indirect impact of terrorism through institutional quality, appears negative with statistical significance at

conventional level. This implies that even in the presence of institutional quality, terrorism imparts adverse impact on tax revenue. However, it is pertinent to mention that the size of the adverse impact reduces from -0.151 to -0.067 in presence of institutional quality. This finding reflects that the present structure of intuitional quality in Pakistan reduces the adverse impact of terrorism on tax revenue to some extent but not completely eliminating it. This directs our attention towards improving the current state of institutional quality in a manner that it not only directly improves the state of tax collection but also helps in eliminating the adversity of terrorism for revenue collection. Badshah et al. (2012) also explain that the existing set of institutions are not capable to play significant role in combating the pitfalls of terrorism in terms of socio political destructions. Therefore, a new set of institutions would be required to combat this menace. It is widely documented that institutions significantly contribute in the growth process both directly and indirectly. Good quality institutions help in channelizing the resources towards productive activities and results in higher investment levels, increase in social capital stock, and effective management of ethnic diversity and conflicts (Kemal, 2003).

Rest of explanatory variables, namely, economic growth performance, inflation rate, government spending and foreign aid are all found significant and their impacts are similar to the first case (see table 5).

In short run, terrorism emerges as insignificant factor in determining tax to GDP ratio (see middle section of table 6). Coefficient of institutional quality is significant with expected positive sign. Moreover, coefficient of interaction term of terrorism and institutional quality is significant with positivesign. This implies that institutional quality will not let tax revenue collection to fall despite the occurrence of terrorist attacks in the short run. Economic growth performance and inflation rate do not impact significantly tax to GDP ratio in the short run. Nonetheless, government spending and foreign aid exert positive and negative impact on tax to GDP ratio, respectively.

From the outcomes of four diagnostic tests, we see that estimated model does not suffer from serial correction, heteroscedasticity, functional form and normality problems (see

lower section of table 6). Finally, the estimates of model (6) are found to be stable based on the outcomes of CUSUM and CUSUM of Squares tests (see figure 2).

Figure 2. Plots of CUSUM and CUSUMSQ Tests
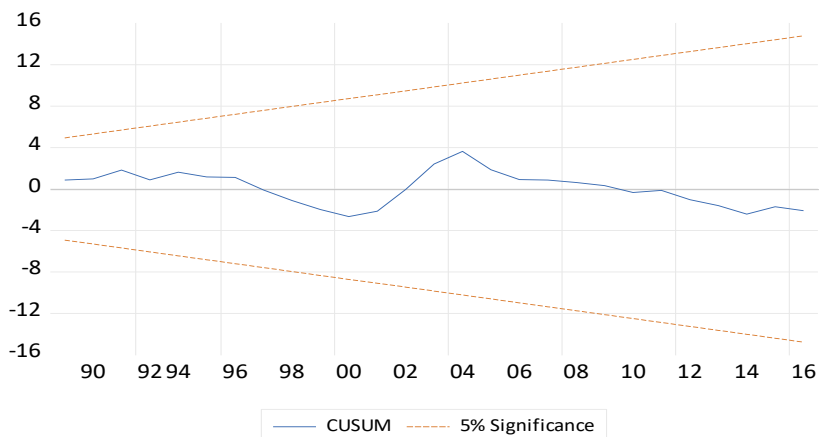
(a)
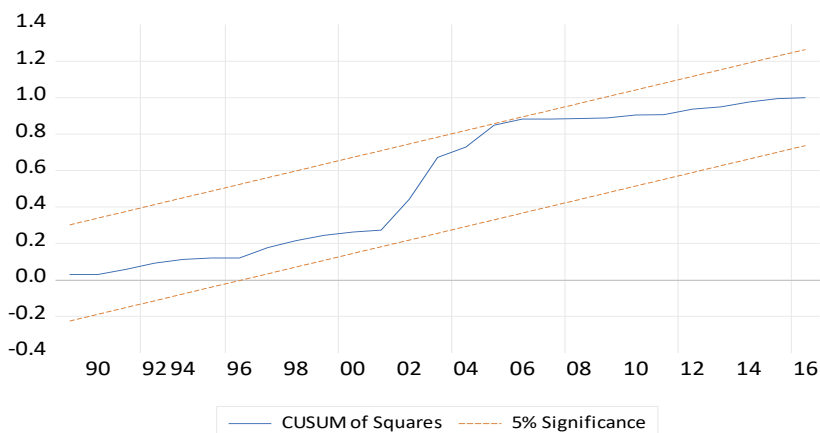
(b)

3.4. Defence Spending and Terrorism: Role of Institutional Quality

The regression results for defence spending response to terrorism are reported in table 7. The upper section of table 7 displays results for the long run relationship. The regression coefficient of number of terrorist incidents is positive and

significant, reflecting that the curse of terrorism matters for increase in military expenditure in Pakistan.

Table 7. Defence Spending and Terrorism

Dependent Variable: DFS		
Selected Model:ARDL(1,2,1,1,2,1)		
Regressor	Coefficient	t-value
TER	0.234**	2.341
GDPGR	0.080***	6.023
TB	0.225**	2.216
AID	0.341*	1.814
DFSI	0.438**	2.143
Error Correction Model: Short Run Estimates		
Dependent Variable: D(DFS)		
Regressor	Coefficient	t-value
Constant	2.542***	5.136
D(TER)	0.084	1.671
D(TER)$_{t-1}$	0.013	0.758
D(GDPGR)	-0.053	-0.642
D(TB)	0.086	0.169
D(AID)	0.060	2.274
D(AID)$_{t-1}$	-0.03	-0.48
D(DFSI)	0.162***	6.581
ECT$_{t-1}$	-0.344***	-5.829
Diagnostic Tests		
$\chi^2_{SC}= 0.332(0.551)$		$\chi^2_{H}= 0.820(0.366)$
$\chi^2_{FF} = 0.818(0.362)$		$\chi^2_{N}= 2.015(0.312)$

Note:***, **and * indicate significant at 1%, 5% and 10% levels respectively. $\chi^2_{SC}, \chi^2_{H}, \chi^2_{FF}$ and χ^2_{N} denote LM test for serial correlation, heteroscedasticity, functional form and normality respectively. The associated p values are in parentheses.

This finding is consistent with our prior expectation that terrorism forces a government to strengthen its national security and terrorism combating ability which demands for increasing public spending on these heads. The armed forces of Pakistan are actively involved in eradicating the evil of terrorism from the country. For the last fifteen years the strict actions have been taken on war footing to secure the homeland from terrorist attacks.Under these circumstances defence spending hasincreased which is more likely to divert the resources of the government from public sector

development spending and social sector development programs to military expenditures in Pakistan.The positive relationship between defence spending and terrorism is also documented by (Nasir & Shahbaz, 2015; Gupta et al., 2004; Cevik & Ricco, 2015; Chuku et al., 2019; Zakaria et al., 2019) report that terrorism leads to an increase in overall fiscal spending.

The coefficients of economic growth, trade balance, foreign aid and defence spending of India are all positive and significant indicating the vital contribution of these factors in defence spending of Pakistan in the long run. It is an undeniable fact that accelerating economic performance of a country ensures availability of resources to a government for increasing defence capability. The defence is categorised a public good and conventional theory of public finance postulates a positiverelationship between economic growth and defence spending. Trade balance (as percent of GDP) reflects trade openness which is also one of the indicators of defence expenditure. With the increase in the degree of a country's integration with the world economy, it becomes easier for the country to access finance for the purchases of military equipment, leading to higher defence spending (Rosh, 1988). Since 1980s Pakistan has been practicing trade liberalization policies, therefore, positive impact of trade balance on defence spending in Pakistan is justified on the ground presented by Rosh (1988). Foreign aid tends to raise defence spending in Pakistan seems reasonably just as since 1950s the country has been found allied with the USA and its partner Western Powers against the socialist block during the Cold War era and the international terrorist organizations like *Al-Qaeda*. The donors provided substantial amount of foreign aid which has been used by the successive governments in the country for meeting development and non-development targets including defence expenditures. Finally, we find that Pakistan's defence spending positively responds to that of its arch rival India. This finding is in accordance with political and economic logic. The two neighbours have been engaged in rivalry and confrontation since their inception in 1947. Security threats occur not only from active warfare but also from an increasing military power of potential enemies. Hence, Pakistan's defence budget positively responds to rise in India's military purchases. Similar findings are

reported by (Chawla, 2001; Sheikh et al., 2013; Aslam et al., 2014). These studies highlight that both countries keep an eye on each other defence expenditures.

In the short run, however, number of terrorist incidents, economic growth performance and trade balance are found to be insignificant determinants of defence expenditure in Pakistan (see middle section of table 7). But the coefficients of foreign aid and defence spending of India are positive and significant, hence exhibit their due role in determining defence spending of the country even in the short run. The coefficient of lagged ECT is negative with statistical significance at 1% level, indicating that the equilibrium relationship of defence spending with all the explanatory variables is stable. The value of coefficient of lagged ECT is -0.344 which indicates that any deviation from the long run equilibrium between defence spending and its determinants will be corrected by 34% in each short run period i.e. a year. The robustness of the model has been confirmed by diagnostic tests reported as the lower section of table 7. The CUSUM and the CUSUMSQ graphical representations refer to the absence of any instability of the estimated parameters as the plots of these statistics remain within the critical bound of the 5% significancelevel (see figure 3).

Figure 3. Plots of CUSUM and CUSUMSQ Tests

(a)
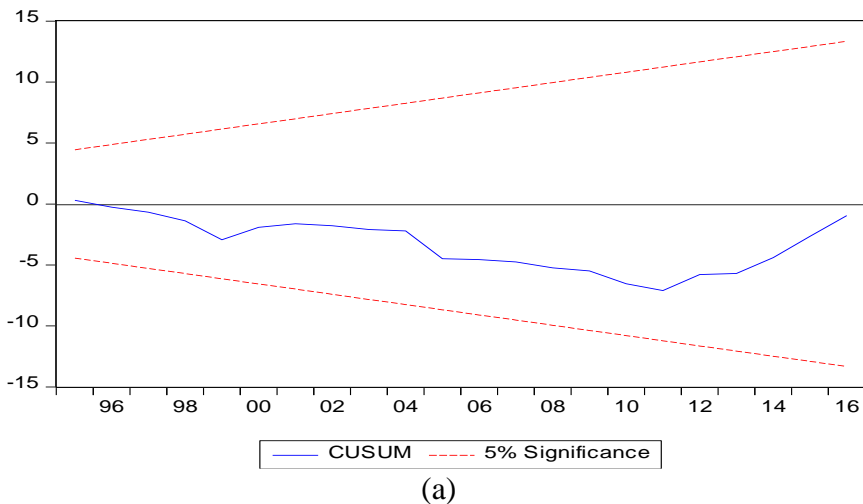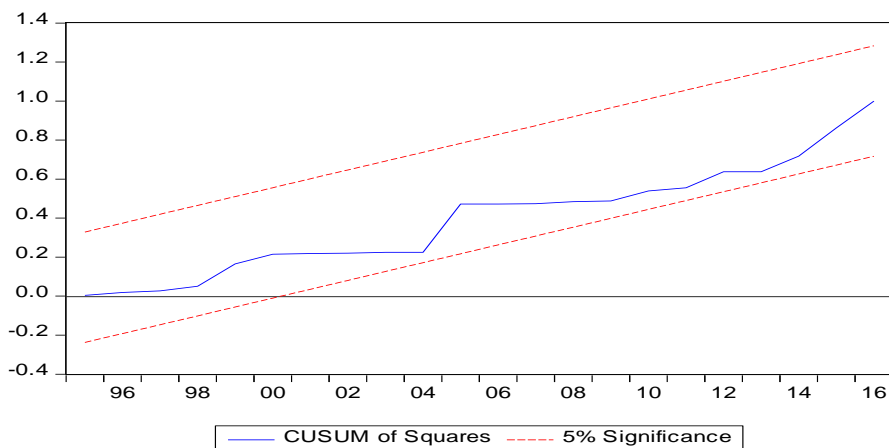
(b)

We now move to table 8 which contains short run and long run parameter estimates of model (8). From top section of table 8, it is apparent that number of terrorist incidents, economic growth performance, trade balance, foreign aid and defence spending of India affectdefence spending of Pakistan positively and significantly in the long run. Here our main interest is identifying the impact of institutional quality and interaction term of terrorism and institutional quality on defence spending. The regression coefficient of institutional quality is negative and significant, implying that well-working institutions tend to decline the defence spending in Pakistan. This outcome is in line with our prior expectation. The existence of better working institutions is less prone to violence. Good qualities institutions are conducive in strengthening capabilities of a government to well manage domestic and foreign conflicts in a peaceful manner without going for a military solution (Desta, 2009). Pakistan does believe in settling its internal and external conflicts in a diplomatic manner so that military options can be avoided. Additionally, the quality of legal and political institutions also affects defence spending from other vital aspects. Firstly, a sound institutional set up is conducive to determining right priorities in defence allocations. It is quite certain that in total military expenditure there are some essential and relatively more wanted elements of spending which cannot be compromised while other elements are less important and wasteful

that ought to be minimised so that overall defence spending may remain within limits. High quality institutions may promote the former type of spending while weeding out the latter.

Table 8. Defence Spending and Terrorism: Role of Institutions

Dependent Variable: DFS		
Selected Model:ARDL(1,1,1,2,2,1,2,1)		
Regressor	Coefficient	t-value
TER	0.272**	2.517
GDPGR	0.117**	2.121
TB	0.188***	3.875
AID	0.332*	1.889
DFSI	0.457***	6.841
INS	-0.095**	-2.572
TER*INS	-0.102***	-3.585
Error Correction Model: Short Run Estimates		
Dependent Variable: D(DFS)		
Regressor	Coefficient	t-value
Constant	1.533***	7.643
D(TER)	0.020	0.441
D(GDPGR)	0.067	1.573
D(TB)	0.134	0.727
D(TB)$_{t-1}$	0.116	0.482
D(AID)	0.044	0.884
D(AID)$_{t-1}$	0.142	1.286
D(DFSI)	0.218***	4.244
D(INS)	-0.014	-0.339
D(INS)$_{t-1}$	-0.052	-1.262
D(TER*INS)	0.086	0.984
ECT$_{t-1}$	-0.524***	-9.313
Diagnostic Tests		
χ^2_{SC}= 0.401(0.531)		χ^2_{H}= 0.794(0.374)
χ^2_{FF} = 0.844(0.353)		χ^2_{N}= 2.213(0.292)

Note:***, **and * indicate significant at 1%, 5% and 10% levels respectively. χ^2_{SC},χ^2_{H},χ^2_{FF} and χ^2_{N} denote LM test for serial correlation, heteroscedasticity, Functional form and normality respectively. The associated p values are in parentheses.

In contrast, poor institutions may be unable to distinguish between good and bad military spending or may even create incentives for the latter (Compton & Paterson, 2016). Hence, quality of institutions does matter for reducing defence spending in a country like Pakistan. Secondly, prevalence of corruption in defence purchases cannot be overlooked which is likely to push up military outlays. However, effective and dynamic institutions ensure rule of law and accountability in a country, leading to significantly control corruption. Thus, establishment of a quality institutional structure is more likely to reduce the elements of corruption in military expenditure such that total defence outlays are reduced. Thirdly, an efficient working of institutions ensures correct priorities and appropriate policies and their effective implementation results in creating a conducive environment that encourages domestic and foreign investors to invest in productive activities. So, overall economic performance of a country gets improved and size of the economy widens. Under such a situation, defence spending as percent of GDP is likely to decline.

Notably,the coefficient of interaction term of terrorism and institutional framework appears negative and statistically significant. The negative coefficient of the interaction term implies that good institutions will help in reducing uncertainty attached with terrorist attacks, therefore, a decline in defence spending to GDP ratio is experienced in wake of terrorist attacks in the presence of good quality institutional setup in Pakistan. Notably, when we compare the direct and conditional impact of terrorism on defence spending, it is observed that the size of direct impact (0.272) is higher than the conditional impact (-0.102), leaving the overall impact of terrorism on defence spending to remain positive [0.272 +(-0.102) = + 0.170]. Hence, once again we conclude that the current quality of institutions in Pakistan is not strong enough to completely eliminate the adversities of terrorism for fiscal policy.This finding is supported by a descriptive analysis of Badshah et al. (2012) who explains that the existing set of institutions are not capable to play significant role in combating the pitfalls of terrorism in terms of socio political destructions. Therefore, a new set of institutions would be required to combat this menace.

In short run, we find that only defence spending of India is a significant driver of the defence spending of Pakistan (see middle section of table 8). It implies that the decision- makers always keep an eye on military expenditure of India and they retaliate to any change in India's defence budget. Number of terrorist incidents, institutional quality, their interaction and other explanatory variables fail to play any role in defence spending of Pakistan.

The coefficient of lagged ECT is negative and significant, showing the stability of the long run association between defence spending and all the explanatory variables. From the coefficient value of the lagged ECT, it is clear that almost 52% deviation from the equilibrium will be corrected every year. Finally, on the basis of four diagnostic tests we see that the model (8) does not suffer from serial correlation, heteroscedasticity, functional form and normality problems (see lower section of table 8). Moreover, results of CUSUM and CUSUMSQ tests also reveal stability of estimated model (see figure 4).

Figure 4. Plots of CUSUM and CUSUMSQ Tests

(a)

(b)
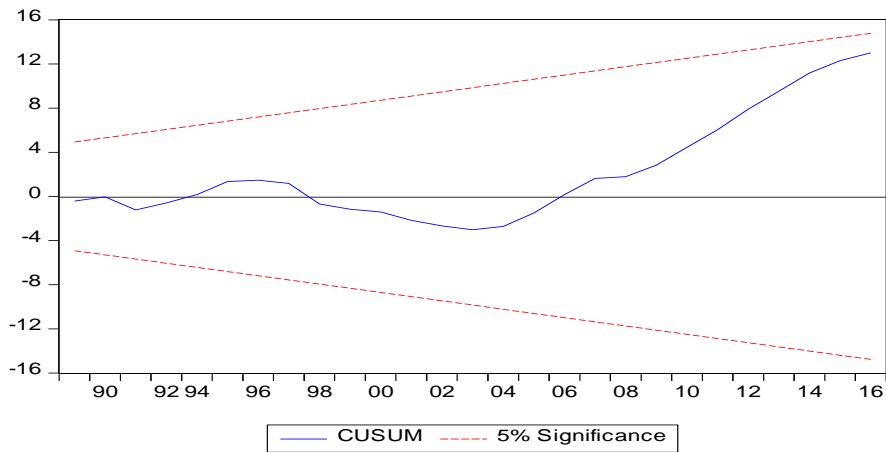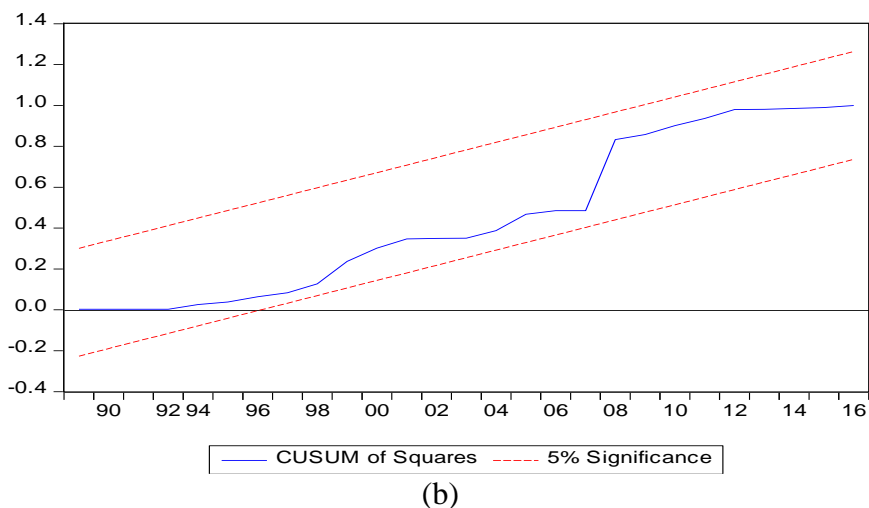
4. Conclusion and Policy Implications

Terrorism has serious socio-economic and political implications specifically for developing countries. Pakistan has a long history of being on the hit list of terrorist attacks due to several reasons such as religious, ethnic, political, and external. In particular, the incident of 9/11 has brought Pakistan to the front line of global terrorism and to-date the country is facing the consequences of the incident.

The present study is conducted to quantify the fiscal consequences of terrorism in Pakistan. The country has devised several strategies to combat the adversities of terrorism.Notably, the fiscal burden of these actions is huge and is becoming unmanageable with the passage of time. By looking at the trend of defence spending, it is evident that the share of defence spending is increasing over time as the security requirements are increasing due to actual or perceived security threats. In order to assess the fiscal response to terrorism in Pakistan, time series data from 1984 to 2016 are employed. By usingthe ARDL estimation technique, the study finds that terrorism has significantly contributed in fiscal difficulties ofthe country. Particularly, the results indicate that an increase in the number of terrorist incidents not only increases the defence spending but it also reduces the tax revenues. Hence,

terrorism has detrimental impact on fiscal behaviour of Pakistan by deteriorating both sides of fiscal position.

The study has contributed in an important dimension in the existing literature by taking the moderating role of institutional qualityin terrorism-defence spending and terrorism–revenue collection relationship. The findings reveal that institutional quality helps in mitigating the adverse impact of terrorism on fiscal spending. However, it only reduces the hazards of terrorism for revenue collection but not completely alleviates it. Hence, it necessitates the idea of improving the quality of institution to substantially tone down the adverse impact of terrorism on fiscal account of Pakistan.

On the basis of the above findings, it is concluded that terrorism is detrimental for both aspects of the fiscal policy of Pakistan. It is evident that that government is taking various actions to control the terrorist activities at one hand, and to provide rehabilitation and reconstruction packages on the other hand. To effectively counter and control the terrorist incidents, the root cause of terrorism needs to be better identified so that appropriate anti-terrorism strategy can be formulated and implemented.Just bringing an increase in defence and military spending will not sufficeto significantly eradicate the menace of terrorism completely. To this end,efforts ought to be made to improvethe quality of institutions for offsetting adverse implications of terrorism for fiscal actions of the government of Pakistan.

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ORCID of Corresponding Author	Nill

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Annexure
Table A1. Unit Root Test Results (Phillips and Perron)

Variable	Test Statistic		Critical	Order of
	Level	1stDifference	Values (5% Level of Significance)	Integration
TAX	-1.830	-6.925	-2.960	I(1)
TER	-2.276	-5.270	2.960	I(1)
GDPGR	-3.312	-	2.960	I(0)
INF	-2.406	-6.853	2.960	I(1)
GE	-0.717	-6.590	2.960	I(1)
AID	-2.046	-6.910	2.960	I(1)
INS	-1.519	-4.612	2.960	I(1)
TER*INS	-1.803	-7.860	-2.960	I(1)
DFS	-0.998	-4.814	2.960	I(1)
TB	-2.314	-6.128	2.960	I(1)
DFSI	-1.488	-4.844	2.960	I(1)

Table A2a: Chow Break Test Results (TAX)

Test	Test statistics	P-Value
F-statistics	0.192	F(1,31) 0.664
Log likelihood ratio	0.204	Chi-Square(1) 0.651
Wald Statistic	0.192	Chi-Square(1) 0.661
Null Hypothesis: No breaks at specified breakpoints		

Table A2b: Chow Break Test Results (DFS)

Test	Test statistics	P-Value
F-statistics	2.158	F(1,31) 0.225
Log likelihood ratio	2.202	Chi-Square(1) 0.209
Wald Statistic	2.184	Chi-Square(1) 0.212
Null Hypothesis: No breaks at specified breakpoints		

Table A3. PCA Estimates

Principal Components Analysis
Date: 11/10/18   Time: 19:36
Sample: 1984 2016
Included observations: 33
Computed using: Ordinary correlations
Extracting 5 of 5 possible components

Eigenvalues: (Sum = 5, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.682421	0.362309	0.4278	1.682421	0.4278
2	1.320112	0.214099	0.2852	3.002533	0.7130
3	1.106013	0.310800	0.1832	4.108546	0.8962
4	0.795213	0.698972	0.1009	4.903759	0.9971
5	0.096241	---	0.0029	5.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3	PC 4	PC 5
COR	-0.340527	0.495022	0.614248	0.332557	0.388716
DEA	0.554431	0.074891	-0.307963	0.725624	0.256176
LOR	0.588286	0.168775	0.175276	-0.574247	0.514736
BRQ	0.152592	0.821525	-0.201767	-0.110916	-0.498798
ETT	0.455285	-0.214372	0.675594	0.144267	-0.519154

Ordinary correlations:

	COR	DEA	LOR	BRQ	ETT
COR	1.000000				
DEA	-0.677873	1.000000			
LOR	-0.642540	0.658343	1.000000		
BRQ	-0.415237	0.437493	0.487972	1.000000	
ETT	0.075826	0.311009	-0.606668	-0.152035	1.000000