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# Economic Growth Effects of Military Expenditure in the Absence and Presence of Armed Conflicts: The Case of Pakistan and India

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# Economic Growth Effects of Military Expenditure in the Absence and Presence of Armed Conflicts: The Case of Pakistan and India

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**Abstract**

This paper examines the relationship between military expenditure and economic growth in the absence and presence of armed conflicts (internal and external), in the context of Pakistan and India. We employ an Autoregressive Distributed Lag (ARDL) cointegration method with different diagnostic techniques by using time series data from 1960 to 2019. The empirical findings indicate a positive and significant impact of military expenditure on economic growth in the absence of armed conflicts in the case of Pakistan. The results also suggest that external armed conflicts have a significantly negative effect on economic growth in both contexts, but external armed conflicts are more harmful to the Indian economy as compared to its counterpart. Further, the findings suggest that military expenditure stimulates economic growth in the presence of significantly higher external armed conflicts. However, military expenditure in the absence of armed conflicts has stronger growth-stimulating effects than in the presence of external armed conflicts. This suggests that armed conflicts offset some of the positive economic growth effects of military expenditure.

*Keywords*: economic growth; military expenditure; external armed conflicts; internal armed conflicts; ARDL; Pakistan; India.

*JEL Classification*: H56, H57, H59, 010, 011, 040.

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# 1 Introduction

The considerable debate over the economic growth effects of military expenditure started after the contribution by Benoit (1973, 1978), who suggested that military expenditure has a positive impact on economic growth in less developed countries. Subsequently, this unexpected inference led to extensive research activity in military-growth literature by using different empirical and theoretical methods for different countries, which result in no definite relationship between military expenditure and economic growth. Some studies state a positive association, others a negative, and some suggest no relationship at all (Stewart (1991)). This study examines the economic growth effects of military expenditure conditional and unconditional on armed conflicts by using the time-series data from 1960-2019, in the case of Pakistan and India. This analysis is distinct from previous studies in the following three ways.

First, this paper considers two South Asian nuclear-armed neighbouring countries, Pakistan and India, which have hitherto hardly been considered in growth-defence literature or included in much extensive analysis that incorporates a higher number of countries with different social, security and economic conditions that do not lead to any substantive conclusion, while this analysis is exclusively based on Pakistan and India. There are several reasons why India and Pakistan could be excellent case studies for determining the economic impacts of military expenditure. Most importantly, both countries allocate substantially high budgets to their military sector. According to the Stockholm International Peace Research Institute (SIPRI, 2021) report, Pakistan's military burden (military expenditure share of GDP) increased from 3.3% in 2011 to 4% in 2020, which is higher than the United States (largest spender on military,3.7%) and world (2.4%) military share to GDP. On the other hand, India is 3rd world's largest military spender, whose defence spending increased by 34% from 2011 to 2020, which is equal to 79 billion dollars. Further, according to Institute for Economics and Peace (IEP, 2020) report, both Pakistan and India ranked poorly (150th and 139th, respectively) in 2020 Global Peace index (GPI) of 163 countries, respectively. Additionally, the same report also shows that Pakistan and India stood at 52nd and 112th position in the economic cost of violence percentage of GDP index with a cost of 8% and 5% of GDP, respectively. These findings highlight that both countries face higher internal and external security threats which could be the main reason for exhausting a substantial amount of resources on defence every year.

Second, our analysis considers armed conflict measures (internal and external) while determining the relationship between military expenditure and economic growth, which to the best of our knowledge has not been considered in the case of Pakistan and India. Previous papers based on these case studies did not control for conflicts while investigating the growth-military relation (e.g.:Tahir (1995); Khilji et al. (1997); Khan (2004); Shahbaz et al. (2013); Tiwari and Shahbaz (2013)) which may easily cause omitted variable bias in estimated coefficients, especially when conflict-prone countries are under consideration. According to Aizenman and Glick (2003), the true relationship between defence expenditure and economic growth can only be determined after appropriately controlling for conflicts and the interaction between defence spending and conflict level. Their study also empirically verified the non-linear relationship between military expenditure and economic growth conditional on armed conflicts. Their findings suggest that military expenditure in the presence of significantly higher external threats has a positive impact on economic growth, while negative in the absence of external threats. Dunne et al. (2005) in their critical review paper, where they compared various theoretical models used by defence economists, concluded that Aizenman and Glick (2003) reformulated Barro (1990) growth model. which allows security impacts on economic growth by increasing defence expenditure in the presence of threats, is more promising and has a comparative advantage over other conventional theoretical models to explain defence outlays and economic growth. Thus, it would be worth investigating the economic impacts of military expenditure in the presence of threats in the case of Pakistan and India, where both military expenditure and threat levels are high.

Third, this analysis uses the most recent and comprehensive time series data set for both countries from 1960-2019, collected from Stockholm International Peace Research Institute (SIPRI) database and the World Bank, which allows for a more thorough and advanced analysis in this context. Further, for empirical analysis, firstly we use various unit-root tests such as Augmented Dickey-Fuller (ADF) test, Philips-Peron (PP) test, Kwiatkowski, Philips, Schmidt, and Shin (KPSS) test, and Zivot-Andrew (ZA) test, after confirming the integration level of underlying variables via unit root tests, we employ Autoregressive Distributed Lag (ARDL) technique to cointegration. This analysis also uses the Fully Modified Ordinary Least Square (FMOLS) method to check the robustness of ARDL long-run estimates.

This paper is based on six main sections. The second section provides a brief review on the relationship between military expenditure and economic growth, the third section gives a short review on countries' backgrounds. The fourth section explains data, model specification and empirical methods. The fifth section is based on results and discussion, and the final section provides a conclusion.

## 2 A Brief Review on the Relationship Between Military Expenditure and Economic Growth

The empirical debate over the economic growth impacts of military expenditure started after the contributions of Benoit (1973, 1978), who based his analysis on a cross-sectional of 44 lower-developed countries (LDCs) between 1950 and 1965, suggested that countries facing a larger military burden (military expenditure/GDP ratio) tend to grow faster than those with a lower military burden. These unexpected results directed a large number of subsequent empirical studies toward this subject with different theoretical and empirical methods to assess the validity of his results. Consequently, this research activity divided defence-growth literature into two main groups. One group views defence expenditure as an assurance of security, peace, and welfare. On the other hand, the second group views such outlays are wastage of scarce resources and exhaustion of such resources could lead to serious economic consequences (Dunne and Tian (2015)).

Multiple studies surveyed the prior literature; Dunne et al. (2010) reviewed 102 existing studies on military-growth literature, reports that 39 and 35% cross-country and case studies indicate negative economic growth impacts of military expenditure, respectively, while 20% show positive impacts of military expenditure on economic growth in both cases. Whereas around 40% of the studies are inconclusive. In the most recent survey of 168 defence-growth studies by Dunne and Tian (2013) found that the negative economic impacts of military expenditure are reported by 44 and 31% cross-sectional studies and case studies, respectively. Whereas, 20% report positive effects of military expenditure on economic growth and the remaining are ambiguous.

In military-growth literature, there is no standard framework to examine the economic impacts of military expenditure because most of the theoretical frameworks do not consider the role of military expenditure explicitly ( Dunne and Tian (2015)). However, the theoretical models have purposed several channels through which military expenditure can impact economic output such as technology, capital, labour, debt, social-political effects, conflict etc. (Dunne et al. (2010)). These channels can be grouped into three main channels; demand, supply, and security (Dunne et al. (2005)).

In the demand channel, defence spending operates through the Keynesian aggregate demand multiplier effect. According to this channel, in the presence of spare capacity in the country, additional defence spending stimulates aggregate demand, which in turn increases capital utilization and decreases unemployment. Subsequently, it leads to higher investment and economic growth levels (Deger (1986)). The empirical support for this debate is provided by the following studies: Ward et al. (1991); Mueller and Atesoglu (1993); MacNair et al. (1995); Sezgin (2001); Wijeweera and Webb (2009); Tiwari and Shahbaz (2013) etc. Therefore, in this context, military expenditure often considers as it has economic growth-stimulating effects. Even in many underdeveloped countries, the military sector considers as being capable of developing social infrastructure (roads, railways, airports etc.) and human capital (military education, training skills etc.) which in turn is likely to contribute to the development process of the country (Benoit (1978)). However, it has also been argued that defence spending has an opportunity cost and it diverts resources from public and private sectors that are more growth-oriented than defence. Mostly in underdeveloped countries due to budget constraints, higher military expenditure is often financed by increasing taxes, cutting other growth-friendly expenditures (e.g., education, health, infrastructure etc.), and increasing borrowing and money supply. This argument is empirically supported by the following studies: Lebovic and Ishaq (1987); Mintz and Huang (1990); Dunne et al. (2001, 2002); Shahbaz et al. (2013) etc., for the different sets of countries. Besides, if the country is also importing arms, in that case, it might lead to adverse balance of payment problems.

The supply channel operates through the availability of factors of production such as natural resources, physical and human capital, labour, and technology. Which all establish the future output of the country. Besides, as mentioned earlier military expenditure has an opportunity cost. Therefore, some of the demand effects such as crowding out private and public effects may have supply effects by altering capital stock (Dunne et al. (2005)). Moreover, Mylonidis (2008) also mentioned a possible opportunity cost attached to defence spending such as the adverse balance of payment especially in arms importing countries, lower tax ration for the public sector, inefficient bureaucracies due to higher rent-seeking behaviours, lower level of public and private investments, diverted research and development (R&D) activities and trained worked force from the public sector. However, the proponents of military expenditure suggest that military R&D expenditure can spill over into private and public sectors in the form of advanced technology (i.e., nuclear energy, jet engines etc.) Similarly, the military-trained workforce can stimulate total factor productivity through serving in both military and civilian/private sectors (Deger and Sen (1995)).

In the security channel, the provision of national security by the military sector enhances the security of individuals and property from indigenous and foreign threats, which is essential for smooth market operations and for providing a peaceful environment for investment and innovation. According to Dunne et al. (2005) military expenditure to some extent increases national security that in turn may increase economic growth. Adam Smith mentioned that the first responsibility of any sovereign state is to secure its nationals from violence and invasion of other independent societies and that can only be possible with the help of military force. Further, it has been observed often that major obstacles to development in many underdeveloped countries are wars and lack of security. Therefore, higher military spending can provide the opportunity for capital accumulation and producing more output, which could lead to higher economic growth (Thompson (1974)). However, when military expenditure is driven from rent-seeking behaviour but not from security needs, in such cases defence spending can provoke an arms race or wars between the countries. Aizenman and Glick (2003) and some followed-up studies (Yang et al. (2011); Musayev (2016)) validated this argument empirically, showing that higher military expenditure impact positively on economic growth when a country experiences significantly higher threat level and impact negatively when a country faces higher corruption level.

All the above-stated channels interact and influence economic output differently depending on the underlying country. For instance, comparatively advanced developing countries might have concerns over technology and foreign direct investment, while conflict-prone countries might have concerns over the conflict trap they are in or their security situation (Dunne (2012)). Even though the debate on the relationship between military expenditure and economic growth has been going on for more than 40 years but the result always relies on the empirical findings among other factors such as countries or a set of underlying countries, theoretical and empirical methods, time period etc. (Dunne and Tian (2015)).

# 3 A Brief Background of Pakistan and India

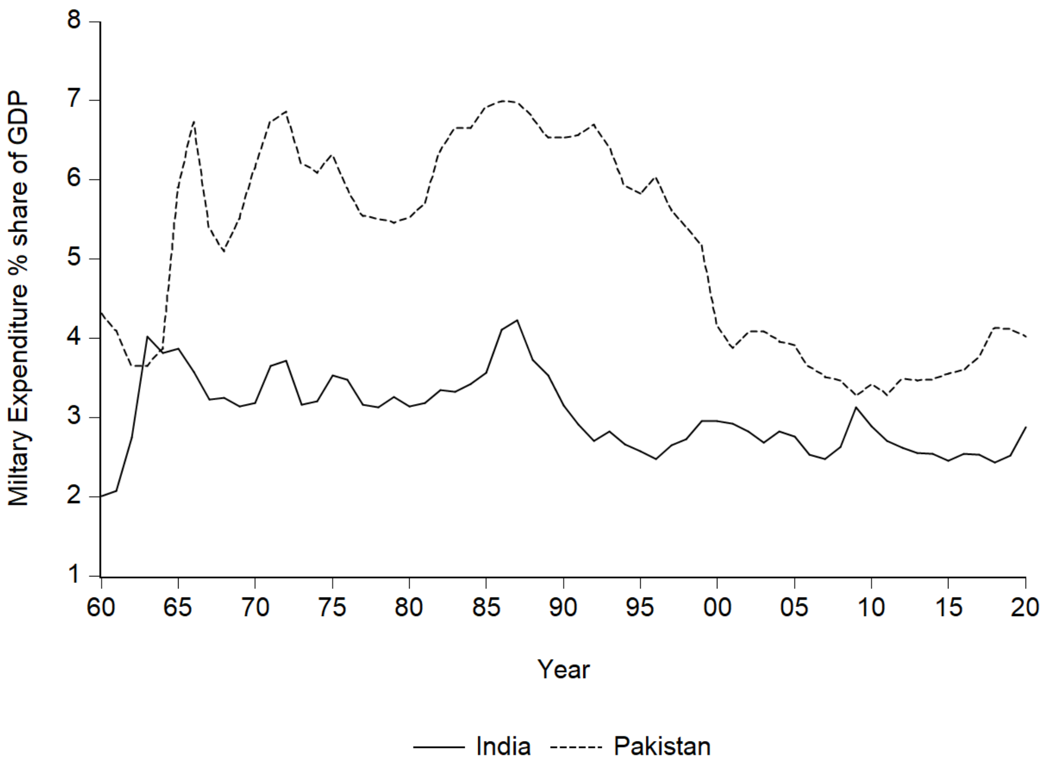
Pakistan and India are two of the world's most populous countries with 216.5 million (5th largest) and 1.32 billion (2nd largest) people, respectively, which both fall into the lower-middle income group, according to the world bank 2020 country classification on the basis of gross national income. Further, United Nation Development Program (UNDP, 2020) ranked Pakistan and India poorly on the Human Development Index, both ranked 154th and 131st out of 189 nations, respectively. Also, both countries exhaust a large portion of their GDPs to the defence sector. There are several reasons behind keeping high levels of military expenditures in both countries.

First, in Pakistan, the military has been ruling the country either directly or indirectly, since independence (1947) four military coups have directly governed Pakistan for around 33 years. A reasonable assumption would be that military rulers are more likely to devote higher resources to the military sector. Second, poor relations and longstanding border or territorial disputes with India, with which Pakistan had fought 3 major wars since independence:1965, 1971, and 1999. Third, Pakistan had been a major partner with the US against the Soviet-Union invasion (1979) in Afghanistan and the US-led war against terror, which consequently originated several new security challenges for Pakistan such as terrorism. Finally, Pakistan shares its second-longest border with Afghanistan and the security situation in Afghanistan always has direct and indirect impacts on Pakistan's internal and external security matrix. Sharing a 3232 km long border with India and a 2640 km long with Afghanistan requires a large number of military personnel and equipment, which automatically increases the overall portion of defence expenditure in GDP.

On the other hand, besides Pakistan, India has been embroiled in an endless border dispute with China because of this border conundrum both countries fought a war in 1962 and have been engaged in several border skirmishes. The troubled relationship and border disputes of India with neighbouring China and Pakistan increase the importance of maintaining a higher defence budget to deter the enemy forces. Furthermore, the Indian military has also been confronting several separatist movements. In Punjab, the Khalistan movement by Indian Sikhs seeks to create a separate sovereign state for Sikhs called Khalistan. The secessionist movement in Jammu and Kashmir (which is also claimed by Pakistan), and various violent insurgencies in the northeast of India; Asam, Nagaland, Manipur, and Tripura.

There have been wide fluctuations in defence expenditure in Pakistan and India in the past 60 years in absolute terms and as a proportion of GDP. As figure 1 illustrates, Pakistan's military burden (military expenditure as a percentage of GDP) is higher than the Indian military burden throughout from 1960-2020 except in 1963, when the Indian military burden was slightly greater than Pakistan's military expenditure percentage of GDP as a result of Indo-China War in 1962. Pakistan's military expenditure decreased from 4.3% to 3.8% from 1960 to 1963. However, after 1964 military burden of Pakistan reached to 6.7% from 3.7% by 1966 because of the 1965 war between Pakistan and India. Afterwards, the decreasing pattern of military expenditure can be seen in both countries. Again, Pakistan and Indian military expenditure increased up to 6.9% and 3.7% by 1972, respectively, because of another war between Pakistan and India, in which East Pakistan (Now Bangladesh) separated from West Pakistan (now Pakistan).

FIGURE 1: Military Expenditure as Percentage Share of GDP: Pakistan and India




During the next few years, military expenditure in Pakistan declined gradually from 6.9% of GDP to around 5.5% in 1979 and in between this period Pakistan was clandestinely working on the nuclear project. Meanwhile, in mid-1974 India conducted its first successful nuclear detonation and later its military expenditure increased between 1975 and 1977 because during this period Indian Prime Minister Indira Gandhi declared an emergency across the country because of imminent internal and external threats.

After 1979, Pakistan's military expenditure percentage of GDP gradually increased from 5.5% to 6.8% by 1989, because during this period Pakistan cooperated with the U.S against the Soviet Union's invasion of Afghanistan. After the Soviet withdrawal from Afghanistan between 1988 and 1989, the U.S dramatically reduced its support to Pakistan as well as its presence in the region, as a result, Pakistan's military burden declined after 1988. On the other hand, Indian military expenditure increased after 1984 from 3.4% to 4.2% in 1987 due to civil unrest, during this time Indian military started operation 'Blue Star' against Sikh separatists in Punjab (India) and Indian Prime Minister Indira Gandhi was assassinated.

During 1990-2000 Pakistan and Indian military expenditure share to GDP decreased from 6.4% to 4.2% and 3.1% to 2.9% of GDP, respectively. During this period around 1998, both countries conducted successful nuclear bomb tests and right after that fought a limited war (Kargil war) in 1999. After the 9/11 attacks when the U.S invaded several countries including Afghanistan to eradicate militancy, Pakistan joined the

U.S-led Global war on terror. Therefore, Pakistan's military burden slightly increased from 3.8% to 4.1% after 2001. Later, Pakistan's military expenditure share of GDP fluctuated around 4% up till now. While the Indian military burden stayed around 3%.

The dynamics of military expenditures along with serious national security concerns make both countries particularly good case studies for determining the direct and indirect impacts of military expenditure and armed conflicts (internal and external) on economic growth.

# 4 Data, Model Specification, and Empirical Method

## 4.1 Data

The empirical analysis is based on time series data of two countries, Pakistan and India, over the 1960-2019 period. The dependent variable real GDP per capita (constant 2010 US$) is simply a real gross domestic product divided by population and it has been extracted from World Bank's World Development Indicators (WDI) database.

Military expenditure is measured as a real military expenditure in constant 2010 US$, and it has been obtained from Stockholm International Peace Research Institute (SIPRI). SIPRI military expenditure involves where possible all capital and current spending on the military forces, defence ministries, government agencies engaged in defence projects, paramilitary forces, and military space activities. SIPRI always include all kinds of expenditure on current personal, civil and military, retirement pensions, social services, maintenance and operations, military R&D, procurement, military construction and military aid (includes in defence spending of a donor country). SIPRI does not include expenditure on civil defence and previous military activities such as demobilization, veterans' benefits, destruction of arms and conversion of arms production facilities.

Armed conflict data has been derived from the Uppsala Conflict Data Program (UCDP), which defines armed conflict as "a contested incompatibility that concerns government and/or territory where the use of armed forces between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in a calendar year". This analysis uses the 'intensity level' of armed conflict, which is coded in the form of 1 and 2. 1 indicates minor armed conflict: between 25 and 999 battle-related deaths. Whereas, 2 indicates war or high-intensity conflict: at least 1000 battle-related fatalities each year. Further, we added 0 in the data set to show less than 25 battle-related deaths or no death at all.

Polity score data has been extracted from the Polity IV database, which reflects the degree of democracy/autocracy in a range of -10 (consolidated autocracy) and 10 (consolidated democracy). The data on this variable is till 2018 because it has not been updated to 2019 yet, due to the unavailability of funding. The rationale behind including regime-type variables is that economic institutions (such as regulatory institutions, property rights, institutions for macro-economic stabilization, institutions for conflict management etc.) are crucial for economic growth because these institutions play a vital role in resource allocation (Rodrik (2008)).

Real gross capital formation (2010 constant US$) has been collected from the World Bank database. Gross capital formation is also called gross capital investment. This variable does not only considers fixed assets of the country/economy but also incorporates the net changes in the inventories. Fixed assets include land improvement (drains, ditches, fences etc.), equipment purchases, construction of rails, roads, schools, hospitals and commercial, buildings etc. While inventories include a stock of goods kept by producers to meet unexpected and temporary fluctuations in demand, and work in progress.

The data on real government expenditure (constant 2010 US$) also has been taken from World Data Bank (WDI) database. According to WDI, this variable includes all the current government spending on purchases of goods and services. It also includes national defence expenditures but not military expenditures. Finally, the Population growth variable also has been obtained from World Data Bank (WDI).

### 4.2 Model Specification

This analysis is based on Aizenman and Glick (2003) reformulated Barro (1990) growth model, which allows non-linear growth impacts of defence expenditure conditional on threats. This theoretical model is based on the following conjectures: military expenditure in the absence of external threats reduces economic growth, external threats without military expenditure impede economic growth, and military spending in the presence of sufficiently higher external threats stimulates economic growth.

In this analysis, we have incorporated both internal and external conflicts. Although Aizenman and Glick (2003) only considered external threats in their analysis but later they recommended the inclusion of internal threats in future studies. Finally, the above conjectures can be expressed in the following forms.

$$\frac{\partial LGDP_t}{\partial LMiliExp_t} = \alpha_1 + \alpha_4 EXT_t + \alpha_5 INT_t; \alpha_1 < 0, \alpha_4 > 0, \alpha_5 > 0 \quad (1)$$

$$\frac{\partial LGDP_t}{\partial EXT.Conf_t} = \alpha_2 + \alpha_4 LMili_t; \alpha_2 < 0, \alpha_4 > 0 \quad (2)$$

$$\frac{\partial LGDP_t}{\partial INT.Conf_t} = \alpha_3 + \alpha_5 LMili_t; \alpha_3 < 0, \alpha_5 > 0 \quad (3)$$

Eq 1, 2, and 3 are driven from equation 4, which is illustrated below:

$$LGDP_t = \delta + \alpha_1 LMiliExp_t + \alpha_2 EXTConf_t + \alpha_3 INTConf_t + \alpha_4 LMili.EXT_t + \alpha_5 LMili.INT_t + \beta X_t + \mu_t \quad (4)$$

Where in eq 4, $LGDP_t$ is a log of real per capita GDP, $LMiliExp_t$ is a log of real military expenditure, $EXTConf_t$ is for external conflicts, $INTConf_t$ term represents internal armed conflicts, $Mili.EXT_t$ and $LMili.INT_t$ are the interactive terms that include military expenditure, external and internal conflicts, $X_t$ is a vector of control variables that includes $Polity_t$ (democracy index), population growth ($POPG_t$), log of real gross capital formation ($LGCF_t$), and Log of real government expenditure ($LGOV_t$). Finlay, t is for the time period and $\mu_t$ is an error term.

### 4.3 Econometric Method

To empirically estimate the military-growth relationship in the absence and presence of armed conflicts in Pakistan and India, equation 4 is estimated by using AutoRegressive Distributed Lag (ARDL) model. The ARDL model introduced by Pesaran et al. (1995) is a single equation method that has several advantages. This method does not require all underlying variables to be integrated at the same level. This technique is applicable even if the variables are integrated at level (I(0)), the first difference (I(1)) or a combination of both. This method produces robust estimates in small and finite samples. Further, an error correction model can be derived from ARDL via linear transformation, which integrates both short-run dynamics and long-run equilibrium without losing the long-run information (Nkoro et al. (2016)). The generalized ARDL (p,q) model can be expressed in the following way.

$$LGDPg_t = \delta + \sum_{i=1}^{p} \theta_i LGDPg_{t-i} + \sum_{i=0}^{q} \alpha_i Z_{t-i} + \sum_{i=0}^{q} \beta_i X_{t-i} + \mu_t \quad (5)$$

Where in eq 5, LGDPg indicates the log of real per capita GDP, Z contains all variables of interest (log of real military expenditure, external armed conflicts, internal armed conflicts, and interactive terms of military expenditure with internal and external armed conflicts), and X is a vector of other control variables. p and q represent the optimal lag length of dependent and independent variables. Finally, $\mu_t$ is an error term and $\delta$ is a constant.

In order to select the optimal lag length for the eq 5 to avoid serial correlation issues in the model, the analysis employs Schwarz Bayesian Criteria (SBC) lag criteria as suggested by Pesaran et al. (1999) . The next step is to test the long-run relationship between the underlying variables, for that Pesaran et al. (2001) proposed bounds testing approach, which is based on F statistics. The null hypothesis of this test assumes variables are not cointegrated (i.e. $\alpha_i = \beta_i = 0$).Whereas, the alternative hypothesis assumes cointegration exists (i.e. $\alpha_i \neq \beta_i \neq 0$). The bounds test approach is based on two sets of critical values, one set (lower critical bound) considers that all the under-considered variables are integrated at I (0), it points toward no long-run association among the underlying variables. Whereas. the second set of critical values (upper critical bound) which assumes all variables are integrated at I(1), meaning there is a long-run relationship among the variables. The null hypothesis of no co-integration can be rejected if the F-statistics value is greater than the upper critical bound, and not rejected if the value is lower than the lower critical bound. However, if the F-statistics value falls inside the lower and upper critical bounds, no definite inference can be drawn in that case.

After confirming the presence of cointegration among the underlying variables, the next step is to examine the long-run equilibrium and short-run dynamics by using the ARDL model parameterised in the error correction (ECM) form.

$$\Delta LGDPg_t = \delta' + \gamma(LGDPg_{t-1} - \alpha_i' Z_t - \beta_i' X_t) + \sum_{i=1}^{p-1} \omega_i'' \Delta LGDPg_{t-i} + \sum_{i=0}^{q-1} \alpha_i'' \Delta Z_{t-i} + \sum_{i=0}^{q-1} \beta_i'' \Delta X_{t-i} + \varepsilon_t \quad (6)$$

Where, $\Delta$ is a first difference operator, $\delta'$ represent constant, and $\gamma$ is the error-correcting speed of adjustment coefficient. $\alpha_i'$ and $\beta_i'$ are long-run coefficients. $\omega_i''$, $\alpha_i''$, and $\beta_i''$ are the short-run coefficients. Finally, $\varepsilon_t$ is an error term with zero mean and constant variance-covariance. Further, $\gamma$ is expected to be negative and significant, its numeric value decides how quickly the dependent variable return to the long-run equilibrium after experiencing shock in the short run.

Moreover, this analysis also uses some diagnostic, stability, and robustness tests to determine the goodness of fit of the under-considered model. The diagnostic tests examine whether the residuals of the regression models are free from autocorrelation and heteroskedasticity issues, for that we employ Breusch Godfrey Correlation LM and Harvey tests, respectively. The stability of the coefficients can be tested by using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals ($CUSUM_{SQ}$). Further, we use the fully modified ordinary least square (FMOLS) method to check the robustness of long-run ARDL estimates.

## 5 Results and Disscussion

In order to establish the integration level of the variables, firstly, we employ the Augmented Dickey-Fuller (ADF) test with constant, constant and trend, and none (without constant and trend) options. The null hypothesis of the ADF test states that the series is non-stationary. The unit root tests result in both contexts (Pakistan and India) are presented in Table 1. The ADF unit root test indicates that in the case of Pakistan only external conflicts (Ext Conf) and Internal conflicts (stationary without constant and trend at 10% significance level) series are stationary at the level and in the case of India both external conflicts (Ext Conf) and military expenditure (constant and trend stationary at 5% significance level) are stationary at level (l(0)) while remaining variables show the evidence of unit root at level (I(0)). However, after taking the first difference (I(1)) all the variables become stationary.

Second unit root test we employ is the Philips-Peron (PP) test, which is normally considered as an alternative of the ADF test. Both tests share the same null hypothesis that the series is non-stationary. Table 1 shows that PP test outcome is consistent with ADF test results except for the internal conflicts (INT Conf) series in the case of Pakistan, which is now stationary at I(0) in all cases (constant, both, and none).

Another conventional unit root test we use is the Kwiatkowski, Philips, Schmidt, and Shin (KPSS) test. The null hypothesis of this test is completely opposite of ADF and PP tests. In this test, the rejection of the null hypothesis indicates that the series has a unit root or is non-stationary. Table 1 shows that KPSS results are also consistent with ADF and PP tests. In this case, the null hypothesis cannot be rejected after taking the first difference of the variables in the Pakistani context. Whereas, we can reject null hypothesis in the Indian context for GDP per capita (LGDP) series (non-stationary with constant).

The conventional unit root tests (ADF, PP, and KPSS) can be used to determine the integration level of the variables. However, these tests have a well-known weakness against structural breaks. The presence of structural breaks in the series might decrease the power of rejecting the unit-root hypothesis of these tests. Therefore, we have also employed Zivot-Andrew (1992) unit test which allows one structural break in the series. The null hypothesis of ZA test assumes that the series has a unit root with a break(s), while the alternative hypothesis assumes that the series is stationary with a break(s). Table 1 illustrates that in this case almost all of the variables are I(0) stationary with a break(s) in the Pakistani context while in the Indian case LGDP. LMiliExp (with constant), EXT Conf (with both constant and trend), and INT Conf are stationary at I(0) with a break(s).

TABLE 1: Unit-Root Test Results

| | | ADF | | | PP | | | KPSS | | Zivot Andrew | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Variables | Constant | Both | None | Constant | Both | None | Constant | Both | Constant | Trend | Both |
| Pakistan | | | | | | | | | | | | |
| Level | LGDP | -2.30 | -2.44 | 4.13 | -2.41 | -2.35 | 6.01 | 0.96*** | 0.23*** | -3.62*** | -2.83** | -3.20*** |
| | LMiliExp | -1.65 | -2.81 | -2.83 | -1.58 | -1.99 | 4.28 | 0.94*** | 0.22*** | -3.87*** | -4.10** | -4.43** |
| | Ext Conf | -3.97*** | -4.07** | -2.65*** | -5.08*** | -5.20*** | -3.71*** | 0.21 | 0.21 | -5.75*** | -5.25 | -6.18*** |
| | INT Conf | -2.33 | -2.85 | 1.62* | -3.35** | -4.22*** | -2.35** | 0.49* | 0.12* | -4.40*** | -3.32* | -4.40*** |
| 1st Diffrence | | | | | | | | | | | | |
| | LGDP | -4.08*** | -4.53*** | -2.30** | -6.22*** | -6.57*** | -3.65*** | 0.36 | 0.06 | -7.30** | -6.85 | -7.24*** |
| | LMiliExp | -6.29*** | -6.60*** | -4.43*** | -5.37*** | -5.44*** | -4.41*** | 0.18 | 0.07 | -6.86 | -6.98 | -7.12* |
| | Ext Conf | -7.69*** | -7.63*** | -7.75*** | -16.06*** | -15.91*** | -16.08*** | 0.08 | 0.08 | -7.68** | -7.70 | -7.89* |
| | INT Conf | -8.23*** | -8.15*** | -8.28*** | -11.60*** | -11.49*** | -11.69*** | 0.03 | 0.03 | -8.26 | -8.48 | - 8.26 |
| India | | | | | | | | | | | | |
| Level | LGDP | 4.03 | 0.32 | 5.19 | 6.64 | 0.09 | 7.65 | 0.92*** | 0.25*** | -2.07** | -2.77** | -3.09** |
| | LMiliExp | -1.28 | -6.40** | 2.65 | -1.41 | -4.24*** | 4..35 | 0.98*** | 0.04 | -7.48** | -7.44 | -7.65 |
| | Ext Conf | -4.06*** | -4.04** | -2.59**. | -5.97*** | -5.27*** | 4.43*** | 0.11 | 0.06 | -6.26 | -6.05 | -6.64*** |
| | INT Conf | -2.56 | -2.44 | -0.80 | -2.93** | -3.08 | -0.95 | 0.53** | 0.11** | -4.07** | -3.79*** | -4.43*** |
| 1st Difference | | | | | | | | | | | | |
| | LGDP | -4.37*** | -6.91*** | -2.17*** | -6.47*** | -10.75*** | -3.74*** | 1.03*** | 0.10 | -7.34 | -7.21 | -7.44 |
| | LMiliExp | -6.46*** | -6.36*** | -5.09*** | -5.27*** | -5.24*** | -4.38*** | 0.12 | 0.08 | -6.40 | -8.38* | -8.17** |
| | Ext Conf | -8.92*** | -8.83*** | -8.97*** | -12.68*** | -12.56*** | -12.78*** | 0.03 | 0.04 | -8.90 | -5.85 | -6.36** |
| | INT Conf | -6.06*** | -5.99*** | -6.12*** | -9.92*** | -9.98*** | -9.98*** | 0.12 | 0.05 | -6.41* | -6.-05 | -6.43** |

Notes: LGDP is a log of real GDP per capita, LMiliExp is a log of real military expenditure, ExtConf is for external armed conflicts, and INTConf shows internal armed conflicts. The null hypothesis for ADF and PP test state that the series is non-stationary, and the null hypothesis for KPSS shows that the series is stationary. Finally, the null hypothesis for the ZA test states that the series has a unit root with a break(s). * shows the significance level at 10%, ** shows significance level at 5%, and *** indicates significance level 1%.

Altogether, the bottom line here is that variables are stationary at the mixed level of integration even in this case.

All the unit root tests confirm that the variables of interest are integrated at the mixed level (1(0) and 1(1)). In this situation, the ARDL approach to cointegration will provide consistent and reliable results because this method can be applied whether the variables are integrated at I(0), I(1) or a mixture of both. Now before proceeding to the ARDL cointegration testing method to find out the long-run association between the variables under consideration. It is essential to determine the optimal lag order of the models, for that we have used the SBC graph method and selected ARDL (1,0,0,0,0,0,0,0,0) for Pakistan and ARDL (1,0,0,0,0,0,0,0,2) for India, both graphs are available in the appendix (figure 7 and 8). Based on the selected ARDL models, bounds test for cointegration results are reported in Table 2. The cointegration test involves a comparison between F-statistics and critical values of upper I(1) and lower I(0) bounds presented by Pesaran et al. (2001), if the F-statistics exceed the upper critical bound values, then the null hypothesis of no cointegration will be rejected and if the F-statistics value falls inside the upper and lower bounds in that case inference will be inconclusive (Pesaran et al. (2001)). Table 2 shows that F-statistics values in both contexts (Pakistan and India) are higher than the upper bound. This implies that the null hypothesis of no cointegration cannot be accepted.

TABLE 2: Cointegration Test: ARDL Bounds Test

| | Pakistan | India | Signif | I(0) | I(1) |
|---|---|---|---|---|---|
| F-Statistc | 5.59 | 5.39 | 10% | 1.88 | 2.99 |
| k | 9 | 9 | 5% | 2.14 | 3.3 |
| | | | 2.5% | 2.37 | 3.6 |
| | | | 1% | 2.65 | 3.97 |

Notes: I(0) and I(1) indicate lower and upper critical bounds, respectively. The null hypothesis suggests no cointegration exists. k indicates the number of regressors in the model.

The presence of a cointegration vector allows to establish a long-run association between the underlying variables and that further allows to determine the partial effects of military expenditure, conflict, polity, gross capital formation, government expenditure, and population growth on GDP growth in both contexts. The ARDL long-run and short-run results of Pakistan and India are reported in Table 3. Table 3 shows that a 1% increase in Pakistan's military outlays % share of GDP will increase economic growth by 0.28%. This finding accords with Khan (2004) and Anwar et al. (2012) studies, where they empirically proved that defence expenditure does not hurt economic growth in the case of Pakistan. On the other hand, in the case of India, the coefficient on military expenditure is positive but it is not significant at the conventional level. This implies that Indian military expenditure does not have any impact on economic growth. This result is in-line with Khalid and Mustapha (2014) study, where they also failed to determine any significant relationship between defence outlays and output in the case of India.

Moreover, the coefficient on the external conflict in the case of Pakistan is significantly negative, implying if external conflict increases by 1 it will impede growth by -0.56%, and as the intensity of external conflict rises further, for instance to 2, the economic growth, in that case, will reduce by 1.12%. Similarly, in the Indian context, the coefficient of external conflict is also negative and significant at the 5% level. Interestingly, the Indian coefficient is bigger in magnitude than

Pakistan's one. Implying that external conflicts have more deteriorating effects on the Indian economy than Pakistan's. These findings accord with Aizenman and Glick (2003); Musayev (2016); Yang et al. (2011) studies, where they also find growth deteriorating effects of external threats. On the other hand, coefficients on internal conflicts are negative but insignificant in both cases.

TABLE 3: ARDL Long-Run and Short-Run Estimates

| | Variables | Pakistan | India |
|---|---|---|---|
| Long Run | | | |
| | LMili Exp | 0.28*** | 0.04 |
| | | (0.05) | (0.07) |
| | Ext Conf | -0.56* | -0.75** |
| | | (0.27) | (0.29) |
| | Int Conf | -0.19 | -0.07 |
| | | (0.28) | (0.35) |
| | LMIli.Ext | 0.02* | 0.03** |
| | | (0.01) | (0.01) |
| | LMili Int | 0.01 | 0.002 |
| | | (0.01) | (0.01) |
| | Polity | -0.0003* | -0.04** |
| | | (0.002) | (0.01) |
| | LGCF | 0.18*** | 0.14*** |
| | | (0.05) | (0.05) |
| | LGOV | 0..03 | 0.20** |
| | | (0.06) | (0.06) |
| | POP | -0.01 | -0.53*** |
| | | (0.02) | (0.05) |
| Short Run | | | |
| | d.POP | | -0.563* |
| | | | (0.329) |
| | d.$POP_{t-1}$ | | 1.284*** |
| | | | (0.386) |
| | $ECM_{t-1}$ | -0.46 | -0.71*** |
| | | (0.06) | (0.09) |
| | Constant | -1.97*** | -1.30*** |
| | | (0.25) | (0.16) |
| | R-Squared | 0.54 | 0.64 |

Notes: Log of real GDP per capita is a dependent variable, LMili Exp is log real military expenditure, Ext Conf and Int Conf represent external and internal armed conflicts. Mili.Ext and Mili Int are interactive terms of military expenditure and armed conflicts. Polity is a democracy index; LGCF and LGOV are for log real gross capital formation and log real government expenditure, respectively. Finally, Pop shows population growth and ECM is an error correction term. The optimal lag order for Pakistan and India is (1,0,0,0,0,0,0,0,0,0) and (1,0,0,0,0,0,0,0,0,2), respectively. Standard errors are presented in parenthesis, * shows a significance level at 10%, ** shows a significance level at 5%, and *** indicates a significance level at 1%.

The coefficients of interactive terms involving military expenditure and external conflict for both Pakistan and India have a significantly positive impact on economic growth. Suggesting that an additional defence expenditure in the existence of a significantly higher external threat will accelerate economic growth by 0.02% and 0.03% in both Pakistan and India, respectively. These results accord with Aizenman and Glick (2003); Musayev (2016); Yang et al. (2011) studies where they also empirically proved the nonlinear relationship between defence outlays and economic growth conditional on external armed conflict. However, the magnitude of coefficients on interactive terms are clearly smaller than the coefficients of military expenditure (0.28% and 0.04%) alone, especially in the Pakistani context. That is because the presence of external conflicts offset some of the military expenditures' positive effects. While the interactive terms consisting of internal conflicts and military expenditure are not statistically significant at any conventional level for both countries.

Moving on to the control variables, Polity has a negative and significant impact on economic growth in both cases. However, in the Pakistani context, the coefficient is almost zero. Whereas gross capital formation coefficients are highly significant and positive as expected in both countries. Similarly, government expenditure also affects economic growth positively, but only in the case of India. Finally, the estimated coefficient on population growth is negative but only significant in the case of India. This suggests holding other variables constant 1% increase in population growth will reduce growth by 0.53% in the Indian context.

The estimated coefficients of lagged error correction terms ($ECM_{t-1}$) (derived from the long-run cointegrating relationship) are equal to -0.46 and -0.71 for both Pakistan and India, respectively. The coefficients suggest that the deviation from the long-run equilibrium of economic growth in Pakistan and India will be corrected by 46% and 71% within a year, respectively. This also indicates that the speed of adjustment towards the long run is higher in India than in Pakistan. The significance and the negative sign of the $ECM_{t-1}$ coefficient also validate the existence of a long-run relationship between the underlying variables (Benerjee et al, (1998).

Table 4 shows that both models pass the diagnostic tests against serial correlation and heteroskedasticity. The analysis employed the Breusch Godfrey Correlation LM test and Harvey test to check the serial correlation and heteroskedasticity issues in the models, respectively. The null hypothesis for the serial correlation test is no serial correlation. Similarly, the null hypothesis of the heteroskedasticity test assumes that the model is homoscedastic. In both cases, we accepted the null hypothesis which suggests that our models are free from serial correlation and heteroskedasticity issues. Moreover, in order to assess the stability of the long-run and

TABLE 4: Diagnostic Tests

| | Pakistan | | India | |
|---|---|---|---|---|
| | F-Statistics | P-Values | F-Statistics | P-Values |
| Serial Correlation | 0.002 | 0.97 | 0.20 | 0.66 |
| Heteroskedasticity | 1.51 | 0.17 | 1.63 | 0.12 |

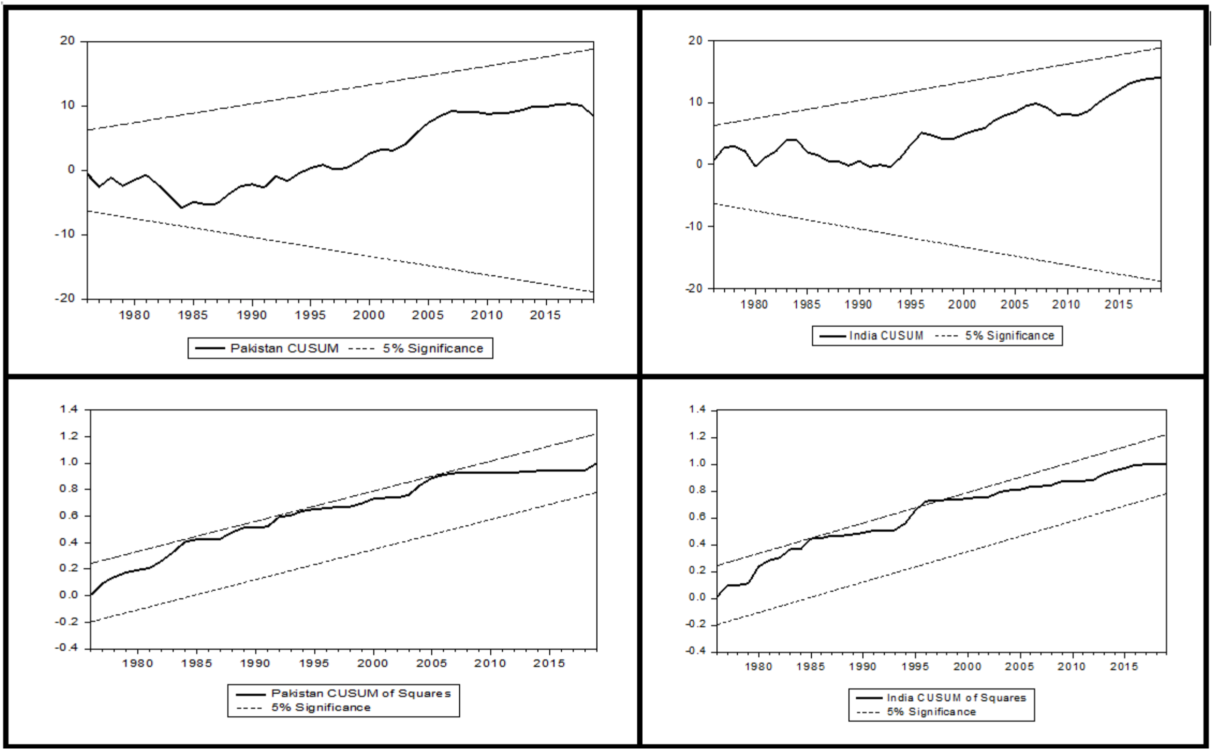
Notes: the null hypothesis for serial correlation and heteroskedasticity tests states that no serial correlation and the model are homoscedastic, respectively.

short-run coefficients. We employed Cumulative Sum (CUSUM) and Cumulative Sum of Squares ($CUSUM_{SQ}$) methods. Figure 2 confirms that both short and long-run estimates are stable as the CUSUM and $CUSUM_{SQ}$ statics stay within the bound of 5% significance level in both cases.

The robustness of ARDL long-run estimates has been checked by using the fully modified ordinary least square (FMOLS) method. Both FMOLS and ARDL long-run estimates are illustrated in Table 5. FMOLS results confirm the reliability and consistency of ARDL long-run coefficients.

Thus, we can confidently conclude that our ARDL long-run estimates are robust and free from any statistical biases.

FIGURE 2: Cumulative Sum of Recursive Residuals and Cumulative Sum of Squares Tests for Stability




Notes: Top 2 plots represent the cumulative sum of recursive residuals (Long-Run Models) and the bottom 2 plots represent the cumulative sum of squares (Short-Run Models) for both countries. The straight lines show critical bounds at 5% significance level

TABLE 5: FMOLS and ARDL Long-Run Results

| | Pakistan | | India | |
|---|---|---|---|---|
| Variables | FMOLS | ARDL | FMOLS | ARDL |
| LMili Exp | 0.28*** | 0.28*** | 0.03 | 0.04 |
| | (0,04) | (0.05) | (0.07) | (0.07) |
| EXT Conf | -0.53** | -0.56* | -1.03*** | -0.75** |
| | (0.22) | (0.27) | (0.30) | (0.29) |
| INT Conf | 0.33 | -0.19 | 0.30 | -0.07 |
| | (0.21) | (0.28) | (0.32) | (0.35) |
| MIli.Ext | 0.02** | 0.02* | 0.04*** | 0.03** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Mili INT | -0.01 | 0.01 | -0.01 | 0.002 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Polity | -0.0004** | -0.0003* | -0.01 | -0.04** |
| | (0.0001) | (0.002) | (0.01) | (0.01) |
| LGCF | 0.17*** | 0.18*** | 0.19*** | 0.14*** |
| | (0.039) | (0.05) | (0.06) | (0.05) |
| LGOV | 0.05 | 0..03 | 0.15** | 0.20** |
| | (0.04) | (0.06) | (0.07) | (0.06) |
| POP | -0.02 | -0.01 | -0.47*** | -0.53*** |
| | (0.02) | (0.02) | (0.05) | (0.05) |

Notes: FMOLS is a fully modified ordinary least square method and ARDL is an autoregressive distributed lag model. The log of real GDP per capita is a dependent variable. Standard errors are presented in parentheses. * shows a significance level at 10%, ** shows a significance level at 5%, and *** indicates a significance level at 1%.

## 6 Conclusion

This paper examined the economic impacts of military expenditure in the presence and absence of armed conflicts, in the case of Pakistan and India. To the best of our knowledge, this is the first analysis on Pakistan and India that has considered threat measures while determining the relationship between military expenditure and economic growth. The inclusion of armed conflict with defence expenditure into a growth equation can give a better explanation to those countries that experience a high threat level and a high military expenditure such as Pakistan and India, as both countries have serious internal and external security concerns. This analysis is based on Aizenman and Glick (2003) theoretical framework, that allows a non-linear association between military expenditure and economic growth conditional on threats. The empirical analysis has been conducted by using different unit root tests (ADF, PP, KPSS, and Zivot Andrew), an Autoregressive Distributed Lag (ARDL) cointegration technique with different diagnostic tests, and Fully Modified Ordinary Least Square (FMOLS) to check the robustness of ARDL long-run estimates.

Through empirical analysis, we found a positive and significant direct impact of military expenditure on economic growth in the absence of armed conflict in the case of Pakistan, while insignificant in the Indian context. These findings are not in line with Aizenman and Glick (2003) cross-sectional study, where they have a negative direct impact of defence expenditure on economic growth. That might be because their empirical analysis is based on a cross-sectional of 91 heterogeneous countries, while this analysis is specifically based on the case studies. Also, The military-growth relationship depends on several other factors such as empirical techniques, sample size, underlying countries, time span etc. The stimulating economic growth effects of military expenditure in Pakistan might be because the Pakistani military army plays a major role in running state affairs both directly and indirectly. It owns self-generating capital sources such as Banks, arms industries, housing colonies, universities, schools, colleges, and hospitals across the country. Further, the Pakistani army is also playing an important role in building infrastructure, especially in those areas which were badly affected by terrorism and where government access is limited.

Another important finding of our empirical analysis is that external conflicts have a direct negative impact on economic growth in both countries. These results are highly in accord with Aizenman and Glick (2003) study, where they have empirically proved that external conflicts directly deteriorate economic growth. Furthermore, we also find that the external threats are more harmful to the Indian economy than to the Pakistani economy. The plausible reason behind this may be because besides Pakistan, India has a troubling relationship with China and China is one of the largest trading partners of India. Thus, whenever tension increases at the borders between India and China that directly and indirectly affects their trade relations. Consequently, it ends up hurting the Indian economy.

Moving on to another crucial finding that emerges from our study is that the economic effects of defence expenditure are a non-linear function of effective external militarized conflicts in both countries. This implies that military spending in the presence of significantly higher external threats stimulates economic output in both countries (Pakistan & India). That might be because higher military expenditure attenuates the intensity of conflicts and help strengthen the confidence of national and international investors to invest by providing a peaceful environment. However, military spending in the absence of armed conflict has stronger growth-stimulating effects than in the presence of armed conflict. The reason behind this is that conflicts offset some of the positive effects of defence outlays.

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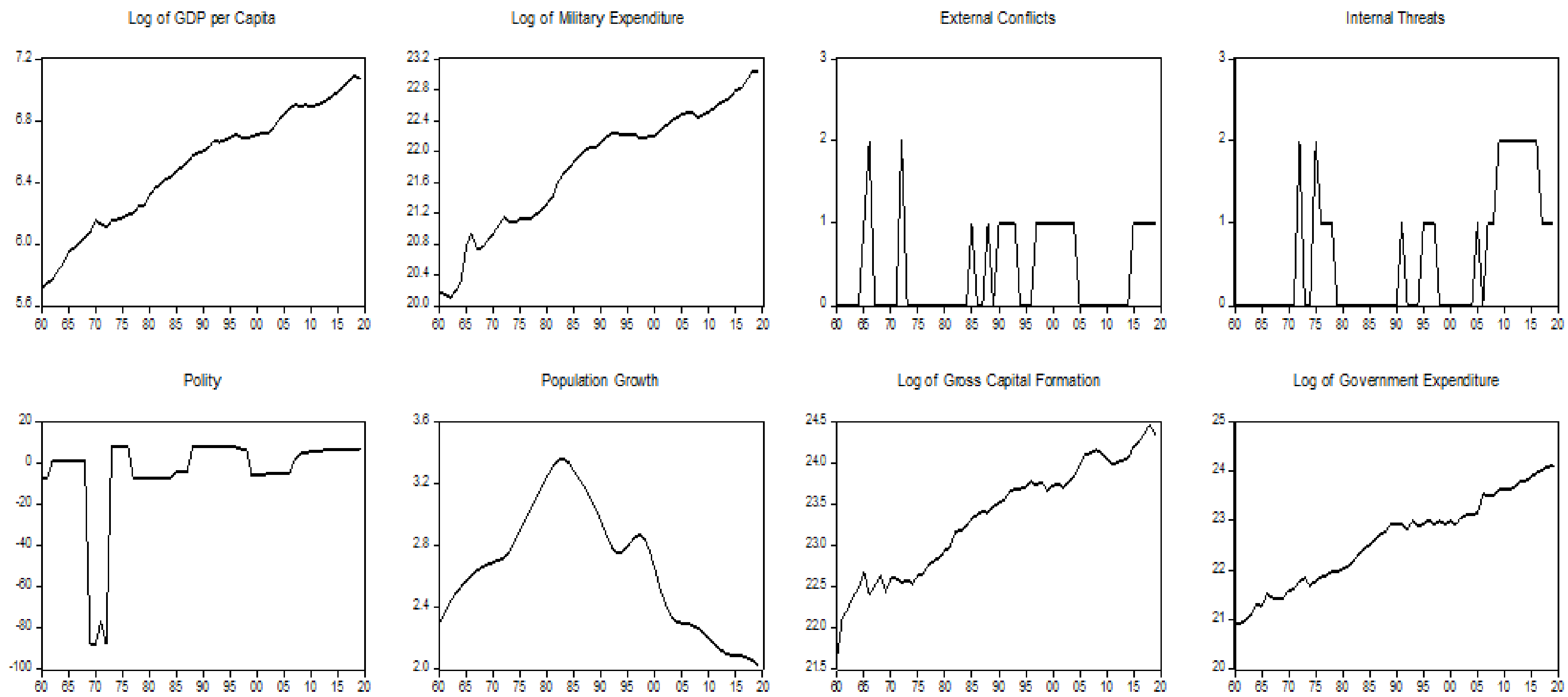


FIGURE 3: Pakistan: Time-Series Plots At Level

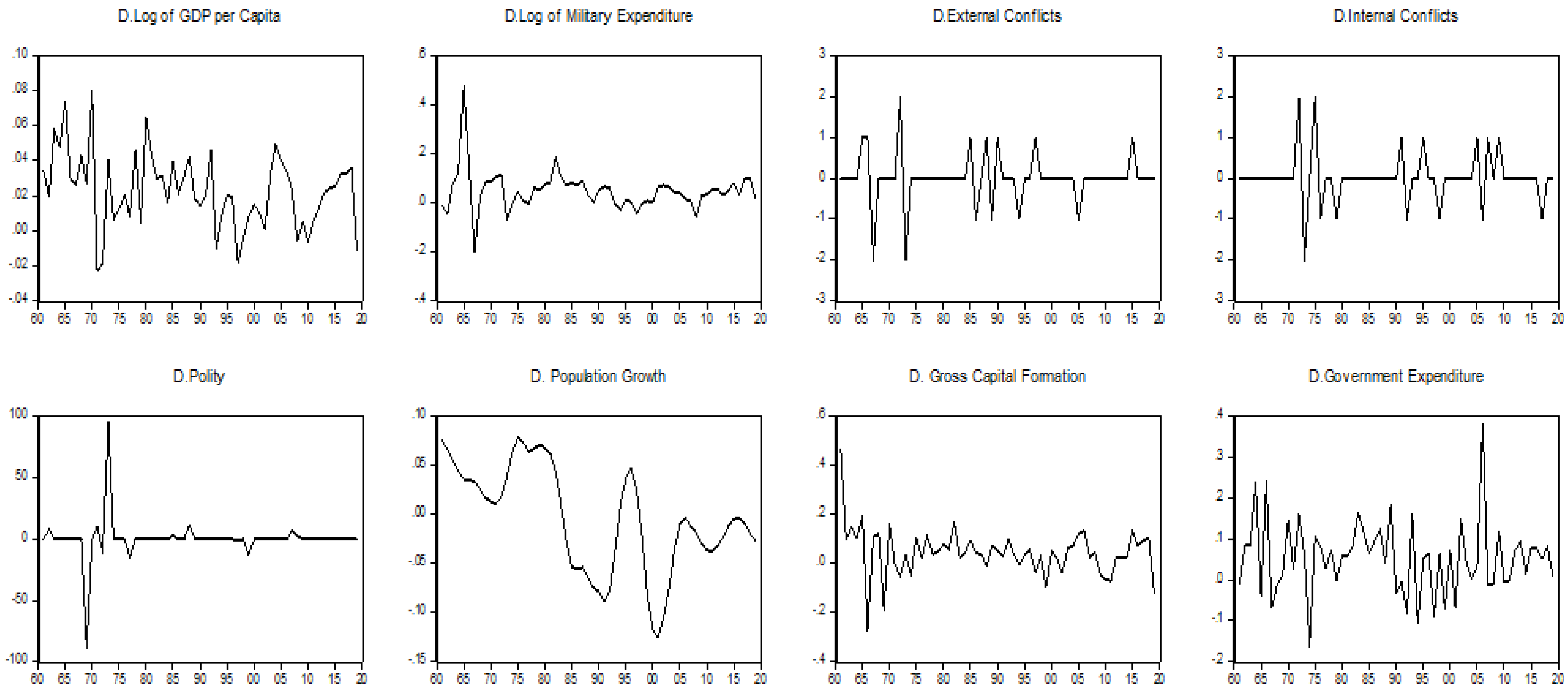


FIGURE 4: Pakistan: Time-Series Plots At 1st Difference

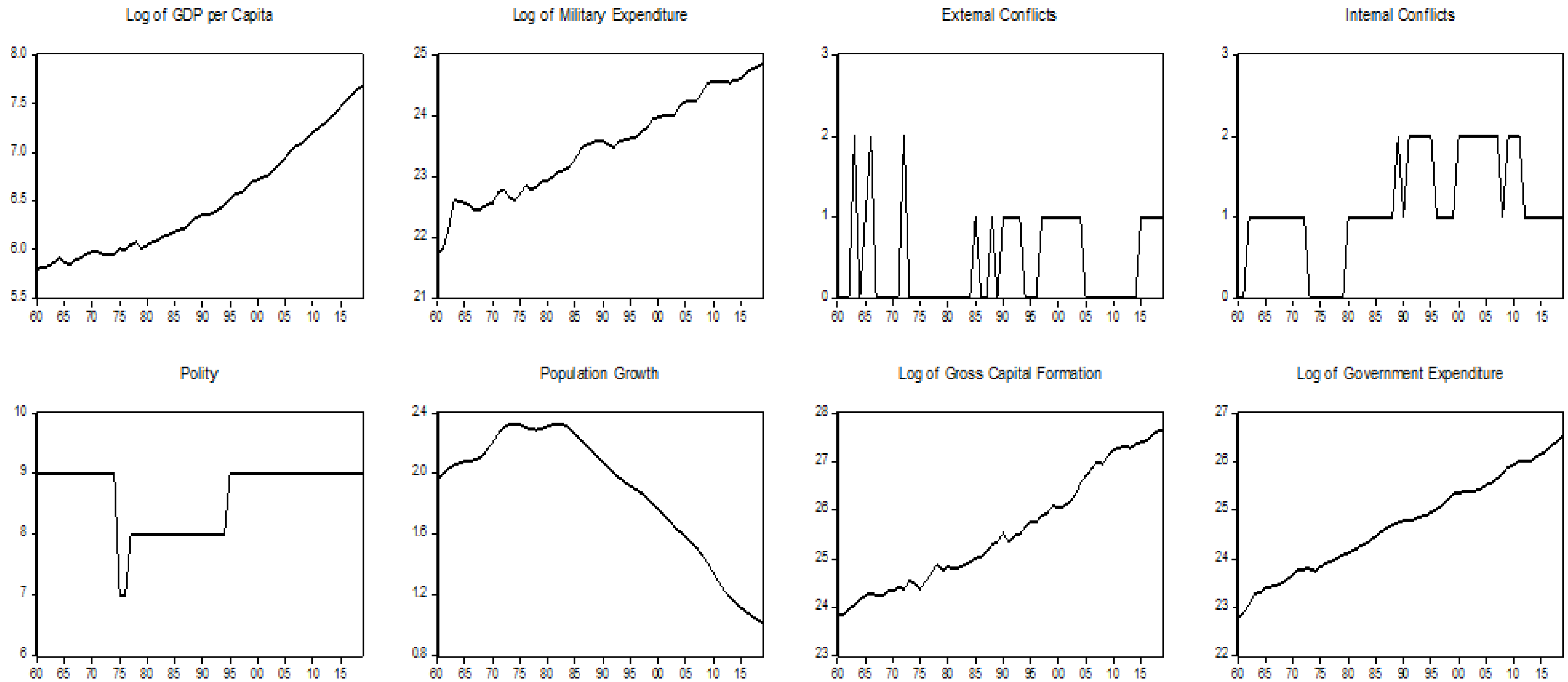


FIGURE 5: India: Time-Series Plots At Level

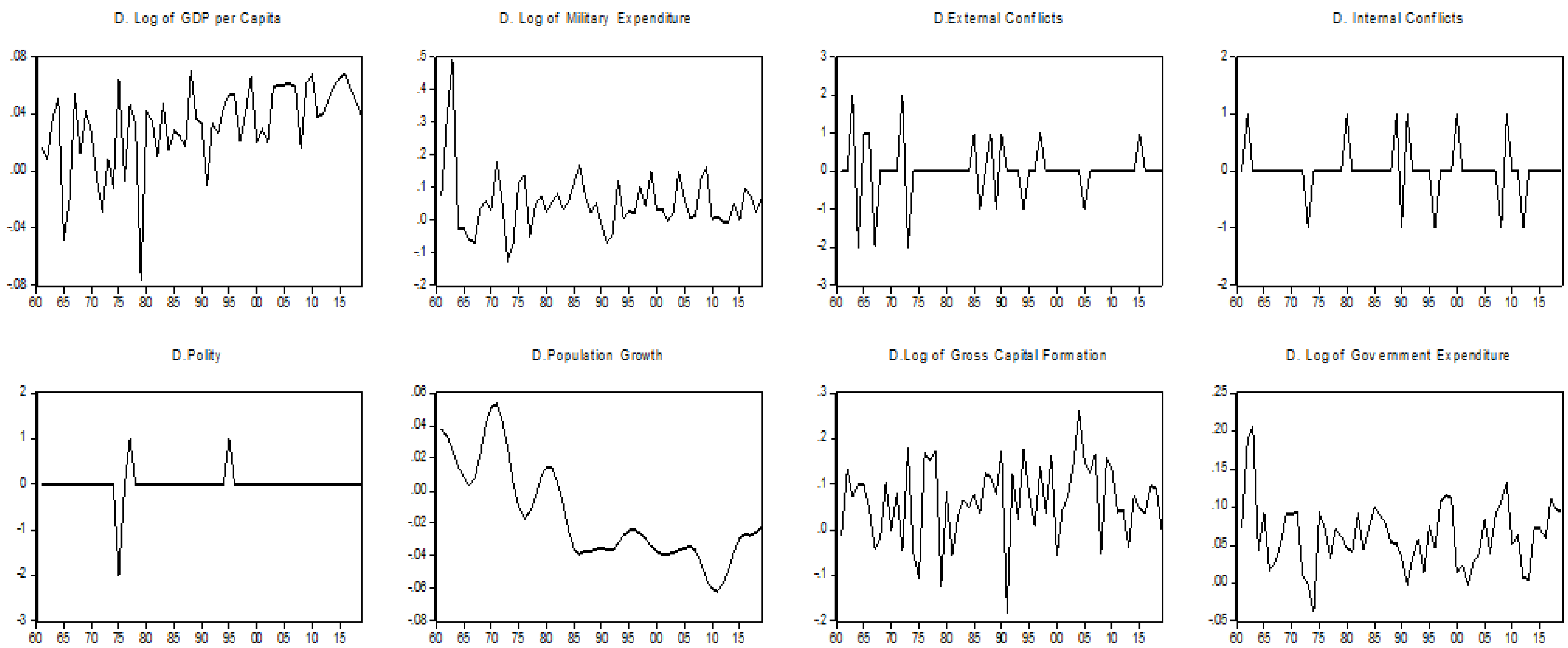


FIGURE 6: India: Time-Series Plots At 1st Difference

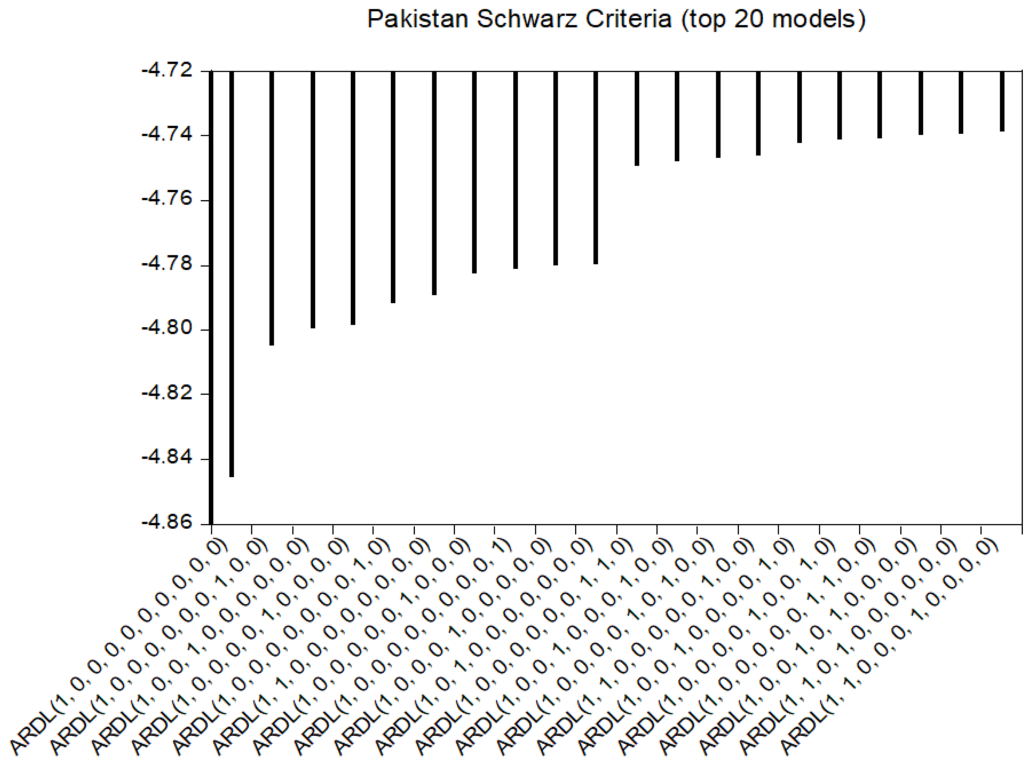


FIGURE 7: Pakistan: Optimal Lag Order

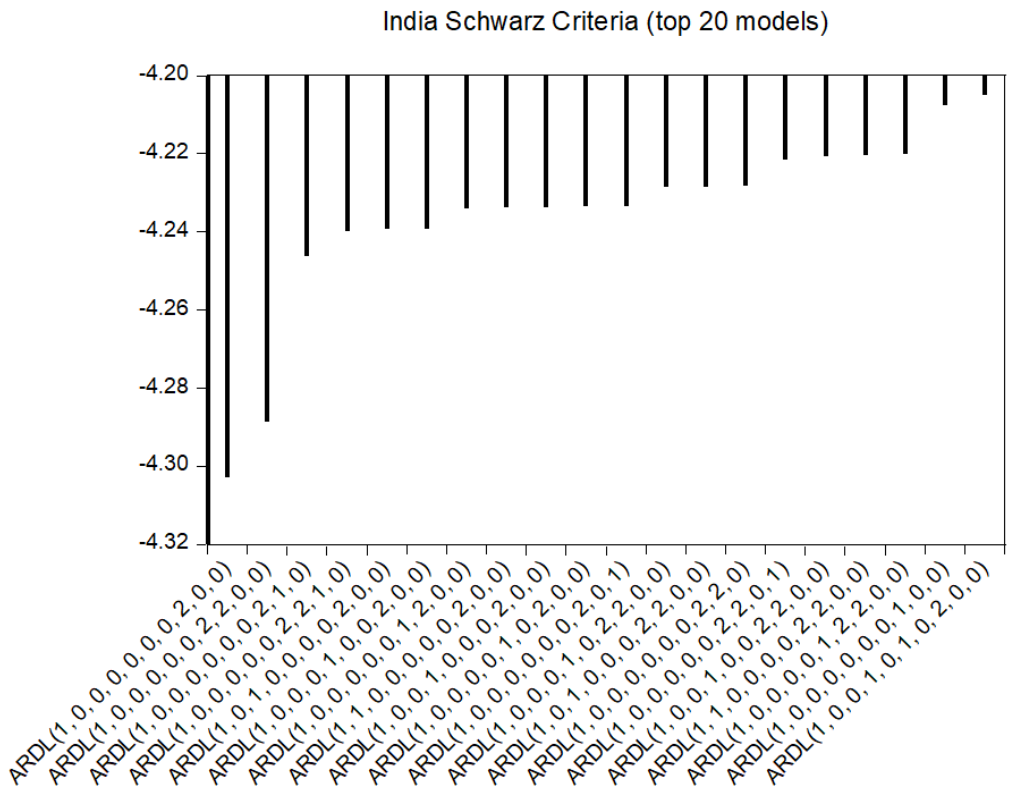


FIGURE 8: India: Optimal Lag Order