Antecedents of the Digital Peace

James F. Pasley

The objective of this research paper is to determine if international development and international cooperative efforts by industrialized nations focused on the spread of information technology might assist to promote harmony within the conflict-prone Global South, thereby creating a "digital peace." The notion of a digital peace suggests that as technology spreads throughout the international system, so too will a pacification of interstate relations. Some scholars have suggested the current age of technological innovation has propelled the industrialized powers of the Global North not only into a realm of interconnected economic triumphs, but to the absence of interstate warfare within their borders. This article explores that claim and addresses whether this is a realistic expectation in the Global South through quantitative and qualitative research. Quantitatively, it examines the claims of advocates of a looming panhuman digital peace by attempting to measure the effects of the level of state technology on conflict escalation between interstate dyads. Qualitatively, it surveys the prospects for the successful spread of information technologies to the Global South by exploring what antecedent factors might need to be in place in order to ensure the success of such a transfer. The prospects for a twenty-first century Pax Digitalis are then assessed.

1. INTRODUCTION

Johan Gutenberg set into motion a global communications revolution in the 15th Century with his creation of movable type. This development allowed for mass printing of materials which, in turn, promoted the spread of knowledge throughout the world. Today, at the dawn of the twenty-first century, the world is experiencing yet another monumental communications revolution in the form of digitized information. With the emergence and acceptance of individual computers, printed books are being replaced by optical disks (CD-ROM, CDI) enabling individuals to incorporate not merely text, but sound and animated images into one multimedia presentation. This digitalization of knowledge not only has accelerated the transfer of information, but has made it accessible to persons all over the globe. In developed countries, the computer, present in schools, businesses, government and homes is multimedia in nature, linked to the information highway called the Internet. Individuals can participate in interactive educational programs, contact various libraries for document consultation, and exchange data and information with others.

The implications of such a free and rapid flow of information are profound. The spread of telecommunications and information technology around the world has led some to suggest that the world may experience a Pax Digitalis in the twenty-first century (Hampson and Oliver 1998). Such an argument is based on the belief that since the end of World War II warfare has occurred predominantly, if not exclusively, within the territories of the states of the Global South. Why has this been the case? It might be argued that technology has promoted not only democracy, but also an economic interconnectedness between the states of the Global North. Both of these factors (democracy and economic interdependence) have tended to show a decrease the likelihood of interstate conflict (Gasiorowski and Polachek

1982; Polachek 1980; Dixon 1986; Pollins 1989; Doyle 1993; Senese 1997).[1] But will technology impact regions of the developing world in a similar way? In other words, might technology promote peace within the international system as modernists have suggested? Technology has been used not merely to fight wars with more precision, but some scholars have argued that, at least with respect to nuclear technology, it also has prevented them (Gaddis 1990; Mearsheimer 1990; Waltz 1993; Lavoy 1995; Weltman 1995; Gray 1996; Payne 1998a, 1998b). Therefore, the international system, before enjoying a panhuman democratic peace (Chan 1984; Bremer 1992, 1993a, 1993b; Dixon 1993; Russett 1990, 1993, 1995; Senese 1997), might sooner achieve a digital peace if technology spreads rapidly. This article first will examine the claim that technology will serve to pacify international relations by lessening the level of escalation between states involved in conflict and then it will survey current attempts by Canada and the United States to promote the information revolution in the developing world.

2. TIME'S ARROW

Modernists envision that as technology advances over the coming decades, so too will constraints on conflict escalation. This is because the process of evolving technology would tend to promote more order within the system. MIT professor Raymond Kurzweil (1999, 32) observes the following with regard to the evolution of life forms, and of technology:

FIgure 1. The Law of Accelerating Returns as Applied to an Evolutionary Process

An evolutionary process is not a closed system; therefore, evolution draws upon the chaos in the larger system in which it takes place for its options for diversity; and

Evolution builds on its own increasing order.

Therefore, in an evolutionary process, order increases exponentially.

Thus, technology, like any evolutionary process, builds on itself, and by doing so, increases order within the system in which it operates. Indeed, from a conflict perspective, empirical evidence suggests that as technology improves, warfare decreases in frequency within the international system. This notion is based on Correlates of War (COW) data tracking the frequency and character of war in the international system since 1816. By breaking time-periods into roughly thirty year blocks until the end of the Cold War the number of initiated wars declines precipitously over time in relation to the number of states in the system. In fact, since 1918 the frequency of war outbreak "actually declines from four

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[1] It should be noted, however, that there is no clear consensus on the impact of trade on conflict. While most studies have provided support for the idea that trade between pairs of states reduces conflict between them, Russett (1967) and Barbieri (1996) have challenged this proposition

per state per decade prior to World War II to two per state per decade since [and even less since the Berlin Wall was dismantled in 1989]. And if we control not for the number of states but the number of *pairs*, the decline appears even more dramatic" (Singer 1991: 57). As Table One clearly indicates, the frequency of warfare in the international system per state per year declines in every approximate thirty year time-period occurring since the Concert of Europe.[2]

Table 1. War in the International System, 1816-1994

Years	Period	# of Wars	# of States	Avg. Wars per state
1816-1848	Concert of Europe	33	28	1.18
1849-1881	Wars of European unification	43	39	1.10
1882-1914	Resurgent Imperialism	38	40	.95
1915-1944	The Great Depression	24	59	.41
1945-1988	The Cold War	43	117	.37
1989-1994	Post Cold War	24[3]	174	.12

Part of this may be attributable to the deterrent effect of nuclear weapons (at least after 1945), as well as the growing accuracy and effectiveness of modern weaponry. As the intensity, accuracy and effectiveness of weaponry is advanced and augmented by technology, so too may the likelihood of order in the international system. While interstate warfare and conflict unlikely will ever abate completely, it appears they can be lessened in frequency and intensity by the march of technological progress.

In an evolving system, as is the case with the current state-centric international system, the passage of time generally reflects the growth of order within the system. Successful behaviors are learned or mimicked as the system members adapt to what has proven to be

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[2] Such optimism has been challenged by some scholars who suggest that the proper measure should not be the number of wars that start, but the number of wars presently under way (Small and Singer 1982; Wallensteen and Sollenberg 1995). Still, as Kegley and Wittkopf (1997: 365) note, "The so-called outbreak of peace in the post-Cold War era is not mythical, however, as only four large-scale wars were under way between states in the 1989-1994 period (Wallensteen and Sollenberg 1995: 345)."

[3] Post Cold War figure adjusted for a thirty year time period.

beneficial behavior in the past. Thus successful institutions are generally adopted, as has been the case for democracy following the victory of the democratic institutional structures of the West during the Cold War.

Indeed there is a proliferation of democratic institutions throughout the world, which many have suggested will lessen the chances for conflict between states. This so-called End of History thesis, eloquently proposed by Francis Fukuyama (1993), argues that lesser states tend to emulate more successful ones and because the West scored a Pyrrhic victory in the Cold War, Fukuyama suggests that the democratic institutions of the winners will be copied throughout the world. In fact, there is some evidence of this institutional mimicry as democracy has sprung up in every corner of the world.

But are institutions the solitary force for positive change in the international system? Like Fukuyama, Kenneth Waltz (1979) argues for the impressionability of states suggesting that states who are successful are those that are best able to adapt. This Darwinian notion of state evolution contends that democratic institutions will not be the only aspect copied by others. A secondary proliferation has become one not of institutions, but rather, technology. Waltz (1979) notes, "Self-help is the principle of action in an anarchic order, and the most important way in which states must help themselves is by providing for their own security." Therefore the proliferation of technology is inevitable, as states strive to ensure their own survivability. But what impact will the spread of technology have on international conflict?

The fundamental dynamics of international politics regularly act to restrict the extent to which a state can reach its aims at the expense of other states. As observers starting with Thucydides have pointed out, in a world of autonomous states, each will act to check the most objectionable efforts of others. As a result, most attempts to make excessive gains have been self-defeating. This is the basic lesson of the balance of power (Waltz 1979). A state that seeks domination may gain a series of successes, but doing so will lead others to see the state as such a menace that they must temporarily scuttle their disputes to defeat it, lest they later be dominated by it. This results in a coalition of weaker forces banding together to put down the dominant hegemony.

Technology has served to magnify these international difficulties facing states. Information technology, as David Rothkopf notes (1998: 326), has created a system in which "power is being so endlessly redistributed and redefined that its changing nature is… a source of strength for those who can adapt to it most quickly." Because the information revolution is evolving so rapidly its consequences are unclear. The impact of weapons technology appears more lucid when considering the impact of the technological terror of nuclear weapons on the international system (Gallois 1961; Sandoval 1976; Waltz 1981; Bueno de Mesquita and Riker 1982; Mearsheimer 1990; Weltman 1995). The danger of escalation, coupled with the clear impossibility of winning a nuclear conflagration, means that leaders realize that serious challenges to a nuclear adversary's vital interests could end in Armageddon. Therefore, conflict stalemate is naturally promoted between nuclear powers because in such pairings victory is unrealizable. But is such an escalation limitation limited to weapons technology? Possibly not.

According to numerous scholars the impact of the spread of information technologies could be profound (Berkowitz 1996; Yamaguchi 1997; Hashim 1998; Kobrin 1998; Libicki 1998; Rothkopf 1998; Vlahos 1998). Most vocal among them has been David Rothkopf. Rothkopf (1998) believes that the information technologies' impact on the international system is so significant that it actually has altered the structure of the system. Rothkopf (1998: 326) claims the real politic world has morphed into a cyber politic world, "in which

the actors are no longer just states and raw power can be countered or fortified by information power." Such change undermines "the notion that relations among states are determined by raw power and that the mighty will prevail" (Kissinger 1994: 104). Such a blurring of the power lines between states might serve to limit conflict between them because the prospects for either side prevailing against the other would be unclear.

3. METHODOLOGY

In order to ascertain if there is a significant difference in conflict escalation among differing types of states three categories of dyads have been created: symmetrical high-tech dyads (two high technology states), asymmetrical technology dyads (only one high technology state), and developing dyads (two low technology states). States categorized as "high technology" were those judged dominant in research-laden technologies such as aeronautics and aerospace, telecommunications and telematics, nuclear energy, computers, and bio-industry (Chaliand and Rageau 1994).

The conflict observations were taken from the Militarized Interstate Dispute (MID) data set (Gochman and Maoz 1984; Jones, Bremer and Singer 1997). Those disagreements between states considered to be interstate disputes must contain at least one of the following three events: "(1) an explicit threat to resort to military force; (2) a mobilization, deployment, or other display of military force; or (3) an actual resort to military force" (Senese 1997: 4). For these events to be included, they "must be explicit, overt, non-accidental, and government sanctioned" (Gochman and Maoz 1984: 586).

The current MID data set includes interstate dispute data through 1992 (Jones, Bremer and Singer 1997). The year 1950 has been chosen as the beginning point for data analysis in this paper because this was the first full year in which more than one state in the international system had nuclear capability. Both the United States and the Soviet Union had the atomic bomb in 1950, firmly rooting the two superpowers as Cold War adversaries and technology leaders. Within this time period of 1950-1992, 1,042 conflict dyads are available for study.

4. DEPENDENT VARIABLE: CONFLICT ESCALATION

Escalation processes have been analyzed previously in concert with deterrence (Bueno de Mesquita and Riker 1982; Zagare 1992), arms races (Richardson 1960) and the bargaining process (Schelling 1960, 1966; Kahn 1965; Young 1968; Smoke 1977). Schelling (1960, 1966) suggests that one of the effects of escalation is to persuade an opponent to back down by playing on the fear that continued and/or future escalation will lead to disastrous results. Thus, escalation is often conceptualized as a game of competitive risk taking, with actors attempting to demonstrate their superior ability to tolerate risk (Schelling 1960, 1966; Kahn 1965; Maoz 1985, 1990; Geller 1990).

Disputes between states are rarely, if ever, static occurrences (Ray 1974). Such confrontations often evolve from one stage of conflict to another involving an augmentation in hostilities as the initial spark of the confrontation creates a larger conflagration. Thus, this paper employs two measures for its dependent variables. First it uses the highest level of conflict reached between pairs of states as a dependent variable. This score (see Table

Two), referred to as the level of hostility, is a scaled reference point allowing the quantitative differentiation between levels of conflict. MID dispute level types range from 1 (a nonmilitary act) to 22 (interstate warfare).

Table 2. MID Dispute Level Codes

1 = Nonmilitary act	4 = Threat to occupy territory
2 = Threat to use force	5 = Threat to declare war
3 = Threat to blockade	6 = Threat to use nukes

7 = Show of troops	11 = Nuclear Alert
8 = Show of ships	12 = Mobilization
9 = Show of planes	13 = Fortify border
10 = Alert	14 = Border Violation

15 = Blockade	18 = Clash
16 = Occupation of territory	19 = Raid
17 = Seizure	

20 = Declaration of war
21 = Use of CBN weapons
22 = Interstate warfare

The level of hostility in a dispute is an important marker for distinguishing it from other disputes. For example, it seems reasonable to assert that a threat to blockade an area is less hostile than an actual naval blockade, just as a mere threat to use force is less hostile than an actual raid into another state's sovereign territory. Thus, the higher a dispute escalates, the more dire its consequences can be.

As a second marker, dispute severity also was used as a dependent variable for conflict escalation. The severity of interstate disputes was measured by the number of battle fatalities registered by both states. An increase in the number of fatalities is considered to display conflict escalation because "an increase in severity is usually associated with an increase in the intensity of actions taken by combatants, in terms of militarized uses of force" (Senese 1997: 7). In other words, higher battle fatalities are considered to be characteristic of a more serious conflict. The MID data set employs seven levels of fatalities in its coding procedures: 0, 1 to 25, 26 to 100, 101 to 250, 251 to 500, 501 to 999, and >999 battle deaths.[4]

5. INDEPENDENT VARIABLES

Eight independent variables are examined in this paper. The first two of these directly relate to the focus of the paper: presence of high technology. It is hypothesized that those

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[4] MID does not provide the actual fatality numbers for disputes.

dyads in which both of the paired states have high levels of technology will produce less conflictual outcomes than those dyads in which only one high technology state is present, or in which none is present. This is because in high technology dyads there is a lower likelihood of misreading the other side due to poor communications. Also there is likely to be greater destructive potential on both sides than in the other two types of dyads.

Asymmetrical technology dyads are hypothesized to be more conflictual than high technology dyads because one side has a clear advantage over the other. In these cases the high technology likely will take advantage of the less advanced state simply because it can.

Two dummy variables have been created to measure the effect of technology on conflict escalation. First, a symmetrical dyad variable has been created. In this variable dyads in which two high technology states are present are coded as "1" and all other cases as "0". Second, an asymmetrical dyad variable has been created. For this dummy variable those dyads in which only one high technology state is present are coded as "1" with all others coded as "0". A dummy variable need not be created for the independent category of non-high-tech dyads because its value is determined by the first $k - 1$ dummies entered into the regression equation. In other words, the independent category (also known as the reference category) is equal to the Y intercept.

The data set provides 1,042 conflict dyads between the years of 1950-1992. 50 of these conflicts involve a symmetrical pairing of high technology powers. 348 dyads are asymmetrical in nature. The remaining 644 cases are dyads in which no state with high technology was present.

The third predictor variable to be used in this study is democracy. Numerous studies have been undertaken to explore the effect of democratic institutions on conflict resolution among states (Chan 1984; Maoz and Abdolali 1989; Bremer 1992, 1993a, 1993b; Dixon 1993; Russett 1990, 1993, 1995; Senese 1997). Strong agreement among scholars has arisen that democratic dyads produce more peaceful outcomes than other dyadic groupings. The coding of states as being democratic or not is based on scores taken from the Jaggers and Gurr's (1995) Polity III data set which has been employed in recent studies on the effects of democracy on conflict (Reiter and Stam 1998; Ward and Gleditsch 1998). Polity III rates individual states' level of democracy on an 11-point (0-10) scale (Jagger and Gurr 1995). This is a continuous interval measure ranging from a score of "0" least democratic to a score of "10" or most democratic.

Fourth, a variable has been created to measure the impact of dyadic maturity on conflict escalation. This variable will attempt to capture the impact of stability on interstate relations. The assumption here is that more mature polities will recognize the potential costs of escalation as well as the ability to call on past experience to reduce the likelihood of conflict severity. Scholars have noted a tendency for states in transition, specifically, states whose regimes are in flux, to be more likely to engage in military ventures than those whose governments remain stable (Mansfield and Snyder, 1995).[5] The logic of this argument states that those countries which are in a state of flux are more prone to military action because their leaders are seeking to rally their publics around a patriotic cause in order to save their faltering position. This rally around the flag effect (Miller 1995; Levy and Vakili 1992) is intended to provide the leader with the necessary internal support to stay in power.

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[5] While the findings of Mansfield and Snyder (1995) are generally supported, a study by Gleditsch and Ward (1997) does challenge them. However, this paper finds the work of Mansfield and Snyder (1995) to be more compelling.

Therefore, a variable of <u>dyadic</u> maturity (or stability) has been created by measuring polity persistence in years. This variable will be dichotomized, as has been common practice in previous studies (Bremer 1992; Senese 1997), as mature/not mature based on a twenty year threshold. Again the data will be drawn from the Polity III data-set which extends from 1800-1994. If both the regimes in a dyad have persisted for at least twenty years the dyad will be considered mature; otherwise the dyad will be considered not mature.

As a fifth independent variable, proximity will be studied. The impact of geographical proximity has been shown in previous studies to be significant on the escalation of hostilities between states not only because of the animosity close interactions can produce, but also because of the monetary expense of such efforts (Bremer 1992; Diehl 1985; Russett 1993; Vasquez 1993; Senese 1997). Fighting war is a costly business after all, so the monetary impact of moving troops and equipment often serves as a strong deterrent. Proximity serves to lessen these costs, thereby augmenting the chances for interstate bloodshed. As Senese (1997) argued, "States are less constrained for participation (in warfare) when the venue of combat is geographically proximate."

In order to determine the effects of proximity on conflict escalation the Correlates of War (COW) contiguity data set has been used. Five divisions of state-to-state contiguity are delineated by the COW data: contiguous by land, or separated by 12, 24, 150, or 400 miles or less of water (those over 400 miles are not considered contiguous). Geographically proximate rivals are classified as those that are contiguous by land or separated by 150 miles or less of water.[6] Proximate dyads are coded as "1" and all others as "0".

Sixth, the impact of alliances on interstate relations will be examined. The inclusion of data on alliances is needed and appropriate because of its possible relation to joint conflict. Alliance members generally have been shown to engage infrequently in conflict with one another (Mihalka 1976; Bueno de Mesquita 1981; Weede 1989; Kim 1991; Bremer 1992). In order to ascertain whether dyadic pairs are alliance members the Correlates of War alliance data is used (Small and Singer 1982). Weede (1989) and Bremer (1992) both find that the major effect of alliance on conflict can be captured in an allied/not allied dichotomy. Therefore, allied dyads are coded as "1" and all others as "0".

Seventh, a variable measuring trade relations for each of the dyadic pairs of states has been created. Realist thinkers have argued that the relative gains of one trading partner could ultimately threaten the survival, or at least the international standing, of the other (Gowa and Mansfield 1993; Grieco 1988). Liberals, on the other hand, have suggested that the absolute gains accumulated by both trading partners may create security externalities, which would both increase trade and decrease conflict (Snidal 1991).

There is no strong scholarly consensus, however, on the impact of trade on international conflict. Several studies of interstate conflict and trade have shown that conflict is negatively related to international trade (Gasiorowski and Polachek 1982; Polachek 1980; Pollins 1989). Yet Russett (1967) and Barbieri (1996) produce quite different findings. Russett (1967: 198) found that trade partners were "twice as likely to fight" than those which were not. Barbieri (1996) concludes that trade interdependence increases the

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[6] This delineation is used by Senese (1997: 11) who defends it by noting, "An earlier study (Bremer 1992) shows the major effect of proximity on conflict to be captured by a 'contiguous by land or sea' versus 'not contiguous' distinction." In both these studies (Bremer 1992; Senese 1997) 150 miles was shown to be the proper cut-off point in accounting for proximal significance.

probability that dyads will experience militarized disputes. These mixed findings suggest any hypothesis with respect to the impact of trade on conflict levels between interstate is imperiled. Thus, it is assumed that trade will have a significant impact on dyadic conflict, yet in what direction remains uncertain.

The majority of trade data are derived from the International Monetary Fund's *Direction of Trade Statistics electronic tape*.[7] Data were reconfigured from national accounts to dyadic trade flows using the importing countries' reported trade figures. When these figures were absent, the exporter's reports were used. The values that each state reports to import from each partner were added to derive the dyadic total. Each state's total imports and export figures were combined to arrive at each nation's total trade.

Unlike the case of trade, one key variable affecting the decision to escalate has reached a status of general consensus among researchers. A number of studies have shown that an actor's relative military capabilities is the most vital variable affecting the decision to escalate (Garnham 1976a, 1976b; Organski and Kugler 1980; Bueno de Mesquita 1981; Leng and Gochman 1982; Gochman and Maoz 1984; Bremer 1992; Geller 1993). Military capabilities are important to consider because they determine the level of potential costs which can be doled out by either side (Small and Singer 1982). Empirical evidence suggests that states of relatively equal military capability are more likely to go to war with each other than states with disparate capabilities (Bremer 1992).

So as an eighth marker, an independent variable measuring military capabilities has been created. This capability score was obtained from the Correlates of War (COW) data set (Small and Singer 1982). Military capabilities are measured by six indicators: military expenditures, military personnel, iron/steel production, energy consumption, total population, and urban population. These indicators are combined in the COW data set to create an index reflecting a state's percentage of the total capabilities in the world for each year. From this index, a variable is created to serve as a reflection of the ratio of military capabilities of the two actors per dispute. The stronger state is represented in the numerator and the weaker state in the denominator. The ratio will vary from 1.0 (the actors' capabilities are equal) to any positive number less than 1.

These eight independent variables were regressed against the dependent variable measures of level of hostility and severity of hostility in order to ascertain the impact of each on conflict escalation.

6. RESULTS

The one-tailed regression results (Tables Three and Four) show that high technology dyads significantly reduce conflict escalation between states in terms of level of conflict but

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[7] Data are made available by Katherine Barbieri (1996b). Data were collected for all sovereign states within the interstate system, as defined by the Correlates of War (COW) Project, for the period 1870-1992. Barbieri (1996a: 31) notes concerning the data: "In many instances, the electronic version of the IMF data tape reports trade flows as zero or missing, but these trade values are reported in their annual publications. Missing data were investigated and supplemented with The International Monetary Fund's *International Financial Statistics* (1956-1998) and *The Direction of Trade Statistics Yearbook* (1956-1998)."

not in terms of fatalities. The Y intercept value of 13.792 is the mean response if all the independent variables equal zero. If such was the case the model predicts an outcome of nearly 14 on the twenty-two point MID scale.

Table 3. The Effect of Technology on Conflict Level

Variable	Estimate	t-Score	Significance
INTERCEPT	13.792	16.422	.01
Technology	−1.274	1.528	.06
Tech Asym	1.032	2.751	.01
Democracy	−.481	.767	.22
Maturity	−2.197	3.684	.01
Proximity	.738	1.964	.03
Allied	−1.565	1.689	.05
Trade	.001	2.383	.01
Capabilities	2.690	2.439	.01
N = 840			
R^2 = .12			

Table 4. The Effect of Technology on Conflict Fatalities

Variable	Estimate	t-Score	Significance
INTERCEPT	.377	1.643	.05
Technology	−.102	.602	.28
Tech Asym	.005	.070	.47
Democracy	−.079	.602	.28
Maturity	−.157	1.297	.10
Proximity	.425	5.458	.01
Allied	−.126	.664	.26
Trade	−.001	.494	.31
Capabilities	.253	1.082	.19
N = 789			
R^2 = .12			

Beginning with the two predictor variables of concern to this paper, the high-tech symmetry variable reduced the level of conflict between states by 1.27 and was significant in at the .06 level. This indicates that a pairing of symmetrical high-tech dyads leads to a 1.27 reduction in the level of conflict on the twenty-two point MID scale. In the case of asymmetrical technology dyads a 1.032 increase in conflict likelihood was found and it was significant at the .01 level.

This divergence in findings between symmetrical and asymmetrical dyads suggests that the pacifying effect of technology is nullified in asymmetrical situations. This is most likely the case because symmetrical relationships promote extraordinary caution between countries, with both states preferring to err on the side of caution and de-escalate the conflict. High-

tech societies have more to lose from war and so they likely want to be certain of a quick victory.

It is assumed that asymmetrical technology dyads permit bullying by the more technologically advanced power. Technological capability allows high-tech powers to react more strongly to conflict challenges by lower tier states. Thus when the United States decided to capture Manuel Noriega, it invaded Panama to do so. Such a decision almost certainly would not have been made had Panama possessed a high-tech military.

Most of the other independent variables were found to have a significant effect on conflict between states. The most powerful results were from the "Maturity" variable ($p = .01$) which measured regime longevity. This variable indicates that the likelihood of conflict is decreased in dyads whose two states have had long and stable regimes. This was expected, as previous studies have shown that mature regimes tend to behave more prudently in conflict situations (Bremer 1992; Senese 1997).

Surprisingly, however, the presence of democratic institutions in dyads was not shown to produce significant effects ($p = .22$) on conflict escalation, though the sign is in the expected direction. While this finding is antithetical to Democratic peace research, it is important to recall that the dependent variable in this study is different. Democratic peace researchers are focused upon the presence of interstate war as a dependent variable, while this paper has expanded this to include any sort of conflict between states. This paper's findings are similar to those of Paul Senese (1997) who found that democratic dyads, while unlikely to escalate all the way to war, were just as likely as other types of dyads to escalate to threat and displays of force. Senese (1997: 1) finds: "Once a democratic pair has entered a militarized dispute, it is about as likely (possibly a little more so) to escalate that dispute through further stages of antagonism short of war, as is a non-jointly democratic dyad."

Geographic proximity was shown to have significant effects ($p = .03$) on dyadic escalation. This reconfirms the earlier research mentioned previously which asserted that states bordering one another are more likely to escalate conflicts than those that do not. Thus, neighbors in conflict are more likely to escalate than distal dyadic combinations.

Alliance membership was shown to reduce significantly ($p = .05$) the likelihood of conflict escalation between dyads. Again, this was to be expected, as the institutional constraints placed on alliance members were believed to reduce the likelihood of conflict escalation between them.

Military capabilities were shown to have a significant ($p = .01$) impact on conflict escalation as well. As the conventional military capabilities of two states approach relative equality, the likelihood of escalation increases. This finding confirms earlier research, suggesting that evenly matched rivals are more likely to escalate than dyads containing two militarily divergent states. This is most likely the case in conventional instances because neither side is deterred. Relative conventional military equality precludes either party from clearly appreciating ahead of time which side would prevail. Thus, the conflict escalates.

Trade was shown to have a very minimal impact ($p = .01$) in terms of its magnitude of effect, on conflict escalation. As the level of trade between two states increased, so too did the likelihood of conflict escalation. These results are somewhat counter-intuitive, but, again, some earlier research has produced similar findings.

Employment of the second dependent variable (conflict fatalities) largely did not produce significant results. In fact, the only two variables to display a significant effect on fatality levels were geographic proximity ($p = .01$) and maturity ($p = .10$). These findings suggest first that geographically proximal states tend to produce higher numbers of fatalities

during dyadic conflicts with one another than other types of state couplings. This makes sense as proximity provides more and easier opportunities for contact with one's adversary. Second, the findings show that mature states have fewer fatalities in dealings with one another.

Despite the fact that the remaining variables were not significant, their b values all were in the same direction as was in the case when conflict level was the dependent variable, with the exception of trade. This movement from a positive to a negative b-value of this variable indicates that while trade may lead to marginally higher levels of conflict escalation between interstate dyads, the fatality levels between trading partners are reduced (though insignificantly). What this may indicate is that trading partners are inclined to escalate conflicts between one another, but rarely carry such escalation to a point of interstate war, where fatality levels would be higher. Recall also that previous research has produced mixed results with respect to trade and conflict. Irrespective, it seems reasonable based on the b-vales and significance levels to assert that trade has a very minimal effect on conflict escalation between interstate dyads.

In total, these results suggest some positive effects for the presence of high technology in conflict dyads, but only when it occurs symmetrically. Technological symmetry must exist for any pacifying effects to occur. In such symmetrical high-tech dyads conflict levels are significantly reduced, though fatalities are not. Notably, asymmetrical dyads appear to be less stable. Indeed the regression results show that conflict and fatalities are increased in asymmetrical technology dyads, though when the dependent variable was fatalities the results were not significant.

So technology can be a successful deterrent to conflict escalation when it occurs in symmetrical interstate relationships. Thus the spread of technology throughout the international system may indeed produce some of the pacifying effects theorized. What is important is the speed and manner in which technology spreads. Introduction of high technology to only **one** side of an unstable regional rivalry (thereby creating a high-tech asymmetry) could produce disastrous results. But when both sides of a dyadic rivalry possess high technology, the level of conflict between the two will be reduced.

7. TECHNOLOGY IN FOREIGN POLICY

The dilemma this leaves the Global North with is how to successfully proliferate technology to the developing world in a steady, safe way. One example may be found with Canada. In 1996 its Minister of Foreign Affairs, Lloyd Axworthy, introduced a progressive foreign policy called the Canadian International Information Strategy (CIIS) which sought to promote information technologies in the developing world. The CIIS has been called upon by Minister Axworthy to establish a free media source in troubled regions of the Global South "to reduce the likelihood of conflict." Axworthy has been strategically thoughtful in recognizing that the state cannot operate alone in the development arena. He has called upon a merger between government, non-governmental organizations (NGOs), the media, and multi-national corporations, in order to most effectively promote the Canadian foreign policy ideals of equality and human rights.

The United States has information technology development programs similar to Canada, though less focused as an overarching foreign policy. USAID, for instance, operates Africa Link which facilitates access to the Internet for colleagues and partners in Africa. Of greater

significance is the Leland Initiative which is a fifteen million dollar US government effort to twenty-one African countries. It builds on existing information technology capacity with the ultimate aim of facilitating Internet access throughout Africa. However, the paltry funding which this program receives, coupled with the technological backwardness of the region does not augur much success. Indeed what such efforts fail to recognize is that many of the states of the Global South simply do not have the infrastructure, training, or stability required for an influx of technology to be productive. The irony, of course, is that the very level of development the CIIS and the Leland Initiative are attempting to promote through the spread of information technology, precludes many developing states from its use. Practical issues such as phone lines, electricity, literacy, and government stability all must be addressed first if the introduction of technology is to have any significant and lasting impact.

The spread of such technologies to developing states also is not without its critics in the security community who argue that as digital technology spreads throughout the world, it will degrade the security of the states of the Global North by making them more vulnerable to hackers and high-tech sabotage. The Global North's dependence on information technologies could create vulnerabilities that an adversary might be able to exploit. The United States, according to former Reagan administration official Walter Wriston (1997: 179), has a vulnerable military infrastructure as the US "has about 90% of our military traffic moving over public computer networks, [making] it... increasingly hard to tell the military from the civilian infrastructure." Protecting one's own information-related operations while attacking an enemy's is likely to be even more fundamental to military success than in the past. This geographic expansion of the battlefield will compel military commanders to think more globally (Davis 1996).

The other major component of information warfare is the potential vulnerability of high-tech civilian societies (banking and financial systems, telecommunications networks, and computer reliant technologies) to electronic attack. Wriston notes (1997: 180), "If US satellites suddenly go blind and the telephone network on the east coast goes down, it is possible that the United States could not even identify the enemy." President Clinton has established The Commission on Critical Infrastructure Protection to reduce the likelihood of a successful electronic attack on US infrastructure.

While there will remain a possibility of cyber-attacks, these will be unlikely on any large scale because the interconnectedness which information technology demands, creates a world of mutual vulnerabilities. Technological interdependence is likely to deter conflict, not promote it. Cyber-pranks will persist, but not on a scale which would threaten state stability.

8. CONCLUSION

The evidence of this article suggests that the steady spread of information technology throughout the world may be a risk worth taking, as technology could serve to evolve the international system toward a more stable and orderly environment. Quantitative analysis showed that high-tech dyads were less conflictual than other types. This suggests that notions of a digital peace might be something more than radical idealism.

The real dilemma the developed states of the Global North face now is how to ensure the steady spread of technology to the developing world. Poverty, disease, famine, and war are

all the catch-phrases of the Global South which the information revolution could serve to lessen, but these open wounds of the developing world are also what is limiting the spread of technology to those who need it most. The limited infrastructure of the Global South makes their transition into the global digital community all the more difficult. Countries such as Canada and the United States have realized the challenge before them and are taking steps in the right direction in the realm of international development, but more dependence for development may shift away from states to NGOs and MNCs in the decade ahead because state governments simply cannot bear the financial burden alone.

Inevitably, technology will spread throughout the international system. Only time will reveal whether the proliferation of technology will make the world a more peaceful place or not. The early evidence, however, suggests that there is reason for hope that a high-tech world may be a more pacific one as well.

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James F. Pasley. Department of Political Science, Saint Leo University, Saint Leo, FL 33571-6665, USA. Tel: +1(352)588-8277. E-mail: james.pasley.c@saintleo.edu.