When Armies Don't Fight: Are Militaries in India and Pakistan Strategically Aligned to Promote Peace in South Asia?

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Abstract:

The paper analyses role of military spending and number of military personnel in India and Pakistan in conflict mitigation. The paper finds that Pakistan's military spending is a cause of deterrence from Indian hegemony in the region confirming the defence literature that puts the role of military as a strategic asset for a country. The paper also suggests that both democracy and economic development puts downward pressures on India and Pakistan hostilities however democracy is not a sufficient condition in itself to mitigate conflict. The innovation of the paper is that it constructs real proxies of conflict from the defence literature and utilizes defence spending in the analysis as a means to a peaceful resolution between bilateral issues within South Asian region.

Keywords: Military, Conflict Resolution, South Asia

1. Introduction: Rational behind Military Spending?

One of the main duties of a sovereign country is to protect its territory and people from violence emanating from other countries or from non-state actors such as terrorist groups. This duty can mainly be performed by means of military power. There is a substantial body of theoretical and empirical literature in political science and economics that seeks to explain defense spending. The theoretical explanations can be classified in three categories: (1) arms races; (2) organizational and bureaucratic politics; and (3) economic welfare maximization. The arms race literature, following Richardson (1960), explains time-series patterns of military expenditure in terms of action-reaction behavior between two rivals. It identifies three major influences: (a) the military spending of the other nation (rival) in the threat system (the 'reaction', 'defense' coefficient); (b) the economic burden of defense (the 'fatigue coefficient'); and (c) the underlying grievances held by one nation against the other (the 'grievance' coefficient). The arms-race model of military expenditure seems more suitable for countries involved in conflict or engaged in an enduring rivalry, such as the US–USSR Cold War rivalry (Majeski, 1985), the Indian–Pakistani (Deger and Sen, 1990), the Arab–Israeli (Mintz et al., 1990), and the Greek–Turkish relationships (Kollias and Makrydakis, 1997). In these cases the military preparedness of the other represents the overwhelming security issue/consideration.

The organizational and bureaucratic politics explanation emphasizes 'incrementalism' and bargaining over the defense budget, starting from the status quo. It implies that the best predictor of new increments to military spending is simply the increments of the immediate past; that is, the main determinant of this year's defense budget is last year's budget (Correa and Kim, 1992). The economics literature tends to ignore bureaucratic or political processes. It uses a standard neo-classical model in which a nation-state is represented as a rational agent who maximizes a welfare function depending on security and economic variables subject to a budget constraint. Defense spending balances the welfare benefits of extra security derived from military expenditure against its opportunity costs in terms of forgone civilian output (Dunne and Perlo-Freeman, 2001; Avramides, 1997; Smith, 1995). Economic resources are usually proxied by GDP; external threat by military spending in the nation's rival(s) as well as in country's allies; domestic economic factors by variables such as the budget deficit, inflation, unemployment; political variables, by variables such as the ideology of the political party in power and the electoral cycle. Most studies on the demand for military spending employ time-series analysis for individual countries but there are also a few cross-sectional studies (for instance, Dunne and PerloFreeman, 2001). Country studies have produced mixed results for the main determinants of defense spending, making it difficult to come up with useful generalizations.

Developing countries have enough problems without either the waste of resources constituted by military expenditure, or the social and economic destruction brought about by warfare. Some of the strongest empirical influences on military expenditure reflect either neighborhood arms races, or the patronage demands of politically powerful military establishments. Both of these problems are potentially addressable. One of the other major influences on military expenditure in developing countries is internal rebellion. Where civil wars are ongoing military expenditure is greatly elevated. Further, there is evidence that governments set their defense expenditure at levels designed to deter such rebellions. Since, poor economic performance is a major risk factor, high military expenditure, by contributing to such poor performance, may inadvertently contribute to the risks that it is attempting to reduce. Both military expenditure and war retard development. This is not surprising, but there is now reasonable quantitative evidence on the scale of the effects. Military expenditure diverts government resources that could be put to better use – public services, infrastructure, or lower taxes.

For developing countries, the adverse effects of a given level of military expenditure on income are probably even more costly than for the global average. In developed countries such expenditure may in part be concealed routes for providing subsidies to high-tech firms, hence the term "military-industrial complex." In the poorer developing countries military equipment is imported, rather than produced domestically and so does not offer any side-benefits to technical progress. For developing countries by far the most common form of war is civil war. Whereas international warfare is often quite brief, civil wars last a long time – typically around seven years. Such wars are getting longer – they now appear to continue for around three times as long as the civil wars prior to 1980. The cost of civil war is considerable. During the war the growth rate is typically reduced by around 2 percent. The losses can sometimes continue post-war: for example, people may continue to move their wealth out of the country due to perceived high risks of further conflict. Such perceptions would often not be misplaced.

Developing countries have astonishing levels of poverty, yet their governments choose to devote a significant proportion of their resources to military spending which, as discussed above, actually retards growth and so accentuates that poverty. The global average for military spending is around 3.5 percent of GDP, but the ranges from virtually zero, to an astonishing 45 percent. Five factors are driving these large differences: 1. Active international warfare 2.

Peacetime military budget inertia 3. Neighborhood effects (arms races) 4. Internal rebellion or civil war 5. Beneficiaries and vested interests The most obvious is that high military expenditure is sometimes a response to active warfare.

There are also large differences in military spending among countries that are at peace. We find that one important influence on spending is if there is a past history of international war. Countries that have such a history spend around 1.3 percent of GDP more than countries that have not. Possibly this reflects an assessment of the higher risk of future conflict. However, it may also reflect inertia or political interests – once a country has built a large military, as happens during war, there are internal forces maintaining the level of government expenditure. Such persistence would not be surprising; it is indeed common in other areas of public expenditure. To the extent that a past war raises military expenditure because of a perceived higher risk of further war, it reflects fear of neighbors, or aggressive intentions towards them. We might therefore expect that the level of military expenditure chosen by a government would, to an extent, be influenced by the level chosen by its neighbors. This is indeed what we find. That is, the average level of spending of neighboring countries significantly influences the level chosen by a government. This can be interpreted in various ways, the most obvious of which is that of a neighborhood arms race. For most countries the most serious external threat comes from their neighbors and so the appropriate level of deterrence is set by the behavior of neighbors. A different interpretation of the same phenomenon is that military expenditure is set by regional norms of behavior, in a form of emulation. If the neighbors are spending a particular share of national income on defense, then the chiefs of the military, or the minister of defense, have a relatively easy case to argue with the minister of finance, that their own country should spend approximately at the same level. Whatever the interpretation, the consequence of this regional spillover effect is that military expenditure is, in effect, a regional public bad. Each time one country raises its military expenditure there will be a ripple effect across the region. Further, as neighbors respond to the initial increase, the country that increased its military expenditure may itself respond with further increases – the classic process of an arms race. We estimate that the typical multiplier from an initial increase in spending in one country to the new neighborhood equilibrium may involve both the country and its neighbors having increased the level of spending by around three times the initial increase. While the threat of international war is clearly one concern that might motivate military spending, for most developing country governments internal rebellion is a far more likely threat than international war. Currently, civil wars are around ten times as common as international wars. Thus, military expenditure may often be motivated by the desire to defend the government from the threat of rebellion.

The above motivations for military expenditure have either been to fight a war or to deter it. However, these are not the only motivations for military spending. As with other forms of public expenditure, military expenditure has beneficiaries. In developed countries these beneficiaries are largely industrial companies that produce military hardware. Developing countries largely import such hardware and so the domestic beneficiaries are predominantly military employees. We might therefore expect that where military employees have a lot of influence over government decisions, the government will be persuaded to choose a higher level of military expenditure. This is a natural tendency – if professors were in charge of a government they would probably increase expenditure upon universities. This is a testable proposition because there is one readily observable circumstance in which military employees indeed have considerable influence over government decisions, namely if the government is a military dictatorship. Indeed, where the military is in charge of the government, military efficiency is likely to decline since there is no independent source of scrutiny and evaluation of performance. Some of these motivations suggest that military expenditure could be

considerably lower without sacrificing interests that are worthwhile. To the extent that high spending reflects neighborhood arms races, it is potentially feasible to negotiate mutual reductions in spending. Since most developing countries receive aid inflows, it might conceivably be possible to strengthen confidence in such agreements by linking them to the conditions for aid eligibility. This might be done in the context of voluntarism: that is, a neighborhood might request the international community to assist the enforcement of its agreement. However, aid donors might also reasonably require that countries in receipt of aid inflows should avoid large levels of military expenditure. Such a use of donor conditionality could arise both to promote neighborhood arms reduction, and to discipline military governments that would otherwise indulge their own sector in excessive expenditure. (see Collier, P, 2006; pp 1-5)

2. Literature Review on the Dynamics of Military Spending: Empirical versus Theoretical Models

There is now a large body of empirical literature investigating the economic effects of military spending, with little consensus as to what these effects might be. The early cross-country correlation analyses of Benoit (1973; 1978) quickly gave way to a variety of econometric models, reflecting different theoretical perspectives. Keynesian, neoclassical and structuralist models were applied using a variety of specifications, econometric estimators and types of sample in cross-section, timeseries or panels. The diversity of results led to arguments for case studies of individual countries and relatively homogeneous groups of countries. Dunne (1996) provides a survey of this work. The mainstream growth literature has not found military expenditure to be a significant factor in explaining growth. For instance, Sala-i-Martin et al. (2004) consider 67 variables, including the initial share of military spending, as possible determinants of growth 1960-1996 in a cross-section of 88 countries. Using Bayesian averaging, they find 18 variables that appear significant, with a posterior inclusion probability of better than 10%. The share of military spending ranks 45, with a probability of 2.1%. There are many similar findings. In contrast to this, many papers in the defence economics literature have found military expenditure to be a significant determinant of growth. The difference seems to come largely from the use of different models. In defence economics the Feder-Ram model tends to be widely used, while it is not used in the mainstream growth literature. Given the disjunction between the mainstream growth literature and the defence economics literature it seems useful to provide a review of the issues and contrast the approaches. However, there are other approaches that suggest that defence economics may be able to contribute to the growth debate.

The vast literature on the economic effects of military expenditure has suggested a large number of different channels through which military expenditure may influence output. Smith (2000) and Dunne (1996), provide more detail and references, but here we will briefly list them to indicate the range of possibilities, rather than provide references or evaluation. They can be broadly grouped into demand effects, supply effects and security effects. Demand effects operate through the level and composition of expenditure. The most obvious is the Keynesian multiplier effect, an exogenous increase in military spending increases demand and, if there is spare capacity, increases utilisation and reduces unemployment of resources. Underconsumption theories reverse this causation and explain military expenditure by the government's need to manage demand. Military expenditures have opportunity costs and may crowd out other forms of expenditure, such as investment. The extent and form of crowding out following an increase in military spending will depend on prior utilisation and how the increase is financed. The government budget constraint requires that an increase in military expenditure be financed by: cuts in other public expenditure, increased taxes, increased

borrowing or expansion in the money supply. There is a large literature on war finance. The way the increase is financed will have further effects, e.g. a larger deficit may raise real interest rates, which feeds back on the economy. Increases in military expenditure will also change the composition of industrial output, with input-output effects. Similar arguments apply to cuts in military expenditure, though the effects may not be symmetric. Supply effects operate through the availability of factors of production (labour, physical and human capital and natural resources) and technology, which together determine potential output. Some of the demand effects, e.g. crowding out of investment, may also have supply effects by changing the capital stock. The literature differs in whether the focus is on total output, including that used by the military, or just civilian output. Conscription and other forms of coercion as well as ideological fervour may increase the mobilisation of factors of production, particularly during times of perceived threat of war, but the resources mobilised are mainly used for military purposes. Clearly resources used by the military are not available for civilian use, but there may be externalities. Training in the armed forces may make workers more or less productive when they return to civilian employment. Military R&D may have commercial spin-offs. Security of persons and property from domestic or foreign threats is essential to the operation of markets and the incentives to invest and innovate. To the extent that military expenditure increases security it may increase output. Adam Smith noted that the first two duties of the state were 'that of protecting the society from the violence and invasion of other independent societies….that of protecting, as far as possible, every member of society from the injustice or oppression of every member of it'. In many poor countries, war and lack of security are major obstacles to development. However, military expenditure may be driven not by security needs but by a rent seeking military industrial complex and military expenditures may provoke arms races or damaging wars and in such cases there would not be positive security effects. Many of these effects are contingent, depending on such things as the degree of utilisation, how the military expenditure is financed, the externalities from military spending and the effectiveness of military expenditure in countering the threat. These factors are likely to vary over countries and over time, with the consequence that the economic effect of military spending will also vary. The time horizons of these effects are very different, some are quite short-run others very long-run. All these measurements have to be done within the context of a particular model. Gleditsch et al. (1996) contains a large number of studies using country specific models.

3. Data and methodology

3.1. Data

Since interstate conflict involves at least two parties, it is a dyadic concept. This current research involved constructing dyadic proxies for India-Pakistan interstate trade, military burden, development expenditure, economic development and democracy to test the five hypotheses presented above. Data definitions appear in the appendix.

Measuring conflict

The literature on interstate conflict classifies conflict data sets into two categories: 1) war data and 2) events data (Polachek and Seiglie 2006). War data sets focus on the more hostile aspects of interstate interactions such as crises, wars or militarised interstate disputes (Jones, Bremer and Singer 1996). The most comprehensive war data set is available under the Correlates of War Project (COW), which has updated war data sets employed by Wright (1942), Richardson (1960), and Singer and Small (1972). The other major data set on interstate armed conflict is hosted by the Uppsala Conflict Data Project (UCDP) with the collaboration of the International Peace Research Institute, Oslo (PRIO) and is collected on an annual basis and covers the full post-World War II period, 1946–2003. Events data focuses on all interstate events and bilateral interactions reported in newspapers. McClelland's (1978) World Events

Interaction Survey (WIES) is probably the first of its kind based on bilateral interactions occurring during 1966-1992, reported in *The New York Times*. Azar's (1980) Conflict and Peace Data Bank (COPDAB) is an extensive longitudinal collection of about one million daily events reported from 47 newspaper sources between 1948 and 1978. Since this paper is interested in the evolution of the India-Pakistan conflict over the last 55 years, the Uppsala/PRIO and COW interstate war data set will be used instead of events-based data sets because the former data sets provide conflict data, which covers most of the period of 55 years (1950-2005) selected for this analysis. Events data set is not available for the entire period. Although the events data set captures daily observations, the macroeconomic and democracy data varies annually, which limits the use of daily information on conflict. Hostility between India and Pakistan has been high most of the last 55 years, enabling the COW data set to capture the severity of conflict during most of the dispute. Greater coverage by the COW and Uppsala data sets, and availability of macroeconomic and democracy data on an annual basis limits the scope of using the events data sets.

Six different measures of conflict are carefully compiled by using COW and Uppsala datasets:

1. Annual fatality Levels ranging 0-6 (*Fatal*)
2. Precise number of deaths (*Volfatal*)
3. Number of days of conflict in a year (*Dur*)
4. Highest action in disputes taken by both India and Pakistan (*Hiact*)
5. Annual hostility level severity (*Hstlev*)
6. Conflict intensity ranging 0-2 (*Cnf*)

There are several reasons for the selection of various proxies of conflict. The most appropriate proxy and the one which is most closely linked to conflict (or its severity) are number of deaths in the battlefield. Not only that, number of death variable has a higher level of variation among yearly observations but they are also more random, while subtly establishing nature of ongoing conflict which sometimes resulted in outright war. We know from *Hstlev* that hostilities have remained high through out periods of 1950-2007, but it is more interesting to know the ground realities of the battle field, where with the exceptions of three major wars when battle ground constitutes larger international borders between both States, Pakistan and India's exchange of fire concentrates on the 'Line of Control'. (See high conflict zone maps for India and Pakistan at the end of the chapter) There are two proxies for number of deaths in battle field. One is *Volfatal* capturing exact number of deaths and *Fatal* which capture annual fatality level to the scale of (0-6). *Volfatal* (exact number of deaths) have ever higher levels of variation among data, where number of deaths in three major wars (1965, 1971 and 1999), reached highest thresh-holds of conflict (in thousands) with declaration of outright war and thus would appear as out-liars in such instances in the long term conflict where number of deaths have remained low (less than a 100). In contrast, the variation because of indexation in *Fatal* becomes more subtle as the score would only vary between 0 and 6.

That makes *Fatal* a preferred proxy and *Volfatal* as the second best one. *Dur* (Days of conflict), *Hiact* (Higest Action in disputes) and *Hstlev* (Annual Hostility Levels) are also useful proxies. They capture the severity of conflict with a different angle. Inclusion of these measures in the analysis would help us carry out robustness check for the results on *Fatal*. Larger set of conflict measures would enable us to evaluate the statistical validity of the larger model. Furthermore, utilizing more proxies of conflict provides better insight into the nature of conflict, especially when causality tests are undertaken. Remember, Causality tests would show which measures of conflict (if employed more than one, as in our case) would have an effect on our endogenous independent variables (i.e, military burdern, bilateral or multilateral trade).

Measuring international trade

Generally, the sum of imports and exports between actor and target countries captures dyadic trade. (Polachek and Seglie 2006) In the last 60 years the patterns of interstate trade between Pakistan and India changed. Before trade between both countries collapsed to near zero in the early 1970s, Pakistan was exporting more to India. Since the 1970s, Pakistan imports more. In the 1950s, Pakistan and India's trade with each other constituted a significant amount of their respective total trade. However, after the 1965 war, India-Pakistan trade never reached more than two per cent of their respective total trade levels. Until the late 1980s, India had been a relatively closed economy, whereas Pakistan has traditionally been more open. The researcher constructed two composite measures of India-Pakistan trade. They are Pakistan's total trade with India as a percentage of Pakistan's total trade (*Tpitp*), and India's trade with Pakistan as a percentage of India's total trade (*Tpiti)*. The expectation is for both trade proxies to relate negatively with conflict. It would be interesting to investigate whether trade between both countries as a share of each country's total trade also affects the responsiveness of bilateral trade in conflict mitigation. If trade reduces conflict, trade with more countries should reduce conflict even more. (Dorussen 1999) Thus, it is important to investigate how more trade with the rest of the world affects India-Pakistan hostilities. This research involves eight dyadic proxies to capture the combined international integration levels for both countries. Pakistan's total trade as a ratio of India's total trade (*Xmpi*), and its inverse, India's total trade as a ratio of Pakistan's total trade (*Xmip*) are the first two indicators. If both of these trade proxies relate negatively with hostilities, the clear conclusion is that any external trade competition does not increase bilateral rivalry between India and Pakistan, but instead both countries have similar trade policies or could integrate within regional bodies like SAARC (the South Asian Association for Regional Cooperation). However, any evidence of a positive relationship between conflict and these two trade proxies would suggest that the competition in international markets has significant implications in sustaining their rivalry.

Measuring military expenditure

Military expenditures can reflect hostility, as well as deterrence. (Polachek and Seglie 2006) In the India-Pakistan case, it is vital to examine how each county's military expenditure/military burden affects the dispute. Pakistan's spending on military expenditure as a proportion of GDP is higher than India's. Additionally, since military expenditures may also capture the capability of a country to deal with civil unrest or intra-state conflict, the high prevalence of continuing intra-state conflicts in various regions of India can also explain India's military expenditures. Pakistan has had fewer civil wars. This may mean that Pakistan's military burden captures its security concerns vis-à-vis India solely. If so, dyadic variables that take the military burden of Pakistan as a ratio of the Indian military burden, should affect conflict positively and vice versa. Here are the eight different dyadic proxies of military burden utilising data on military expenditures as well as military personnel constructed from Correlates of Wars.

Military expenditures can either reflect aggression or deterrence, as we have posited above. We need to examine country specific dynamics of military spending to find out how each country's military expenditure/military burden affects the dispute. We already know that Pakistan's spending on military expenditure as a proportion of GDP is higher than India's (figure 3). Additionally, since military expenditures may also capture the capability of a country to deal with civil unrest or intra-state conflict, Indian military expenditure can also be explained in terms of the high prevalence of continuing intra-state conflicts in various regions of India. Pakistan has had fewer civil wars. This may mean that Pakistan's military burden captures its security concerns principally vis-à-vis India. Thus to go beyond average dyadic investigation

of the effect of military burden on conflict, we utilize 2 dynamic proxies of military burden which take military expenditure of Pakistan as a ratio of Indian military expenditure (*Lmilbrd2*) and the inverse (*Lmilbrd3)* in addition to taking average of India and Pakistan's military expenditures (*Lmilbrd1*). If, as we speculate, Pakistan's military burden is more closely related to conflict than India's, *Lmilbrd2* will have a positive sign and the inverse (*Lmilbrd3*) should have a negative sign, thus showing denominator effects of the inverse. (See Notes at the end of the chapter for details)

1. Log of Pakistan's defence expenditure over GDP as a ratio of India's defence expenditure over GDP (L*milbrd 1*).
2. Log of India's defence expenditure over GDP as a ratio of Pakistan's defence expenditure over GDP (L*milbrd 2*).
3. Log of Pakistan's defence expenditure over GDP as a ratio of Pakistan's defence expenditure over GDP plus India's defence expenditure over GDP (L*milbrd 3*).
4. Log of India's defence expenditure over GDP as a ratio of Pakistan's defence expenditure over GDP plus India's defence expenditure over GDP (L*milbrd4*).
5. Log of India's defence expenditure average over GDP and Pakistan's defence expenditure over GDP (*Lmilbrd5*).
6. Log of Pakistan and India's GDP weighted average of defence expenditures (*Lmilbrd6*). The proportion of military personnel to the total population represents the extent of militarisation in a society.
7. Log of Pakistan military personnel over Pakistan's total population as a ratio of India's military personnel over India's total population (*LMilppi*).
8. Log of India's military personnel over India's total population as a ratio of Pakistan's military personnel over Pakistan's total population (*LMilppi*).

Note that the first two proxies are the inverse of each other and expected to reveal the relative sensitivity of each country's military expenditure to conflict. Proxies 3 and 4 are a robustness check with military expenditures of each country divided by the combined military expenditure score of both countries. If *Lmilbrd3* is positively associated with conflict, this hypothesis can substitute for *Lmilbrd1*. If Pakistan's military expenditure is more closely associated with their bilateral conflict and if Indian military expenditure captures the element of deterrence, as well as belligerence with other national and international rivals, then the combined military expenditures should have lower explanatory value than Pakistan's military expenditure alone but the sign for combined military score should remain positive. This paper strives to investigate the average effects of military expenditures by both countries on India-Pakistan rivalry by taking two more proxies of military burden. This is to investigate whether military burden has on average a conflict enhancing effect, irrespective of country of origin, after analysing its country specific application for deterrence or belligerence.

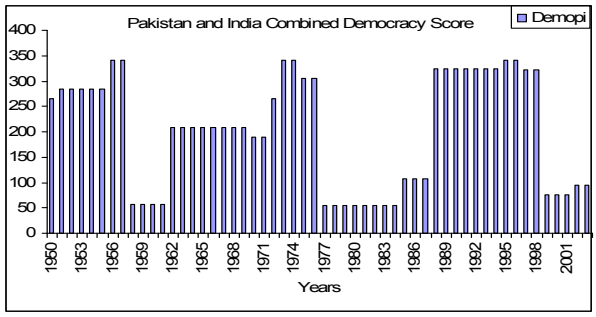
Measuring democracy, growth and other variables

To capture democracy levels for India and Pakistan required use of the Polity IV project hosted by The Center for International Development and Conflict Management (CIDCM). Polity IV computes a combined polity score by subtracting autocracy scores from democracy scores for the corresponding year. The value of this Polity score ranges from -10 to 10, where -10 denotes the highest autocracy level, and 10 denotes the maximum democracy score. Although India always takes a high positive value of seven or above, Pakistan frequently takes on negative values. The next step involved constructing a dyadic variable of democracy for both countries by multiplying their Polity scores, following Polachek and Seiglie (2006), adding 10 to each country's polity series to make the negative polity values positive so that the

combined democracy score captures the variations in the democratisation process only on a positive scale. The dyadic democracy variable shows values as low as 50 on the scale of 0 to 400 when there are high levels of political dissimilarities between Pakistan (dictatorship) and India (democracy), and as high as 350 when both countries are governed by democracies (see figure 2).

The weighted average of India and Pakistan's real GDP per capita growth rates (Gpi) represents the dyadic proxy of economic progress for both countries. Constructing the series for both countries involved taking GDP at constant prices (taken from economic surveys) and dividing it by population levels. The researcher tallied the data using the GDP per capita series available in the World Development Indicators (2006) data set. The four different proxies of social development based on India and Pakistan's education data[1] are, GDP weighted average of per capita education expenditure; mean average of per-capita education expenditure; Pakistan and India's education expenditures as a ratio of Pakistan and Indian's GDP; and the average of Pakistan's education expenditure as a percentage of its GDP and India's education expenditure as a percentage of its GDP. Note that the first two proxies employ per-capita education expenditure and the last two proxies employ total education expenditure. The purpose of the four education proxies is to perform a robustness check on the role of education in conflict mitigation. India and Pakistan are two of the most densely populated countries in the world. Pakistan has 160 million inhabitants, and India has more than one billion. In line with earlier literature, this thesis also uses the mean average of both countries populations as a standardising variable in the analysis. (see Polachek 1997)

***Figure 1** Dyadic democracy scores for Pakistan and India*



3.2. Methodology

Any simple least square regression analysis may lead to spurious results because of endogeneity problems among the variables (from trade, military spending, social sector expenditure and growth to conflict and vice-versa). It seems necessary to utilise a simultaneous equation model to address potential endogeneity problems between various variables. Since the data is a time-series, it is appropriate to use Vector Autoregressive model (VAR), which is an extension of univariate Autoregressive (AR) models to capture the evolution and the interdependencies between multiple time-series. (Sims 1980) Treat all variables in a VAR symmetrically by including an equation for each variable explaining its evolution based on its own lags and the lags of other variables in the model. The number of equations in a VAR model depends upon the number of endogenous variables; each endogenous variable is regressed on its lagged value, and the lagged values of all other endogenous variables as well as any number of exogenous variables. This solves the problem of endogeneity among variables. In this sense, VAR model

[1] There is an insufficiently long time-series for public health spending data for India.

is a seemingly unrelated regression (SUR) model with lagged variables and/or deterministic terms as common regressors so that one can interpret the regression results for each equation as ordinary least square estimators.

The basic $p-$ lag vector autoregressive (VAR(p)) model has the form

$$Y_t = c + \Pi_1 y_{t-1} + \Pi_2 y_{t-2} + ... + \Pi_p y_{t-p} + \varepsilon_t \quad (1)$$

where c is a $(n \times 1)$ vector of constants (intercept), Π_i is a $(n \times n)$ matrix (for every $i = 1,...., p$) and ε_t is a $(n \times 1)$ vector of error terms.

A bivariate VAR(2) can be written as the following system of equations:

$$y_{1t} = c_1 + \Pi^1_{1,1} y_{1,t-1} + \Pi^1_{1,2} y_{2,t-1} + \Pi^2_{1,1} y_{1,t-2} + \Pi^2_{1,2} y_{2,t-2} + \varepsilon_{1t} \quad (2)$$

$$y_{2t} = c_2 + \Pi^1_{2,1} y_{1,t-1} + \Pi^1_{2,2} y_{2,t-1} + \Pi^2_{2,1} y_{1,t-2} + \Pi^2_{2,2} y_{2,t-2} + \varepsilon_{2t} \quad (3)$$

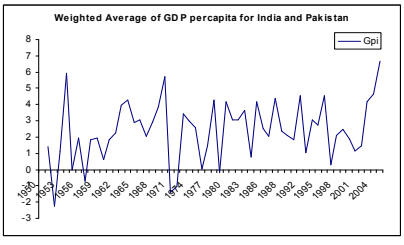
The lag length p has to be determined by model selection criterion (MSC) because too many lagged terms will consume more degrees of freedom and may introduce the problem of multicollinearity. Introducing too few lags will lead to specification errors. One way of deciding this question is to use Akaike (AIC), Schwarz-Bayesian (BIC) or Hannan Quinn (HQ) criteria and choose the model that gives the lowest values of these criteria. AIC criterion asymptotically overestimates the order with positive probability, whereas BIC and HQ criterion estimate the order consistently under general conditions if the true order p is less than or equal to $p\max$.

After fitting a VAR, it may be important to know which way causalities run. One way to do that is by running Granger causality tests after the VAR analysis. In a bivariate VAR model, a variable y_2 is said to Granger-cause a variable y_1 if, given the past values of y_1, past values of y_2 are useful for predicting y_1 (Granger 1969). Similarly it is feasible to extend the current analysis to test Granger-causality for multivariate VAR (p), where $Y_t = (y_{1t}, y_{2t}, ..., y_{nt})'$.

4. Results with VAR models

This section reports the results of the multivariate VAR regression analysis. As we can see, the data set is purely time series, which may mean that most of the variables may simply only follow a random walk. Generally that is the case with most time series. (See detailed Notes at the end of the paper) If a regression employs non-stationary or a mix of stationary and non-stationary variables, the error term would suffer from autocorrelation which would in turn mean that the error term obtained from such a regression would also be non-stationary. Generally, non-stationarity in variables may be solved by taking first difference of the series. However, it is not necessary to always take first differences, and stationary may be achieved at levels by taking time lags of variables where time trends or random walks would not be observed anymore.

Figure 2. *Pakistan and India's Dyadic Growth Rates*



As we have taken dyadic proxies, the problem of random walk may be minimised and we may obtain stationarity for our variables at levels rather than first differences. Table 6.2 undertakes unit root analysis to test for stationarity in the dyadic variables under the modified or augmented Dickey-Fuller t test (DF-GLS) proposed by Elliot, Rothenberg & Stock (1996), where each series is transformed via a generalised least squares (GLS) regression before performing the test. The results show that we could effectively solve for unit-roots (random walk) at levels, although for some variables we only obtain stationarity after quite a number of lags. In case of *Tpitp*, taking lags up to 15 periods solves for the random walk. By contrast, the economic development variable capturing the dyadic growth rates for India and Pakistan (*Gpi*) has been observed to be a perfectly stationary series (figure 1). Unit-root test confirms this observation; stationarity is achieved at levels with 0 lags.

Table1. *DF-GLS unit root tests*

Variables	Lag	With intercept	With intercept and trend
Fatal (annual fatality levels, 0-6)	1	-3.528*** (Ng-Perron)	-3.774*** (Ng-Perron)
Volfatal (precise numbers)	1	-4.789* **(Ng-Perron)	-4.844*** (Ng-Perron)
Dur (days of conflict)	1	-4.058* **(Ng-Perron)	-4.233***(Ng-Perron)
Hiact (highest action in disputes)	1	-2.382** (Ng-Perron)	-2.590 (Ng-Perron)
Hstlev (annual hostility levels, 1-5)	1	-2.371** (Ng-Perron)	-2.512 (Ng-Perron)
Cnf (conflict intensity ranges given by the PRIO-Uppsala data set)	1	-3.025* **(Ng-Perron)	-4.082*** (Ng-Perron)
Tpitp (Pakistan-India bilateral trade as a proportion of Pakistan's trade)	15	-1.112* (Ng-Perron)	-1.861 (Ng-Perron)
Tpiti (Above as a proportion of Indian trade)	15	-3.856*** (MAIC)	-3.319** (Ng-Perron)

Xmpi (Pakistan's total global trade as a ratio of India's global trade)	2	-2.710*** (Ng-Perron)	-2.860* (Ng-Perron)
Xmip (inverse of the above)	8	-4.951*** (MAIC)	-4.923*** (MAIC)
Lxpi1 (Log GDP weighted average of Pakistan and India's total exports)	0	2.951** (D-Fuller)	2.951** (D-Fuller)
Lxpi2 (Log mean of Pakistan's total exports over Pakistan's GDP and India's total exports over India's GDP)	0	-4.769*** (SIC)	-4.929*** (SIC)
Lmpi1 (Log GDP weighted average of Pakistan and India's total imports)	1	-4.049*** (SIC)	-3.961*** (SIC)
Lmpi2 (Log mean of Pakistan's total imports as a proportion of Pakistan's GDP and India's total imports as a ratio of India's GDP)	1	-4.511*** (SIC)	-4.382*** (SIC)
Lmilbrd1 (Log of Pakistan's defence expenditure over Pakistan's GDP as a ratio of India's defence expenditure over India's GDP)	5	-2.209** (Ng-Perron)	-2.795* (Ng-Perron)
Lmilbrd2 (Inverse of the above)	5	-2.209**(Ng-Perron)	-2.795*(Ng-Perron)
Lmilbrd3 (Log of Pakistan's defence expenditure over Pakistan's GDP as a ratio of Pakistan's defence expenditure over Pakistan's GDP plus India's defence expenditure over India's GDP)	5	-1.911*(Ng-Perron)	-2.686*(Ng-Perron)
Lmilbrd4 (Log of India's defence expenditure over India's GDP as a ratio of Pakistan's defence expenditure over Pakistan's GDP plus India's defence expenditure over India's GDP)	5	-2.128*(Ng-Perron)	-2.831*(Ng-Perron)
Lmilbrd5 (Log of Mean of India's defence expenditure over GDP and Pakistan's defence expenditure over GDP)	1	-4.735*** (SIC)	-4.748*** (SIC)
Lmilbrd6 (Log GDP weighted average of Pakistan and India's defence expenditures)	0	-	-4.308*** (SIC)
Lmilppi (Log of Pakistan's military personnel over Pakistan's total population as a ratio of India's military personnel over India's total population)	1	-4.082*** (SIC)	-4.098*** (SIC)
Lmilpip (inverse of the above)	1	-4.082*** (SIC)	-4.098*** (SIC)
Ledupi1 (log GDP weighted average of per capita education expenditure in India and Pakistan)	1	-	-5.374*** (SIC)
Ledupi2 (log mean of per capita education expenditure in India and Pakistan)	1	-	-5.478*** (SIC)
Ledupi3 (log of Pakistan and India's education expenditures as a ratio of both GDPs)	1	-5.918*** (SIC)	-5.907*** (SIC)
Ledupi4 (log of average of Pakistan's education expenditure over GDP plus India's education expenditure over GDP)	1	-	-5.642*** (SIC)
Gpi (weighted average of GDP per capita growth rates for both countries)	0	-4.256*** (Ng-Perron)	-4.276*** (Ng-Perron)
Demopi (combined democracy scores)	7	-2.790*** (Ng-Perron)	-2.997*** (Ng-Perron)
Poppi (average of total populations)	10	-	-7.392*** (MAIC)

-***, ** and *shows significance at 1%, 5%and 10% level

- The Lag structure is selected through (1) Ng-Perron sequential t (Ng-Perron), (2) the minimum Schwarz information criterion (SIC), (3) the Ng-Perron modified information criterion (MAIC) and (4) Dickey-Fuller test (D-Fuller).

Proxies treated as endogenous variables include those for conflict, bilateral and multilateral trade, economic progress, military burden and social development; whereas the concepts treated as purely exogenous are dyadic democracy and population. Since, these time-series variables are stationary at levels, although with some time lags, this allows the use of unrestricted VAR analysis instead of restricted VECM methodology. It is now possible to proceed to VAR analysis. The reduced form VAR model for conflict is as follows

$$Conf_t = \alpha_1 + \alpha_{2,t-i} Conf_{t-i} + \alpha_{3,t-i} Tr_{t-i} + \alpha_{4,t-i} Mil_{t-i} + \alpha_{5,t-i} E_{t-i} + \alpha_{6,t-i} G_{t-i} + \alpha_7 Demo_t + \alpha_8 P_t + \mathrm{E}_t \quad (4)$$

Where $Conf_t$, Tr_{t-i}, $Mil_{t-i}, E_{t-i}, G_{t-i}, Demo_t$ and P_t depict interstate conflict, bilateral or multilateral trade, military burden, education expenditure, real growth rate of GDP per-capita, dyadic democracy score and population respectively; t ranges from 1950-2007 and $i = 1,....,p$. Here p is the optimal lag structure for the VAR model. $\alpha_{2,t-i}$ $\alpha_{3,t-i}$ $\alpha_{4,t-i}$ $\alpha_{5,t-i}$ and $\alpha_{6,t-i}$ are (6×6) metrics (for every $i = 1,....,p$).

Running the above model for the number of fatalities (*Fatal*), best captures the severity of the militarised conflict between the two nations. Later analysis employs other conflict proxies.

Table 2 shows the results for bilateral trade with the eight proxies of military burden proposed. The evidence suggests that trade between Pakistan and India significantly decreases hostilities between both nations. However, the low values of $\alpha_{3,t-i}$ coefficients suggest that bilateral trade has a limited role to play in conflict mitigation. This is not surprising because trade between Pakistan and India remained very low, and comprises only a small fraction of each country's total international trade. Although low trade levels between both countries may very well be the cause of the ongoing conflict, the current analysis does not need to be concerned with reverse causality because the VAR model takes care of potential endogeneity problems between F*atal* and *Tpitp* or *Tpiti*. On the other hand, *Lmilbrd1, Lmilbrd2, Lmilbrd3, Lmilbrd4, Lmilbrd5* and *Lmilbrd6* all relate significantly with conflict, especially in the case of *Tpitp*. *Lmilbrd1* and *Lmilbrd3* relate negatively with conflict, and *Lmilbrd2* and *Lmilbrd4* positively relate with conflict. This confirms the hypothesis that Pakistan's high military expenditure is a close determinant of the India-Pakistan conflict.

The high values of the $\alpha_{4,t-i}$ coefficients in this case indicate that any increase in military expenditure by Pakistan when compared to India correlates with higher conflict. However negative signs of *Lmilbrd2* and *Lmilbrd4* also suggest that India's military expenditure is weakly related to conflict whereas as Indian military expenditure is also directed at its domestic civil wars and security concerns with other states and thus in the case of *Lmilbrd1*, *Lmilbrd2*, *Lmilbrd3* and *Lmilbrd4* the explanatory power comes from Pakistan's military expenditure. Furthermore, combined military scores in *Lmilbrd5* and *Lmilbrd5* relate positively with conflict and the relationship is significant for both proxies of bilateral trade. This result suggests that irrespective of Indian security concerns national or international, or Pakistan's anxieties about Indian hegemony, military expenditures on average do not have deterrent effect (in terms of fewer fatalities), but high military expenditures by both sides show some evidence of an arms race. The insignificance of *Lmilppi* and *Lmilpip* may also indicate the transformation of contemporary conventional war tactics, in which military size *per se* has a limited role in providing strategic depth. However the negative sign of *Lmilppi* and the positive sign of *Lmilpip* hints that higher militarisation in Pakistan may very well be an outcome of the ongoing hostilities between the two nations, as higher Pakistani military personnel has a deterrent effect, and the converse is true for India. Education expenditures *Ledupi1* and growth rates *Gpi* relate significantly to conflict mitigation, and the size of coefficients suggests that the potential for spending on education in decreasing hostilities is quite substantial. Democracy also decreases the severity of conflict, but the low values of coefficients show the relationship is quite weak.

Table 3 present results for multilateral trade with various proxies of military burden. In combination with various proxies of multilateral trade, the explanatory power of *Lmilbrd1, Lmilbrd2, Lmilbrd3* and *Lmilbrd4* reduced, as they are generally insignificant, but the coefficients also reduce, especially for *Xmpi* and *Xmip*. The only military burden proxy that is consistently significant and comes out with the right sign is *Lmilbrd6*. This means that the present conclusion about the average conflict-enhancing role of military expenditures remains unaltered. Results in Table 3 also show that *Xmpi* is generally insignificant, whereas *Xmip* is significant in nearly all specifications. This is an interesting result, which suggests that higher Indian levels of trade integration mitigate conflict more than when Pakistani openness rises. However, the negative signs for both proxies confirm that greater openness in either country would significantly decrease conflict. Furthermore, it is reasonable to conclude that there is no

rivalry between India and Pakistan in terms of their trade with the rest of the world, and any competition to capture international market share is healthy. Table 6.3C shows results for average trade scores for both countries differentiated by exports and imports. Exports by both countries to the rest of the world relate negatively with conflict and the relationship is significant at the one per cent level. Also, note that the values of $\alpha_{3,t-i}$ increased further for combined exports when compared with the results in Table 2, indicating that the more these two countries are able to export to the rest of the world, the lower the levels of bilateral conflict. The high coefficients of *Xmpi* can lead the inference that the explanatory power for *Xpi* comes more from the Indian side. Both countries are at similar rungs on the technological ladder and share the potential to export to the rest of the world, along with countries like China. In contrast to exports, results on *Lmpi1* and *Lmpi2* show that rising imports do not increase hostilities, as the signs are always negative but the overall insignificance of combined import scores mean imports may not exert any negative pressure on hostilities either. The results for education expenditure, economic performance and democracy remain unchanged.

Table 2 *VAR regression equations for fatal under multiple specifications of bilateral trade and military burden*

Right Hand Side Variables	Left Hand Side Variable : Fatal													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bilateral Trade														
Tpitp (16)	-0.30***	-0.30***	-0.32***	-0..28***	-0.24**	-0.23**	-0.22**							
Tpiti (16)								-0.76*	-0.76*	-0.83**	-0.70*	-0.61*	-0.64*	0.55*
Military Burdeñ														
lmilbrd1 (6)	2.33*							2.02						
lmilbrd2 (6)		-2.33*							-2.02					
lmilbrd3 (6)			6.53*							6.03				
lmilbrd4 (6)				-3.45							-2.84			
lmilbrd5 (2)					6.84**							6.54**		
lmilbrd6 (1)						3.26*							3.52*	
Lmilppi(2)							-1.80							
Lmilpip(2)														1.79
Social Development														
Ledupi1(2)	-4.98	-4.98	-4.83	-5.9*	-6.35**	-8.34***	-6.08**	-6.7*	-6.7*	-6.9*	-6.2*	-5.9**	-8.35***	-6.10**
Economic Growth														
Gpi (1)	-0.40***	-0.40***	-0.41***	-0.40***	-0.28***	-0.35***	-0.34***	-0.39***	-0.39***	-0.39***	-0.39***	-0.31***	-0.38***	-0.37***
Exogenous Variables														
Demopi (7)	-0.003	-0.003	-0.003	-0.003	-0.003	-0.004*	-0.004*	-0.003	-0.003	-0.003	-0.004	-0.003	-0.003*	-0.004*
Poppi (10)	0.064***	0.064***	0.063***	0.066***	0.112***	0.094***	0.076***	0.063***	0.063***	0.062***	0.064***	0.101***	0.088***	0.07***
N	38	38	38	38	38	38	38	38	38	38	38	38	38	38
R2	0.61	0.61	0.62	0.61	0.63	0.61	0.59	0.57	0.57	0.58	0.57	0.61	0.59	0.57
VAR(p)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)	VAR(2)

-***, **, * shows significance at 1%, 5% and 10% level

- VAR (p) reports lag-order for each VAR model based on final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) and the Hannan and Quinn information criterion (HQIC),

Table 3 *VAR regression equations for fatal under multiple specifications of multilateral trade and military burden*

Right Hand Side Variables	Left Hand Side Variable : Fatal													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mutilateral Trade														
Xmpi(3)	-0.71	-0.71	-0.75	-0.74	-0.62	-0.77*	-0.75*							
Xmip(9)								-3.74***	-3.74***	-3.77***	-3.74***	-3.89***	-2.68***	-3.83***
Military Burdeñ														
lmilbrd1 (6)	0.08							-0.18						
lmilbrd2 (6)		-0.08							0.18					
lmilbrd3 (6)			0.91							0.27				
lmilbrd4 (6)				-0.58							0.50			
lmilbrd5 (2)					0.04							-0.49		
lmilbrd6 (1)						3.38**							2.26*	
Lmilppi(2)							-1.02							
Lmilpip(2)														0.92
Social Development														
Ledupi1(2)	-3.64***	-3.64***	-3.59***	-3.69***	-3.60***	-8.07***	-2.85***	-4.73***	-4.73***	-4.67***	-4.79***	-4.44**	-7.70***	-4.22***
Economic Growth														
Gpi (1)	-0.37***	-0.37***	-0.37***	-0.38***	-0.37***	-0.34***	-0.37***	-0.40***	-0.40***	-0.39***	-0.40***	-0.40***	-0.36***	-0.39***
Exogenous Variables														
Demopi (7)	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***	-0.006***	-0.005***	-0.006***	-0.006***	-0.006***	-0.005***	-0.006***	-0.006***	-0.005***
Poppi (10)	0.067***	0.067***	0.066***	0.067***	0.066***	0.094***	0.062***	0.083***	0.083***	0.082***	0.084***	0.078***	0.101***	0.075***
N	45	45	45	45	45	45	45	45	45	45	45	45	45	45
R2	0.42	0.42	0.42	0.42	0.42	0.46	0.42	0.45	0.45	0.45	0.45	0.45	0.47	0.46
VAR(p)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)	VAR(1)

-***, **, * shows significance at 1%, 5% and 10% level

- VAR (p) reports lag-order for each VAR model based on final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) and the Hannan and Quinn information criterion (HQIC),

It would be interesting to run multivariate Granger causality tests to see if causality runs from the determinants of conflict-to-conflict, and whether there are cases of reverse causality. This research included Granger causality tests for each VAR specification, presented in Tables 2 and 3. Table 4 provides a summary of Granger causality tests for all endogenous regressors of conflict, and where there is an instance of reverse causality, it is noted. The results in Table 4 show that all regressors except *Lmilppi, Lmilpip*, *Lmpi1* and *Lmpi2* Granger cause conflict. There were also observations of some instances of reverse causality, especially for *Tpitp, Tpiti, Lmilbrd5, Lmilbrd6, Ledpi1, Ledupi2* and *Ledupi4* in case of *Fatal, Lmilbrd6* in case of *Volfatal, lmilbrd6* and *Ledupi1* in case of *Cnfpi, Lmilbrd6* and *Ledupi1* in case of *Dur*, *Lxpi2*, *Lmilbrd6* and *Ledupi1* in case of *Hstlvl* and *Lxpi2*, *Lmilbrd6* and *Ledupi1* in case of *Hiact*.

***Table 4** Granger causality Wald tests*

Direction of Causality	Causes	RC	Direction of Causality	Causes	RC
Tpitp → *Fatal*	√***	√*	*Gpi* → *Volfatal*	√***	×
Tpiti → *Fatal*	√*	√**	*Lxpi2* → *Cnfpi*	√***	×
Xmpi → *Fatal*	√**	×	*Lmilbrd3* → *Cnfpi*	√***	×
Xmip → *Fatal*	√***	×	*Lmilbrd4* → *Cnfpi*	√***	×
Lxpi1 → *Fatal*	√***	×	*Lmilbrd6* → *Cnfpi*	×	√*
Lxpi2 → *Fatal*	√***	×	*Ledupi1* → *Cnfpi*	√*	√*
Lmpi1 → *Fatal*	×	×	*Gpi* → *Cnfpi*	√***	×
Lmpi2 → *Fatal*	×	×	*Lxpi2* → *Dur*	√***	×
Lmilbrd1 → *Fatal*	√**	×	*Lmilbrd3* → *Dur*	√***	×
Lmilbrd2 → *Fatal*	√**	×	*Lmilbrd4* → *Dur*	√**	×
Lmilbrd3 → *Fatal*	√***	×	*Lmilbrd6* → *Dur*	×	√*
Lmilbrd4 → *Fatal*	√***	×	*Ledupi1* → *Dur*	√***	√***
Lmilbrd5 → *Fatal*	√***	√**	*Gpi* → *Dur*	√***	×
Lmilbrd6 → *Fatal*	√***	√***	*Lxpi2* → *Hstlvl*	√***	√*
Lmilpip → *Fatal*	×	×	*Lmilbrd3* → *Hstlvl*	√**	×
Lmilppi → *Fatal*	×	×	*Lmilbrd4* → *Hstlvl*	√*	×
Ledupi1 → *Fatal*	√***	√***	*Lmilbrd6* → *Hstlvl*	×	√***
Ledupi2 → *Fatal*	√***	√***	*Ledupi1* → *Hstlvl*	×	√***
Ledupi3 → *Fatal*	√***	×	*Gpi* → *Hstlvl*	√*	×
Ledupi4 → *Fatal*	√***	√*	*Lxpi2* → *Hiact*	√**	√*
Gpi → *Fatal*	√***	×	*Lmilbrd3* → *Hiact*	×	×
Lxpi2 → *Volfatal*	√***	×	*Lmilbrd4* → *Hiact*	×	×
Lmilbrd3 → *Volfatal*	√***	×	*Lmilbrd6* → *Hiact*	×	√***
Lmilbrd4 → *Volfatal*	√***	×	*Ledupi1* → *Hiact*	√*	√**
Lmilbrd6 → *Volfatal*	√***	√*	*Gpi* → *Hiact*	√*	×
Ledupi1 → *Volfatal*	√***	×			

***, **, * shows significance at 1%, 5% and 10% level, RC stands for reverse causation, √ means causes and × means not causes

The reverse causality in the India-Pakistan bilateral trade measures show that low levels of trade are also an outcome of the India-Pakistan conflict, which has spanned more than 50 years. Any

decrease in hostility levels would also exert a positive and favourable effect on bilateral trade, which would create fertile ground for dispute resolution. Thus, more bilateral trade through reduction of tariffs is a noteworthy confidence building measure. The presence of reverse causality in average military spending is also not a surprise. This means that the India-Pakistan conflict is a significant cause of historically high military expenditures between both countries. Especially if high levels of conflict between India and Pakistan lower India's military expenditure as a proportion of Pakistan's military expenditure, then *Lmilbrd1* and *Lmilbrd3* would relate positively with conflict, which is the case in Tables 2. In light of the results, one interpretation may be that a military build-up by Pakistan increases as a response to conflict. This may be true because the dominant role of the army and high military expenditures in Pakistan are justified due to continuous high levels of hostility with its neighbour. Otherwise, Pakistan does not have any major dispute with any other nation, or frequent instances of intra-state disputes to justify the high budget allocation for defence. Reduction of hostilities would thus favourably affect the military burden in both countries, and both India and Pakistan could have more resources to channel towards its development and poverty reduction strategies. The reverse causality from conflict to education expenditure could explain this process.

Reverse causality between conflict measures and proxies of education expenditure highlight the resource constraints faced by both sides due to their rivalry where funds allocated to defence seem to crowd out public investment in the development sector. Also found is reverse causality between *Lxpi2, Hstslvl* and *Hiact*. This result highlights the economic implication of conflict. If hostility levels rise and conflict moves closer to outright war, it will strangle export capability with the rest of the world for both countries. This will have negative effects on growth potential as well. For example, right after the 1971 and 1999 wars between Pakistan and India, total trade shares for both countries witnessed a deep decline. Economic growth Granger causes conflict and the relationship is negative. The growth patterns of both countries are independent of conflict, as far as reverse causality is concerned. The relationship is highly significant at a one per cent level in all the observed instances of Table 4. Any slowdown in growth rates in either of the two nations seems to correlate positively with conflict and this trend has been present since 1950.

5. Conclusions:

Previous studies on the subject have measured conflict between both countries through their military expenditures. Such studies have put the blame on Pakistan for rising hostilities between two countries as Pakistan' military budget as a proportion to GDP is much higher than that of India. However analysis in this paper refutes such claims. As per the practice in defence literature, this paper considers military expenditures as strategic assets and they are interacted with real proxies of conflict such as hostile actions and threats of using force by India or Pakistan and fatalities caused by cross border military actions. The study finds that Pakistan's military expenditures always rise when fatalities of the conflict rise. But the rising military expenditures in Pakistan in return cause a fall in the threat level of a possible hostile action from Indian side resulting in ex post fall in fatalities. Eventually, the rise in military expenditures in Pakistan in response to rise in military expenditures in India is good for peace between both countries as the former create significant deterrence against the possibility of hostile actions from Indian side.
The author also extends the analysis to capture political and economic linkages of the conflict. Note that the time period utilized in the study is from 1950-2007, thus capturing the historic dynamics of conflict as well as more contemporary economic explanations to it. The study finds that economic development abates the possibility of conflict and brings both countries closer to peace. However

there is also evidence of economic competition. If Pakistan is able to export more to the outside world, hostility would rise from the Indian side. The converse is not true. Pakistan is again a peaceful nation when comes to trade competition. The evidence in this regards comes in 2002, when India tried to restrict Pakistan's trading capabilities by unilaterally amassing troops in Pakistani borders. 2002 is the year when Pakistan started to witness an economic come back from the economic crunch of the 1990s. Later in 2007 Pakistan also lost GSP+ arrangement in EU on an Indian complain to WTO. GSP+ provided Pakistan increased market access to EU for its products. Ever since GSP + was taken away, Pakistan's market shares in EU have been declining.
Though military expenditures and economic development have been found to play a vital role in promotion of peace between India and Pakistan through deterrence effect, democracy in Pakistan also abates hostilities. Another important finding of the paper is that rise in education expenditures would bring both countries closer to the practice of real democracy and increase the possibility of peaceful solution to bilateral issues. Here comes the paradox highlighted by the paper that high military expenditures squeeze education budgets in Pakistan and India, thus limiting the possibility of peace. In an ideal scenario, Pakistan and India should both curtail military budgets by focusing more on peace than conflict.

6. Notes on Empirical Results

6.1. Granger Causality and Military Burden

Table 4 high-lights the country specific dynamics of military burden in India and Pakistan and nature of conflict. For example, if conflict lasts for more days, or hostilities rise or severity of action (i.e., in extreme case of out right war) rise between both parties, all would have a significant and positive shock on military expenditures in India and Pakistan as there is a presence of reverse causality between Lmilbrd6 and these measure of conflict but no presence of causality. No presence of causality means that arms race between India and Pakistan (Lmilbrd6) would not lead to rise in hostilities, neither increase the yearly duration of the conflict or lead to highest action (out-right war). This is an important result suggesting that higher military expenditures by both sides also have a deterrent effect on conflict, but if fatalities in the conflict rise, it will put a positive pressure on other measures of conflict, which in turn have positive shock on the arms race because we also find in table 4 that *Lmilbrd6*, in presence of reverse causation, appears to also positively and significantly cause *Fatal* or *Volfatal*. In contrast, *Lmildbrd1, Lmildbrd2, Lmildbrd3*and *Lmilbrd4*, which are dynamic interactions of Indian and Pakistani military expenditures, significantly cause conflict while there is no reverse causation. This points out towards the prevalent mistrust between both parties and the reason behind the arms race, where Pakistan's military expenditure is more sensitively related with conflict than the Indian military expenditure. Though, Pakistan may see its rise in military expenditure as deterrence to match Indian military expenditure, it would in effect has a positive effect on conflict as it would sustain hostilities between both parties at not only higher levels of severity but also the duration of the conflict on average would rise. Furthermore, Hiact (highest action in conflict) is not affected by military expenditures as all measures of military burden do not cause Hiact, though in case of Milbrd1, highest action in conflict positively influence the former suggesting that outright wars or increase in the severity of action would put upward pressure on the military expenditures of Pakistan and India much equally. In case of war, one may explain this relationship by simply suggesting that Pakistan and India spend more resources on military procurement to cover such depleted military assets which have been increasingly utilized in the conflict.

6.2. Taking Inverse Ratios: "What They Really Show for Military Burden and Trade?"

The nature of variables is dyadic, corresponding to the analysis which is so common in conflict studies which investigate conflict in dyadic settings. However, defence or trade or democracy would provide results which may only capture dyadic effects while may not reveal some very important country specific information. For example, high military expenditure is conflict enhancing and higher bilateral or multilateral trade is conflict reducing. Such assertions may be substantiated by theory or empirics but it may suffer from one limitation: if the dyadic variables are constructed in a fashion that they only capture average effects of the two parties involved, (e.g. *Lmilbrd6*) results may be misleading as in reality, one party may be more relevant than other or the two parties may work in opposite directions.

For example, in our case, Pakistan's military expenditure is seen as conflict enhancing especially by Indian side. However, Pakistan sees military expenditure as a deterrence from outside (i.e., Indian) aggression suggesting that actually Indian military expenditure is fuelling the conflict. Indian, in contrast, traditionally see its high military expenditure as a deterrence to not only outside aggression but also inside civil unrest, whereby India has a high concentration of its military resources in the region of Kashmir. In the conflict literature, military expenditures are assets, which represent national capabilities to not only deter international conflict but also curtail any such civil unrest which may be a risk for economic development at national level. Thus relationship between military expenditures and conflict is not a linear one but a very dynamic one. Even if our dyadic proxy of military expenditure, which may take an average of India and Pakistan's military expenditure, has a positive relationship with Conflict between two nations, we cannot say with certainty whether such empirical finding may lead to the conclusion that Military expenditures are conflict enhancing. It may be that Pakistani military spending is conflict enhancing and Indian military spending show an effect of deterrence (which means conflict reducing). Or it may be the opposite case. Another scenario may be that high military expenditure in India may show rivalry with a third party (China, a case in point) and thus may not be relevant at all in our analysis, while Pakistan may indeed be addressing its concerns viz-a-viz Indian hegemony and spend high on military build-up as a matter of deterrence.

Please note that it is to our discretion to put Pakistan or India as a numerator or denominator. Changing the position may have implications due to case sensitivities (as we would find in case of *Lmilbrd1* and *Lmilbrd2*). For example *Lmilbrd 1*, where India is in the denominator, has a positive sign suggesting *Lmilbrd1* is conflict enhancing. However, *Lmilbrd 2*, where Pakistan is in the denominator, has a negative relationship with conflict, suggesting on its face value that *Lmilbrd2* is conflict reducing. Both results are conflicting. According to our hypothesis, military burden for India and Pakistan, both should be conflict enhancing. That we do find for *Lmilbrd6*, which is just average of both. Hence, in the light of *Lmilbrd6* and its relationship with conflict, the signs of *Lmilbrd1* and *Lmilbrd2* actually give away important information, which is about relative importance of India and Pakistan's military expenditure in the conflict. If conflict is more related with Pakistani military expenditure then in case Pakistan military expenditure goes into the denominator, the sign should change and it does change in our regression models quite consistently satisfying maximum number of robustness checks. In the light of these results, a positive sign of *Lmilbrd6* suggests that Indian military expenditure also enhance conflict, but it is less relevant than the Pakistani one to explain severity of conflict between both nations.

In multilateral trade, inverse specifications serve this very analysis to investigate dyadic as well as country specific relationship to understand the dynamics of India-Pakistan conflict not only with its evolutionary settings but also with country specific perspective as to how trade may be related with conflict and thus suggest a peace strategy in rather comprehensive manner. For example, a higher coefficient of *Xmip* when compared to *Xmpi* shows that any rise in Indian trade with rest of the world has a proportionally greater effect on conflict mitigation than a rise in Pakistan's trade with rest of the world. Economic integration by Indian side would decrease costs of peace for India at a much greater pace than if Pakistan integrates with rest of the world. Our theoretical model has covered such dynamic trade-offs for India and Pakistan. In undertaking such empirical methodology (not to mention the utilization of VAR), chapter 6 confirms or rejects many assertions which are put forward in academic as well as popular literature to explain India-Pakistan conflict.

6.3. Why Granger Causality through a VAR?

Since there is endogeniety problem between variables of interest, VAR can analyze the nature of relationship without assuming dependency of one variable over the other. Only granger causality tests, which follow VAR analysis, inform us about the direction of relationship and it may be the case, as we found in our analysis, the direction of relationship between a pair of variables is two way. This again is important information. Thus the purpose is to investigate nature (+ or -) of relationship between conflict variables and other endogenous independent variables (military burden, bilateral or multilateral trade, economic development etc), while also examining the direction of relationship. VAR provides one of the best time series methodologies. However, first we have to solve for random walk or trends in our time series variables. Since our variables of choice are dyadic in nature, we could solve for random walk at level instead of first difference.

As we can see, the data set is purely time series which may mean that most of the variables may suffer from random walk. Generally that is the case with most time series. If a regression employs non stationary or a mix of stationary and non-stationary variables, the error term would suffer from autocorrelation which would in turn mean that the error term obtained from such a regression would also be non stationary. Generally, non-stationarity in variables may be solved by taking first difference of the series. It is not necessary to always take first difference and stationary may be achieved at level by taking time lags of variables where time trends or random walk would not be observed anymore:

1. Stationary Time Series (Basic Characteristics):
   (a) Mean reverting around a constant long-run mean
   (b) Constant variance which time-invariant
2. Non Stationary Time Series (Basic Characteristics)
   (a) Has no long-run into which the series returns
   (b) The variance depends on time and approached infinity as time goes to infinity

(A) Types of Non Stationarity

1. The random walk model with drift:
   $yt = \mu + yt\text{-}1 + ut$ (6.19)
2. The deterministic trend process:
   $yt = \alpha + \beta t + ut$ (6.20)
3. The explosive process:
   $yt = \mu + \phi yt\text{-}1 + ut$ (6.21)

   where $\phi > 1$. Typically, the explosive case is ignored and we use $\phi = 1$ to characterise the non-stationarity because:

   (a) $\phi > 1$ does not describe many data series in economics and finance.
   (b) $\phi > 1$ has an intuitively unappealing property: shocks to the system are not only persistent through time, they are propagated so that a given shock will have an increasingly large influence.

(B) The Augmented Dickey Fuller (ADF) Test

Dickey and Fuller (1979) and Fuller (1976) developed the basic test for unit roots and order of integration. The basic objective of the test is to test the null hypothesis that $\phi = 1$ in: $yt = \phi yt\text{-}1 + ut$ against the one-sided alternative $\phi < 1$.

So we have

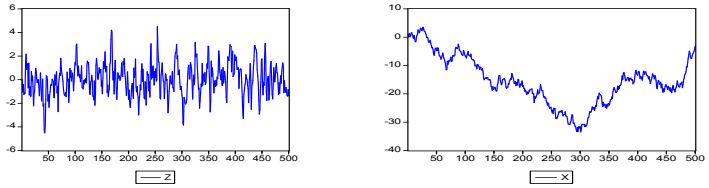
H0: series contains a unit root

Vs. H1: series is stationary.

Figure 6.7

Properties of Times Series

Plot of a stationary series Plot of Random Walk Series



We usually use the more convenient regression:

$\Delta yt = \gamma yt\text{-}1 + ut$

so that a test of $\phi=1$ is equivalent to a test of $\gamma=0$ (since $\phi\text{-}1=\gamma$).

$yt = \phi yt\text{-}1 + ut$, $yt\text{-}yt\text{-}1 = \phi yt\text{-}1 - yt\text{-}1 + ut$, $\Delta yt = (\phi\text{-}1)yt\text{-}1 + ut$

Dickey and Fuller proposed three tests. The null (H0) and alternative (H1) models in each case are

i) H0: $yt = yt\text{-}1+ut$ H1: $yt = \phi yt\text{-}1+ut$, $\phi<1$

This is a test for a random walk against a stationary autoregressive process of order one (AR(1))

ii) H0: $yt = yt\text{-}1+ut$ H1: $yt = \phi yt\text{-}1+\mu+ut$, $\phi<1$

This is a test for a random walk against a stationary AR (1) with drift.

iii) H0: $yt = yt\text{-}1+ut$ H1: $yt = \phi yt\text{-}1+\mu+\lambda t+ut$, $\phi<1$

This is a test for a random walk against a stationary AR (1) with drift and a time trend.

The three models can be described as cases with:

i) No intercept, no trend
ii) Intercept, no trend
iii) Intercept and trend

As the error term is unlikely to be white noise Dickey and Fuller extended their procedure suggesting an "augmented" version that uses *p* lags of the dependent variable

As the error term is unlikely to be white noise Dickey and Fuller extended their procedure suggesting an "augmented" version that uses *p* lags of the dependent variable. The alternative model in case (i) is now written:

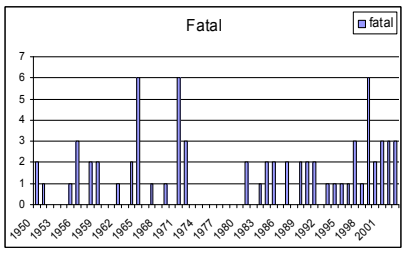
A problem now arises in determining the optimal number of lags of the dependent variable.

There are 2 ways

- use the frequency of the data to decide
- use information criteria

In our case, we have taken dyadic proxies, and thus the problem of random walk may have been minimised and we may obtain stationarity for our variables at level rather than first differences.

6.4. Fatalities and Trade Relationship



What would be the impact of a 100 percent increase in bilateral trade or multilateral trade on Conflict (fatalities)? For example, the coefficients in table 2 and 3 suggest if bilateral trade or multilateral trade doubles, fatalities (*Fatal*) would witness a decrease of at least 2 points or 200

percent in case of multilateral trade and only 20 percent (less than a half point) in case of bilateral trade. This means if *Fatal* have scored 5, and trade with rest of the world doubles, Fatal will go down to score 3. Generally, *Fatal* has taken up score of 3 or 2, which means usually battle deaths have been either 26-100 deaths in case of score 2 or 101-250 deaths in case of score 3. With high coefficients of multilateral trade in reducing fatal, one may confer that multilateral trade (relationship with outside world) traditionally have been playing a key role to contain fatalities and also possibility of out right war between India and Pakistan. In contrast, bilateral trade has much smaller effect in containing fatalities and thus plays a very limited role in conflict mitigation between India and Pakistan.

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Appendix1: Data Definitions

Dyadic Variables

	Conflict	
Cnfpi	Intensity of Conflict between Pakistan and India, Scores 1 (minor) when 25 to 999 battle-related deaths and 2 (war) when at least 1000 battle-related deaths in a given year,	Years: 1950-2003, Sources: UCDP/PRIO Armed Conflict Data set Version IV, Harbom et al. (2006)
Dur	Number of days a conflict lasts in a year between Pakistan and India,	Years: 1950-2003, Source: COW Inter-State War Data, Version 3.02, Faten et al. (2004)
Fatal	Annual fatality level of conflict between Pakistan and India, scores from 0 to 6 0 None 1-25 Deaths 26-100 Deaths 101-250 Deaths 251-500 Deaths 501-999 Deaths 6 >999 Deaths	Years: 1950-2003, Sources: COW Inter-State War Data, Version 3.02, Faten et al. (2004)
Hiact	Highest action by Pakistan and India in annual corresponding dispute [bracketed numbers refer to corresponding hostility level] 0 No militarised action [1] 1 Threat to use force [2] 2 Threat to blockade [2] 3 Threat to occupy territory [2] 4 Threat to declare war [2] 5 Threat to use CBR weapons [2] 6 Threat to join war [2] 7 Show of force [3] 8 Alert [3] 9 Nuclear alert [3] 10 Mobilisation [3] 11 Fortify border [3] 12 Border violation [3] 13 Blockade [4] 14 Occupation of territory [4] 15 Seizure [4] 16 Attack [4] 17 Clash [4] 18 Declaration of war [4] 19 Use of CBR weapons [5] 20 Begin inter-state war [5] 21 Join inter-state war [5]	Years: 1950-2003, Source: COW Inter-State War Data, Version 3.02, Faten et al. (2004)
Hstlev	Annual hostility levels reached by India and Pakistan in each annual corresponding dispute No militarised action Threat to use force Display of force Use of force War	Years: 1950-2003, Source: Faten et al. (2004)

VolFatal	Precise volume of fatality in each annual corresponding dispute,	Years: 1950-2003, Sources: COW Inter-State War Data, Version 3.02 (Faten et al. 2004), CSCW/PRIO Battle Deaths data (Lacina 2005), CSP Data set on Major Episodes of Political Violence 1946-2006 http://members.aol.com/cspmgm/warlist.htm
	Bi Lateral Trade	
Tpitp	Bilateral trade between Pakistan and India as a ratio of Pakistan's total trade,	Years: 1950-2007, Source: Direction of Trade Statistics yearbook, IMF International Financial Statistics 2007 (IMF)
Tpit	Bilateral trade between Pakistan and India as a ratio of India's total trade,	Years: 1950-2007, Source: Direction of Trade Statistics yearbook, IMF International Financial Statistics 2007 (IMF)
	Multilateral Trade	
Xmpi	Pakistan's total trade (exports + imports) as a ratio of India's total trade (exports + imports),	Years: 1950-2007, Source: International Financial Statistics 2007 (IMF)
Xmip	India's total trade (exports + imports) as a ratio of Pakistan's total trade (exports + imports),	Years: 1950-2007, Source: International Financial Statistics 2007 (IMF)
Lmpi1	Log GDP weighted average of Pakistan and India's total imports,	Years: 1950-2007, Source: International Financial Statistics 20067(IMF)
Lmpi2	Log mean average of Pakistan's total imports as a proportion of Pakistan's GDP and India's total imports as a ratio of India's GDP,	Years: 1950-2007, Source: International Financial Statistics 2008 (IMF)
Lxpi1	Log GDP weighted average of Pakistan and India's total exports,	Years: 1950-2007, Source: International Financial Statistics 2008 (IMF)
Lxpi2	Log mean average of Pakistan's total exports over Pakistan's GDP and India's total exports over India's GDP,	Years: 1950-2007, Source: International Financial Statistics 2008 (IMF)
	Military Burden	
Lmilbrd1	Log of Pakistan's defence expenditure over Pakistan's GDP as a ratio of India's defence expenditure over India's GDP,	Years: 1950-2007, Sources: Correlates to war data set version 3.02, World Development Indicators 2006 (World Bank), Government Finance Statistics Year Book (IMF) and Economic Survey of Pakistan
Lmilbrd2	Log of India's defence expenditure over India's GDP as a ratio of Pakistan's defence expenditure over Pakistan's GDP,	Years: 1950-2007, Sources: Correlates to war data set version 3.02, World Development Indicators 2006 (World Bank), Government Finance Statistics Year Book (IMF) and Economic Survey of Pakistan

Lmilbrd 3	Log of Pakistan's defence expenditure over Pakistan's GDP as a ratio of Pakistan's defence expenditure over Pakistan's GDP plus India's defence expenditure over India's GDP,	Years: 1950-2007, Sources: Correlates to war data set version 3.02, World Development Indicators 2006 (World Bank), Government Finance Statistics Year Book (IMF) and Economic Survey of Pakistan
Lmilbrd 4	Log of India's defence expenditure over India's GDP as a ratio of Pakistan's defence expenditure over Pakistan's GDP plus India's defence expenditure over India's GDP,	Years: 1950-2007, Sources: Correlates to war data set version 3.02, World Development Indicators 2006 (World Bank), Government Finance Statistics Year Book (IMF) and Economic Survey of Pakistan
Lmilbrd5	Log of Mean average of India's defence expenditure over GDP and Pakistan's defence expenditure over GDP,	Years: 1950-2007, Sources: Correlates to war data set version 3.02, World Development Indicators 2006 (World Bank), Government Finance Statistics Year Book (IMF) and Economic Survey of Pakistan
Lmilbrd6	Log GDP weighted average of Pakistan and India's defence expenditures,	Years: 1950-2007, Sources: Correlates to war data set version 3.02, World Development Indicators 2006 (World Bank), Government Finance Statistics Year Book (IMF), Economic Survey of Pakistan, Economic Survey of India
Lmilppi	Log of Pakistan's military personnel over Pakistan's total population as a ratio of India's military personnel over India's total population,	Years: 1950-2007, Sources: Correlates to war data set version 3.02 and International Financial Statistics 2006 (IMF)
Lmilpip	Log of India's military personnel over India's total population as a ratio of Pakistan's military personnel over Pakistan's total population,	Years: 1950-2007, Sources: Correlates to war data set version 3.02 and International Financial Statistics 2006 (IMF)
	Economic Growth	
Gpi	Weighted average of real GDP per capita growth rates for Pakistan and India,	Years: 1950 to 2007. Sources: Pakistan Economic Survey, Indian Economic Survey, International Financial Statistics 2006 (IMF)
	Democracy	
Demopi	Pakistan and India's combined democracy score (by adding 10 to India and Pakistan's Polity2 values for each year and then taking the product of these values in order to convert the variable in dyadic form),	Years: 1950-2007, Source: Polity IV Project (Centre for International Development and Conflict Management)
	Population	
Poppi	Average of Pakistan's total population and India's total population	Years: 1950-2001, Source: International Financial Statistics 2006 (IMF)

Appendix 2:

India Pakistan Peace Negotiations in 2006

Musharraf's Peace Proposals

- Pakistan gives up its claim to Indian-administered Kashmir if people from both regions have freedom of movement
- Neither part of Kashmir can become independent, but both can have a measure of self-governance
- Troops from both sides to be withdrawn in a staggered manner
- A joint mechanism to supervise both regions, in which people from India, Pakistan and Kashmir are represented

(BBC News: 7 Dec 2006)
http://news.bbc.co.uk/2/hi/south_asia/6217734.stm

- "The destinies of our two nations are the past behind us"

(Indian Prime Minister Man Mohan Singh: *Nation', December 21, 2006)*

Indian Response

interlinked. We need to put

Pakistani Newspaper 'the

OUTCOME: ***Kashmir rivals re-open trade route***

An old trade route has reopened after 60 years across the Line of Control (LoC) that divides disputed Kashmir.

"Trucks carrying fruit, nuts and honey were flagged off by Indian officials from Salamabad in Indian-administered Kashmir under tight security. Lorries are expected to arrive later on Tuesday from the Pakistani side, bringing rice, rock salt and furniture. The opening of the trade route is part of a 2004 peace agreement between India and Pakistan, which both claim Kashmir. The trade link follows other confidence-building measures introduced in Kashmir in recent years, including the opening of rail and bus links."

Drum Beating: The BBC's Altaf Hussain says the atmosphere in Salamabad, on the Indian side of the LoC, on Tuesday morning was festive. (Tuesday, 21 October 2008 12:15 UK) http://news.bbc.co.uk/2/low/south_asia/7681320.stm

"I have always dreamed of going to the other side (of LoC), but I never thought I would be driving a lorry there so soon"
Truck driver Mohammad Arif

ON THE SIDELINES of Peace:
Kashmir under indefinite curfew
BBC NEWS: 24 August 2008

- *The strikers want a referendum which they hope will lead to self-determination for the region.*
- *Thousands of troops are enforcing the curfew in Srinagar*