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Proliferation and International Crisis Behavior*

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The literature on international conflict is divided on the impact of nuclear proliferation on state conflict. The optimists' argument contends that nuclear weapons raise the stakes so high that states are unlikely to go to war when nuclear weapons enter the equation. The pessimists rebut this argument, contending that new proliferators are not necessarily rational and that having nuclear weapons does not discourage war but rather makes war more dangerous. Focusing on one observable implication from this debate, this article examines the relationship between the severity of violence in crises and the number of involved states with nuclear weapons. The study contends that actors will show more restraint in crises involving more participants with nuclear weapons. Using data from the International Crisis Behavior (ICB) project, the results demonstrate that crises involving nuclear actors are more likely to end without violence and, as the number of nuclear actors involved increases, the likelihood of war continues to fall. The results are robust even when controlling for a number of factors including non-nuclear capability. In confirming that nuclear weapons tend to increase restraint in crises, the effect of nuclear weapons on strategic behavior is clarified. But the findings do not suggest that increasing the number of nuclear actors in a crisis can prevent war, and they cannot speak to other proliferation risks.

Introduction

The primary justification for the US invasion of Iraq in 2003 was the fear that the Iraqi government was developing weapons of mass destruction (WMD), which included the possibility that Saddam Hussein was continuing in his efforts to build nuclear weapons. Preventing the proliferation of nuclear weapons has been a driving force behind US policy towards North Korea and Iran as well. Much of the literature about nuclear weapons since the 1950s has been about how to control or eliminate them, and enormous diplomatic effort has been invested in constraining their proliferation. Is the effort to stop proliferation – which can be measured in lost lives, diplomatic effort, and billions of dollars – worthwhile? Are there possible advantages to proliferation that might justify a different attitude towards the spread of nuclear weapons? This article attempts to provide empirical insight for part of this broad question. Proliferation may lead to a host of problems, ranging from nuclear terror to nuclear accidents to war (Sagan & Waltz, 2003). This article has a narrower focus and examines only the issue of war.

* The replication data are available for download at http://www.prio.no/jpr/datasets. Please see http://cidcm.umd.edu/icb for a complete description of the International Crisis Behavior data and an interactive database of the crises. Please direct all correspondence to VAsal@email.albany.edu.

Specifically, we seek to answer the question posed by Waltz (Sagan & Waltz, 2003: 6): 'Do nuclear weapons increase or decrease the chances of war?' One side of this discussion contends that proliferation will lead to a decrease in the level of interstate violence because 'Nuclear weapons, then and now, deter threat or retaliation posing unacceptable damage' (Cimbala, 1998: 213). The opposing argument questions the very logic of deterrence as suggested above when it comes to nuclear weapons. Aron (1965), for example, argues that new proliferators may not be as rational as the original nuclear states. Thus, as nuclear weapons spread, the deterrence that operated between the Soviet Union and the United States of America during the Cold War might not apply.

Much of the literature on the impact of nuclear weapons does not empirically test the arguments made (Geller, 2003: 37; Huth & Russett, 1988: 34). Here, we strive to move beyond speculation to observe the impact of nuclear proliferation on the level of violence used in crises. We examine the relationship between the severity of the violence in crises in the International Crisis Behavior (ICB) dataset and the number of involved states with nuclear weapons, controlling for other factors that increase the likelihood of severe violence.[1] We find that crises involving nuclear actors are more likely to end without violence. Also, as the number of nuclear actors involved in a crisis increases, the likelihood of war continues to drop. Drawing from Waltz (Sagan & Waltz, 2003) and the rational deterrence literature, we argue that states facing the possibility of a nuclear attack will be more willing to concede or back down from violent conflict.

[1] We should note that our unit of analysis is the crisis. Our findings do not get at the behavior of specific states and the different outcomes of crises for different states. We should also note that we do not test the question of how the number of nuclear weapons each actor possesses impacts crisis behavior. The question of minimal deterrence is important, but it lies beyond the scope of the current study, which seeks to examine the impact of the very presence of nuclear actors.

Proliferation: Good or Bad; for What and Whom?

Not surprisingly, much of the current literature examines the nature of nuclear proliferation from the perspectives or interests of the United States of America (Clark, 1997; Powell, 2003). For the USA, non-proliferation means fewer enemies with the ability to threaten the American heartland. But proliferation may damage more than the USA's ability to defend itself. Proliferation may severely constrain the projection of US or Western force abroad in regions of strategic importance (Payne, 1997).

The negative impact of proliferation on the security environment, however, may be seen in a very different light if the security and political interests of the USA do not drive the analysis. Indeed, several non-US perspectives reject non-proliferation arguments, as 'dividing states into "responsible" ones who can set and change the rules of the game and those "irresponsible" nations who have to accept the rules leads to discriminatory ideas of non-proliferation' (Mashhadi, 1994: 107; see also Goheen, 1983).[2] Or, as Singh (1998) bluntly states, arguments for non-proliferation may be dismissed as 'Nuclear Apartheid'.

For some states, proliferation has such important strategic value that they will make any effort to go nuclear, as in the case of Iraq in the 1980s and 1990s (Kokoski, 1995). The justification for proliferation in countries like India, Iraq, and Pakistan is often security (Sagan, 1996/97). Mearsheimer (1990: 20) argues, 'states that possess nuclear deterrents can stand up to one another, even if their nuclear arsenals vary greatly in size'. Gallois

[2] Mason (1992: 149) argues that this attitude is also part of what motivated French resistance to an anti-proliferation attitude prior to their membership to the Non-Proliferation Treaty. 'France disagrees with the underlying logic of the Non-Proliferation Treaty, which is seen as an additional manifestation of "patronizing Anglo-Saxon Puritanism" which finds it normal to divide the world into civilized countries (i.e., countries which would have a responsible attitude toward their nuclear weapons) and uncivilized countries (i.e., the rest of the world).'

(1961) was one of the first to make this argument for the value of proliferation for smaller states based on the deterrent value that even a small number of nuclear weapons can provide. During the Cold War, and despite superpower nuclear umbrellas, this logic was persuasive for the French as well as for the British and the Chinese (Goldstein, 2000: 360).

Clearly, the direction the missile is pointing may have serious implications for a country's views on proliferation. As Waltz suggests, 'weapons and strategies change the situation of states in ways that make them more or less secure' (Sagan & Waltz, 2003: 6). We suggest judging proliferation by the impact it has on international crises and the probability that a war will result. Does the participation of a nuclear state in a crisis increase or decrease the likelihood that the crisis will devolve into war? And, since proliferation implies the wider spread of nuclear weapons, we also ask if there is a difference in impact when a crisis involves more than one participant that has nuclear capabilities. While there have been few empirical tests of whether the presence of nuclear actors increases or decreases a crisis's proclivity for war, we are unaware of any studies that consider the impact of additional nuclear actors.

Nuclear Weapons and Instability

The anti-proliferation argument about the possible contribution of nuclear weapons to the outbreak of war rests on the fear that these weapons, given their destructive capabilities, are inherently dangerous and their spread to a variety of places is counterproductive.

> What dangers does proliferation pose? In the short term, the great dangers are a regional nuclear war, which could obliterate cities, kill millions and devastate downwind areas; and nuclear terrorism. . . . Over the longer term, there will be new nuclear threats as more and more nations acquire more sophisticated delivery systems. (Forsberg et al., 1995: 2)

Given the magnitude of the risk that nuclear weapons pose, those who argue against proliferation do not see a payoff that matches the risks. Nuclear weapons are 'obstacles to, rather than facilitators of, international security' (Hanson, 2002: 361). Anti-proliferators (1) question whether nuclear weapons prevent war (a question of the very utility of deterrence); (2) wonder about its applicability to new proliferators and their rationality, even though it may have worked between the USA and the Soviet Union during the Cold War; (3) fear a war during a transition period to nuclear status of a member of an existing rivalry; and (4) fear the dangers of nuclear weapons being controlled by countries where the military is the deciding voice. In this article, we focus on the first of these questions and test if participation of one or more nuclear states in a crisis increases or decreases the likelihood that the crisis will devolve into war.[3]

McGwire (1994: 215) rejects the claim that nuclear weapons prevent major wars, except within a very narrow context. He gives examples of Vietnam, the Iran–Iraq War, and the Korean War. Based on his analysis of international crises, Geller supports this conclusion, stating that 'nuclear weapons cannot be relied upon to impede escalatory behavior by either nuclear or non-nuclear antagonists. . . .

[3] The scope of this article precludes us from addressing other key aspects about the merits of proliferation. The first of these aspects is the increased chance of nuclear accidents. Sagan argues that the danger of accidents in countries that do not have the resources and technical know-how of the USA makes non-proliferation an important goal (Sagan & Waltz, 2003). Interestingly, the same concerns lead Feaver & Niou (1996: 229) to advocate assisted proliferation to prevent 'unsafe nuclear arsenals – ones prone to accidental or unauthorized use'. The second major issue not addressed in this article is the possibility that proliferation increases the chance that nuclear weapons will fall into the hands of terrorists. For the argument against proliferation that this possibility suggests, see Allison et al. (1996). Finally, we do not fully address the question of whether the new proliferators behave differently than the old proliferators or whether there would be an increased risk of accidents. For an explication of the arguments dealing with nuclear accidents and the different nature of the new proliferators, see Brito & Intriligator (1996), Feaver (1992/93), Kaiser (1989), and Sagan (1994).

Nuclear disputes, however, show a pronounced tendency to escalate (short of war) and to engage coercive tactics that include the limited use of force' (Geller, 1990: 307). Payne (1997) and Hanson (2002) go even further by raising the possibility that nuclear weapons were not even important to keeping peace between the superpowers.

Nuclear Weapons and Restraint

Other, more optimistic, scholars see benefits to nuclear proliferation or, perhaps not actively advocating the development of more nuclear weapons and nuclear-weapon states, see that the presence of nuclear weapons has at least been stabilizing in the past. For example, some scholars are confident of the promise of the 'nuclear peace'.[4] While those who oppose proliferation present a number of arguments, those who contend that nuclear weapons would reduce interstate wars are fairly consistent in focusing on one key argument: nuclear weapons make the risk of war unacceptable for states. As Waltz argues,

> the higher the stakes and the closer a country moves toward winning them, the more surely that country invites retaliation and risks its own destruction. States are not likely to run major risks for minor gains. War between nuclear states may escalate as the loser uses larger and larger warheads. Fearing that, states will want to draw back. Not escalation but deescalation becomes likely. War remains possible, but victory in war is too dangerous to fight for. (Sagan & Waltz, 2003: 6–7)

'Nuclear war simply makes the risks of war much higher and shrinks the chance that a country will go to war' (Snyder & Diesing, 1977: 450). Using similar logic, Bueno de Mesquita & Riker (1982) demonstrate formally that a world with almost universal membership in the nuclear club will be much less likely to experience nuclear war than a world with only a few members.

Supporters of proliferation do not see leaders of new nuclear states as being fundamentally different from those of the old nuclear states in terms of their levels of responsibility (Arquilla, 1997), nor do they see them facing unique challenges in managing and securing these weapons (Feaver, 1992/93: 162–163). The response to the argument that small powers, non-Western powers, and military powers will behave less responsibly than the USA and other 'responsible' powers is that the evidence does not support the view that new nuclear powers are 'different' in the worst sense of the word (Lavoy, 1995; Hagerty, 1998; Arquilla, 1997; Feldman, 1995; Karl, 1996/97). Van Creveld (1993: 124) sums up this viewpoint when he points out that 'where these weapons have been introduced, large-scale interstate warfare has disappeared'.

Dismissing the fear that deterrence will not work if the arsenal is not big enough or under enough control, Chellaney (1995) contends that the Cold War is evidence that even minimum deterrence is sufficient. In support, Feaver (1992/93: 186) argues that 'even a modest nuclear arsenal should have some existential deterrent effect on regional enemies, precisely because decapitation is so difficult'. There are those who argue that security is increased at a systemic level when the number of nuclear states increases because of the level of uncertainty created when more than one or two players are playing with a nuclear deck. When this happens, 'the probability of deliberate nuclear attack falls to near zero with three, four, or more nuclear nations' (Brito & Intriligator, 1983: 137). Cimbala (1993: 194) agrees, arguing that 'it is only necessary to threaten the plausible loss of social value commensurate with the potential gains of an attacker'.

[4] Gaddis (1986) discusses how the presence of nuclear weapons contributed to restraint between the USA and the USSR. Kahn (2001: 61) similarly argues, 'given that all-out wars have almost become a thing of the past due to the prevailing nuclear deterrent relationship between the adversaries in these volatile regions, it seems that scholarly focus should now shift from nuclear war dynamics to the more crucial aspect – the protracted conflict itself.'

Assessing Proliferation Using Deterrence Theory

The causal mechanism in a proliferation optimist argument like that of Waltz (Sagan & Waltz, 2003), which expects war to be less likely as the number of nuclear actors increases, is connected to a rationalist view of nuclear deterrence (see Zagare & Kilgour, 2000; Huth, 1999). Proliferation optimists implicitly contend that, as the number of nuclear actors in the system increases, the proportion of disputes involving nuclear actors should increase as well.[5] That is, all else being equal, the more of any type of actor you add to the playing field of international politics, the more likely that that type of actor will be involved in a crisis. If nuclear weapons increase the prospects of deterrence, then proliferation should result in more crises with restrained actors that are prone to back down instead of escalate.

Rational deterrence advances the notion that actors are effectively able to deter other states from aggression if they can credibly posture themselves as resolute and strong states. States with nuclear weapons should be especially effective at deterrence if they can convince their adversary that there is some possibility nuclear weapons would be used. Nuclear states may resort to brinkmanship or costly signals to overcome the credibility problem (Schelling, 1960, 1962, 1966; Powell, 1988, 1989, 1990; Fearon, 1994). As long as there is some probability that a state would use a nuclear weapon against an opponent, the enormity of the costs of that event should be enough to deter opponents from escalating in a conflict even if the probability of that event is low.

While Zagare & Kilgour (2000) point to a number of inconsistencies in 'classical deterrence theory', as advocated by such scholars as Waltz, the general argument that nuclear weapons can decrease the willingness of actors to engage in violent conflict is consistent with Zagare & Kilgour's 'Perfect Deterrence Theory'. In their view, deterrence is a function of both capabilities and credibility. The capability to inflict great damage is the only necessary condition for deterrence, and the strength of deterrence will generally be improved as the credibility of nuclear use increases. Relevant to Perfect Deterrence Theory, this article does not advance the notion that deterrence will never fail, just as Zagare & Kilgour (2000) formally demonstrate that deterrence can fail in many instances. Our logic is probabilistic in that nuclear weapons should decrease the likelihood of violent conflict, not eliminate it.

The formal models of Zagare & Kilgour (1993, 2000) and Kilgour & Zagare (1991) suggest that as an actor increasingly values the status quo more than fighting, the ability for deterrence to succeed increases. Applied to nuclear weapons, if a state making a demand faces higher expected costs of war because of the threat of nuclear retaliation, then that actor is more likely to prefer backing down to fighting. Kilgour & Zagare (1991: 321) state, 'by increasing the costs of warfare, deterrence becomes more likely as the credibility requirements of a deterrent threat become less onerous'.

This leaves one to wonder why the state with nuclear weapons does not then try to exploit the willingness of the other side to shy away from conflict and simply make large demands of its own. Under this logic, the nuclear actor might raise its demands until the other actor has a reasonable relative valuation of fighting and the probability of war is roughly the same as if there were no nuclear deterrent. But if demands are made according to a risk-return-tradeoff, under similar assumptions modeled by Powell (1999: 101), then increases in the expected costs of war of an opponent should be greater than any increases in the demands of exploitive actors.

[5] It is not clear how strong this effect may be, since the possession of nuclear weapons may affect an actor's probability of being in a serious dispute. The authors leave a complete examination of how proliferation might affect crisis onset to future research. The point is that proliferation increases the opportunity for nuclear actors to participate in disputes.

So, the probability of war should decrease as the costs of war increase, even if the demands also increase in response.

Rational deterrence theory is by no means undisputed (see Morgan, 2003). Sagan (Sagan & Waltz, 2003: 50) argues, 'the assumption that states behave in a basically rational manner is of course an assumption, not an empirically tested insight'. This article addresses Sagan's point directly, as we hypothesize what would follow if Waltz's view of deterrence generally worked and then use empirical tests to see if the observed world looks as predicted. If Waltz is wrong, then we should not see a pacifying effect of nuclear weapons in international crises.

Data and Methods

International Crisis Behavior Data

To study the impact of nuclear weapons on international crisis behavior, we employ the International Crisis Behavior (ICB) dataset (Brecher & Wilkenfeld, 2000). The database includes 434 international crises from 1918 to 2001. Following Huth & Russett (1990), the set of crises should be an appropriate set of cases because these are all instances in which some challenge or threat is made, and there is some possibility of deterrence success or failure. In this way, the mechanisms specific to immediate deterrence are tested, which Morgan (2003) notes are generally understudied in the deterrence literature. An actor is defined as being in crisis when some value is threatened, there is a finite time to react to the threat, and there is an increase in the perception of military hostilities.

Hypotheses and Variables

Arguments that see a positive link between nuclear weapons and crisis stability suggest that we should see less violence in crises involving nuclear states and that the severity of violence should decrease as the number of states that possess nuclear weapons increases. Anti-proliferation arguments often contend that we should see more violence induced by either accidental war due to miscalculations of power or a desire for pre-emptive war. At the very least, anti-proliferation work, such as Sagan's (Sagan & Waltz, 2003), disputes the claim that nuclear weapons will lead to greater constraint in the foreign policies of possessing actors. In this article, we test the optimists' view. That is, does the involvement of nuclear actors in a crisis lessen the likelihood that violence will be used? Thus, our dependent variable is intensity of violence, an ordinal variable that ranges from 'no violence' to 'full-scale war'. Table II below describes this variable and others more closely. We test the following hypotheses:

H0: The probability that a crisis will have higher levels of violence will not be affected by the number of nuclear actors.

H1: The more nuclear crisis states involved in an international crisis, the higher the probability that the crisis will have lower levels of violence.

The independent variable that is relevant to the hypotheses is a count of the number of nuclear actors involved in each crisis. Note that we do not distinguish between status quo and revisionist actors because such a distinction does not necessarily follow from the theoretical framework. Morgan (2003) argues that there should not be much of a difference between an understanding of deterrence – where the status quo state has nuclear weapons – and an understanding of compellence – where the revisionist state has nuclear weapons. Like Morgan, our expectations are based on an assumption that nuclear weapons will affect all aspects of coercive diplomacy. That is, nuclear actors should be better able to make other states back down short of war, whether they are defending the status quo or not. In addition, the information about which states are status quo or defender states is not readily available

in the ICB data. Indeed, it is difficult to make such decisions as an outside observer, especially when a pre-emptive attack on a state that will likely threaten the status quo in the future might appear from the outside as a revisionist attack.

One of the models used in the analysis uses a different primary explanatory variable. This is a variable that identifies whether the crises involve any 'nuclear dyads' in which actors on both sides of a conflict have nuclear weapons. The included variable can help identify whether the mere addition of nuclear actors to a crisis breeds restraint, or whether it is just a dyadic phenomenon where both sides feel the deterrent effect.

The first challenge is determining who has nuclear weapons. While the first and second generation of nuclear powers (China, France, United Kingdom, USA, and Russia/USSR) went public when they achieved 'nuclear power status', this is not true for any of the third-generation nuclear powers. There are also three nuclear inheritor countries (Belarus, Kazakhstan, and Ukraine) where the issue of who has command and control (Russian forces or the militaries of the new countries) was often unclear to the outside observer. This latter group is not problematic for this analysis because none of them were involved in an international crisis. This still leaves the problem of determining when India, Israel, North Korea, Pakistan, and South Africa became nuclear powers. To make this assessment, we have largely relied on data from the following organizations: the Federation of American Scientists, the Nuclear Threat Initiative, the Council for a Livable World, the *Bulletin of the Atomic Scientists*, the Center for Defense Information, and the Center for Nonproliferation Studies. In addition, we have turned to the academic literature for a closer look at those countries whose move into the nuclear club has been more opaque. Where there is a disagreement, we have coded the transition to being a nuclear power based on what appears to be a plurality of opinion. Table I presents the dates that we use and the key sources of information we relied on for each. Given the fact that the lack of a nuclear test does not mean a country does not have nuclear capability and the additional hazy nature of some of the information, we dated the nuclear status of each country from the beginning of the year that it was reported to have nuclear capability. Thirteen countries are listed as becoming nuclear powers at some time over the last fifty years. Of those, four have given up on being nuclear powers: South Africa, Belarus, Kazakhstan, and Ukraine. Of these four, only South Africa has been involved in an international crisis.

We control for a number of factors in the analysis. First, we control for the number of actors in a crisis, to avoid a confounding relationship in which our key explanatory variable is actually just picking up the diffusion potential of crises and not the actual effect of nuclear weapons. The gravity of the threat in a crisis is also controlled for to account for a potential selection effect, best characterized by Fearon (2002), who comments on the debate between Lebow & Stein (1990) and Huth & Russett (1990). The set of cases in which there are serious threats may appear different with regard to various outcome variables, because these are the cases in which general deterrence has failed, and there is at least one very resolved actor. While there may be additional similar, unobservable selection processes that we do not account for, including threat gravity is one cut at trying to control for the differences that might be expected in crises with serious threats versus crises with lesser threats. The discussion section expands on this issue.

The third control variable is whether the crises are protracted or not. Nuclear actors may develop nuclear weapons for security purposes related to the presence of protracted conflicts (Sagan, 1996/97), and protracted conflicts tend to be associated with higher

Table I. Nuclear Capabilities

Country	*Year achieved nuclear capabilities*	*Year end*	*Citations*[†]
Belarus*	1991	1996	
China•	1964	Ongoing	
France•	1960	Ongoing	
India•	1974	Ongoing	http://www.nti.org/e_research/profiles/India/index.html http://www.fas.org/nuke/guide/india/nuke/index.html Hagerty (1998: 73)
Israel•	1967	Ongoing	http://www.fas.org/nuke/guide/israel/nuke: 1966/67 Cohen (1998: 232, 274): late 1966/67
Kazakhstan*	1991	1995	
North Korea**•	1992	Ongoing	http://www.nti.org/e_research/profiles/NK/Nuclear/index.html: 1991 http://www.fas.org/nuke/guide/dprk/nuke/cia111902.html: 1992 Cirincione, Wolfsthal & Rajkumar (2002: 244): capability possibly since before 1994
Pakistan•	1987	Ongoing	http://www.nti.org/e_research/profiles/Pakistan/index.html: 1989–90 http://www.fas.org/nuke/guide/pakistan/nuke/index.html: 1987 Hagerty (1998: 82, 99–95): possibly 1983, most probably by 1986/87
South Africa•	1978	1993	Horton (1999): 1977 or 1979 Liberman (2001: 54): 1978 Albright (1994): 1979 http://www.fas.org/nuke/guide/rsa/nuke/stumpf.htm: 1979 http://cns.miis.edu/research/safrica/chron.htm: 1978
Ukraine*	1991	1996	
United Kingdom•	1952	Ongoing	
USA•	1945	Ongoing	
Russia/USSR•	1949	Ongoing	

• Involved in a crisis as nuclear power.
† For countries that have had opaque nuclear policies; we include the different dates when there are discrepancies.
* Belarus, Kazakhstan, and Ukraine had possession of nuclear weapons on their territories, but it appears that they did not have operational control of these weapons. All nuclear warheads were reported removed from their territories by 1996 or 1995. In any case, none of the countries have been involved in an international crisis since their independence.
** The start of North Korea's status as a nuclear power is still very unclear. Of all the countries listed, the determination of North Korean status is the least certain.

Table II. Variables Used in Analysis

Variables	*Mode*	*Mean*	*Standard deviation*
(DV) Intensity of violence (sev) 1) No violence 2) Minor clashes 3) Serious clashes 4) Full-scale war	2	2.349	1.049
(IV1) Number of nuclear powers involved in crisis (nuke): from 0 to 5	0	.655	.889
(IV2) Number of crisis actors (cractr) 1) One actor 2) Two actors 3) Three actors 4) Four actors 5) Five actors 6) Six actors 7) More than six actors	2	2.187	1.173
(IV3) Gravity of crisis threat* (gravcr) 0) Non-grave threat 1) Threat of grave damage or to existence	0	.206	.405
(IV4) Protracted conflict* (protract) 0) Non-protracted conflict 1) protracted conflict	1	.633	.483
(IV5) Difference in capabilities (cincdif)	–	.0380	.0527
(IV6) Jointly democratic opponents (jointdem) 0) No dyads jointly democratic 1) Jointly democratic dyad	0	.0534	.225
(IV7) Jointly nuclear dyad (nukedyad) 0) No dyads jointly nuclear 1) Jointly nuclear dyad	0	.0749	.264
(IV8) New nuclear actor (newnuke) 0) No involvement of actors that developed nuclear weapons after 1964 1) Involvement of 'new' nuclear actors	0	.137	.344
(IV9) Superpower crisis actor 0) The USA and USSR/Russia are not crisis actors 1) The USA or USSR/Russia are crisis actors	0	.170	.376

Observations: 281.
Explanations for IV2, IV3, and IV4 are taken from http://www.icbnet.org/Data/icb1v4-1codebook.pdf and Brecher & Wilkenfeld (2000). IV1 counts the number of actors that have nuclear weapons in a crisis, based on the actors in the dyadic ICB data (Hewitt, 2003). IV5 is the absolute mean difference in CINC scores of any dyad in the conflict, where the CINC scores are from the National Material Capabilities 3.0 1 data (Singer, Bremer & Stuckey, 1972), and the dyads are determined by Hewitt's (2003) ICB dyadic data. IV6 considers a crisis as having jointly democratic opponents when the Polity IV (Marshall & Jaggers, 2002) composite index is at least six for each of the actors in at least one of the dyads in a crisis.
* Originally, these variables had more categories, but they are used as binary variables here to ensure that they are ordinal.

levels of violence (Caprioli & Boyer, 2001; Brecher & Wilkenfeld, 2000; Brecher, 1999; Bremer, 1992; Brecher & James, 1988). We also control for the difference in capabilities, as the possession of nuclear weapons parallels the possession of other military capabilities that might be related to levels of crisis violence in ways unrelated to nuclear weapons. Zagare & Kilgour (2000) argue that the capability level necessary for deterrence to work can be achieved with conventional weapons, so controlling for capability allows us to test for the relevance of nuclear weapons. This variable is constructed using the CINC score index from the National Military Capabilities (NMC) data, which allows an analyst to compare the potential military capacities of countries. The value used for each observation is the mean difference in CINC score between opposing actors listed in the dyadic ICB data (Hewitt, 2003). The presence of jointly democratic dyads is controlled for in order to avoid any potentially confounding relationships between the democratic peace and the role of nuclear weapons.

Two additional control variables are included in separate models to demonstrate robustness across potentially mitigating phenomena. First, a variable that indicates whether any of the actors involved in a crisis are 'new' nuclear actors is used to take another look at some of the proliferation-pessimist views. If it is the case that the five nuclear-weapon members of the NPT are inherently more responsible than the actors that developed nuclear weapons later, then there should be different propensities toward violence in crises with the newer nuclear actors. Second, one of the models includes a dummy variable that indicates if one of the superpowers was a crisis actor. This variable is used to account for the fact that the USA and Soviet Union/Russia were involved in 75 crises since 1945 and may behave differently than other nuclear actors because of their superpower status. This variable also captures some of the variation in the number of nuclear weapons that crisis actors possess and may have some implications for the debate over whether just a few nuclear weapons are sufficient for deterrence to work.

When analyzing the impact of nuclear weapons using the ICB dataset, one can decide either to analyze only the period when nuclear weapons were available, 1945 to the present, or to use both the periods before and after the presence of nuclear weapons in the analysis. The post-WWII period is most appropriate, as the set of observations prior to this time period had no potential to have variation in the independent variable. Of the 285 crises that the dyadic ICB dataset lists from 1945 to 2001, a little less than 45% (131) involved at least one nuclear power. Table III illustrates how many nuclear crises involved more than one nuclear actor.

Analysis

Given the ordinal nature of the dependent variable, we use maximum-likelihood ordered-logit estimation (ologit) to analyze the data. To interpret the coefficients from the logistic regression, we use the Clarify simulation program (King, Tomz & Wittenberg, 2000; Tomz, Wittenberg & King, 2003) to generate probabilities that allow us to see how our independent variables affect the dependent

Table III. Number of Nuclear Actors Involved in Crisis in Crises with Nuclear Actors, 1945–2001

Number of nuclear actors involved in crisis	*Number of crises of this type**	*Relative frequency*
1	97	74.05
2	21	16.03
3	8	6.11
4	4	3.05
5	1	0.76

* Total = 131.

variable. We do this with the control variables set at their mode or mean. In this way, we assess the impact of the number of nuclear actors involved in a crisis in the most common circumstances (with the other variables set at their mode).

As Model 1 in Table IV illustrates, all of our variables are statistically significant except for the protracted conflict variable. Our primary independent variable, the number of nuclear actors involved in the crisis, has a negative relationship with the severity of violence and is significant. This lends preliminary support to the argument that nuclear weapons have a restraining affect on crisis behavior, as stated in *H1*.

It should be noted that, of the crises that involved four nuclear actors – Suez

Table IV. Multivariate Models of Violence Levels, 1945–2001

	Ordered Logit		*Logit*	*Ordered Logit*	
	1	*2*	*3*	*4*	*5*
Number of nuclear powers	–0.372 (2.18)**	–	–0.560 (2.03)**	–0.412 (1.95)**	–0.355 (2.06)**
Nuclear dyad	–	–0.699 (1.51)	–	–	–
Number of crisis actors	0.657 (5.07)***	0.599 (4.80)***	0.936 (4.98)***	0.675 (4.80)***	0.696 (4.92)***
Gravity of crisis threat	1.100 (3.52)***	0.989 (3.23)***	1.218 (2.94)***	1.089 (3.46)***	1.140 (3.58)***
Protracted conflict	0.348 (1.44)	0.337 (1.40)	0.897 (1.90)*	0.335 (1.37)	0.350 (1.44)
Difference in capabilities	–4.526 (1.92)*	–6.253 (2.90)***	–7.666 (1.50)	–4.137 (1.57)	–3.023 (0.96)
Jointly democratic opponents	–1.055 (2.04)**	–0.936 (1.82)*	–1.293 (1.16)	–1.058 (2.05)**	–1.072 (2.08)**
New nuclear actor	–	–	–	0.131 (0.33)	–
Superpower involvement	–	–	–	–	–0.320 (0.70)
Constant	–	–	–4.194 (7.50)***	–	–
Cut 1	0.103 (0.281)	0.084 (0.283)	–	0.139 (0.301)	0.188 (0.306)
Cut 2	1.604 (0.289)	1.577 (0.291)	–	1.640 (0.310)	1.689 (0.315)
Cut 3	3.201 (0.346)	3.161 (0.346)	–	3.236 (0.362)	3.290 (0.370)
Observations	281	281	281	281	281
Pseudo R-squared	0.088	0.085	0.245	0.088	0.088

Absolute value of z statistics in parentheses.
* significant at 10% in a two-tailed t-test; ** significant at 5%; *** significant at 1%.

Nationalization War (1956), Berlin Wall (1961), October Yom Kippur War (1973), and Iraq No-Fly Zone (1992) – and five nuclear actors – Gulf War (1990) – only two are not full-scale wars. While this demonstrates that the pacifying effect of more nuclear actors is not strong enough to prevent war in all situations, it does not necessarily weaken the argument that there is actually a pacifying effect. The positive and statistically significant coefficient on the variable that counts the number of crisis actors has a magnitude greater than that on the variable that counts the number of nuclear actors. Since increases in the number of overall actors in a crisis are strongly associated with higher levels of violence, it should be no surprise that many of the conflicts with many nuclear actors – by extension, many general actors as well – experienced war. Therefore, the results can only suggest that, keeping the number of crisis actors fixed, increasing the proportion of nuclear actors has a pacifying effect. They do not suggest that adding nuclear actors to a crisis will decrease the risk of high levels violence; but rather, adding more actors of any type to a crisis can have a destabilizing effect.

Also in Table IV, Model 2 demonstrates that the effect of a nuclear dyad is only approaching statistical significance, but does have a sign that indicates higher levels of violence are less likely in crises with opponents that have nuclear weapons than other crises. This lukewarm result suggests that it might not be necessary for nuclear actors to face each other in order to get the effect of decreased propensity for violence. All actors should tend to be more cautious in escalation when there is a nuclear opponent, regardless of their own capabilities. While this might weaken support for focusing on specifically a 'balance of terror' as a source of stability (see Gaddis, 1986; Waltz, 1990; Sagan & Waltz, 2003; Mearsheimer, 1990), it supports the logic in this article that nuclear weapons can serve as a deterrent of aggression from both nuclear and non-nuclear opponents.[6]

Model 3 transforms the violence variable to a binary indicator of war and demonstrates that the principal relationship between the number of nuclear actors and violence holds for the most crucial outcome of full-scale war. Model 4 demonstrates that accounting for the presence of new nuclear actors does not greatly change the results. The coefficient on the *new nuclear actor* variable is statistically insignificant, which lends credence to the optimists' view that new nuclear-weapon states should not be presupposed to behave less responsibly than the USA, USSR, UK, France, and China did during the Cold War. Finally, Model 5 similarly illustrates that crises involving superpowers are not more or less prone to violence than others. Superpower activity appears to not be driving the observed relationships between the number of nuclear-crisis actors and restraint toward violence.

It is important to establish more specifically what the change in the probability of full-scale war is when nuclear actors are involved. Table V presents the probability of different levels of violence as the number of nuclear actors increases in the Clarify simulations. The control variables are held at their modes or means, with the exception of the variable that counts the number of crisis actors. Because it would be impossible to have, say, five nuclear-crisis actors and only two crisis actors, the number of crisis actors is held constant at five.

[6] Geller (1990), building from Snyder & Diesing (1977) and Osgood & Tucker (1967), actually finds that nuclear dyads are more likely to escalate (short of war) in conflict situations because there is a higher 'threshold' for competitive risk-taking when both sides know that all-out war should be avoided at all costs. With a negative but insignificant coefficient on the nuclear dyad variable, our results suggest that there might be competing effects in a nuclear dyad. Both sides will be restrained from high levels of violence but more comfortable at lower levels of escalation. We leave further explanation of the specific dynamics within a nuclear dyad to future research.

Table V. Probability of Different Levels of Severity of Violence Based on Number of Nuclear Powers Involved*

Severity of violence	*Number of nuclear powers*					
	0	*1*	*2*	*3*	*4*	*5*
(1) No violence	0.04	0.05	0.07	0.11	0.15	0.21
(2) Minor clashes	0.11	0.14	0.18	0.23	0.27	0.30
(3) Serious clashes	0.30	0.34	0.36	0.36	0.34	0.31
(4) Full-scale war	0.56	0.47	0.38	0.30	0.24	0.19

* cractr = 5, gravcr = 0, protrac = 1, cincdif = .0481, jointdem = 0.

As we can see, the impact of an increase in the number of nuclear actors is substantial. Starting from a crisis situation without any nuclear actors, including one nuclear actor (out of five) reduces the likelihood of full-scale war by nine percentage points. As we continue to add nuclear actors, the likelihood of full-scale war declines sharply, so that the probability of a war with the maximum number of nuclear actors is about three times less than the probability with no nuclear actors. In addition, the probabilities of no violence and only minor clashes increase substantially as the number of nuclear actors increases. The probability of serious clashes is relatively constant.

Overall, the analysis lends significant support to the more optimistic proliferation argument related to the expectation of violent conflict when nuclear actors are involved. While the presence of nuclear powers does not prevent war, it significantly reduces the probability of full-scale war, with more reduction as the number of nuclear powers involved in the conflict increases.

As mentioned, concerns about selection effects in deterrence models, as raised by Fearon (2002), should be taken seriously. While we control for the strategic selection of serious threats within crises, we are unable to control for the non-random initial initiation of a crisis in which the actors may choose to enter a crisis based on some ex ante assessment of the outcomes. To account for possible selection bias caused by the use of a truncated sample that does not include any non-crisis cases, one would need to use another dataset in which the crisis cases are a subset and then run Heckman-type selection models (see Lemke & Reed, 2001). It would, however, be difficult to think of a different unit of analysis that might be employed, such that the set of crises is a subset of a larger category of interaction. While dyad-year datasets have often been employed to similar ends, the key independent variable here, which is specific to crises as the unit of analysis, does not lend itself to a dyadic setup. Moreover, selection bias concerns are likely not valid in disputing the claims of this analysis. If selection bias were present, it would tend to bias the effect of nuclear weapons downward, because the set of observed crises with nuclear actors likely has a disproportionate share of resolved actors that have chosen to take their chances against a nuclear opponent. Despite this potential mitigating bias, the results are statistically significant, which strengthens the case for the explanations provided in this study.

Conclusion

The presence of nuclear weapons has an important and pacific impact, a finding that lends support for an optimistic view of the stabilizing effect of nuclear weapons. Waltz's (Sagan & Waltz, 2003: 7) contention that 'the presence of nuclear weapons makes states exceedingly cautious' seems to be borne out. Simply put, when nuclear actors are present, states – both nuclear and non-nuclear – resort to violence less often, because they do not want to risk the exceptional costs of a nuclear strike. Given the fact that much of the examination

of this issue has been impressionistic (Geller, 2003), this finding is important for our continuing effort to better understand the advantages and disadvantages of nuclear proliferation, as well as its effects.

We should also note that this was a 'hard' test for the pro-proliferation argument – we are not asking if nuclear dyads are less likely to go to war. Our analysis indicates that the presence of nuclear-weapons states as crisis actors, regardless of which side they are on, decreases the likely level of violence. This fits with the theoretical arguments of proliferation optimists and rational-deterrence theorists. Despite the support for the optimists, the evidence is not as overwhelming as one might wish, given the costs involved if there is a mistake in the calculations of leaders armed with nuclear weapons during a crisis. A 37% change in the probability of full-scale war is a large amount, but as Waltz (Sagan & Waltz, 2003: 6) points out, the costs of a mistake can be nothing short of 'destruction'. Is a change of 37% in probability worth taking the risk that proliferation may reach a ruler who is truly irrational? In either case, the findings suggest avenues for future research using the ICB dataset to explore various impacts that nuclear weapons have on crisis behavior.

Our findings shed light only on the general impact that increasing the number of nuclear participants in a crisis has on the outcome of that crisis. We do not address other potential perils that proliferation might bring, such as greater risks of accident or the higher risks of use by terrorist networks. The pacification effect of nuclear states in crises is only one of many important factors to consider when states adopt their proliferation stances. And it should not be lost that the pacification effect is only so strong, as some serious violent conflicts have occurred between nuclear-weapon states. Zagare & Kilgour (2000) demonstrate that deterrence can fail in any number of situations. The costs of failed deterrence are so great when there are nuclear weapons involved that policymakers must seriously weigh the benefits of decreasing the likelihood of deterrence failure with increasing the costs of each failure instance.

Finally, the motivations, behaviors, and outcomes for the various actors beyond the level of violence experienced remain beyond the scope of our present analysis. Given our findings, a closer look at the different outcomes for nuclear actors and non-nuclear actors in crises suggests itself as a useful next step in our understanding of the impact of nuclear proliferation.

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