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ON THE COSTS OF NOT LOVING THY NEIGHBOUR AS THYSELF:
The trade, democracy and military expenditure explanations behind India–Pakistan rivalry

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ABSTRACT

We examine whether greater inter-state trade, democracy and reduced military spending lower belligerence between India and Pakistan. We begin with theoretical models covering the opportunity costs of conflict in terms of trade losses and security spending, as well as the costs of making concessions to rivals. Conflict between the two nations can be best understood in a multivariate framework where variables such as economic performance, integration with rest of the world, bilateral trade, military expenditure, population are simultaneously taken into account. Our empirical investigation based on time series econometrics for the period 1950-2005 with causality tests suggests that reduced trade, greater military expenditure, less development expenditure, lower levels of democracy, lower growth rates and less general trade openness are all conflict enhancing. Moreover, there is reverse causality between bilateral trade, militarization and conflict; low levels of bilateral trade and high militarization are conflict enhancing, equally conflict also reduces bilateral trade and raises militarization. We also run forecasting simulations on 6 different VECM models. *Globalization* or a greater openness to international trade in general are more significant drivers of a liberal peace, rather than a common democratic political orientation suggested by the pure form of the democratic peace.

Keywords

Inter-state conflict and trade, democracy and conflict, conflict and economic development

J.E.L codes: D74, F13, F15, F51.

ON THE COSTS OF NOT LOVING THY NEIGHBOUR AS THYSELF: The Trade, Democracy and Military Expenditure Explanations Behind India–Pakistan Rivalry[1]

1 INTRODUCTION

Conflict may be motivated by factors such as historical grievances, the clash of civilizations (Huntingdon, 1996), or pure avarice. Outright hostility between states implies the absence of peaceful cooperation, manifesting itself in diminished inter-state commerce, which in turn could further exacerbate the rivalry between the same countries. In this paper we are concerned with inter-state rivalry between India and Pakistan. Civil war, however, is the most dominant form of war at present; see Harbom, Högbladh and Wallensteen (2006) for data, and Murshed (2002) for a theoretical overview. Despite the preponderance of civil war, inter-state rivalry has not withered away, and these too can also divert substantial amounts of resources away from poverty reduction in developing countries.

International trade allows one country to peacefully benefit from the endowments of another nation through voluntary exchange. Furthermore, free trade integrates the world economy. War is another way of expropriating the endowments of another country, but it is costly as it destroys part of both countries pre-existing wealth. Predation is an alternative to production, but it is not usually the most efficient, as predation (war or other forms of larceny) unnecessarily wastes resources. Such, unenlightened behaviour may be rational or optimal from the standpoint of the individual person or a nation, but is inefficient in the global sense. The work of Francis Edgeworth, writing in the late 19th century, provides a useful starting point in understanding the economic rationale for violence. Edgeworth distinguished between consent—and its absence—in human economic interaction:

> The first principle of Economics is that every agent is actuated only by self-interest. The workings of this principle may be viewed under two aspects, according as the agent acts without, or with, the consent of others affected by his actions. In wide senses, the first species of action may be called war; the second, contract. [Edgeworth, 1881, pp 16-17].

International economic interactions between nations may involve peaceful trade, or it could be belligerent with reduced economic interaction. Outright war is just one manifestation of the rivalry between nations; the armed peace is equally consistent with aggressiveness. India and Pakistan are a case in point. They have had at least four large scale military confrontations (1948, 1965, 1971 and 1999), but otherwise spend a great deal of time in uncompromising posturing vis-à-vis each other. India, in particular, frequently accuses Pakistan of sponsoring terrorism in her territory. But occasionally they make goodwill

[1] We wish to thank Admasu Shiferaw and Arjun Bedi for valuable comments on previous drafts of this paper.

gestures, such as sending out peace buses between cities like Delhi and Lahore, and agree to cricket tours. Less frequently, major concessions are made mainly by Pakistan, such as President Musharraf's willingness to put aside the long standing Pakistani demand and United Nations resolution for a plebiscite to settle the future of Kashmir.[2] Figure 1 charts the hostility levels of the two states on a scale of 0-6. It has never been below 2, but is usually at a high level of 4, which measures belligerency short of outright war.

FIGURE 1
Hostility between Pakistan and India

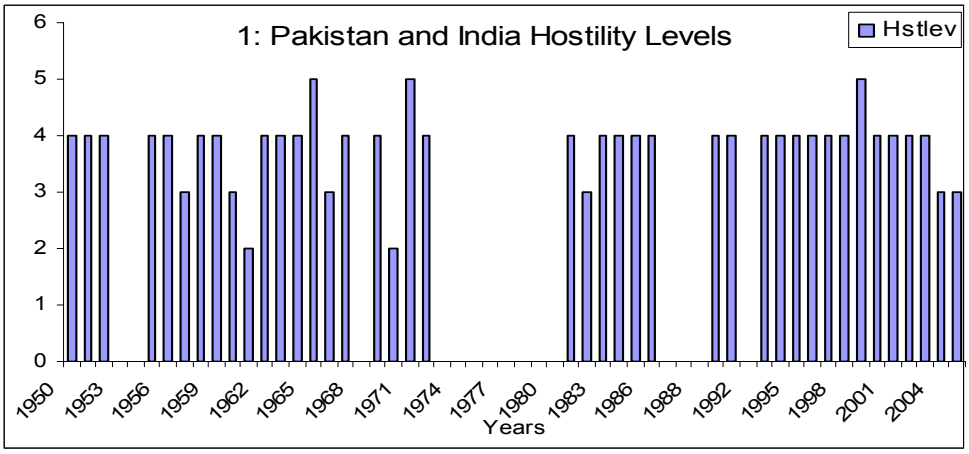


TABLE 1
The Military Burden in Selected Countries

Countries with Conflict	Defence Expenditure (% of GDP)	Countries without Conflict	Defence Expenditure (% of GDP)
India (2004)	2.34	Canada (2004)	1.19
Pakistan (2004)	4.14	Germany (2004)	1.38
Egypt (2004)	2.76	Holland (2004)	1.73
Syria (2003)	6.97	Sweden (2004)	1.73
Israel (2004)	9.30	Argentina (2004)	1.01
Lebanon (2003)	3.92	Mexico (2004)	0.51
Saudi Arabia (2004)	7.70	Nicaragua (2004)	0.69
Oman (2001)	12.16	Panama (2004)	0.97
Yemen (1999)	5.28	Paraguay (2004)	0.70
South Korea (2004)	2.45	Peru (2004)	1.20
USA (2004)	3.98	Guatemala (2004)	0.40
UK (2004)	2.57	El Salvador (2004)	0.66

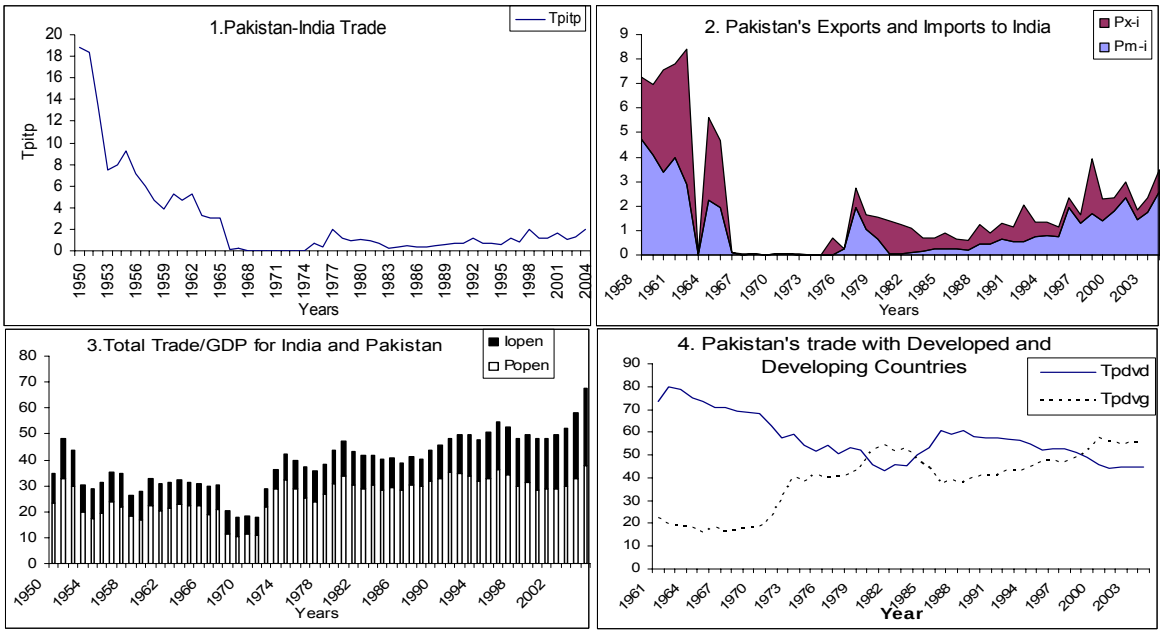
The most recent year for which data is available is given in parenthesis.

Source: World Development Indicators (2006)

[2] See http://news.bbc.co.uk/2/hi/south_asia/3330031.stm.

Both countries spend a considerable amount in military expenditure, measured as a proportion of GDP (see table 1). In fact, these two countries have among the highest military burdens in the world outside the Middle East. One can surmise, that such large scale military expenditure detracts from development and poverty reduction in South Asia which has the largest concentration of the world's poor, defined by below purchasing power parity $1 a day per-person.

FIGURE 2
Patterns in India-Pakistan Trade



Polachek (1997) and Polachek and Seiglie (2006) argue that wars and disputes between geographically contiguous states involve greater losses, as more efficient geographically proximate trade is displaced.[3] This effect, however, depends on the absence of alternative trading partners, who despite

[3] When we come to comparing trade and conflict with many nations, not just dyadic (pair-wise) interactions, Dorussen (1999) argues that although trade reduces conflict, in the presence of many countries, an increase in the number of countries or the world's endowment may induce more conflict, as there are more countries to grab from. Formally, it lowers the minimum probability of military success needed to make conflict worthwhile in the presence or absence of trade with the target country. Hegre (2002) shows that by taking ratios of the probabilities (rather than differences as in Dorussen, 1999) the benefits of trade rise as the number of countries increase. Thus, Dorussen (1999) establishes gains from conflict after globalization, whereas Hegre (2002) models benefits from cooperation (or trade) as globalization gathers pace.

greater distance may be equally or more efficient. Figure 2 shows that India-Pakistan official trade (as a proportion of Pakistan's total international trade) steadily declined from nearly 20% in the early 1950s, plummeting to almost zero after their war in 1965, and has shown some signs of recovery in the 1990s. But it is still below the levels of the 1950s, which was shortly after the two nations were separated politically. This is despite the fact that India and Pakistan have fairly open economies at the present. Pakistan has traditionally been more open than India (Figure 2, panel 3). Pakistan also trades more with developing countries compared to developed countries, as shown by graph 4 in figure 2. Conflict and rivalry are symptomatic of the absence of cooperation including lower trade volumes. Equally, conflict may be said to be a consequence of the lack of trade.

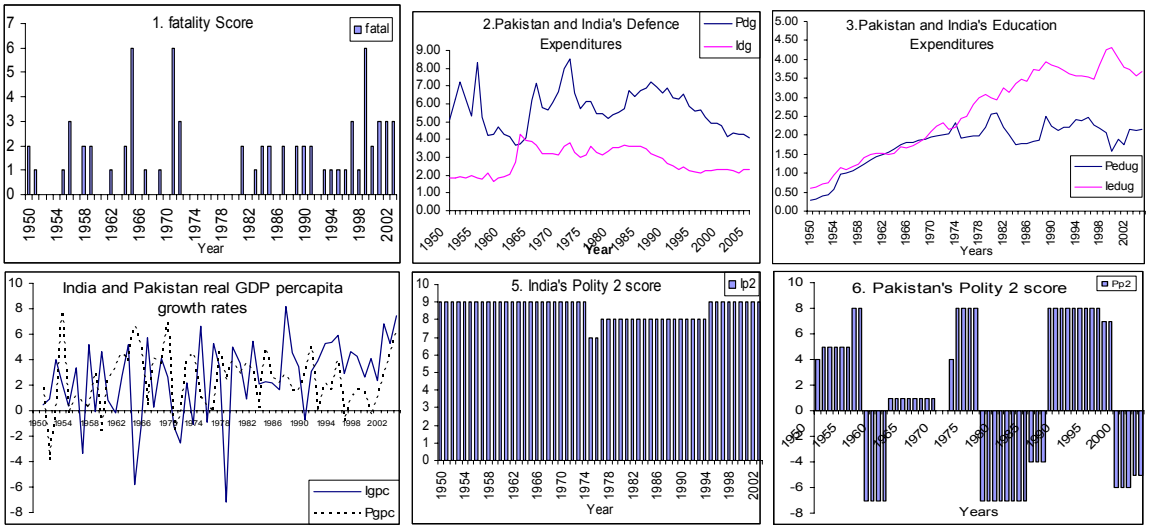
A related issue concerns the so-called *democratic* peace,[4] see Polachek (1997) and Polachek and Seiglie (2006) for a review of this substantial literature. The idea is that democracies will not fight each other because they share cultural norms that militate against forceful dispute resolution, or alternatively the checks and balances that characterise political processes in advanced democracies restrain violence. Put simply, the idea is that established democracies do not go to war with each other, but cooperate instead. The intellectual basis for this argument has been traced back to Immanuel Kant's (1795) work on the Perpetual Peace, where a like mindedness referred to as *cosmopolitanism* would prevent outright war between republics; a tendency that could be reinforced by commercial interdependence. Mirroring Kant's thoughts, the contemporary philosopher, John Rawl's (1999) notion of peace between liberal societies or nations, arguing that liberal societies do not go to war with each other because their needs are satisfied, they are non-acquisitive in the sense of not wishing to grow beyond an achieved steady-state level of (presumably high) income, and they are tolerant of difference. They will only fight in self-defence, and invade to prevent gross human rights abuses such as genocide in other countries. They can, however, occasionally be duped into supporting foreign wars. Polachek (1997) makes a case for the alternative notion of the *liberal* peace, presenting empirical evidence to suggest that advanced democracies cooperate, not because of their similar political systems, but due to their vast and multiply intersecting economic interdependence. Barbieri (1996) demonstrates that the liberal peace based upon the pacific effects of economic interdependence may be a chimera. Oneal and Russett (1999) and Hegre (2000), however, argue that economic interdependence reinforces peace, particularly between democracies. Perhaps, we need a theory that embeds democracy with economic interdependence. Democracies may, however, go to war with other democracies that are distantly located, culturally disparate and considerably poorer, something that is also echoed in Kant (1795). Indeed, Robst, Polachek and Chang (2006) present some evidence to suggest that more democratic nations could exhibit some degree of

[4] Sometimes the literature refers to this concept also as the liberal peace, which is a source of some confusion as some authors refer to the peace emanating from economic interdependence as the liberal peace.

belligerence to less democratic countries, such as in the case of India's actions vis-à-vis Pakistan. Nevertheless, increased democratic levels can mandate concessions and re-negotiation with neighbours.

The Polity score of democracy (see, Polity 4 project) ranges from 0-10. Similarly there is an autocracy score of between -10 to 0. Together, the autocracy and democracy score gives us an average score, acting as an indicator of the overall political system, which is graphed above. Graph 5 in figure 3 shows that India has one of the highest democracy scores in the developing world for the entire 50 year period (7-9), whereas Pakistan's experience with democracy fluctuates, with high autocracy scores associated with military coups in 1958, 1969, 1977 and 1999.

FIGURE 3
Conflict, Development and Democracy Trends in India-Pakistan



Comparisons of graphs 2 and 3 in figure 3 indicates that military expenditures tend to move inversely with development (education) expenditure, providing *prima facie* evidence that large military expenditure crowds out development in the social sector. Pakistan's military expenditure is consistently above India's except in the mid-1960s when India had wars with both China and Pakistan. In Pakistan's case, military expenditure as a proportion of GDP has historically been at 5%, but rising during and after its 1965 and 1971 wars with India to as high as 8%. The average defence expenditure of Pakistan is 5.5% of GDP in the 1950-2005 period, whereas for India it is about half at 2.8% of GDP. Since the 1990s Pakistan's military expenditure has been falling, and is now at a little above 4% of GDP, which represents a historical low. As Indian education expenditure rose to 4 % of GDP in the1990s, its defence expenditure fell from nearly 4% of GDP in the mid-1960s to less than 3% of GDP (it has rarely been below 2% of GDP). Pakistan's education public expenditure is stagnating at around 2% of GDP.

The opportunity costs of conflict could rise when countries move to higher stages of economic development as they have more to lose from conflict, and have more resources to negotiate peaceful settlements. The 1990s is considered to be a golden decade for India as GDP growth rates on average the Indian economy grew at 5-6% annually. Pakistan has been growing at an average of 6% for the last 3 to 4 years. Traditionally, from the early 1960s up to the early 1990s, Pakistan's was the faster growing economy of the two. Both countries are in the second most rapidly growing region (South Asia) in the world (World Development Indicators, 2006).

There is more to India-Pakistan conflict than merely Pakistan's political orientation and a comparison of bilateral economic growth rates. This is because of the fact that despite high growth rates and relatively high democracy scores in Pakistan up to 1999, conflict between the countries escalated in the 1990s. By contrast, the current regime in Pakistan with a strong military orientation (the military is highly influential and the President continues to be the army chief), and therefore less democratic, is making major unilateral concessions to India vis-à-vis their long standing disputes over Kashmir. Could that be related to the very recent impressive growth record in Pakistan? If anything, conflict between the two nations can be best understood in a multivariate framework where the relevant variables and processes (economic performance, integration with rest of the world, trade between the conflicting nations, military expenditure, democracy, and population) are simultaneously taken into account. The purpose of this paper is to examine whether greater inter-state trade, democracy and reduced military spending lower belligerence between India and Pakistan. We also investigate the causal links between bilateral conflict and these variables in a time series framework, between 1950 and 2005 in most cases. The rest of the paper is organised as follows: section 2 contains the theoretical model, the econometric analysis is presented in section 3, and section 4 concludes.

2 THEORETICAL MODEL

This section consists of two parts: the first deals with the costs of belligerent behaviour in a single country context where the losses are displaced trade and the crowding out effects of defence expenditure; the second looks at the costs of peaceful behaviour where the disutility of making concessions to an adversary is modelled in a two country setting. The situations we model either pertain to limited warfare, with negligible effects on national endowments, or alternatively we could be said to model the costs of an armed peace associated with large security and military establishments. In many ways, conflict has similar effects as other forms of trade wars.

2.1 Costs of War

We begin with a single country's decision making with regard to belligerence, based on Polachek (1997). The welfare of either country (U) depends upon consumption (E), and security (S), entering the utility function in a separable fashion:

$$U = u(E, S) \tag{1}$$

where:

$$E = cQ - X + M - T \tag{2}$$

Q is the total endowment of the country where a proportion c is devoted to private and public non-military consumption and investment; a fraction $1\text{-}c$ to a public good covering security or military expenditure. X and M denote exports and imports to the rival country, and T represents trade (exports minus imports) with the rest of the world. θ is the price of the exportable and the price of the importable is the numeraire good, normalised at unity. There is also a balance of trade constraint, the value of exports must equal imports:

$$\theta X(S) - M + T = 0, \ldots X_S < 0 \tag{3}$$

Following Polachek (1997) let us postulate that conflict disrupts trade. Specifically, it lowers exports, but unlike in Polachek's model both countries are hostile towards each other, and not just one country (described as the actor) against a passive target. So, in our model, both countries exports to each other will decline, along with ambiguous effects on the terms of trade. The country whose goods are demanded more elastically will experience the negative terms of trade effect. Nevertheless, exports displaced by conflict are a loss, as they represent foregone trade, especially in the context of neighbours who might be expected to trade substantially in peaceful circumstances. Substituting (3) as a constraint and (2) into (1) allows us to write a Lagrangian function (L), where λ indicates the Lagrange multiplier:

$$L = u(cQ - X + M - T; S) + \lambda[\theta X(S) - M + T] - C(S) \tag{4}$$

The function C represents the distortionary (taxation and crowding out) costs of security expenditure, which rises with S, so that the partial derivative is positive. This is an additional cost associated with security spending, absent in Polachek's (1997) model. The first order condition with respect to S is:

$$u_s = -\lambda X_s + C_s \cdots u_s, C_s > 0, X_s < 0 \tag{5}$$

In equation (5) the marginal utility of security (u_s) is equated to its marginal costs. The latter (on the right-hand side of (5)) is comprised of the trade disruption due to conflict, and the cost of diverting resources to military and security expenditure. This, last effect, is absent from the Polachek models. The cost of conflict is not just confined to displaced trade, but it also has a distortionary resource cost because of security expenditure, either because of distortionary taxation or due to the crowding out effect on other forms of investment, including government spending on health and education; see Deger and Sen (1990). Note, that security expenditure and benefits derived from confronting one's enemy does yield positive utility, but comes at a price.

There is, therefore, an additional cost of belligerent behaviour over and above losses from trade displacement, and is likely to be substantial because it detracts from poverty reduction directly. It is worth noting that trade costs and losses from resource misallocation are *a priori* likely to be greater for the smaller economy, Pakistan. The same will be true of the terms of trade which are likely to deteriorate for Pakistan. This is because a smaller economy's exports to its larger neighbour are usually a greater proportion of its total exports, its goods may be demanded more elastically, and the costs of an arms race are larger for the smaller nation.

2.2 Costs of Peace

If peace is Pareto optimal, why don't countries engage in it?[5] In this section we model the costs of peace, which include psychic non-pecuniary costs of making concessions to one's adversaries. Additionally, we try to demonstrate how increased globalization and democratisation can help to reduce conflict by lowering the cost of making concessions to one's neighbours. To analyse these factors we require a two country expected utility model of non-cooperative strategic interaction.

The two countries: India and Pakistan are indexed by subscripts *I* for India and *P* for Pakistan. There are two states of nature, denoted by superscripts: one more peaceful or dovish (*D*), and the other associated with greater hawkishness (*H*). Their probabilities are defined as π and $1 - \pi$, respectively. An important feature of our model is that states of conflict, or peace, are relative. The probability of either state is in turn affected by an action (*a*) by India and effort (*e*) by Pakistan. These are also the strategic variables employed by the two sides to the conflict. We postulate that the probability of the peaceful state π rises with the input of action and effort by the two sides, but at diminishing rates. One can imagine a range of activities by one or both sides if they wish to promote peace, including a greater willingness to compromise, reduce military expenditure, devoting more resources to peaceful economic development, or a greater willingness to respond to calls for peace by third-parties such as the UN or under the influence of pressure from the United States.

Actions and efforts to seek peace entail costs for each party. The costs of actions to promote peace could take a variety of forms, but, above all, there is the loss of face to either party's hawkish domestic political constituencies, including the military establishment. Increased globalization may, however, augment the stock of rhetoric available to politicians who wish to push their 'peace' agenda through the political process. Secondly, and in a more palpable sense, increased international trade and the growth it brings may provide the

[5] Sir Normal Angell, winner of the 1933 Nobel peace price and former editor of *Foreign Affairs*, in his great book *The Great Illusion,* asserted that nations could never enrich themselves through war, and even a victorious nation would come off economically worse from a war; see Angell-Lane (1910).

additional resources to buy off domestic 'war' lobbies. A more democratic government, following military rule, may similarly use its mandate from the people to justify greater peace and reduced military expenditure.

The expected utility of India is given by

$$U_I = \pi(a,e)U_I{}^D(E_I{}^D + S_I{}^D) + (1-\pi)(a,e)U_I{}^H(E_I{}^H + S_I{}^H) - Z(a(T)) \quad (6)$$

where $U^D{}_I$ and $U^H{}_I$ denote utilities or pay-offs in dovish and hawkish states respectively, weighted by the probabilities of the two states. $E_I{}^D + S_I{}^D$, $E_I{}^H + S_I{}^H$ indicate the exogenous pair of payoffs from consumption and security expenditure respectively in the less belligerent and more belligerent states respectively. The difference is that in dovish state security spending is lower and private consumption higher than in the hawkish state. There will also be more trade between the two countries. Most importantly, the dovish state of nature will imply greater poverty reduction. *Z* is the cost function of undertaking the action, *a*. Action, *a*, increases the probability of peace,π, however, undertaking it entails a cost, as described above. *T* indicates greater globalization (more trade with the rest of the world), and this is postulated to reduce the cost of making peace via the cost function (*Z*) as discussed above, $Z_{a1} < 0$.[6] Also, $\pi_a > 0$, but $\pi_{aa} < 0$; there are diminishing returns to these actions. Note, however, both $Z_a > 0$ and $Z_{aa} > 0$.

Turning to Pakistan, we symmetrically have

$$U_P = \pi(a,e)U_P{}^D(E_P{}^D + S_P{}^D) + (1-\pi)(a,e)U_I{}^H(E_P{}^H + S_P{}^H) - L(e(T,P)) \quad (7)$$

L is the cost of effort, e, which increases the probability of peace, π. As with India, greater globalization lowers the marginal cost of making peaceful concessions, but so does a hybrid concept called increased democratisation (*P*) for Pakistan only given the nature of swings there between democratically elected governments and military rule; L_{e1} and $L_{e2} < 0$. Also, $\pi_e > 0$, but $\pi_{ee} < 0$, $L_e > 0$, and $L_{ee} > 0$.

In the non-cooperative or Cournot-Nash game played by the two sides both sides move simultaneously. Each side, therefore, maximises its own utility function with respect to its own choice variable. For India, it implies maximising utility, Equation (6), with respect to *a* as shown by

[6] Increased globalization is unlikely to *directly* affect the marginal productivity of actions or efforts (*a*, *e*) that raise the probability of peace (π).

$$\pi_a\left[U_I{}^D(\cdot)-U_I{}^H(\cdot)\right]=Z_a \tag{8}$$

Pakistan maximises Equation (7) with respect to e

$$\pi_e\left[U_P{}^D(\cdot)-U_P{}^H(\cdot)\right]=L_e \tag{9}$$

Note that in Equations (8) and (9) each side will equate its marginal benefit from exercising their own strategic choice to the corresponding marginal cost. Each side's strategic choices will depend on the first order conditions given in Equations (8) and (9), along with a fixed conjecture about the opposition's strategic choice. These lead to the (linear) reaction functions for both sides, obtained by totally differentiating Equations (8) and (9) with respect to a and e. For India this is indicated by

$$\frac{de}{da/R_I}=\frac{Z_{aa}+\pi_{aa}\left[U_I{}^H(\cdot)-U_I{}^D(\cdot)\right]}{\pi_{ae}\left[U_I{}^D(\cdot)-U_I{}^H(\cdot)\right]}\gtreqless\ldots 0\ldots if\ \ldots\pi_{ae}\gtreqless 0 \tag{10}$$

and for Pakistan by

$$\frac{de}{da/R_P}=\frac{\pi_{ae}\left[U_P{}^D(\cdot)-U_P{}^H(\cdot)\right]}{L_{ee}+\pi_{ee}\left[U_P{}^H(\cdot)-U_P{}^D(\cdot)\right]}\gtreqless\ldots 0\ldots if\ \ldots\pi_{ae}\gtreqless 0 \tag{11}$$

Note that $\pi_{ae} = \pi_{ea}$ by symmetry.

The reaction functions are positively sloped if $\pi_{ae} > 0$, implying that the two strategies are complements. This is the standard assumption in the literature on conflict. In our model, however, we postulate that $\pi_{ae} < 0$, the choice variables are strategic substitutes, and the reaction functions slope downwards (Figure 4). This can occur because the strategy space is defined in terms of peace. Thus, if one side behaves more peacefully it increases the utility of both parties and the other side may free ride on this action by not bringing about a corresponding increase in their action.

In Figure 4, two non-cooperative equilibria are illustrated by points N and C respectively. Point C is more cooperative and peaceful with greater inter-country trade and poverty reduction. A shift from N to C can occur because of greater globalisation (rise in T) because of, say, the establishment of a free trade area, and increased international (not necessarily just bilateral) trade lowers the marginal cost of peaceful behaviour ($Z_{a1}, L_{e1} < 0$). Analytically this means a change in the first-order condition for India:

$$\pi_a\left[U_I{}^D(\cdot)-U_I{}^H(\cdot)\right]=Z_{a1}dT \tag{8'}$$

and for Pakistan

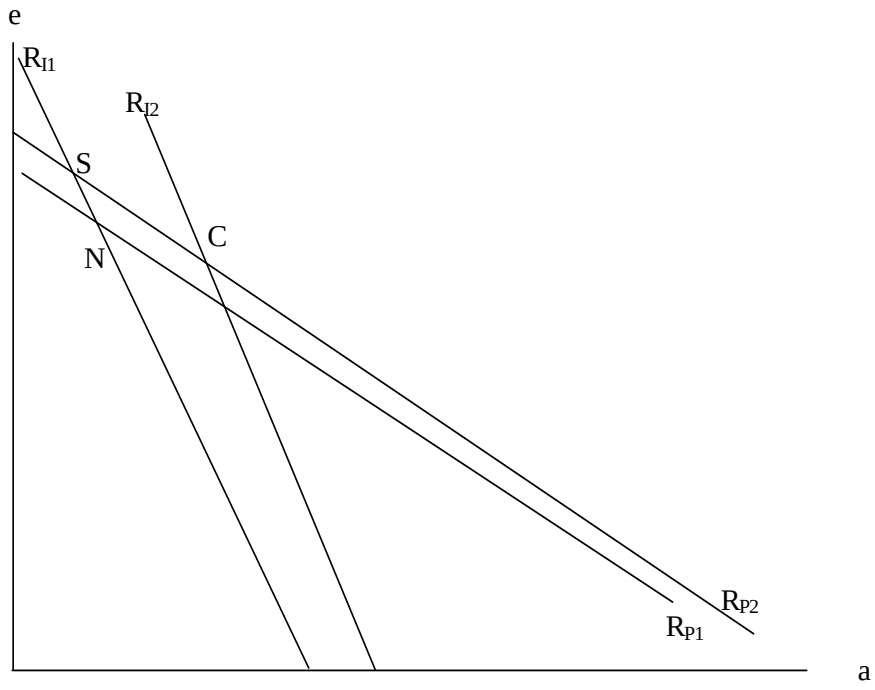
$$\pi_e\left[U_P{}^D(\cdot) - U_P{}^H(\cdot)\right] = L_{e1}dT \qquad (9')$$

This pertains to the liberal peace. Alternatively, there could be a rise in the exogenous pay-offs in terms of consumption expenditure (E) in (8) and (9) above, leading to the same outcome in figure 4.

The costs of peaceful actions may be easier to bear when countries (in this case only Pakistan) are more democratic, as there may be a mandate from the people to engage in more poverty reduction, greater social sector spending and lower military expenditure. This corresponds to the democratic peace and will cause the first order condition for Pakistan to become:

$$\pi_e\left[U_P{}^D(\cdot) - U_P{}^H(\cdot)\right] = L_{e2}dP \qquad (9'')$$

FIGURE 4
Reaction Functions of India and Pakistan



This causes Pakistan's reaction function to shift outwards along India's, with a new equilibrium at point S. Note, however, in the new equilibrium (point S) India has effectively passed on some of the burden of adjustment to Pakistan. In fact, the level of effort exercised by Pakistan is greater than even in the more cooperative solution (C), but not India's. This could be argued to be the case at present. As India moves closer to the United States, and with the latter's global war on terror more pressure is exerted on Pakistan to make unilateral concessions towards India since 2001. We could even argue that India is free riding on Pakistan.

3 EMPIRICAL ANALYSIS

3.1 Hypotheses

$\mathbf{H_1}$: Greater bilateral inter-state commerce, as well as greater multilateral trade with third countries lowers various forms of bilateral inter-state conflict. This corresponds to the liberal peace. This hypothesis follows from our theoretical discussion, specifically the first order conditions in (8') and (9'), and in inversely from the right-hand side of (5).

$\mathbf{H_2}$: More military spending as a result of increased insecurity raises conflict. The hegemonic power, however, may have internal conflict (India has many civil wars) and other neighbours to militarily confront. The marginal utility of security spending rises in (5), as well as in (8) and (9).

$\mathbf{H_3}$: Development expenditure (such as public spending on education) should lower conflict, because of economic growth which enables more consumption in equations (4) to (9). This is also related to the increased democratisation hypothesis, below.

$\mathbf{H_4}$: GDP growth will decrease inter-state conflict; there is more to lose from war. This raises the utility from consumption in (4), (6) through to (9).

$\mathbf{H_5}$: Increases in dyadic democracy scores will lead to less conflict, related to the notion of the democratic peace. Increased democracy may lower the cost of concessions and compromise with former enemies, as in (9") above.

3.2 Data and Methodology

3.2.1 Data

Since inter-state conflict involves at least two parties, it is a dyadic concept. We construct dyadic proxies for India-Pakistan inter-state trade, military burden, development expenditure, economic development and democracy to test the five hypotheses we have presented above. Data definitions are given in the appendix.

3.2.1.1 Measuring conflict

The literature on inter-state conflict classifies conflict data sets into two categories: 1) war data and 2) events data (Polachek and Seiglie, 2006). War data sets focus on more hostile aspects of inter-state interactions such as crises, wars or militarized inter-state disputes (Jones, Bremer and Singer, 1996). The

most comprehensive wars 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 inter-state 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 inter-state 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 between 1966-1992, reported in 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 forty seven newspaper sources between 1948 and1978. Since we are interested in the evolution of India-Pakistan conflict over a period of the last 55 years, we will use Uppsala/PRIO and COW inter-state war data set 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) which we have selected for our analysis. Events data set is not available for the entire period. Though the events data set captures daily observations, our macroeconomic and democracy data varies annually which limits the use of daily information on conflict. Secondly, as shown in figure 1, hostility between India and Pakistan has usually been high in most of last 55 years, enabling the COW data set to capture the severity of conflict in most years of the dispute. Greater coverage by the COW and Uppsala data sets, and the availability of macroeconomic and democracy data on an annual basis also limits the scope of using the events data sets.

3.2.1.2 Measuring international trade

Generally dyadic trade is captured by sum of imports and exports between actor and target countries (Polachek and Seglie, 2006). Figure 2 shows that in the last 55 years the patterns of inter-state trade between Pakistan and India have changed. Before trade between both countries collapsed to near zero in early 1970s, Pakistan was exporting more to India. Since the 1970s, Pakistan is importing more from its neighbour. 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 2 percent of their respective total trade levels. Till the late 1980s, India had been a relatively closed economy, whereas Pakistan has traditionally been more open. We construct two composite measures of India-Pakistan trade. They are Pakistan's total trade with India as percentage of Pakistan's total trade (Tpitp), and also India's trade with Pakistan as a percentage of India's total trade (Tpiti). We expect both trade proxies to be negatively related with conflict. It would be interesting to investigate whether trade between both countries as share of each countries 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. We construct a total of 8 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 are negatively related with hostilities, we can conclude 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.

3.2.1.3 Measuring military expenditure

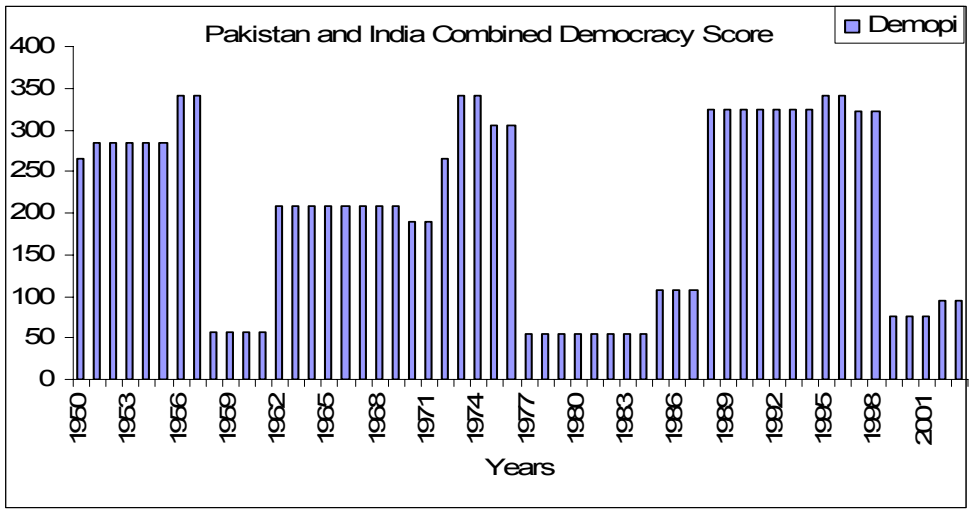
Military expenditures can reflect hostility, as well as deterrence (Polachek and Seglie, 2006). In the India-Pakistan case, we would like to examine how each county's military expenditure/ military burden affects the dispute. Pakistan's spending on military expenditure as a proportion of GDP is higher than India's. Additionally, since military expenditures may also capture the capability of a country to deal with civil unrest or intra-state conflict, 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 vis-à-vis India solely. If so, dyadic variables which take the military burden of Pakistan as a ratio of the Indian military burden, should affect conflict positively and vice versa. We construct 8 different dyadic proxies of military burden utilizing data on military expenditures as well as military personnel from Correlates of Wars: 1. The 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*). Note that first two proxies are the inverse of each other and are expected to reveal the relative sensitivity of each countries' military expenditure to conflict. The last two proxies are a robustness check where military expenditure of each country is divided by the combined military expenditure score of both countries. If Lmilbrd3 is positively associated with conflict, we can substantiate our hypothesis for Lmilbrd1. If Pakistan's military expenditure is more closely associated with their bilateral conflict, and if Indian military expenditure captures 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. We 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 analyzing its country specific application for deterrence or belligerence. Thus we propose two further proxies: 5. the log of average of India's defense expenditure over GDP and Pakistan's defense expenditure over

GDP (L*milbrd5*), 6. Log of Pakistan and India's GDP weighted average of defense expenditures (Lmilbrd6). The proportion of military personnel to the total population represents the extent of militarization in a society. Thus we choose two further variable specifications for military burden: 7. Log of Pakistan military personnel over Pakistan's total population as a ratio of India's military personnel over India's total population (L*Milppi*) and 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 (L*Milppi*).

3.2.1.4 Measuring democracy, growth and other variables

To capture democracy levels for India and Pakistan, we turn to the Polity IV project hosted by Center of International Development and Conflict Management (CIDCM). Polity IV computes a combined polity score by subtracting autocracy scores from the 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 the maximum democracy score. Although India always takes a high positive value of 7 or above, Pakistan frequently takes on negative values. We construct a dyadic variable of democracy for both countries by combining multiplying their Polity scores, following Polachek and Seiglie (1969). We add 10 to each countries polity series to make the negative Polity values positive so that our combined democracy score may capture the variations in the democratization 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 5).

FIGURE 5
Dyadic democracy scores for Pakistan and India



We take the weighted average of India and Pakistan's real GDP per capita growth rates (Gpi) as the dyadic proxy of economic progress for both countries. We constructed the series for both countries by dividing GDP at constant prices taken from economic surveys, and dividing it by population levels. The data was later tallied with GDP per capita series available at the World Development Indicators (2006) data set. We also constructed 4 different proxies of social development based on India and Pakistan's education data[7]: 1. GDP weighted average of per capita education expenditure, 2. Mean average of per capita education expenditure, 3. Pakistan and India's education expenditures as a ratio of Pakistan and Indian's GDP and, 4. 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 four education proxies are constructed to carry out a robustness check on the role of education in conflict mitigation. India and Pakistan are one of the most densely populated countries in the world. Pakistan has 160 million inhabitants, and India has over a billion citizens. In line with the earlier literature, we also take the mean average of both countries populations as a standardising variable in our analysis (see Polachek, 1997).

3.2.2 Methodology

Any simple least square regression analysis may lead to spurious results due to the endogeniety problems among our variables (from trade, military spending, social sector expenditure and growth to conflict and vice-versa). We need to utilize a simultaneous equation model where potential endogenieties between various variables are addressed. Since our data is time series, we will use Vector Autoregressive model (VAR) which is an extension of univariate autoregressive (AR) models to capture the evolution and the interdependencies between our multiple time series (Sims, 1980). All variables in a VAR are treated symmetrically by including for each variable an equation 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 endogeniety among variables. In this sense VAR model is just a seemingly unrelated regression (SUR) model with lagged variables and/or deterministic terms as common regressors so that the regression results for each equation can be interpreted in the same manner as we do for ordinary least square estimators.

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

$$Y_t = c + \Pi_1 y_{t-1} + \Pi_2 y_{t-2} + ... + \Pi_p y_{t-p} + \varepsilon_t \qquad (12)$$

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

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:

$$y_{1t} = c_1 + \Pi^1_{1,1} y_{1,t-1} + \Pi^1_{1,2} y_{2,t-1} + \Pi^2_{1,1} y_{1,t-2} + \Pi^2_{1,2} y_{2,t-2} + \varepsilon_{1t} \quad (13)$$

$$y_{2t} = c_2 + \Pi^1_{2,1} y_{1,t-1} + \Pi^1_{2,2} y_{2,t-1} + \Pi^2_{2,1} y_{1,t-2} + \Pi^2_{2,2} y_{2,t-2} + \varepsilon_{2t} \quad (14)$$

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 that model which 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 we may want 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, we can extend our analysis to test Granger-causality for multivariate VAR (p), where $Y_t = (y_{1t}, y_{2t}, ..., y_{nt})'$.

3.2.3 Results with VAR models

This section reports the results of the multivariate VAR regression analysis. Proxies for conflict, bilateral and multilateral trade, economic progress, military burden and social development will be treated as endogenous variables, whereas dyadic democracy and population will be treated as purely exogenous concepts. Before we carry out the regression analysis, a test for stationarity is in order for all dyadic variables employed in our analysis. If any of the time series variables are non-stationary, appropriate lags are taken to solve for autocorrelation. Stationarity tests are carried out by running the modified Dicky-Fuller t-test also known as the DF-GLS test proposed by Elliot, Rothenberg and Stock (1996). Table 2 provides unit root test results based on these criteria.

Table 2 shows that nearly all variables have unit roots. Since our time series variables are stationary at levels, though with some time lags, we can use unrestricted VAR analysis instead of restricted VECM methodology. We can now proceed to VAR analysis. Our reduced form VAR model for conflict is as follows

$$\begin{aligned} Conf_t = {} & \alpha_1 + \alpha_{2,t-i} Conf_{t-i} + \alpha_{3,t-i} Tr_{t-i} + \alpha_{4,t-i} Mil_{t-i} \\ & + \alpha_{5,t-i} E_{t-i} + \alpha_{6,t-i} G_{t-i} + \alpha_7 Demo + \alpha_8 P_t + \mathrm{E}_t \end{aligned} \quad (15)$$

where $Conf_t$, Tr_{t-i}, Mil_{t-i}, E_{t-i}, G_{t-i}, $Demo_t$ and P_t depict inter-state 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 1950-2005 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 $i = 1,...., p$).

The model above is run for the number of fatalities, *Fatal* because it best captures the severity of the militarized conflict between the two nations. Later, we also employ other conflict proxies in our analysis.

TABLE 2
DF-GLS Unit Root Tests

Variables	Lag length	With intercept	With intercept and trend
Fatal	1	-3.528* (Ng-Perron)	-3.774* (Ng-Perron)
Volfatal	1	-4.789* (Ng-Perron)	-4.844* (Ng-Perron)
Dur	1	-4.058* (Ng-Perron)	-4.233* (Ng-Perron)
Hiact	1	-2.382** (Ng-Perron)	-2.590 (Ng-Perron)
Hstlev	1	-2.371** (Ng-Perron)	-2.512 (Ng-Perron)
Cnf	1	-3.025* (Ng-Perron)	-4.082* (Ng-Perron)
Tpitp	15	-1.112*** (Ng-Perron)	-1.861 (Ng-Perron)
Tpiti	15	-3.856* (MAIC)	-3.319** (Ng-Perron)
Xmpi	2	-2.710* (Ng-Perron)	-2.860*** (Ng-Perron)
Xmip	8	-4.951* (MAIC)	-4.923* (MAIC)
Lxpi1	0	2.951** (D-Fuller)	2.951** (D-Fuller)
Lxpi2	0	-4.769* (SIC)	-4.929* (SIC)
Lmpi1	1	-4.049* (SIC)	-3.961* (SIC)
Lmpi2	1	-4.511* (SIC)	-4.382* (SIC)
Lmilbrd1	5	-2.209** (Ng-Perron)	-2.795*** (Ng-Perron)
Lmilbrd2	5	-2.209**(Ng-Perron)	-2.795***(Ng-Perron)
Lmilbrd3	5	-1.911***(Ng-Perron)	-2.686***(Ng-Perron)
Lmilbrd4	5	-2.128***(Ng-Perron)	-2.831***(Ng-Perron)
Lmilbrd5	1	-4.735* (SIC)	-4.748* (SIC)
Lmilbrd6	0	-	-4.308* (SIC)
Lmilppi	1	-4.082* (SIC)	-4.098* (SIC)
Lmilpip	1	-4.082* (SIC)	-4.098* (SIC)
Ledupi1	1	-	-5.374* (SIC)
Ledupi2	1	-	-5.478* (SIC)
Ledupi3	1	-5.918* (SIC)	-5.907* (SIC)
Ledupi4	1	-	-5.642* (SIC)
Gpi	0	-4.256* (Ng-Perron)	-4.276* (Ng-Perron)
Demopi	7	-2.790* (Ng-Perron)	-2.997* (Ng-Perron)
Poppi	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).

TABLE 3a

Variables	VAR Regression Equations for Fatal under multiple specifications of BiLateral Trade and Military Burden													
	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	-5.09***	-6.35**	-8.34*	-6.08**	-6.07***	-6.07***	-6.19***	-6.02***	-5.97**	-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*	0.072*
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 3b

Variables	VAR Regression Equations for Fatal under multiple specifications of Multilateral Trade and Military Burden													
	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),

- 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 3c

Variables	VAR Regression Equations for Fatal under multiple specifications of Exports, Imports and Military Burden											
	1	2	3	4	5	6	7	8	9	10	11	12
Mutilateral Trade												
Lxpi1(1)	-4.24*	-4.03*	-3.96*									
Lxpi2(1)				-7.89*	-7.15*	-4.78*						
Lmpi1(2)							-0.36	-0.17	0.03			
Lmpi2(2)										-0.71	-0.59	-0.33
Military Burdeñ[a]												
Lmilbrd3 (6)	2.19			5.84**			0.39			0.30		
Lmilbrd4(6)		-0.66			-2.34***			0.44			0.37	
lmilbrd6 (1)			3.51*			2.42***			3.19**			3.09**
Social Development												
Ledupi1(2)	-1.96	-2.08***	-7.13*	-2.87*	-2.89*	-7.02*	-3.97*	-4.19*	-8.66*	-4.01*	-4.13*	-8.43*
Economic Growth												
Gpi (1)	-0.36*	-0.36*	-0.35*	-0.39*	-0.39*	-0.39*	-0.34*	-0.36*	-0.33*	-0.34*	-0.35*	-0.33*
Exogenous Variables												
Demopi (7)	-0.004***	-0.004***	-0.003***	-0.002	-0.002	-0.002	-0.006*	-0.006*	-0.006*	-0.006*	-0.005*	-0.005*
Poppi (10)	0.122*	0.120*	0.154*	0.077*	0.075*	0.103*	0.077*	0.078*	0.104*	0.074*	0.075*	0.103*
N	45	45	45	45	45	45	45	45	45	45	45	45
R2	0.50	0.49	0.55	0.58	0.55	0.55	0.40	0.40	0.45	0.40	0.40	0.44
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)

-*, **, *** 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),

- [a] Results for Lmilbrd1, Lmilbrd2, Lmilbrd5, Lmilppi and Lmilpip are also utilised and the results do not change. (See tables 3a and 3b for details)

TABLE 3d

Variables	VAR Regression Equations for Fatal under multiple specifications of Education and Multilateral Trade											
	1	2	3	4	5	6	7	8	9	10	11	12
Social Development												
Ledupi1(2)	-7.70*	-7.13*	-7.01*									
Ledupi2(2)				-8.17*	-7.52*	-7.44*						
Ledupi3(2)							-4.06***	-6.29*	-5.79*			
Ledupi4(2)										-7.96*	-8.93*	-8.91*
Multilateral Trade												
Xmip(8)	-2.68			-2.68			-3.92***			-3.14		
Lxpi1(1)		-3.96*			-3.92*			-5.46*			-4.74*	
Lxpi2(1)			-4.78*			-4.75*			-6.35*			-5.76*
Military Burdeñ[a]												
Lmilbrd6 (1)	2.26	3.50**	2.42***	2.44	3.62*	2.58***	-0.96	2.02***	0.45	0.51	2.73**	1.52
Economic Growth												
Gpi (1)	-0.36*	-0.35*	-0.39*	-0.37*	-0.36*	-0.39*	-0.42*	-0.41*	-0.45*	-0.39*	-0.38*	-0.42*
Exogenous Variables												
Demopi (7)	-0.006*	-0.003***	-0.003	-0.006*	-0.004*	-0.003	-0.005*	-0.001	-0.001	-0.006*	-0.003***	-0.002
Poppi (10)	0.101*	0.154*	0.103	0.107*	0.158*	0.109*	0.031*	0.107*	0.038*	0.021	0.087*	0.028**
N	45	45	45	45	45	45	45	45	45	45	45	45
R2	0.47	0.54	0.55	0.47	0.55	0.55	0.39	0.53	0.53	0.44	0.55	0.56
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)

-*, **, *** 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),

- [a] Results for Lmilbrd1, Lmilbrd2, Lmilbrd3, Lmilbrd4, Lmilbrd5, Lmilppi and Lmilpip are also utilised and the results do not change. (See tables 3a and 3b for details)

TABLE 4
VAR Regression results for Various Measures of Conflict

Variables	VAR Regression Equations under multiple Specifications for Conflict and Military Burden														
	Volfatal			Cnfpi			Dur			Hstlvl			Hiact		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Mutilateral Trade															
Lxpi2 (1)	-10996*	-9971*	-6662*	-2.60*	-2.48*	-1.22***	-451.46**	-413.04**	-182.81	-6.81*	-6.60*	-4.07**	-25.75**	-25.32*	-16.08***
Military Burdeñ[a]															
Lmilbrd3 (6)	8276*			2.91*			604.72*			5.33***			19.09		
Lmilbrd4(6)		-3352**			-1.46*			-283.85**			-2.68***			-9.98	
Lmilbrd6 (10)			3255***			0.31			-55.94			0.97			4.47
Social Development															
Ledupi (2)	-397.02	-435.58	-6011.6**	-0.74***	-0.69	-1.48	-146.53	-130.7	-180.69	-1.56	-1.47	-3.34	-9.09***	-8.75***	-17.08
Gpi (1)	-517.07*	-524.78*	-554.46*	-0.86**	-0.084***	-0.09**	4.89	4.97	3.63	-0.25***	-0.25***	-0.26***	-1.28**	-1.26**	-1.38***
Exogenous Variables															
Demopi (8)	1.36	1.06	0.06	-0.001***	-0.001***	-0.002***	-0.336***	-0.342***	-0.372***	-0.001	-0.001	-0.001	-0.011	-0.012	-0.012
Poppi (11)	36.38***	34.66***	71.54*	0.023*	0.021*	0.027*	3.531***	3.209***	4.248***	0.051**	0.048**	0.058**	0.253*	0.247*	0.295*
N	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
R2	0.45	0.44	0.42	0.53	0.51	0.42	0.40	0.37	0.31	0.42	0.42	0.38	0.39	0.40	0.37
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)	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),

- [a] Results for Lmilbrd1, Lmilbrd2, Lmilbrd5, Lmilppi and Lmilpip are also utilised and the results do not change. (See tables 3a and 3b for details)

Table 3a shows the results for bilateral trade with 8 proxies of the military burden we propose in section B.1. The evidence suggests that trade between Pakistan and India significantly decrease 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 we know from figure 2, that trade between Pakistan and India has remained very low, and comprises only a very small fraction of each country's total international trade. Though low trade levels between both countries may very well be the cause of the ongoing conflict, here we do not need to worry about reverse causality because our 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 are significantly related with conflict especially in case of *Tpitp*. *Lmilbrd1* and *Lmilbrd3* are negatively related with conflict, and *Lmilbrd2* and *Lmilbrd4* are positively related with conflict. This confirms our 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 will be correlated with higher conflict. However negative signs of Lmilbrd2 and Lmilbrd4 also suggest that India's military expenditure is weakly related with conflict whereas as argued Indian military expenditure is also directed to its domestic civil wars and security concerns with other states and thus in case of *Lmilbrd1*, *Lmilbrd2*, *Lmilbrd3* and *Lmilbrd4* the explanatory power comes from Pakistan's military expenditure. Furthermore, combined military scores in Lmilbrd5 and Lmilbrd5 are positively related 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 militarization in Pakistan may very well be an outcome of the ongoing hostilities between 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* are significantly related to conflict mitigation, and the size of coefficients suggests that the potential of 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 3b and 3c show the 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* have reduced as they are generally insignificant but the coefficients have also been reduced especially for *Xmpi* and *Xmip*. The only military burden proxy which is consistently significant and also comes out with the right sign is *Lmilbrd6*. This means that our conclusion about the average conflict enhancing role of military

expenditures has not been altered. Results in table 3b 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, we can also conclude that there is no rivalry between India and Pakistan in terms of their trade with rest of the world, and any competition to capture international market share is healthy. Table 3c shows results for average trade scores for both countries differentiated by exports and imports. Exports by both countries to rest of the world are negatively related with conflict and the relationship is significant at the 1% level. Also, note that the values of $\alpha_{3,t-i}$ have increased further for combined exports when compared with the results in table 3b, indicating that the more these two countries are able to export to rest of the world, the lower are the levels of bilateral conflict. The high coefficients of *Xmpi* can lead us to infer 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 the likes of China. In contrast to exports, results on *Lmpi1* and *Lmpi2* show that rising imports although 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.

We investigate the potential of development expenditure in conflict mitigation in detail by employing 4 proxies of education expenditure, with 3 different combinations of multilateral trade, while using *Lmilbrd6* as a common proxy for military burden. The results are presented in table 3d. In contrast to defence expenditure, which is positively related to conflict, efforts to improve human capital by allocating more funds to education are a strong determinant of conflict mitigation as the results in table 3d demonstrate. All four proxies of education expenditure always enter the conflict regression equation with a negative sign, and are significant in all specifications. The high values of $\alpha_{5,t-i}$ indicate that channeling resources to development sector in general, and investment in education in particular, may go a long way in building peace. The weighted average of Pakistan and Indian per-capita growth rates (*Gpi*) are negatively and significantly related with *Fatal* in all specifications confirming the hypothesis that countries are more peaceful when they are moving forward economically. The combined democracy score (*Demopi*) is always negatively related to conflict, and also significant. However, the low values of democracy coefficients suggest that political orientation has played a more limited role in the India-Pakistan conflict. Our results also show that the high levels of population in both countries, where a significant proportion are uneducated and poor on both sides, contribute positively to the conflict, although the effect is small. The results on *Xmip*, *Lxpi1* and *Lxpi2* confirm yet again that India and Pakistan should open up further, as conflict mitigation is highly responsive to multilateral trade. In other words, we can conclude that a lower military burden would mean both countries can invest more on education,

higher multilateral trade combined with increased education level will seriously contribute to peace between Pakistan and India on a sustainable basis. Though democracy is also good for peace, economics clearly trumps democracy as a conflict mitigating factor.

Further robustness checks, under additional specifications of the conflict dependent variable, are carried out on (15) with different proxies of conflict (i.e, *Volfatal*, *Cnfpi, Dur*, *Hstlvl* and *Hiact*). Each definition of conflict is regressed on *Lmilbrd3, Lmilbrd4* and *Lmilbrd6,* whereas *Lxpi2, Ledupi1, Gpi, Demopi* and *Poppi* make up the common set of regressors in a total of 15 specifications. The results are given in Table 4. They confirm the validity of all the 5 hypotheses proposed at start of our empirical section, and our theoretical model. More trade, increased education expenditure, higher GDP per capita growth rates, a greater democratic orientation, all exert downward pressure on conflict, as all of these variables are significant in most cases, and always carry the right signs. A comparison of coefficients suggests that integration with the world has by far the most dominant effect on conflict mitigation than any other variable. Note that in table 4 we only consider multilateral trade, and not bilateral India-Pakistan trade. Education spending comes second in its effectiveness in enhancing peace. The results in Table 4 also show that annual battle deaths, severity of conflict, duration of escalation, hostility levels and highest hostility level decrease when both countries score high on democracy. Again, persistently low values taken by democracy $\alpha_{7,t}$ means that political orientation plays a less prominent role in explaining the severity of dispute or levels of escalation. There is some evidence that these countries have entered into outright war even when both were democracies. The 'Kargil' war of 1999 is a case in point. By contrast, the long military stand off between India and Pakistan in 2002, occurred at a time when Pakistan was highly autocratic. The results in the table 4 also indicate that *Lmilbrd3* always enters (15) with a positive sign and is significant in 4 out of 5 cases. The coefficients of *LMilbrd3, Lmilbrd4 and Lmilbrd6 are* highest for *Volfatal and Dur* suggesting that military expenditures significantly increase the severity of conflict as more days of the year are spent in hostility and higher fatalities are borne by both sides.

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 also cases of reverse causality. We ran Granger causality test for each VAR specification for which we present results in tables 3a, 3b, 3c, 3d and 4. A summary of Granger causality tests are provided in table 5 for all endogenous regressors of conflict, and where there is an instance of reverse causality it is noted. The results in table 5 show that all regressors except *Lmilppi,* Lmilpip, *Lmpi1* and *Lmpi2* Granger cause conflict. We also witness 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 5
Granger Causality Wald Tests

Direction of Causality	Causes	RC	Direction of Causality	Causes	RC
Tpitp → *Fatal*	(√)*	(√)***	*Gpi* → *Volfatal*	(√)*	×
Tpiti → *Fatal*	(√)***	(√)**	*Lxpi*2 → *Cnfpi*	(√)*	×
Xmpi → *Fatal*	(√)**	×	*Lmilbrd*3 → *Cnfpi*	(√)*	×
Xmip → *Fatal*	(√)*	×	*Lmilbrd*4 → *Cnfpi*	(√)*	×
*Lxpi*1 → *Fatal*	(√)*	×	*Lmilbrd*6 → *Cnfpi*	×	(√)***
*Lxpi*2 → *Fatal*	(√)*	×	*Ledupi*1 → *Cnfpi*	(√)***	(√)***
*Lmpi*1 → *Fatal*	×	×	*Gpi* → *Cnfpi*	(√)*	×
*Lmpi*2 → *Fatal*	×	×	*Lxpi*2 → *Dur*	(√)*	×
*Lmilbrd*1 → *Fatal*	(√)**	×	*Lmilbrd*3 → *Dur*	(√)*	×
*Lmilbrd*2 → *Fatal*	(√)**	×	*Lmilbrd*4 → *Dur*	(√)**	×
*Lmilbrd*3 → *Fatal*	(√)*	×	*Lmilbrd*6 → *Dur*	×	(√)***
*Lmilbrd*4 → *Fatal*	(√)*	×	*Ledupi*1 → *Dur*	(√)*	(√)*
*Lmilbrd*5 → *Fatal*	(√)*	(√)**	*Gpi* → *Dur*	(√)*	×
*Lmilbrd*6 → *Fatal*	(√)*	(√)*	*Lxpi*2 → *Hstlvl*	(√)*	(√)*
Lmilpip → *Fatal*	×	×	*Lmilbrd*3 → *Hstlvl*	(√)***	×
Lmilppi → *Fatal*	×	×	*Lmilbrd*4 → *Hstlvl*	(√)***	×
*Ledupi*1 → *Fatal*	(√)*	(√)*	*Lmilbrd*6 → *Hstlvl*	×	(√)*
*Ledupi*2 → *Fatal*	(√)*	(√)*	*Ledupi*1 → *Hstlvl*	×	(√)*
*Ledupi*3 → *Fatal*	(√)*	×	*Gpi* → *Hstlvl*	(√)***	×
*Ledupi*4 → *Fatal*	(√)*	(√)***	*Lxpi*2 → *Hiact*	(√)**	(√)***
Gpi → *Fatal*	(√)*	×	*Lmilbrd*3 → *Hiact*	×	×
*Lxpi*2 → *Volfatal*	(√)*	×	*Lmilbrd*4 → *Hiact*	×	×
*Lmilbrd*3 → *Volfatal*	(√)*	×	*Lmilbrd*6 → *Hiact*	×	(√)*
*Lmilbrd*4 → *Volfatal*	(√)*	×	*Ledupi*1 → *Hiact*	(√)***	(√)**
*Lmilbrd*6 → *Volfatal*	(√)*	(√)***	*Gpi* → *Hiact*	(√)***	×
*Ledupi*1 → *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 India-Pakistan conflict which has spanned more than 50 years. Thus any decrease in hostility levels would also exert a positive and favourable effect on bilateral trade which would create fertile grounds 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 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 be positively related with conflict, which is the case in table 3a, 3b, 3c and 4 . In the 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 of 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 doesn't have any major dispute with any other nation, or frequent instances of intra-state disputes to justify the high budget allocation for defense. Reduction of hostilities would thus favourably affect the military burden in both countries, and both India and Pakistan can 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 defense seem to crowd out public investment in development sector. We also find that there is reverse causality between *Lxpi2* and *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 rest of the world for both countries. This will have negative effects on growth potentials also. For example one can observe from figure 2, section 1, that right after 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 1% level in all the observed instances of table 5. These results substantiate our graphical analysis, where hostilities between both countries seem to go down when both countries are performing well on the macroeconomic front. Any slow down in growth rates in any of the two nations seem to be positively correlated with the conflict and this trend has been very much present since 1950.

3.2.4 Results with VECM models

Our analysis above establishes an average relationship between conflict and some of its identified determinants in a pure dyadic setting. We now wish to further analyze country specific effects in order to investigate in detail the potential of each country's trade levels, military burden, development expenditure and economic performance in enhancing peace and mitigating conflict. For Pakistan, we use Pakistan's trade share with rest of the world (*Popen*), Pakistan's total exports to GDP ratio (*Pexpg*) and Pakistan's imports to GDP ratio (*Pimpg*) as proxies of Pakistan's multilateral trade. Pakistan's exports to India (*Pxi*) are a proxy for bilateral trade. Pakistan's defence expenditure as a percentage of its GDP (*Pdg*) is a proxy for the military burden, and *Pedug* is Pakistan's education expenditure as a percentage of its GDP. Similarly for India, we employ 3 proxies of multilateral trade namely *Iopen, Iexpg* and *Iimpg*, 1 proxy of bilateral trade (*Ixp*), 1 proxy of military burden (*Idg*) and 1 proxy for education expenditure (*Iedug*). We will not use separate Polity scores for India and Pakistan, as any changes in combined democracy scores are due to Pakistan. Before we carry out our econometric analysis, we undertook the stationary test. Here note that our new variables are not a complex

combination of weighted proxies of dyadic nature and thus may show higher levels of autocorrelation because they are simple percentages of times series variables which are mostly capturing single country time dynamics. Achieving stationarity in such a series at their level may be difficult.

TABLE 6
Augmented Dickey Fuller Test

Variables	Lag length	With intercept	With intercept and trend
Δ **Fatal**	1	-0.875*	-0.929*
Δ **Popen**	1	-0.977*	-0.984*
Δ **lopen**	1	-1.192*	-1.495*
Δ **Pexpg**	1	-0.937*	-0.965*
Δ **lexpg**	1	-0.940*	-1.257*
Δ Pimpg	1	-1.125*	-1.121*
Δ limpg	1	-1.321*	-1.449
Δ Pxi	1	-1.692*	-1.702*
Δ lxp	1	-1.971*	-2.328*
Δ Pedu	1	-0.946	-1.025*
Δ ledu	1	-0.841*	-0.879*
Δ Pgpc	1	-1.992*	-1.995*
Δ lgpc	1	-2.292*	-2.293*
Δ Pdg	1	-1.421*	-1.441*
Δ ldg	1	-0.899*	-0.877*
Δ Pmilpop	1	-1.289*	-1.292*
Δ lmilpop	1	-0.756*	-0.766*
Δ Demopi	1	-0.982*	-0.982*

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

For time series variables, it is quite possible for random walks to be related to each other so that a regression of one random walk on the other has a stationary error term. As a simple example, consider a two variable system:

$\Delta y_{1,t} = \varepsilon$ and $\Delta y_{2,t} = u$ let $y_{1,t} + y_{2,t}$ be stationary. The simplest example is that $y_{2,t} = -y_{1,t} + v.$

That is, let one random walk be the negative of the other and allowing for some error. Then the sum is simply a random error with no unit root or autocorrelation. If the combination of unit root variables is not a unit root then there must be some relationship between them. If there is co-integration then a relationship exists, if not it does not. Therefore establishing that a relationship exists between unit root variables is equivalent to establishing co-integration. That relationship is called the co-integrating vector, which for our example is (1, 1) since the sum is stationary. There is a way to write a system that captures all the relationships and avoids unit roots. Consider

$$\Delta y_{1,t} = \alpha_1(\beta_1 y_{2,t-1} + \beta_2 y_{1,t-1}) + \varepsilon_t + v_t,$$
$$\Delta y_{2,t} = \alpha_2(\beta_1 y_{2,t-1} + \beta_2 y_{1,t-1}) + u_t + v_t$$

This is called a vector error correction model. The error correction comes from the co-integrating relationship. The betas contain the co-integrating equation and the alphas the speeds of adjustment. If $y_{1,t}$ and $y_{2,t}$ are far from their equilibrium relationship, either $y_{1,t}$ or $y_{2,t}$ or both must change, the alphas let the data choose. The vector part of the name does not apply to the model above, but it will if the error terms are autocorrelated.

We ran unit root tests on the above variables and find that the unit root is only solved at first differences, as shown by table 6. Since at levels, nearly all variables have unit roots, there should be at least one co-integrating relationship for our analysis to move forward. In other words, we can no more use unrestricted VAR analysis but need to under take Vector Error Correction Methodology (VECM) which is only a restricted VAR, where we first find the presence of the number of co-integration equations in each VECM specification and then run the regression analysis. As mentioned above, VECM also allows us to have a rich set of information among variables including their short and long-term adjustment dynamics and thus provides more comprehensive insights into the relationship among variables than an unrestricted VAR would do.

The three reduced form VECM equations for Conflict would be as follows then:

$$\begin{aligned} Conf_t = \alpha_1(&\beta_{1,t-i} Conf_{t-i} + \beta_{2,t-i} Ptr_{t-i} + \beta_{3,t-i} Itr_{t-i} + \beta_{4,t-i} Pdg_{t-i} + \\ &\beta_{5,t-i} Idg_{t-i} + \beta_{6,t-i} Demo_{t-i}) + \sum_{y=1}^{6} C_{ya,t-i} + E_{1t} \end{aligned} \quad (16)$$

$$\begin{aligned} Conf_t = \alpha_2(&\beta_{7,t-i} Conf_{t-i} + \beta_{8,t-i} Pedu_{t-i} + \beta_{9,t-i} Iedu_{t-i} + \beta_{10,t-i} Pdg_{t-i} + \\ &\beta_{11,t-i} Idg_{t-i} + \beta_{12,t-i} Demo_{t-i}) + \sum_{y=1}^{6} C_{yb,t-i} + E_{2t} \end{aligned} \quad (17)$$

$$\begin{aligned} Conf_t = \alpha_3(&\beta_{13,t-i} Conf_{t-i} + \beta_{14,t-i} Pgpc_{t-i} + \beta_{15,t-i} Igpc_{t-i} + \beta_{16,t-i} Pdg_{t-i} + \\ &\beta_{17,t-i} Idg_{t-i} + \beta_{18,t-i} Demo_{t-i}) + \sum_{y=1}^{6} C_{yc,t-i} + E_{3t} \end{aligned} \quad (18)$$

Here, $\beta's$ show the co-integration relationship for each variable under investigation for each equation, and the $\alpha's$ show the adjustment parameters. $C's$ are the constant terms for each six variables on the right hand side of each VECM equation, and $E's$ are the respective error terms. As mentioned, the general openness indicator, total export shares, total import shares and exports to the other country of conflict for both India and Pakistan are utilized as 4 separate single country proxies of trade. Thus there are 4 separate specifications for equation (16). This makes total number of VECM specification rise to 6.

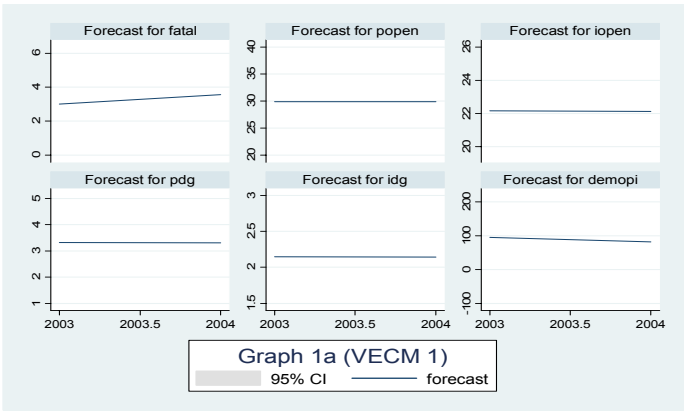
TABLE 7
VECM Regression Results for Fatal:

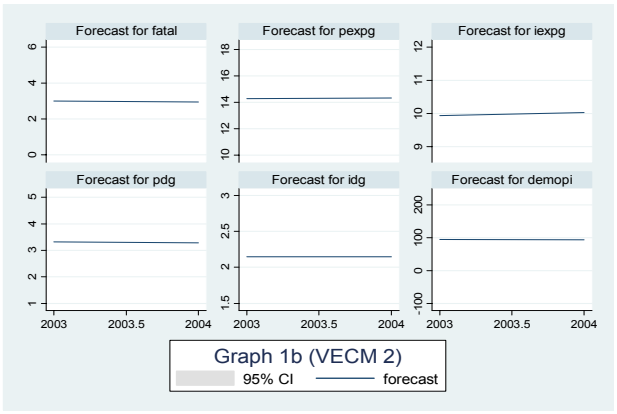
Variables	VECM Regression Equations for Fatal under multiple specifications of Trade, Education and Growth											
	VECM 1		VECM 2		VECM 3		VECM 4		VECM 5		VECM 6	
	α	β	α	β	α	β	α	β	α	β	α	β
Fatal	-0.92*	1	-0.80*	1	-0.87*	1	-0.96*	1	0.70*	1	0.05	1
Popen	0.27	0.15*										
lopen	0.39*	-0.38*										
Pexpg			0.28***	0.15								
lexpg			0.11**	-0.36***								
Pimpg					-0.02	0.30*						
limpg					0.29*	-0.85*						
Pxi							4.51	-0.007				
lxp							2.20	-0.015*				
Pedu									-0.02	2.27*		
ledu									-0.002	-1.53*		
Pgpc											-0.11**	2.18*
lgpc											-0.37*	2.57*
Pdg	-0.027	0.034	-0.081	0.52*	0.031	-0.25	0.048	-0.024	-0.082	0.84*	0.02	2.62*
ldg	0.009	-0.866*	-0.017	-0.32	0.030	-1.35*	0.002	-0.031	-0.006	-0.84**	0.002	-2.04
Demopi	17.83*	-0.003***	17.8*	-0.004**	14.73**	-0.002	14.76**	-0.0004	19.11	-0.008*	2.42*	-0.017***
(MaximumVEC Rank)°	*(1) °*		*(1) °*		*(1) °*		*(1) °*		*(1)°*		*(4) °*	
N	53		53		53		45		53		52	
R2	0.53		0.57		0.48		0.52		0.42		0.04	
VEC(p)	VEC(1)		VEC(1)		VEC(1)		VEC(1)		VEC(1)		VEC(1)	

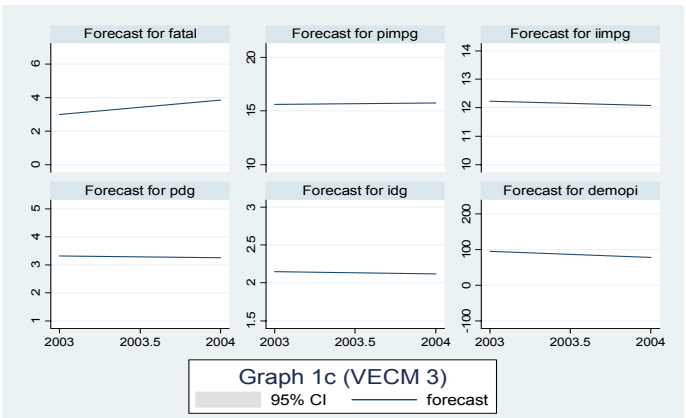
--*, **, *** shows significance at 1%, 5% and 10% level, Δ denotes values first difference

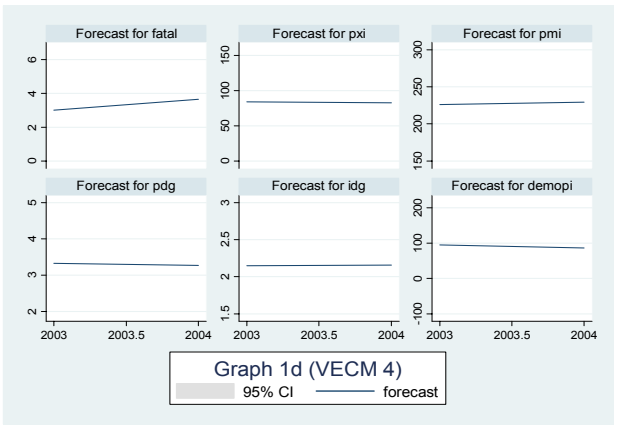
-Here α captures adjustment coefficients for a co-integration equation and β are parameters for each variable in a co-integration equation. *°VEC Rank shows the maximum number of co-integration equations for each VECM model* significant at 5%. - VEC(p) reports lag-order for each VECM model based on final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) and the Hannan and Quinn information criterion (HQIC)

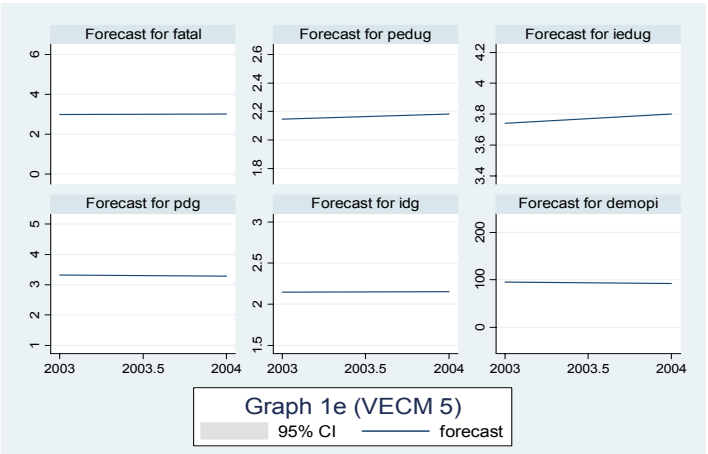
FIGURE 7
Forecasting Simulations based on VECMs for Fatal

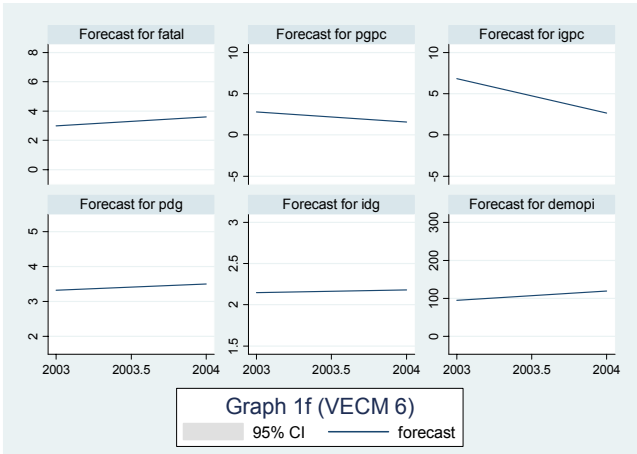












The results for each VECM equation are presented in table 7. The lag length for each VEC equation is (1), based on final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC) and the Hannan and Quinn information criterion (HQIC). There is one co-integrating equation in each VECM, confirming the robustness of the model specification. Note, that optimal value of conflict is zero in the long run,

meaning that our conflict measure, *Fatal* takes the value of 0. The results for VECM 1 show that *Fatal* takes a negative value, and *Popen* and *Iopen* positive values. This means that in the short-term both Pakistan and Indian trade shares are negatively related with *Fatal*. However, only Indian trade is significant enough to exert a negative pressure on hostilities in the short-term adjustment period. In the long run both Pakistan's and Indian trade shares with rest of the world will adjust by moving in opposite directions. In the long run Pakistan would witness a rise in its trade with the outside world and Indian trade would decline to its optimal level. The long-term net result on the trade share of both countries is expected to be positive as trade would be at higher levels with peace than without peace. The long-term rise in Pakistan's trade shares in order to adjust to a fall in hostility levels also mean that the negative effects of India-Pakistan conflict have thwarted Pakistan's capacity to trade in international markets more than in India' case. Results on VECM 2 suggest that in short-term both exports by India and Pakistan would rise to adjust to any fall in conflict. However, in the long run Pakistani exports would remain unchanged, whereas Indian exports will adjust downwards. Similar short-term adjustment dynamics for imports are observed for India in VECM 3. However in the long run Pakistan's imports would rise as conflict moves to its optimal value of 0, whereas imports by India will adjust downwards. The above discussion suggest that Pakistan's trading capability has been seriously hampered by the conflict between both nations despite the fact Pakistan has been historically more open economy when compared to India. As far as Indian trade with the outside world is concerned, in the short-term it is destined to rise further especially if hostilities with Pakistan abate. However, the long run trade share would adjust downwards unless India follows a more open trade policy and further reduce its tariffs to levels similar to its neighbour.

Bilateral trade would also respond to increased peace as shown by the results of VECM 4. In the short-term there is a sign of increase in bilateral trade between India and Pakistan, but the increase is not significant meaning trade between India and Pakistan would remain low. However in the long run Indian exports to Pakistan would go down to reach an optimal level. This is an important finding. Some in Pakistan fear that peace initiatives like reducing tariffs for Indian goods would mean greater dependency on Indian produce. Taking into account the historically high hostility levels between two countries, any peace initiative or confidence building measure which leads to more market access to India is viewed with scepticism in Pakistan, as many fear that dependence on India may expose Pakistan to unnecessary pressures from India, and vulnerable to one sided solutions to the Kashmir dispute. Our results show that in the long run the dependency on Indian cheap goods would actually decline, and both countries would end up being equal trading partners. Thus more bilateral trade, far from creating any power imbalance between India and Pakistan, would equally distribute the gains. Pakistan may fulfil its import needs more from the other developing countries such as China. The results for VECM 5 suggest that education expenditure would increase in the short-term to reduce conflict, and as conflict falls to its optimal level, Pakistan would be able to simultaneously put more resources in education sector. High growth rates also adjust positively to decrease hostility levels and in the long run as the hostilities fall, both countries also witness a strong positive effect on

their growth rates. This means that peace would put India and especially Pakistan on higher growth paths on a sustainable basis.

The results for the military burden show that in the short-term military expenditure would continue to remain at high levels. However, in the long run, as hostilities decline, Indian military expenditure would fall. However, Pakistan's military spending would adjust upward with declining trends in hostility.[8] In the short-term there is also evidence of higher democracy scores as hostilities fall, but low values of the $\beta's$ show that conflict mitigation is quite weakly related to conflict.

In order to further check the conclusions drawn from our VECM results in table 7, we generated 6 different forecast schedules from 6 co-integrating VECMs as a simulation exercise to predict how conflict would be affected to changes in its determinants. Note that the data on *Fatal* are only up to 2002. Thus the one year forecasts are generated for *Fatal* for 2003 period. Figure 7 shows the forecast graphs. Graph 1a, 1b and 1c suggest that if military expenditures by both countries would remain at its current high levels, along with trade with the outside world at their 2002 levels, a slight deterioration in democracy scores will have a significant effect on the rise in hostility. However, if India is able to export or import more, this would at least put a check on any rise in the severity of conflict and hostilities would adjust to some average level. Any decline in Indian trade will enhance hostilities. Current low levels of bilateral trade between Pakistan and India is conflict enhancing so more trade with increased exports by both sides to each other should be encouraged. More access to Pakistani markets on the Indian side may not lead to conflict mitigation if Pakistan is not able to also export more to India. A rise in education expenditure puts a check on hostilities as seen in Graph 1e. Graph 1f is the standard representation of India-Pakistan conflict, and best fits historical trends. The forecasts suggest that conflict will rise, even if there is a significant increase in combined democracy scores, if growth rates plummet. Both Pakistan and India have seen many such years, when hostilities between both countries rose significantly when at least one of the countries is performing poorly, but were channeling more resources on the military as a proportion of their GDPs. The forecasts favour the liberal peace over democratic peace. Thus one may look at current peace talks between both countries with optimism as both are performing well on the economic front and channeling fewer resources on military as a proportion of national income, while at the same time having a divergent set of political institutions.

[8] We have also run VECM regressions military personnel of each country as a proxy of military burden. The results show that in the short to long-term there is a significant decline in military personnel by Pakistani side, indicating lower levels of militarization in the country. Thus high military spending by Pakistani side despite decreasing hostility may indicate procurement of high end technology military imports. Growth rates would rise as hostilities fall, Pakistan may have more resources to channel to not only its development sector but also spend more to increase the efficiency of its armed forces.

4 CONCLUSIONS

Conflict between India and Pakistan, which spans over most of last 60 years since their independence from British rule, has significantly hampered bilateral trade between the two nations. However, we also find that the converse is also true; more trade between India and Pakistan decreases conflict and any measures to improve the bilateral trade share is a considerable confidence building measure. In the short term, greater Indian access to Pakistani markets will help decrease hostilities between the two countries; whereas in the long run as the peace is achieved, both countries could be exporting more to each other. Lately, there has been a high demand of cheaper Indian raw materials in Pakistani industries. A regional trade agreement along the lines of a South Asian Free Trade Agreement (SAFTA) could enable freer access to the markets of member countries, and has a high potential for the improvement of relations between India and Pakistan on a long term basis. Pakistan and India's degree of openness to world trade is the *dominant* economic factor in conflict resolution. One would imagine that in the counterfactual case of significant mutual inward investment, that too would also decrease mutual belligerent tendencies.

Some of our results may appear to suggest that Pakistan's relative military expenditure is conflict enhancing, whereas Indian relative military expenditure has a deterrent effect on conflict. This result, however, needs to be interpreted with caution. It does not necessarily mean that Pakistan is the principal actor initiating inter-state conflict with India. Rather it means that India, the regional hegemon, has other domestic and international concerns to which its defence spending is targeted, besides its disputes with Pakistan. India, for example, has unilaterally massed troops on Pakistan's borders in 1951 and 2002. Indeed, there is some reverse causality between some of the military proxies and conflict suggesting that Pakistan's military build ups may be more reactive. Overall military expenditures are still at high levels in both countries and are diverting scarce resources away from social development spending, such as on education, and poverty reduction. Education spending has been shown to be good for both peace and economic progress.

In an ideal world increased dyadic democracy between pairs of nation should reduce inter-state hostility according to the democratic peace hypothesis; this relationship in our case is present but weak. Peace initiatives, it should be remembered, are not the sole prerogative of democracies; they can also be made by countries which are less than perfectly democratic out of economic self-interest. Pakistan, at present, is making unilateral concessions on many disputed issues with India. Our findings, however, veer towards the liberal peace hypothesis. Economic progress and poverty reduction combined with greater openness to international trade in general are more significant drivers of peace between nations like India and Pakistan, rather than the *independent* contribution of a common democratic polity. So it is more economic interdependence rather than politics which is likely to contribute towards peaceful relations between India and Pakistan in the near future. In many ways, our results for an individual dyad echo Polcahek's (1997) work across several dyads, where it is argued that democracies cooperate not because they have common political systems, but because their economies are

intricately and intensively interdependent. As pointed by Hegre (2000), it is at these higher stages of economic development that the contribution of common democratic values to peace becomes more salient. Meaningful democracy cannot truly function where poverty is acute and endemic, even in ostensible democracies such as India. In the final analysis, it may be that democracy itself is an endogenous by-product of increased general prosperity, as suggested nearly half a century ago by Lipset (1960). Then and only then, will nations be able to fully comprehend Angell-Lanes' (1910) arguments regarding the futility of inter-state conflict.

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DATA AND SOURCES

Single Country Variables

Idg: India's Defence Expenditure as a %age India's GDP at current market prices, Years: 1950-2005, Sources: Correlates of war data set version 3.02, World Development Indicators 2006 (World Bank), Government Finance Statistics Year Book 2006 (IMF) and Economic Survey of Pakistan

Iedug: India's education expenditure as a %age of India's GDP at current market prices, Years: 1950-2005, Sources: Indian Economic Survey, Education Statistics (Department of Education, India) and Education Statistics 2006 (World Bank)

Iexpg: India's total exports as a percentage of India's GDP, Years: 1950-2005, Source: Indian Economic Survey, International Financial Statistics 2006 (IMF)

Ig: Annual growth rate of India's per capita gross domestic product (GDP) at constant prices, Years: 1950-2005, Source: Indian Economic Survey

Igpc: India's real per capita growth rate: Years: 1950-2005, Source: Indian Economic Survey, International Financial Statistics 2006 (IMF), World Development Indicators 2006 (World Bank)

Iimpg: India's total imports as a percentage of India's GDP, Years: 1950-2005, Source: Indian Economic Survey, International Financial Statistics 2006 (IMF)

Imilopop: India's number of military personnel as a percentage of Indi's total population. Years: 1950-2003, Source: COW Inter-State War Data, Version 3.02, Faten et al (2004), International Financial Statistics 2006 (IMF)

Iopen: India's exports plus imports as a %age India's GDP at current market prices, Years: 1950-2005, Source: International Financial Statistics 2006 (IMF)

Ixp: Indian exports to Pakistan, Years: 1960-2005, Source: Direction of Trade Statistics yearbook, IMF

P2i: Polity 2 Score for India, numeric range from -10 (high autocracy) to 10 (high democracy), Years: 1950-2003, Source: Polity IV Project (Center for International Development and Conflict Management)

P2p: Polity 2 Score for Pakistan, numeric range from -10 (high autocracy) to 10 (high democracy), Years: 1950-2003, Source: Polity IV Project (Center for International Development and Conflict Management)

Pedug: Pakistan's education expenditure as a percentage of Pakistan's GDP at current market prices, Years: 1950-2005, Sources: Pakistan Economic Survey and Education Statistics 2006 (World Bank)

Pexpg: Pakistan's exports as a percentage of Pakistan's GDP, Years: 1950-2005, Source: International Financial Statistics 2006 (IMF)

Pdg: Pakistan's Defence Expenditure as a percentage Pakistan's GDP at current market prices, Years: 1950-2005, Sources: Correlates of war data set version 3.02, World Development Indicators (2006), Government Finance Statistics Year Book 2006 (IMF) and Economic Survey of Pakistan

Pg: Annual growth rate of Pakistan's GDP per capita at constant prices, Years: 1950-2005, Source: Pakistan Economic Survey

Pgpc: Pakistan's real GDP per capita Growth rates, Years: 1950-2005, Source: International Financial Statistics 2006 (IMF), Pakistan Economic Survey

Pimpg: Pakistan's imports as a percentage of Pakistan's GDP, Years: 1950-2005, Source: International Financial Statistics 2006 (IMF)

Pmilpop: Pakistan's number of military personnel as a percentage of Pakistan's total population. Years: 1950-2003, Source: COW Inter-State War Data, Version 3.02, Faten et al (2004), International Financial Statistics 2006 (IMF)

Popen: Pakistan's exports plus imports as a percentage Pakistan's gross domestic product at current prices, Years: 1950-2005, Source: International Financial Statistics 2006 (IMF)

Pxi: Pakistan's exports to India, Years: 1960-2005, Source: Direction of Trade Statistics yearbook, IMF

Dyadic Variables

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, UCDP/PRIO Armed Conflict Data set Version IV, Harbom et al (2006)

Demopi: Pakistan and India's combine 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 covert the variable in dyadic form), Years; 1950-2003

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	1-25 Deaths
2	26-100 Deaths
3	101-250 Deaths
4	251-500 Deaths
5	501-999 Deaths
6	6>999 Deaths

Years: 1950-2003, Source: COW Inter-State War Data, Version 3.02, Faten et al (2004)

Gpi: Weighted average of real GDP per capita growth rates for Pakistan and India, Years: 1950 to 2005. Sources: Pakistan Economic Survey, Indian Economic Survey, International Financial Statistics 2006 (IMF)

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
3	Threat to occupy territory [2]
4	Threat to declare war [2]
5	Threat to use CBR weapons [2]
6	Threat to join war
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

1	No militarised action
2	Threat to use force
3	Display of force
4	Use of force
5	War

Years: 1950-2003, Source: Faten et al (2004)

Ledupi1: Log GDP weighted average of India and Pakistan's per capita education expenditures, Years: 1950 to 2005 Sources: Pakistan Economic Survey, Indian Economic Survey, Education Statistics 2006 (World Bank), International Financial Statistics 2006 (IMF)

Ledupi2: Log mean average of India and Pakistan's per capita education expenditures, Years: 1950 to 2005 Sources: Pakistan Economic Survey, Indian Economic Survey, Education Statistics 2006 (World Bank), International Financial Statistics 2006 (IMF)

Ledupi3: Log of Pakistan plus India's education expenditures as a ration of Pakistan plus India's GDPs, Sources: Pakistan Economic Survey, Indian Economic Survey, Education Statistics 2006 (World Bank), International Financial Statistics 2006 (IMF)

Ledupi4: Log of average of Pakistan's education expenditure over GDP plus India's education expenditure over GDP, Years: 1950 to 2005, Sources: Pakistan Economic Survey, Indian Economic Survey, Education Statistics 2006 (World Bank), International Financial Statistics 2006 (IMF)

Lmilbrd1: Log of Pakistan's defence expenditure over Pakistan's GDP as a ratio of India's defence expenditure over India's GDP, Years: 1950-2005, Sources: Correlates of 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: 1950-2005, Sources: Correlates of 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: 1950-2005, Sources: Correlates of 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: 1950-2005, Sources: Correlates of 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: 1950-2005, Sources: Correlates of 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: 1950-2005, Sources: Correlates of 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: 1950-2001, Sources: Correlates of 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: 1950-2001, Sources: Correlates of war data set version 3.02 and International Financial Statistics 2006 (IMF)

Lmpi1: Log GDP weighted average of Pakistan and India's total imports, Years: 1950-2005, Source: International Financial Statistics 2006 (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: 1950-2005, Source: International Financial Statistics 2006 (IMF)

Lxpi1: Log GDP weighted average of Pakistan and India's total exports, Years: 1950-2001, Source: International Financial Statistics 2006 (IMF)

Lxpi2: Log mean average of Pakistan's total exports over Pakistan's GDP and India's total exports over India's GDP. Years: 1950-2001, Source: International Financial Statistics 2006 (IMF)

Poppi: Average of Pakistan's total population and India's total population, Years: 1950-2001, Source: International Financial Statistics 2006 (IMF)

Tpitp: Bilateral trade between Pakistan and India as a ratio of Pakistan's total trade, Years: 1950-2001, Source: Direction of Trade Statistics yearbook, IMF International Financial Statistics 2006 (IMF)

Tpiti: Bilateral trade between Pakistan and India as a ratio of India's total trade, Years: 1950-2001, Source: Direction of Trade Statistics yearbook, IMF International Financial Statistics 2006 (IMF)

Xmpi: Pakistan's total trade (exports + imports) as a ratio of India's Total trade (exports + imports), Years: 1950-2001, Source: International Financial Statistics 2006 (IMF)

Xmip: India's total trade (exports + imports) as a ratio of Pakistan's total trade (exports + imports). Years: 1950-2001, Source: International Financial Statistics 2006 (IMF)

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