

Does conflict have negative consequences on economic growth in South Asia?

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Abstract: *The direct and indirect causes of armed conflict in South Asia is perhaps the single most important reason for increasing military expenditure. It is also a significant threat to the growth of national output in the region. This study examines the impact of conflict on economic growth in conflict-affected South Asian countries from 1980-2014 by employing sufficient determinants, the Solow growth model and Autoregressive Distributed Lag (ARDL) bounds test approach to cointegration. Since military expenditure and military participation have increased simultaneously with internal and external conflict, this study used military expenditure per warring population as a proxy for conflict. Apart from mixed conclusions in the literature, the results of this study suggest that conflict contributes significantly to decreasing per capita GDP in the short- and long-run across South Asia. The findings indicate that the effect is high in the long-run and is most severe in Pakistan, Sri Lanka and India since 85% of conflict in South Asia occurred in these three countries. The study recommends that policymakers and governments should adopt constructive policies to prevent and control internal and external conflicts. Ending conflict undoubtedly leads to minimising the cost of conflict and supports ways of enhancing output in South Asia.*

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1. Introduction

Economic growth is the backbone of any country as it is the basis for economic planning and policy making. Increases in the value of national economic output enhance people's standard of living by providing employment opportunities, reducing poverty, improving public services, enhancing consumption, boosting investment, and limiting government

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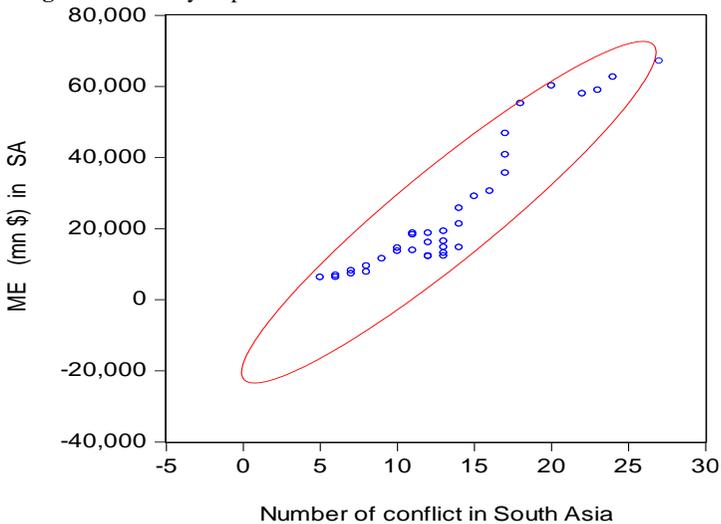
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borrowing and deficit. Nevertheless, armed conflicts and associated war expenditure have been identified as major threats to economic growth in the developing world, particularly in South Asia.

Most countries in South Asia were previously colonies of European empires. Therefore, economic development in the region is highly volatile. Most South Asian countries gained independence in the late 1940s after the withdrawal of superpowers from the colonised countries. However, this was not the end of their problems. Unlike other countries in Asian continents, several countries in South Asia faced internal and external armed conflicts after independence. Countries in the subcontinent like Bangladesh, Pakistan, India, Sri Lanka and Nepal, with the exception of Maldives and Bhutan have experienced more than 400 armed conflicts in the form of ethnic conflicts, religious riots, political conflicts, localised land conflicts, homicides, border problems and external conflicts (Uppsala Conflict Database, 2015).

Figure 1: Military Expenditure and Conflict in South Asia: 1980-2015



Military expenditure is closely associated with internal and external conflict in South Asia (see Figure 1). Military spending in South Asia drastically increased since independence, particularly in India and Pakistan. A similar pattern exists in Nepal, Bangladesh, and Sri Lanka since the 1980s. Military spending in South Asia reached nearly US\$65.5 billion or approximately 4% of global defence spending in 2015. Following the Sino (China) – Indian War in 1962, military spending in India started to increase drastically and remained at an average of 21% of central government spending until 1980. From 1962 to 1980, Pakistan spent nearly 60% of its budget to cover military spending. The arms race between India and

Pakistan, Kashmir problem, ethnic clashes, localised land conflicts in Bihar, Chattisgarh, Jharkhand, Orissa, Andhra Pradesh, Assam, Nagaland and Balochistan, threats from Al-Qaida religious extremist groups and the Taliban further stimulated the sharp acceleration of military spending in both countries. Average military spending from 1980 to 2014 in India had accounted for 22.2% and in Pakistan 31% of the national budget (Calculated based on SIPRI-MED, 2014).

From 1950 to early 1980, military spending averaged 9% of central government spending in Bangladesh, Nepal, and Sri Lanka. However, the civil war and political corruption brought about a sharp boom in defence spending in Sri Lanka since the 1980s. Defence spending in Sri Lanka increased nearly 35-fold from 1983 to 2009 during the war period. In 2014, even after the post-war scenario, military spending seemed too high and was estimated at 12.6% of central government spending. Military spending was noticeably higher in Bangladesh during the 1970s. However, the country could maintain on average 12% of central government spending until 2014. Similarly, the defence budget was very low before 1996 in Nepal. Conversely, it started to increase significantly after the civil war in 1996 to an average of 11.5% of central government spending from 1996 to 2014.

Apart from direct military spending, the shadow cost which is not included in the defence budget is much higher. Governments, international agencies, and organisations need to spend millions on scarce resources to assist in peacekeeping, humanitarian aid, hosting refugees, rehabilitation, and reconstruction during and after the conflict. According to the United Nations High Commissioner for Refugees (UNHCR) (2014), conflict, including war has generated 4.7 million refugees in Asia of whom more than 700,000 refugees originate from Sri Lanka and Nepal. Since the sources of income are limited because of poor economic performance, most governments in this region crowd out resources from the economic sectors to manage ever-increasing military spending (Collier, 2006; Harris, 1996).

There were several negative consequences of the continual conflicts and increasing war expenses (see in the appendix 2). Increasing the operational cost of conflicts limits the government's capacity to invest in infrastructure and other economic development activities, which is fundamental for economic growth. Diversion of resources is another reason for a fall in national savings and investment, and an increase in the debt burden and inflation. The government's economic capacity decreases due to a fall in local and foreign investments, fall in tourist arrivals, demolition of infrastructure, destruction of commercial and capital assets, and loss of cultivatable land (Arunatilake, Jayasuriya, & Kelegama, 2000). Also, the productivity of labour decreases mainly due to the killing of productive workers, transferring skilled workers to the military, lack of confidence, vulnerability, hopelessness, and depression among the youth. As a

consequence of armed conflict and vulnerability, South Asia is home to more than 12% of the global poor and could contribute only 3.75% to the global GDP (World Bank's World Development Indicators, 2016). In addition, according to the measures of per capita GDP derived from purchasing power parity (PPP) out of 228 countries in the world, South Asian countries are in the top 80 poor countries in the world (UN Statistical Division, 2015).

Studying the effect of conflict on per capita GDP growth in South Asia is important as the region has experienced hundreds of internal and external armed conflicts. Apart from the discussion by Sithy Jesmy, Abd-Karim and Applanaidu (2016) and Ganegodage and Rambaldi (2014) on war and economic growth in Sri Lanka, no empirical research has been carried out in South Asia. Although military expenditure and conflicts are unlikely to have positive effects on economic growth in developing countries, the literature shows mixed results. The study by Tiwari and Shahbaz (2013) for India, Shahbaz, Afza and Shabbir (2013) and Haseeb, Abu-Bakar, Azam, Hassan and Hartani (2014) for Pakistan found negative effects of military expenditure on economic growth.

However, the empirical studies by Hassan, Waheeduzzaman and Rahman (2003) and Wijeweera and Webb (2011) found significant positive effects of military expenditure on economic growth in South Asia. Similarly, most of the existing studies conclude that conflicts negatively determine economic growth in the conflict-affected developing world (Sithy Jesmy et al., 2016; Dunne, 2012; Ganegodage & Rambaldi, 2014; Murdoch & Sandler, 2002b; Arunatilak et al., 2000). However, Murdoch and Sandler (2002a) found conflicts have a negative impact only in the short-run.

Apart from mixed conclusions about the effect of military expenditure and conflicts on economic growth, there are several limitations in the reviewed literature. Most studies investigated the pooled cointegration relationship between military spending and economic growth in South Asia. Hence, the size of military expenditure and war effect differs from country to country. This pool effect does not reflect the real effect of military expenditure on individual countries. Moreover, they did not support their arguments with appropriate theories and did not include sufficient determinants. Therefore, it is increasingly important to employ appropriate theoretical models, estimation methods and sufficient determinants from the demand and the supply sides in order to examine the effect of conflict on economic growth in conflict-affected developing nations.

Considering the limitations of existing studies, with the sufficient determinants and employing the Solow theoretical growth model and the ARDL bounds test approach to cointegration, this study examines the short- and long-run effects of war on economic growth in individual countries in South Asia. It contributes to the existing literature by employing an appropriate theoretical model, sufficient determinants and estimating

conflict on economic growth in the short- and long-run for individual countries.

The remainder of the paper is organised as follows. Section 2 reviews the existing literature. Section 3 discusses the theoretical model and estimation tool. Section 4 discusses the research findings, and section 5 concludes the paper.

2. Literature Review

2.1 Conflict in South Asia

South Asia is the second largest conflict region in the world after the Middle East (Ghani & Iyer, 2010). Apart from Maldives and Bhutan, other countries in the subcontinent have experienced numerous internal and external conflicts. Until the late 1940s, South Asia stood united as the Indian subcontinent and was controlled by Great Britain. Considering the violence between Muslims and Hindus, the British government subdivided present India for Hindus and East and West Pakistan for Muslims. Since the borders of the two new countries were not determined systematically, endless disputes started soon after the separation. The situation in Kashmir led to a full-scale war in 1965 and 1999, and regular outbursts of violence (Subramanyam Raju, 2001). Other attacks include the hijacking of an Indian passenger plane in 1999; a bomb attack on the Samjhauta Express train in 2007; Mumbai terrorist attacks in 2008, and attacks at the Punjab border in 2014 which increased the tension between the two countries further (Uppsala Conflict Database, 2014). Apart from the regional war, both countries have launched several nuclear tests since the 1990s (Berry & Desai, 2009).

Continuing religious civil unrest and violence are common in India, such as the destruction of the Ayodhya Babri mosque by Hindu fundamentalist in 1992 and several localised land conflicts in Gujarat, Bihar, Chhattisgarh, Jharkhand, Orissa, Andhra Pradesh, Assam and Nagaland (Uppsala conflict database, 2014). Violence perpetrated by Al-Qaida and threats from the Taliban along with domestic conflicts in Baluchistan and military rule are ongoing causes of tension in Pakistan (Uppsala Conflict Database, 2014). Long lasting external and internal conflict are important reasons for the increasing cost of conflict and underdevelopment in India and Pakistan.

Sri Lanka experienced protracted ethnic conflicts and three decades of tragic civil war since 1983 due to the disregard of the minority from the country's political, economic, and social benefits (Robert Oberst, 1996). The concept of "Sinhala nationalism" is the core element of the ethnic conflict. The burning of the public library in Jaffna in 1981 and killing 13 soldiers in Jaffna in 1983 sparked the 30 years civil war in Sri Lanka (Shinoda, 2011; Lunn, Taylor & Townsend, 2009; Robert Oberst, 1996). Another violent

incident among unemployed Sinhalese youth called JVP (People's Liberation Army) occurred during the early 1970s and early 1990s against the government. Although the civil war ended in 2009, the recent riots against Muslim minorities by Buddhist extremists have fuelled tensions further. The civil war and civil unrest have resulted in accelerated war spending and slower economic growth in Sri Lanka.

Civil unrest and military development in Bangladesh were not as severe as that in India, Pakistan, and Sri Lanka. Political violence by a small group of the Chittagong Hill Tracts (CHT) in the South Eastern border, the threat from religious fundamentalists (Islamic Hukumat) and political and institutional violence are the most common problems in Bangladesh (Rahman, 2004). Similar to Pakistan, military rule and military solutions to the political problem have contributed significantly to heightened military spending and poor economic development in Bangladesh. Underdevelopment and grievance were the primary causes of Maoist movements and this inequality transferred to political violence and civil war in Nepal. Ten years of civil war from 1996 between the government and Maoists have contributed significantly to the increased cost of the war in Nepal. The Nepal government made significant efforts through ceasefire agreements to solve the Maoist problem in 2008 (Berry & Desai, 2009).

2.2 Existing Theories and Empirical Research

The theoretical models of economic growth aim to verify the factors that might contribute to economic growth. From time to time, researchers examined the impact of new determinants that might influence economic growth. Following the criticism of Benoit's controversial study, a considerable amount of research has been undertaken to examine the consequences of conflict on economic growth using the Keynesian demand-side model, Feder-Ram model and Solow model.

The Keynesian school of thought suggested that fiscal policy is the main channel to stimulate economic growth through the multiplier effect. According to this approach, causation runs between government spending proportional to economic growth should be positive whereas the military-growth empirical studies like Digger and Sen (1983) and Atesoglu (2002) developed a simple Keynesian framework including military spending. As a component of government expenditure, military spending is a useful exogenous factor that stimulates economic growth through the short-run multiplier effect. However, this model concerns only the factors on the demand side and ignores supply-side factors (Dunne, Smith & Willenbockel, 2005). Furthermore, this approach is better suited for countries that produce military goods because the increasing demand for military goods will enhance economic growth through the utilisation of labour and capital inputs.

Thus, the sampled countries in this study mostly import armament goods. In line with the Keynesian demand-side model, most of the empirical studies in developing countries, particularly in South Asia, found mixed results between the military expenditure and economic growth nexus. Research by Khan (2004), Shahbaz et al. (2013) and Haseeb et al. (2014) for Pakistan, Tiwari and Shahbas (2013) for India found a negative association, while Wijeweera and Webb (2009) found a positive association for Sri Lanka. Since, South Asian countries import armament goods from industrial countries to control conflicts, this theoretical model is not appropriate to examine the war and growth nexus.

Biswas and Ram (1986) employed Feder's neoclassical production function in a study of defence-growth relationship. It suggested that potential output can be determined through the supply side effects generated through the availability of factor productions like natural resources, labour, human capital and technology. In contrast to the Keynesian demand-side model, the Feder-Ram model considered only the factors in the supply side and ignored the factors in the demand side. Dunne et al. (2005) argued that this model has several weaknesses. It does not explain how the error term emerges and explains only the static relationship as the model does not contain any lagged variables. Also, there is a possibility for the simultaneity problem and collinearity problem. Although the literature shows mixed results between military spending and economic growth, empirical findings from the Feder-Ram model generally provide a positive association (Yildirim, Sezgin & Ocal, 2005; Islam, 2015).

Other than the Keynesian model and Feder-Ram model, the augmented Solow model has a solid theoretical base, uncomplicated for the model development and interpretation and allows both the demand and supply side factors (Dunne et al., 2005). The basic Solow model encourages a number of significant development contributions, including several growth determinants. This method is used commonly to examine the war expenditure and war effect on economic growth. Hence, the study aims to examine the effect of conflict on economic growth.

This study focuses on the literature on the effect of conflict on economic growth. For example, Murdoch and Sandler (2002a & 2002b), in their study between the 1960s and 1990s, employed the Solow theoretical model and found conflict had negatively affected per capita income in the sampled countries. In line with similar theoretical models, Dunne (2012) investigated the impact of war on growth using military spending for four income groups in Sub-Saharan Africa. He estimated the model separately for each group, of which one was involved in the conflict, and the other was not. He found the military burden was significant and negative for all income groups, except the upper-middle income countries in Sub-Saharan Africa. However, it was alarming in the poorer countries of the region. A similar theoretical

framework was extended to Sri Lanka by Ganegodage and Rambaldi (2014) and Sithy Jesmy et al. (2016). Both studies concluded that conflict causes a negative effect on economic growth. They measured the effect of war on military expenditure per warring population and battle-related death per military participation.

Kunu, Hopoglu and Bozma (2016) also concluded that corruption, internal and external conflict and population growth negatively contribute to GDP in the Middle East. They employed a corruption index, and internal and external conflict index to measure corruption and conflict. Aziz and Asadullah (2017) examined the effect of military spending and armed conflict (using dummy variables) on economic growth in developing countries in the post-cold war era. Although their findings differ from the various penal data models, the impact of conflict on economic growth is generally negative. However, they include only military expenditure and conflict as political variables which do not reflect the role of government in its entirety.

Experience shows that South Asia experienced hundreds of internal and external armed conflicts. Thus, there should be a direct or indirect effect of conflict on lagged economic development in South Asia. Studies employed several theoretical model and estimation methods. However, all the existing theoretical models are not appropriate to examine the effect of conflict on economic growth in South Asia as that import arms from developing countries. To examine the significant effect of conflict on economic growth in the developing world, it is necessary to employ the appropriate theoretical model with sufficient demand and supply-side factors. Moreover, several measures, namely dummy variable, military expenditure, battle-related death and military participation were used in the literature to measure war effect. Considering the seriousness of the conflicts, it is increasingly important to use an appropriate proxy to measure the effects of conflict.

3. Research Methodology

3.1 Theoretical Model

As suggested by Dunne et al. (2005), given the limitations of other theoretical growth models, the augmented Solow neoclassical growth model is very popular in recent meta-studies on the subject of the effects of conflict on economic growth. In the defence economy, Knight, Loayza and Villanueva (1996) were the first to employ the Solow growth model to examine the military-growth nexus. However, Dunne et al. (2005) systematically developed the Solow growth model, including demand and supply-side variables together with military expenditure. This study

develops the theoretical model based on Dunne et al. (2005). They formulated military expenditure share of output as follows:

$$A(t) = A(t, M) = A_0 e^{gt} m(t)^\pi \quad (1)$$

Since the objective of this research is to examine the impact of conflict on economic growth, Equation (1) has been reformulated by including the effect of conflict as follows:

$$A(t) = A(t, M) = A_0 e^{gt} [C(t)]^\pi \quad (2)$$

Measuring the effect of conflict is a non-trivial problem. In the literature, many measures have been used as a proxy for conflicts. Among them, Gates et al. (2012), Jeanty and Hitzhusen (2006) and Sithy Jesmy et al. (2016) used battle-related deaths per year. Although battle-related deaths are an appropriate measure of the effect of conflict, data is not available for each year for all South Asian countries. On the other hand, Murdoch and Sandler (2002a & 2002b), Poirier (2012) and Aziz and Asadullah (2017) used a dummy variable as a proxy for conflict. Hence, the size of the war is different from country to country. Dichotomies dummy variables do not reflect the seriousness of the conflicts, and it is not appropriate if the country (Example: India) experienced conflict in the sample period. Besides this, according to the statistics provided in the introduction, unlike other countries, the obvious reasons for increasing military expenditure and military personnel in South Asia is conflict. Military expenditure in South Asia has increased simultaneously with various types of conflict. In other words, military expenditure in South Asia is mostly a cost of conflicts. Ganegodage and Rambaldi (2014) measured war effect variable through a combination of military spending and armed personnel. Considering the availability of data and the obvious reasons for increasing war expenditure is conflicts, this study also used military expenditure (USD million) per warring population ((MEWP) as a proxy for conflict. Thus, by substituting military spending per warring population, Equation (2) can be rewritten as:

$$A(t) = A(t, M) = A_0 e^{gt} [m(t)/wp]^\pi \quad (3)$$

Where, $(m(t))$ represents military expenditure and (wp) signifies warring population. The above Equation (3) assumes that conflict ' $C(t) = \frac{m(t)/wp}{Y}$ ', influences the output via an efficiency parameter that controls labour-augmenting technical changes (Knight *et al.*, 1996; (Dunne et al., 2005). The Solow growth model for output $[Y(t)]$, including labour $[L(t)]$, physical

capital $[K(t)]$ and human capital $[H(t)]$, conflict $[c(t)]$ and level of technology parameter $[A(t)]$ can be written as:

$$Y(t) = A(t, c(t)) K(t)^\delta H(t)^\eta L(t)^{1-\delta-\eta}; \quad 0 < \delta + \eta < 1 \quad (4)$$

The steady-state labour efficiency $A(t)L(t)$ model for per capita GDP (Note 2) with conflict can be written as follows:

$$\begin{aligned} \ln y_e(t) = e^{-\tau t} \ln y(0) + (1 - e^{-\tau t}) [\ln A(0, C(t)) + g t] + \frac{\delta}{1 - \delta - \eta} \ln(S_k) + \\ \frac{\eta}{1 - \delta - \eta} \ln(S_h) - \frac{\delta + \eta}{1 - \delta - \eta} \ln(g + n + d)] + \varepsilon(t) \end{aligned} \quad (5)$$

Where, ' $C(t)$ ' represents a conflict - effect. Hence, Equation (5) can be rearranged as follows:

$$\begin{aligned} \ln y_e(t) = e^{-\tau t} \ln y(0) + (1 - e^{-\tau t}) \left[\ln A(0) + \frac{\delta}{1 - \delta - \eta} \ln(S_k) + \frac{\eta}{1 - \delta - \eta} \ln(S_h) - \right. \\ \left. \frac{\delta + \eta}{1 - \delta - \eta} \ln(g + n + d) \right] + \Psi(1 - e^{-\tau t}) \ln c(t) + \varepsilon(t) \end{aligned} \quad (6)$$

The steady-state long-run GDP per capita can be re-parameterised in detail by setting $\alpha_0 = (1 - e^{-\tau t}) \ln A_0 + e^{-\tau t} \ln y(0)$ in Equation (6) as follows:

$$\begin{aligned} \ln y_e(t) = \alpha_0 + (1 - e^{-\tau t}) \left[\frac{\delta}{1 - \delta - \eta} \ln(S_k) + \frac{\eta}{1 - \delta - \eta} \ln(S_h) \right. \\ \left. - \frac{\delta + \eta}{1 - \delta - \eta} \ln(g + n + d) \right] + \Psi(1 - e^{-\tau t}) \ln c(t) + \varepsilon(t) \end{aligned} \quad (7)$$

Equation (7) can be further re-parameterised in reduced form, including the control variable 'trade openness' as follows:

$$\ln y_e(t) = \alpha_0 + \alpha_1 \ln(S_k(t)) + \alpha_2 \ln(S_h(t)) - \alpha_3 \ln(g + n + d) + \alpha_4 \ln c(t) + \alpha_5 \ln to(t) + \varepsilon(t) \quad (8)$$

or

$$\ln GDP(t) = \alpha_0 + \alpha_1 \ln F(t) + \alpha_2 \ln HCE(t) - \alpha_3 \ln(gnd) + \alpha_4 \ln MEWP(t) + \alpha_5 \ln TO(t) + \varepsilon(t) \quad (9)$$

Equations (8 and 9) require a linear modelling of the transition path of output per capita around its steady state level (Knight et al., 1996). As a result, all the variables in Equations (8 and 9) follow a natural log. Most of

the variables used in this study and its level of measures have generally followed the study of Dunne et al. (2005); Dunne and Nikolaidou (2012); Dunne (2012). The description of the variables are $y(t)$ or $GDP(t)$: per capita GDP (dependent variable) and $c(t)$ or $MEWP(t)$ effect of conflict (main independent variable) measured through military spending per warring population ratio to GDP. Since conflict decreases output in numerous ways, its sign is expected to be negative in determining per capita GDP. Empirical research by Murdoch and Sandler (2002a & 2002b) and Sithy Jesmy et al. (2016) found a significant negative effect of conflict on per capita GDP. Apart from the main independent variable, other control variables, namely, the fixed capital ratio to GDP (Sk or $FC(t)$), human capital expenditure ratio to GDP (Sh or $HCE(t)$), peroxide by education and health expenditure and, Trade openness ratio to GDP ($to(t)$ or $TO(t)$) are generally supported to enhance per capita GDP. A few studies, (Knight et al., 1996; Baldacci, Clements, Gupta & Cui, 2008; Dunne et al., 2005) have revealed the positive effect of these control variables on per capita GDP. Meanwhile, 'n' is another control variable referring to population growth rate as a proxy for the labour force (Note 3) of a country. The value of $(n+(g+d))$ (Note 4) is equivalent (Note 5) to $n+0.05$. Empirical research by Baldacci et al. (2008) also used population growth rate as a proxy for the labour force growth rate and found a significant negative effect in determining per capita GDP.

3.2 Econometric Model: ARDL Bound Test Approach to Cointegration

Compared to other cointegration approaches, the Autoregressive Distributed Lag (ARDL) bounds test approach postulated by Pesaran, Shin and Smith (2001) has been chosen for this study mainly because it has proven to be more efficient for a small sample. Moreover, it has developed a simple single-equation set-up, making it simple to implement and interpret (Harris & Sollis, 2003). Moreover, this approach has not been a victim of endogeneity as it allows testing the cointegration relationship by differentiating dependent and explanatory variables (Ahmed, Muzib & Roy, 2013). Considering the advantages over conventional cointegration methods, in the defence economy, many researchers have employed this approach in empirical studies (Sithy Jesmy et al., 2016; Shahbaz et al., 2014). Before estimating short-run dynamic effects, and the long-run equilibrating relationship between the variables, the following unrestricted ARDL model has been developed by Pesaran et al. (2001) in order to examine some prerequisites.

$$\begin{aligned}
\Delta \ln GDP_t = & \alpha_0 + \sum_{i=1}^{p1} \Phi_{1i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{p2} \Phi_{2i} \Delta \ln FC_{t-i} + \sum_{i=0}^{p3} \Phi_{3i} \Delta \ln HCE_{t-i} + \sum_{i=0}^{p4} \Phi_{4i} \Delta \ln ngd_{t-i} \\
& + \sum_{i=0}^{p5} \Phi_{5i} \Delta \ln TO_{t-i} + \sum_{i=0}^{p6} \Phi_{6i} \Delta \ln C_{t-i} + \Theta_1 \ln GDP_{t-1} + \Theta_2 \ln FC_{t-1} + \Theta_3 \ln HCE_{t-1} \\
& + \Theta_4 \ln ngd_{t-1} + \Theta_5 \ln TO_{t-1} + \Theta_6 \ln C_{t-1} + u
\end{aligned} \tag{10}$$

Equations (8 and 9) define the variables. In the ARDL approach to cointegration, it is important to determine the optimum lag-length of variables [ARDL(p1,p2,p3,p4,p5,p6)] included in the model to make sure the errors in Equation (10) are serially independent and the estimated model is dynamically stable. Determining optimal lag-length leads to meaningful cointegration results (Ng & Perron, 2001). However, it does not require symmetry of lag-lengths. Similarly, bounds test is to be performed in order to take the decision of cointegration (Note 5) by testing the null hypothesis of no cointegration in Equation (10) ($H_0: \Theta_1 = \Theta_2 = \Theta_3 = \Theta_4 = \Theta_5 = \Theta_6$). If there is evidence for the long-run relationship between the variables, then the long- and the short-run models can be estimated from the following ARDL error correction model.

$$\begin{aligned}
\Delta \ln GDP_t = & \alpha_0 + \sum_{i=1}^{p1} \Phi_{1i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{p2} \Phi_{2i} \Delta \ln FC_{t-i} + \sum_{i=0}^{p3} \Phi_{3i} \Delta \ln HCE_{t-i} + \sum_{i=0}^{p4} \Phi_{4i} \Delta \ln ngd_{t-i} \\
& + \sum_{i=0}^{p5} \Phi_{5i} \Delta \ln TO_{t-i} + \sum_{i=0}^{p6} \Phi_{6i} \Delta \ln C_{t-i} + \lambda ETC_{t-1} + u_t
\end{aligned} \tag{11}$$

From Equations (10 and 11), Φ_{ij} are the short-run coefficients, Θ_{ij} is the long-run coefficients, and ECT_{t-1} is an error correction term.

3.3 Data

Data used in the present study for all five countries related to population growth rate, fixed capital formation, per capita GDP, trade openness from 1980 to 2014 and education and health expenditures from 1995 to 2013, were collected from the World Bank's World Development Indicator (2015). Statistical reports for each country were used to collect data for other years of the variables such as education and health expenditure. Data for military expenditure and warring population (military participation) from 1988 to 2014 was obtained from the Stockholm International Peace Research Institute (SIPRI Military Expenditure Database, 2014). From 1980 to 1987, for India and Pakistan, the data were collected from the Regional Centre for Strategic Study (RCSS) Policy Study-10 (by Singh & Cheema, 2000) and Bangladesh and Sri Lanka, from RCSS Policy Study-11 (by Chowdhury &

De-Silva, 2000). However, data for Nepal from 1980-1987 was extrapolated using appropriate univariate time-series. Due to the absence of data before 1980 for military, education and health expenditures, this study used annual time-series data from 1980 to 2014.

4. Empirical Findings and Discussion

4.1 Unit Root Test

The ARDL approach is employed because it can be used to estimate the cointegration relationship even though the variables are found integrated with the mixed order [$I(0)$, $I(1)$] or mutually. However, it is important to confirm that none of the variables is stationary at the second difference, i.e. $I(2)$ because it will invalidate the methodology. This study employs DF-GLS and Ng-Perron tests for testing the presence of unit root in time-series variables. These two statistics provide good explanatory power, size and, are also good for small samples (Martin, Hurn & Harris, 2012). Unit root test results reported in Table 1 confirm that most of the variables in all countries are stationary at first difference, but some of them are stationary at level.

Table 1: Unit Root Test Results

Countries	Variables	DF-GLS			Ng-Perron (MZ_t Statistics)		
		Level	1 st Difference	Conclusion	Level	1 st Difference	Conclusion
Bangladesh	$\text{Log}(GDP_t)$	1.129	-5.030*	$I(1)$	1.568	-2.797*	$I(1)$
	$\text{Log}(ngd)_t$	-0.242	-2.255**	$I(1)$	-0.815	-2.169**	$I(1)$
	$\text{Log}(TO)_t$	-0.473	-3.785*	$I(1)$	-0.412	-2.556**	$I(1)$
	$\text{Log}(FC)_t$	0.532	-3.719*	$I(1)$	0.355	-2.546**	$I(1)$
	$\text{Log}(HCE)_t$	-0.306	-6.260*	$I(1)$	0.179	-2.736*	$I(1)$
India	$\text{Log}(MEWP)_t$	-1.246	-6.778*	$I(1)$	-1.121	-2.733*	$I(1)$
	$\text{Log}(GDP)_t$	1.607	-5.022*	$I(1)$	2.081	-2.849*	$I(1)$
	$\text{Log}(ngd)_t$	2.287	-2.943*	$I(1)$	-0.774	-5.549*	$I(1)$
	$\text{Log}(TO)_t$	0.543	-2.141**	$I(1)$	0.818	-2.702*	$I(1)$
	$\text{Log}(FC)_t$	-1.195	-2.265**	$I(1)$	-1.008	-2.012**	$I(1)$
Nepal	$\text{Log}(HCE)_t$	-0.598	-4.815*	$I(1)$	-0.579	-2.830*	$I(1)$
	$\text{Log}(MEWP)_t$	-0.748	-5.843*	$I(1)$	-0.695	-2.870*	$I(1)$
	$\text{Log}(GDP)_t$	2.011	-5.022*	$I(1)$	2.664	-2.836*	$I(1)$
	$\text{Log}(ngd)_t$	0.703	-2.974*	$I(1)$	1.446	-3.773*	$I(1)$
	$\text{Log}(TO)_t$	-0.732	-4.188*	$I(1)$	-0.473	-2.724*	$I(1)$
Pakistan	$\text{Log}(FC)_t$	-0.476	-6.888*	$I(1)$	-0.294	-2.812*	$I(1)$
	$\text{Log}(HCE)_t$	-0.897	-4.824*	$I(1)$	-0.728	-2.736*	$I(1)$
	$\text{Log}(MEWP)_t$	-0.281	-5.408*	$I(1)$	-0.072	-2.868*	$I(1)$
	$\text{Log}(GDP)_t$	1.494	-4.492*	$I(1)$	2.019	-2.747*	$I(1)$
	$\text{Log}(ngd)_t$	0.907	-5.729*	$I(1)$	1.273	-2.498**	$I(1)$
	$\text{Log}(TO)_t$	-2.730	-	$I(0)$	-2.174	-	$I(0)$

Table 1: (Continue)

Countries	Variables	DF-GLS			Ng-Perron (MZ_t Statistics)		
		Level	1 st Difference	Conclusion	Level	1 st Difference	Conclusion
Pakistan	$Log(FC_t)$	-1.519	-5.713*	$I(1)$	-1.399	-2.814*	$I(1)$
	$Log(HCE_t)$	-1.374	-3.576*	$I(1)$	-1.356	-2.256**	$I(1)$
	$Log(MEWP_t)$	-1.213	-3.997	$I(1)$	-1.033	-2.358*	$I(1)$
Sri Lanka	$Log(GDP_t)$	-1.392	-3.452*	$I(1)$	1.399	-1.992**	$I(1)$
	$Log(ngd)_t$	-1.958**	-	$I(0)$	-2.858*	-	$I(0)$
	$Log(TO_t)$	-0.533	-3.843*	$I(1)$	-0.297	-2.624*	$I(1)$
	$Log(FC_t)$	-2.372	-	$I(0)$	-1.953	-2.829*	$I(0)$
	$Log(HCE_t)$	-2.400**	-	$I(0)$	-2.020**	-	$I(0)$
	$Log(MEWP_t)$	-0.849	-3.168*	$I(1)$	-0.382	-2.287**	$I(1)$

Note: ** and * denote 5% and 1% level of significance respectively.

4.2 Prerequisites of ARDL Bounds Test

Determining an optimal lag-length of the variables included in the model is an important prerequisite in the ARDL approach and is important to acquire meaningful cointegration results (Ng & Perron, 2001). Also, unlike the other approaches, different variables can be assigned different lag-lengths as they enter in the model. The optimal ARDL model for $[ARDL(p_1, p_2, p_3, p_4, p_5, p_6)]$ is selected based on Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) statistics. A summary of selected ARDL models for all countries is presented in Table 2.

Table 2: Prerequisite of ARDL bounds test

Country	Optimal Lag	Decision of Cointegration		LM test for Serial Correlation	
		'F' Statistics	Conclusion	'F' Statistics	'p' Value
Bangladesh	ARDL (1,0,2,0,2,0)	10.818 (a)	exist at 1%	1.944	0.169
India	ARDL (1,2,0,0,1,2)	4.078 (b)	exist at 5%	1.247	0.309
Nepal	ARDL (1,1,1,1,1,1)	7.028 (c)	exist at 1%	3.647	0.071
Pakistan	ARDL (2,0,0,0,0,2)	5.660 (b)	exist at 1%	1.696	0.206
Sri Lanka	ARDL (1,0,0,1,1,0)	5.080 (b)	exist at 1%	1.478	0.236

Note: (a) Unrestricted intercept 10%: $I(0)=2.26, I(1)=3.35$; 5%: $I(0)=2.62, I(1)=3.79$; 1%: $I(0)=3.41, I(1)=4.68$

(b) Restricted intercept 10%: $I(0)=2.08, I(1)=3.00$; 5%: $I(0)=2.39, I(1)=3.38$; 1%: $I(0)=3.06, I(1)=4.15$

(c) Restricted trend 10%: $I(0)=2.49, I(1)=3.38$; 5%: $I(0)=2.81, I(1)=3.76$; 1%: $I(0)=3.50, I(1)=4.63$

Often, we assume that in the case of the ARDL bounds test approach, errors in Equation (10) are not correlated. According to the results reported in Table 2, we can accept the null hypothesis or no serial correlation accepted since the ' p ' values recorded in the Breusch-Godfrey serial correlation LM test statistics are greater than 0.05. The results conclude that the estimated models are free from serial correlation in all countries. Although the ARDL model has the ability to detect heteroskedasticity since it allows different lag order, a robust ARDL model is estimated using a White test that rectifies the problem of heteroskedasticity. Another important prerequisite of the ARDL bounds test is that the estimated model must be dynamically stable. The CUSUM plot of recursive residuals presented in Figure 2 (see appendix 1) in the appendix confirms that the parameters are stable for all countries since the cumulative sum of residuals lies between the 5% critical value.

Before proceeding to estimate the relationship between long- and short-run estimates, it is imperative to confirm the presence of the long-run relationship among variables. The conclusion of cointegration in this study is derived based on Pesaran et al.'s (2001) critical value table recommended for the independent variables ($k=5$) and number of observations ($n=34$). According to the result presented in Table 2, the null hypothesis of no cointegration is rejected since the estimated ' F ' values exceeded the upper bound critical value at a respective significance level.

4.3 Long- and Short-run Cointegration Results

The negative, statistically significant and less than one absolute value of the error correction coefficient (*ECT*) stated in Table 3 for all five countries ('-0.216' in Bangladesh; '-0.485' in India; '-0.752' in Nepal; '-0.239' in Pakistan and '-0.097' in Sri Lanka) indicates that the estimated model converge towards the equilibrium within the specific values of *ECT*. However, apart from Nepal, because of the long memory of time-series data, all the countries have a slower rate of speed of adjustment in the growth model.

Long- and short-run estimates presented in Table 3 indicate that most of the variables have an expected sign in the long- and short-run for all five selected countries. Also, estimated coefficients illustrate the elasticity of independent variables. The sign of the coefficient of the conflict-affect variable ($\text{Log}(MEWP_t)$) has an expected negative sign in both periods in all countries. It is however statistically significant in the long-run in all countries apart from Bangladesh and the short-run in all countries apart from Nepal and Sri Lanka. The results suggest that in the long-run, other factors remain the same, a percentage increase in the effect of conflict will decrease per capita GDP by 0.4%, 0.3%, 1.4% and 1.0 percent in India, Nepal, Pakistan and Sri Lanka respectively. Unlike the long-run, the effect of military

spending on per capita GDP is marginal and statistically significant only in Bangladesh and Pakistan in the short-run. Results indicate that, in the short-run, a percentage increase in the effect of conflict will decrease per capita GDP by 0.1% in Bangladesh and 0.2% in Pakistan.

Elasticity coefficients of the control variables included in the growth model generally have an expected sign. One of the important determinants of per capita GDP in the Solow growth model is fixed capital ($Log(FC_t)$), and it is generally adopted to boost the economic growth. The results in Table 3 show that, apart from Bangladesh, the coefficient of fixed capital is mostly positive and statistically significant in the long- and short-run in all countries.

Another important determinant that enhances per capita GDP is human capital ($Log(HCE_t)$). It is proxied by education and health spending. Similar to fixed capital, human capital commonly displays a positive relationship with per capita GDP in all countries. It is, however, statistically significant in Bangladesh and India in the long-run and Sri Lanka in the short-run. Another important variable in the growth model is trade openness ($Log(TO_t)$) which generally enhances per capita GDP. The coefficient of trade openness is expected to be positive in all countries in the long- and short-run. It is statistically significant in Bangladesh and Pakistan in both periods in Nepal in the short-run. Similarly, the coefficient of ' ngd_t ' has an expected negative sign in all countries apart from Bangladesh but is statistically significant in India and Sri Lanka.

The findings from this study indicate that that detrimental effect of conflict on per capita GDP is much higher in Pakistan, Sri Lanka and India compared to Bangladesh and Nepal. Out of more than 400 conflict incidents in South Asia, 85% were in these three countries. Pakistan and India spend most of its resources on the military for border security and threats from neighbouring countries, the Kashmir problem, domestic conflict, Al-Qaida terrorist attacks and military establishment. Three decades of bitter ethnic war, and continuous religious extremist and political conflicts are important reasons for the increasing military expenditure and slow rate of economic growth in Sri Lanka. Our findings show that conflict negatively impacts on GDP growth in Nepal. However, the effect is not as grave as India, Pakistan and Sri Lanka as the government of Nepal ended the civil war in a relatively short period. Similarly, the findings show that the effects of conflict on economic growth are much lower in Bangladesh in both periods.

The negative effect of conflict on per capita GDP in the long- and short-run in South Asia supports the findings of Ganegodage and Rambaldi (2014) and Sithy Jesmy et al. (2016) for Sri Lanka who employed the Solow theoretical model. Apart from the independent variables, the significance of other control variables is largely consistent with earlier findings with a similar theoretical model. For example, the positive effect of fixed capital,

Table 3: Long- and Short-run Coefficient

Variable	Bangladesh		India		Nepal		Pakistan		Sri Lanka	
	ARDL(1,0,2,0,2,0)		ARDL(1,2,0,0,1,2)		ARDL(1,1,1,1,1,1)		ARDL(2,0,0,0,0,2)		ARDL(1,0,0,1,1,0)	
	Coefficient	't' Value								
Long – Run Estimated Results										
$\text{Log}(ngd)_t$	0.397	1.701	-2.622	-2.400**	-0.114	-0.408	1.579	2.487**	-0.584	-1.323
$\text{Log}(TO)_t$	2.119	3.324*	-0.156	-0.365	-0.779	-1.948***	1.247	2.099**	0.578	0.643
$\text{Log}(FC)_t$	-4.173	-2.281**	0.949	3.719*	0.537	2.716**	-1.078	-1.878	-0.131	0.144
$\text{Log}(HCE)_t$	1.697	4.987*	0.621	2.840*	-0.298	-1.570	0.374	1.056	1.134	0.862
$\text{Log}(MEWP)_t$	-0.434	-1.287	-0.464	-2.041**	-0.296	-2.196**	-1.438	-5.008*	-0.981	-3.054*
c	-	-	8.842	4.326*	-	-	5.967	3.058*	11.720	2.376**
t	-	-	-	-	0.036	5.950*	-	-	-	-
Short –Run Estimated Results										
$\Delta \text{Log}(GDP)_t(-1)$	-	-	-	-	-	-	-0.512	-3.048*	-	-
$\Delta \text{Log}(ngd)_t$	0.049	0.439	0.648	0.268	1.356	5.231*	0.193	-0.842	-0.064	-2.857**
$\Delta \text{Log}(ngd)_t(-1)$	-	-	7.364	2.406**	-	-	-	-	-	-
$\Delta \text{Log}(TO)_t$	0.183	3.895*	0.018	0.138	0.291	2.719**	0.309	2.390**	11.720	-1.953***
$\Delta \text{Log}(TO)_t(-1)$	-0.269	-5.215*	-	-	-	-	-	-	-	-
$\Delta \text{Log}(FC)_t$	-0.914	-4.719*	0.432	4.231*	0.134	1.683	0.388	2.582**	0.664	5.332*
$\Delta \text{Log}(HCE)_t$	-0.063	-1.263	-0.921	-6.308*	0.046	0.508	-0.204	-2.060**	0.292	2.417**
$\Delta \text{Log}(HCE)_t(-1)$	-0.264	-5.438*	-	-	-	-	-	-	-	-
$\Delta \text{Log}(MEWP)_t$	-0.086	-3.153*	-0.021	-1.618	-0.031	-0.607	-0.205	-4.407*	-0.065	-1.446
$\Delta \text{Log}(MEWP)_t(-1)$	-	-	0.229	5.1468*	-	-	-0.353	-3.662*	-	-
C	2.384	11.761*	-	-	5.735	8.030*	-	-	-	-
ECT_{t-1}	-0.216	-11.440*	-0.485	-6.584*	-0.752	-7.953*	-0.239	-7.046*	-0.097	-6.224*

Note: ***, ** and * denote 10%, 5% and 1% level of significance respectively.

trade openness, and the negative, effect of 'ngd' are in line with the earlier findings of Knight et al. (1996) and Baldacci et al. (2008). The results of the positive effect of human capital spending are consistent with the findings of Baldacci et al. (2008) and Rahman (2011).

This research findings further highlight that one of the obvious reasons for decreasing GDP growth is conflict and associated increasing military expenditure. South Asian countries spend on an average 20% of government spending on the military sector (WBs-WDI, 2015). Since the sources of income are limited, military spending is financed by increasing the money supply and debt (Harris, 1996). It is increasingly important to understand that an increase in military spending can limit the government's capacity to invest resources in other productive economic sectors and it can increase the debt burden and inflation (Dunne & Uye, 2010). Also, South Asian countries should realise that conflict increases the cost of food production, slows commercialisation and stock management system, and decreases the productivity of labour by human casualties and by the relocation of productive labour to the military sector.

5. Conclusion and Policy Recommendations

This study determined the impact of conflicts on per capita GDP growth rate in conflict-affected countries in South Asia, namely Bangladesh, India, Nepal, Pakistan and Sri Lanka for 1980 - 2014 by applying the Solow theoretical growth model and ARDL bounds test approach to cointegration. Prior to the estimation of equilibrium relationship, we performed unit root tests, diagnostic test, stability test and evidence of cointegration test. The findings from the ARDL estimations show that conflict has a negative effect on per capita GDP in the long-run and short-run in all South Asian countries. Apart from conflicts, all the other control variables have the expected sign in the long- and short-run in all countries.

The key finding of this study is that military expenditure per warring population negatively impacts per capita GDP, mostly in Pakistan, Sri Lanka, India and Nepal. It is obvious that some level of military spending is necessary to protect the country from external threat and provide internal security. It becomes a problem when the government increases resources on military beyond its capacity, as the region has vulnerable economic development. Therefore, decision-makers should understand that massive allocation of military expenditure is an indication of militarisation and facilitation of conflicts that damage the entire economic development. The possibilities of minimising military spending depend on responsibility, accountability and transparency of each government in South Asia.

Enhancing economic growth in South Asia highly depends on ending the conflict. Solutions to these conflicts are possibly more effective through political means rather than the military. For example, the government can control several political conflicts, ethnic conflicts, religious riots and homicides by implementing good governance from the grassroots and honouring the rights of minorities. In South Asia, most of the conflicts took place due to social, religious, ethnic and reasons which are preventable by reducing the regional disparity between lagged and lead regions and giving equal rights and opportunities to minorities. Also, the implementation of cross-border cooperation between countries is vital for each government to prevent international conflicts and several local conflicts.

Most importantly, most of the political, social, religious and homicides are preventable by getting rid of minor political goals through the elected representatives of each country. Therefore, it is highly recommended that policymakers and governments should establish constructive policies to prevent and control these conflicts. Preventing conflicts and encouraging peace undoubtedly support economic growth in South Asia.

Notes

1. Global Peace index in Singapore is 24 and Malaysia is 28.
2. Here, $y(t) = \frac{Y(t)}{A(t)L(t)} = [I/A(t)]y_e(t)$ level of output per efficient unit of labour.
3. Long time-series data for labour force is not available in any of South Asian countries.
4. 'n' is the population growth rate, 'g' is the technological progress and d is the capital depreciation rate.
5. Mankiw et al. (1992) assumed $(\delta+g) = 0.05$. According to their empirical study based on U.S. data on capital consumption allowance, they obtained ' $\delta=0.03$ ' and ' $g=0.02$ '.
6. Using the Pesaran *et al.*'s (2001) critical value table, evidence of cointegration is tested. When the calculated 'F' statistics exceed the upper bound critical value, the null hypothesis of no cointegration in bounds test have rejected.
7. Some country level statistical reports have been used to collect data Education and health expenditure. For example, India - various reports from the department of higher education in the Ministry of Human Resource Development; Sri Lanka - various issues of the Central Bank annual report; Pakistan - "50 years statistical summary of Pakistan", Volumes I-IV, published by the Pakistan Bureau of Statistics, Government of Pakistan; Nepal - Statistical publication reports. Bangladesh - data extrapolated from 1980-1987 using

appropriate univariate (trend, exponential and quadratic) time-series method.

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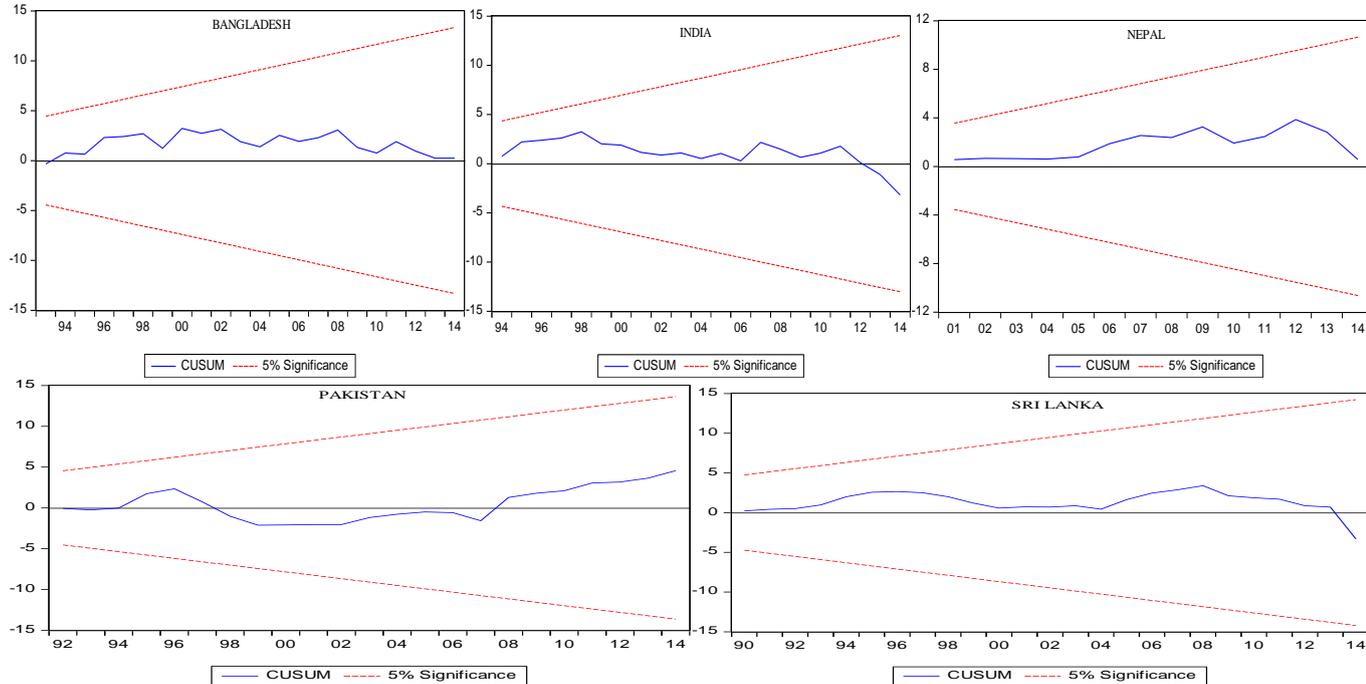
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Appendices

Appendix 1: CUSUM plot for All South Asian Countries



Appendix 2: Causes of Conflict on Per Capita GDP

