A Strategic Approach to Nuclear Proliferation

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Nuclear weapons have occupied a central role in international politics ever since their introduction onto the world stage in 1945. The use of nuclear weapons by the United States on Hiroshima and Nagasaki is widely believed to have compelled Japanese surrender and brought World War II to a close. The vast nuclear arsenals of the United States and the Soviet Union were fundamental to the bi-polar, strategic relationship that structured international politics for over fifty years during the Cold War. And while many analysts hoped that the collapse of the Soviet Union would lead to a reduction in the influence of nuclear weapons in international affairs, it was not to be so. The threat of nuclear proliferation resurfaced as India, Pakistan, and more recently, North Korea have conducted nuclear tests. Other regional powers, including Iran, Iraq, and Libya are pursuing, or have pursued, nuclear capabilities. The terrorist attacks against the United States on September 11, 2001 demonstrated that if terrorists, intent on carrying out mass-casualty attacks, acquired nuclear weapons, the results could be catastrophic. The ease with which states or terrorsists could potentially acquire sensitive nuclear materials was exemplified by the black-market nuclear proliferation ring operated by Pakistani scientist A.Q. Khan. Indeed, in his 2007 annual report to Congress on the projected threats to the national security of the United States of America, Director of National Intelligence J. Michael McConnell concluded that nuclear proliferation poses one of the greatest threats to U.S. national security.[2]

The real-world importance of nuclear weapons has led to the production of a vast scholarly literature on the causes and consequences of nuclear proliferation (e.g., Schelling 1966, Betts 1987, Powell 1990, Sagan and Waltz 1995, Sagan 1996/1997, Singh and Way 2004, Hymans 2006, Solingen 2007). Scholars have thoroughly

examined *why* states want nuclear weapons (e.g., Sagan 1996/1997) and the effect of nuclear proliferation on the stability of the international system (e.g., Sagan and Waltz 1995). Missing from this debate is an analysis of how states acquire nuclear weapons and a systematic empirical examination of how nuclear weapons may affect the security and the diplomacy of their possessors. We shift the focus by analyzing *how* nuclear weapons spread and by disaggregating the consequences of nuclear proliferation on the states that compose the system.

We begin with two simple observations. First, nuclear weapons can potentially have a wide variety of effects on their possessors. Nuclear weapons may alter the frequency, timing, intensity, duration, and outcome of conflicts, and may also affect a state's diplomatic influence. Second, whether or not states want nuclear weapons is irrelevant if they are unable to acquire them. Our basic argument, grounded in the tradition of realist and security-based approaches to nuclear proliferation and nuclear deterrence, is that nuclear weapons on average and across a broad variety of indicators enhance the security and diplomatic influence of their possessors. Because states stand to gain by possessing nuclear weapons, the supply-side factors that enable nuclear development are among the most important determinants of nuclear proliferation. These points may seem obvious to some, but they are surprisingly controversial in the nuclear proliferation literature.

One critique comes from analysts of the consequences of nuclear proliferation. Proliferation pessimists argue that nuclear proliferation makes the world a more dangerous place (e.g., Sagan 1993, Blair 1993, Miller 1993). They claim that the spread of nuclear weapons can lead to preventive military strikes, crisis instability, and

accidental nuclear detonations, contributing to greater levels of international stability. We recognize that nuclear weapons may or may not destabilize the international system. We bypass this debate and shift the unit of analysis from the international system to the states that compose it. Nuclear weapons may have destabilizing systemic effects even as they improve the strategic positions of the states that possess them.

Another possible line of critique comes from scholars who have focused on how states can use nuclear weapons to their diplomatic advantage. This scholarship has tended to conclude that nuclear weapons can deter foreign aggression, but are otherwise largely ineffective tools of diplomacy (e.g., Betts 1987). We agree that nuclear weapons provide their possessors with a powerful deterrent, but we also identify a variety of other types of security and diplomatic advantages that nuclear weapons may afford.

Our theoretical claims also mark a significant departure from the contemporary scholarly literature on the causes of nuclear proliferation. First, recent studies suggest that psychological, economic, and domestic considerations are the principal determinants of nuclear proliferation (e.g., Hymans 2006, Solingen 2007). We do not dispute that these considerations can be important, but emphasize that the strategic benefits of nuclear weapons should not be overlooked. Second, scholars have argued that what is most surprising about nuclear proliferation is how few states have acquired atomic bombs (e.g., Hymans 2006, Solingen 2007). These analysts point to countries like Japan and Germany that have the technical capability to produce nuclear weapons but have refrained from doing so. This leads them to conclude that state demand for nuclear weapons, and not the capability to produce nuclear weapons, is the key to explaining nuclear proliferation. We agree that there are countries that can produce nuclear

weapons, but have not, just as there are countries like Egypt, Libya, and Iraq that have wanted nuclear weapons, but were unable to produce them. The causal significance, therefore, of either demand-side, or supply-side, factors cannot be dismissed by offering counterexamples. We advocate for a more careful scholarly analysis of the supply-side of nuclear proliferation. We emphasize that the ability to produce nuclear weapons is a necessary condition for nuclear proliferation to occur.

Our main goal is to offer a systematic account of the causes and consequences of nuclear proliferation. We explore – theoretically and empirically – our basic assumptions that nuclear weapons, on average and across a broad variety of indicators, have beneficial effects for their possessors, and that, partly for this reason, supply-side factors are among the most important causes of nuclear proliferation.

For many of the papers in this issue, the key variable will be the same: nuclear weapons possession. One of the articles in this issue treats nuclear weapons possession as a dependent variable and seeks to explain the factors that lead states to acquire nuclear weapons. For others, nuclear weapons possession is a key independent variable. These articles seek to understand how the possession of nuclear weapons influences state behavior. Because of its centrality to this issue, it is necessary to define and measure nuclear proliferation carefully. We examine horizontal, as opposed to vertical, nuclear proliferation. That is, we analyze the spread of nuclear weapons to new states. We do not focus on increases in the number of nuclear warheads within nuclear-armed states.

Horizontal nuclear proliferation (from this point on, nuclear proliferation) is easy to conceptualize. When a state that did not possess nuclear weapons, acquires nuclear weapons, nuclear proliferation has occurred. The papers in this issue use a common set

of nuclear proliferation dates (listed in Table 1). States are defined as having acquired nuclear weapons when they first assemble a nuclear weapon that could be delivered against an enemy target. The first five nuclear weapon states, the United States, the Soviet Union, Great Britain, France, and China, immediately tested their nuclear weapons. Measuring when these states crossed the nuclear threshold is as simple as recording the date of the first nuclear test. The subsequent nuclear powers, however, have either never conducted a nuclear test, or have waited a significant period of time before weaponizing a potential nuclear capability. For example, North Korea is believed to have possessed enough separated plutonium to build one or two nuclear bombs by 1994, yet it is not known when North Korea assembled its first nuclear device. North Korea conducted a nuclear test in October 2006, but many experts considered the test a failure and question whether North Korea actually has a functioning nuclear weapons arsenal to this day. North Korea could plausibly be coded as acquiring nuclear weapons in 1994, 2006, or never. Similarly, India conducted a "peaceful nuclear explosion" in 1974, but it is not believed to have fashioned a deliverable nuclear warhead until 1988. Should India be coded as a nuclear power beginning in 1974 or in 1988? To code the remaining nuclear powers, we scoured historical, archival, and policy materials to determine when the country first assembled a deliverable nuclear device. Because, there may be disputes about the precise date at which some countries acquired nuclear weapons, and because critics may question how the choice of dates influences the results, the authors employ a variety of robustness checks to test the sensitivity of our findings to the coding decisions.

Our work seeks to explain seven nuclear proliferation-related dependent variables:

NUCLEAR PROLIFERATION
NUCLEAR COOPERATION
FREQUENCY OF CONFLICT
TIMING OF CONFLICT
INTENSITY OF CONFLICT
OUTCOME OF CONFLICT
DIPLOMATIC INFLUENCE

We examine why states acquire nuclear weapons, why they engage in nuclear cooperation, and explore the relationship between nuclear weapons possession and a variety of security and diplomatic outcomes. This list does not cover the full range of possible nuclear proliferation issues that could be subjected to scholarly scrutiny, but they offer several advantages for our research. First, these outcomes are substantively important. Second, they can be measured, allowing us to quantitatively analyze nuclear proliferation across cases and over time. Third, this list covers a broader range of outcomes than are considered in the existing literature. Indeed, some of these relationships are conceptualized and subjected to empirical scrutiny for the first time in this issue.

We situate our research in the tradition of realist and security-based approaches to nuclear proliferation and nuclear deterrence. We build on earlier work to develop theoretical propositions that are then evaluated in the studies in this special issue of the *Journal of Conflict Resolution*. Our view is that the strategic approach can explain much about the causes and consequences of nuclear proliferation, but not everything.

This special issue seeks to make strides on theoretical, empirical, and methodological dimensions. We aim to accelerate the development of an empirical

research agenda that examines the causes and effects of nuclear proliferation by using robust research tools that make better inference possible. Quantitative studies have been underrepresented in the expansive nuclear proliferation literature, which has focused on comparative, historical, formal, and qualitative analyses of the spread of nuclear weapons and nuclear deterrence. This issue begins to rectify this deficit by bringing together a new generation of scholars, advancing novel theoretical positions and performing quantitative tests on the causes and consequences of nuclear proliferation.

As Sonali Singh and Christopher Way (2004) have argued, statistical analysis is particularly appropriate for the study of nuclear proliferation for three reasons. First, statistical studies can examine the entire universe of cases, avoiding the problems associated with selecting cases on the dependent variable. Second, most of the claims made by theorists of nuclear proliferation are probabilistic, making statistical analysis the most appropriate research tool for their examination. Large sample studies can help to avoid the deterministic conclusions implied by some case-based research. Third, the causes and consequences of nuclear proliferation are multi-causal and statistical analysis can help the researcher to test and control for confounding factors.

To this list, we add a fourth reason. The monadic and dyadic units of analysis that form the backbone of datasets in international relations mesh well with our research focus on the causes and consequences of nuclear proliferation in individual states.

These studies are not the first to employ quantitative analysis to examine nuclear proliferation issues. Quantitative research on nuclear proliferation traces its roots to earlier work by Kegley (1980) and Myer (1984). These were pioneering studies, but the methodological tools available to researchers were insufficient to test the theories of

interest. In recent years, scholars (Singh and Way 2004, Jo and Gartzke 2007, Asal and Beardsley, 2007, Fuhrmann 2008) have begun to quantitatively analyze the causes and consequences of nuclear proliferation. Still, this research has not yet generated the critical mass of scholarship that has proven productive in other fields.

We are advocating for a broad empirical research approach that sharpens and tests theories of nuclear proliferation by conducting systematic tests in large sample environments. We view this endeavor as complementary to other research approaches. Statistics are a tool that, in combination with other research methods, can help scholars discover important nuclear proliferation puzzles and identify critical sources of variation.

Roadmap to the Strategic Approach to Nuclear Proliferation Project

The above discussion introduces our effort to understand the causes and consequences of nuclear proliferation from a strategic perspective. The articles that follow take up this challenge. This issue contains two articles on the causes of nuclear proliferation, four articles on the consequences of the spread of nuclear weapons, and an analytical review essay.

The first two papers in the issue seek to understand the causes of nuclear proliferation. Why do states acquire nuclear weapons? These authors expand on, and refine, recent quantitative work on nuclear proliferation by Singh and Way (2004) and Jo and Gartzke (2007), focusing in particular on the supply-side of nuclear proliferation.

Matthew Kroenig examines the relationship between the international transfer of nuclear materials and technology and the proliferation of nuclear weapons. He notes that policy analysts have frequently claimed a link between nuclear assistance and nuclear

proliferation, but that academic studies of nuclear proliferation have not treated international assistance as a potential cause of the spread of nuclear weapons. Kroenig argues that international nuclear transfers can help states to overcome the common technical and strategic obstacles that they encounter as they attempt to develop nuclear weapons. Applying nonparametric matching techniques and event-history models to a new dataset on international nuclear transfers, he finds that states that receive nuclear assistance are more likely to acquire nuclear weapons than are similar states that do not receive such help. More broadly, Kroenig finds overwhelming support for a supply-side approach to nuclear proliferation. Controlling for demand-side factors, he finds that states that have the ability to produce nuclear weapons, either through domestic capacity or international assistance, are at a greater risk of acquiring the bomb. The strategic approach advocated in this issue suggests that states want nuclear weapons for the strategic advantages that they provide, making the ability to produce nuclear weapons a primary determinant of whether nuclear weapons spread. Indeed, Kroenig's findings suggest that variation in nuclear proliferation outcomes is best explained, not by analyzing which states want nuclear weapons, but by understanding which states are able to get them.

The demonstration of a link between nuclear assistance and nuclear proliferation begs for an explanation of the sources of nuclear assistance. This question has been largely unexplored in the vast literature on nuclear proliferation. Scholars have strained to explain why states want nuclear weapons, but very few (e.g., Kroenig 2007, Fuhrmann 2008) have examined what is arguably the more puzzling question: why do states provide assistance? Matthew Fuhrmann uses new data on civilian nuclear cooperation

agreements to examine this question. Consistent with the strategic approach to nuclear proliferation advocated in this issue, he finds that states use civilian nuclear cooperation agreements to meet security-related objectives. States are more likely to trade civilian technology with friends and less likely to trade with enemies. Contrary to the claims of many pundits and policy analysts, he finds only mixed support for the idea that economic considerations drive nuclear cooperation. Most troubling from a policy standpoint, concerns about nuclear proliferation do not appear to shape the behavior of the nuclear suppliers.

The second set of papers considers the consequences of nuclear proliferation. Taken together they find that nuclear weapons do not affect the frequency of conflict, but they do affect the timing, duration, severity, and outcome of conflict. These papers provide considerable support for the argument that nuclear weapons enhance the security and diplomatic power of their possessors. Nuclear weapon states are neither more nor less conflict prone, but their conflicts are shorter and less intense, and they tend to emerge victorious from them. Furthermore, the authors find that nuclear powers enjoy enhanced international bargaining power.

Gartzke and Jo's paper examines the effect of nuclear weapon possession on the probability of conflict. They find that nuclear weapons have no overall effect. Nuclear weapon states are neither more nor less likely to be involved in international disputes. Instead, they argue that even if nuclear weapons do not directly affect the probability of conflict, nuclear weapons status can still influence the allocation of resources and bargains in favor of nuclear powers. States may be able to use nuclear weapons strategically in order to garner international influence. To test the hypothesis that nuclear

weapon states enjoy greater influence, Gartzke and Jo examine whether nuclear possession affects patterns of diplomatic missions. Important states send and attract diplomatic missions to and from other nations. The authors build on previous research on diplomatic missions and carefully controls for other relevant factors including population and economic size. They find that nuclear weapon states tend to host greater numbers of diplomatic missions. The primary effect of nuclear proliferation on international politics is not a reduction or increase in the probability of conflict, but greater international influence for their possessors.

Michael Horowitz examines how the length of time of nuclear possession affects crisis behavior. If a state's capabilities and resolve, and the way in which a state's capabilities and resolve are perceived by adversaries, influences the probability of conflict, then the probability of conflict may change over time as nuclear learning occurs. Using multiple statistical models, Horowitz finds that when states acquire nuclear weapons they are more likely to reciprocate international disputes and are also more likely to have their disputes reciprocated. Over time, however, this effect reverses. Inexperienced nuclear states are more dispute-prone, while experienced nuclear states are less so. Consistent with the theme of this issue, nuclear weapons improve the strategic position of their possessor. The longer a state possesses nuclear weapons, the less likely it is to become involved in disputes. This finding also has important implications. Any static understandings of nuclear proliferation are likely incomplete because they ignore how nuclear possession interacts with time to influence international conflict behavior.

Robert Rauchhaus employs generalized estimating equation (GEE) models to examine the intensity of conflict involving nuclear powers by studying various levels of

conflict from disputes to full-scale war. He finds that the presence of nuclear weapons tends to shift the intensity of disputes toward the lower end of the conflict scale. Symmetric nuclear dyads are less likely to become involved in a full-scale war, though nuclear status increases other types of dispute behavior. Taken together, Rauchhaus's findings provide strong support for the stability-instability paradox. Nuclear weapons induce lower levels of violence, but deter full-scale war. Consistent with the themes of this issue, nuclear powers can expect to enjoy an improved strategic environment in the form of lower incidences of large-scale international violence.

Kyle Beardsley and Victor Asal are interested in examining the outcome of conflicts involving nuclear-armed states. To test the effects of nuclear status on crisis outcomes, they draw on data from the International Crisis Behavior dataset. They find that when nuclear weapon states face a nonnuclear weapon state (an asymmetric dyad), nuclear weapon states are more likely to win concessions and more likely to experience shorter crises. The findings do not hold for symmetrical nuclear dyads, however. Nuclear weapon states facing a nuclear-armed opponent are no more (or less) likely to experience enhanced bargaining leverage or shorter crises. Beardsley and Asal carefully test the robustness of these findings with a selection model that enables them to rule out the possibility that the results were driven by selection into crises. In support of the issue's basic assertion, nuclear weapon states possess a strategic advantage when facing nonnuclear weapon states: they enjoy shorter crises and to emerge victorious from the crises in which they are involved.

Taken together with the findings of Gartzke and Jo, Beardsley and Asal's paper strongly suggests that the possession of nuclear weapons enhances a state's international

influence. This is an important corrective to much of the previous scholarly literature that has tended to assert that nuclear weapons provide little diplomatic benefit to their possessors.

There is further theoretical significance to these findings. Nearly all of the theoretical work on nuclear deterrence has assumed nuclear symmetry. In fact, the field presently lacks a coherent theory of the behavior of asymmetric nuclear dyads. When combined with the findings of Rauchhaus, Beardsley and Asal's paper suggests the beginning of a theory of conflict within asymmetric nuclear dyads. Nations with nuclear weapons may be able to fight nonnuclear opponents without the fear that the opponent will invade the homeland or challenge the fundamental interests of the nuclear state. Unsurprisingly, the outcomes of these conflicts tend to favor the nuclear-armed state. This empirical finding could become the basis for further theoretical and empirical work on the subject of asymmetric nuclear dyads.

We invited Alex Montgomery and Scott Sagan to comment on the project. As experts on the politics of nuclear proliferation with perspective as practitioners of qualitative research methods, Montgomery and Sagan are both supportive of this project and critical of it. They believe that the strategic approach can contribute to our knowledge and understanding of the causes and consequences of nuclear proliferation. They also argue, however, that the quantitative research methods adopted by the authors of this issue suffer from inherent drawbacks that prevent the examination of some important theoretical relationships. We believe Montgomery and Sagan's critique provides the reader with an important vantage point from which to assess possible limitations of our approach. They also offer a series of suggestions for further research.

We very much welcome these suggestions as we are eager to encourage additional research on this important subject.

Conclusion

The papers in this special issue offer valuable insights about the causes and consequences of nuclear proliferation. Access to nuclear technology and capabilities has been under appreciated as a cause of proliferation in the recent scholarly literature. There is a strategic logic to nuclear assistance, one worth understanding for those who seek to limit the spread of nuclear weapons. Nuclear weapons are neither potent causes of war, nor irrelevant to world politics. They cause their owners to become more influential, more successful in the wars they choose to fight, and to have less intense conflicts, when these conflicts occur. Still, this is a beginning more than an end. Good empirical research often raises as many questions as it answers. We hope that the effort here prompts readers to wonder, and to explore further a topic of global import.

Table 1: Nuclear Weapons Proliferation, 1945-Present

Country	**Date**
United States	1945
Soviet Union/Russia	1949
United Kingdom	1952
France	1960
China	1964
Israel	1967[3]
India	1988[4]
South Africa	1982-1990[5]
Pakistan	1990[6]
Belarus	Never[7]
Kazakhstan	Never[8]
North Korea	Never[9]
Uzbekistan	Never[10]

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Notes

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[2] Michael J. McConnell. "Annual Threat Assessment of the Director of National Intelligence for the Senate Armed Services Committee." February 27, 2007. Unclassified Statement for the Record.

[3] According to Cohen (1998, 273-276), Israel began separating plutonium in 1966 and assembled two makeshift nuclear weapons on the eve of the 1967 war.

[4] According to Perkovich (1999, 293-297), India first readied two dozen nuclear weapons for quick assembly and delivery by aircraft between 1988 and 1990.

[5] According to Albright (1994, 43), South Africa constructed its first nuclear device in 1979, but the first deliverable device wasn't ready until 1982. The 1982 device was deliverable in the sense that it could have been "kicked out of the back of a plane." South Africa began dismantling its nuclear program in 1990.

[6] According to Jones et al. (1998, p. 132, 140n), Pakistan had enough enriched uranium to produce nuclear weapons in 1987, but it was not until 1990 that it manufactured the metal components for a nuclear device.

[7] The nuclear weapons in Belarus, Ukraine, and Kazakhstan were generally believed to have been under de facto Russian/CIS control and that in order to acquire the nuclear weapons, the newly-independent states would have had to seize them from Russian forces. See, for instance, Miller (1993).

[8] See the note on Belarus.

[9] North Korea tested its first nuclear device in October 2006. Many experts believe, however, that this test was a failure and evidence of the fact that North Korea still lacks a deliverable nuclear weapon.

[10] See the note on Belarus.