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Roundtable, Volume X, No. 25 (2019)

issforum.org

Editors: **Mathew Fuhrmann** and **Diane Labrosse**
Web/Production Editor: **George Fujii**

Matthew Kroenig. *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters*. Oxford: Oxford University Press, 2018. ISBN: 9780190849184 (hardcover, $29.95).

Published on **29 March 2019**

Permalink: http://issforum.org/roundtables/10-25-nuclear
PDF URL: http://issforum.org/ISSF/PDF/ISSF-Roundtable-10-25.pdf

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Introduction by James Goldgeier, American University

The *Bridging the Gap* book series at Oxford University Press publishes works that are theoretically grounded and policy relevant. The co-editors—Bruce Jentleson, Steve Weber, and I—marked the formal launch of the series in 2018 with the publication of Georgetown University Professor Matthew Kroenig's *The Logic of American Nuclear Strategy*.

Scholars have long noted a paradox between academic theorizing about a world of Mutual Assured Destruction (MAD) in which superiority based on the number of nuclear warheads does not matter as long as each side possesses a secure second-strike capability, and the pursuit by policymakers for just such superiority as if it does. Kroenig chose his title and subtitle to signal that his book was a direct counter to the work of Robert Jervis, one of the leading scholars in international relations for nearly five decades, who argues that America's nuclear strategy is quite illogical.[1] Kroenig instead argues that rather than policymakers not understanding the logic of a MAD world, academics do not understand that superiority gives policymakers an edge in crises between nuclear powers. Based on a mixed-method analysis involving a statistical model and a set of case studies, Kroenig argues that nuclear superiority provides policymakers with greater resolve and thus enables them to settle crises to their advantage.

One of the leading scholars of strategic nuclear policy, Charles Glaser, opens the roundtable by arguing that while Kroenig is to be commended for taking on a "big and important question," his analysis falls short in countering the longstanding academic analysis of the role of superiority under MAD. Kroenig's argument rests in part on measuring the damage caused by a nuclear attack based on the number of nuclear warheads that a state can launch, the number of cities devastated in an attack, and the number of people killed. Kroenig believes superiority can enable a state to signal to its enemy, 'if you don't back down in this crisis, I can destroy more of your people than you can destroy of mine,' thereby, providing an advantage of resolve. Among a number of points he makes in his review, Glaser believes that fundamentally, Kroenig is underestimating the societal collapse that the side with fewer weapons can generate in the stronger state through a nuclear attack, thereby neutralizing any supposed advantage conferred by greater numbers. Glaser also suggests that many crises between nuclear powers do not lead to any consideration of nuclear use, thus obviating any advantage greater numbers might hold in the bargaining process in those instances.

T. Negeen Pegahi, an expert on deterrence and nuclear strategy, picks up where Glaser leaves off, not only questioning the assumptions behind the theory Kroenig puts forward, but critiquing several of the cases examined in the book. In her review, for example, she lays out in some detail an alternative assessment of the 1999 Kargil conflict between India and Pakistan, and she argues the behavior of both sides is problematic for the theory, for example the former's restraint in the crisis despite its nuclear superiority.

Finally, Rachel Elizabeth Whitlark, who is completing a book on U.S. and Israeli decision-making regarding preventive attacks against adversarial nuclear programs, praises Kroenig for his "creative and comprehensive research design," but she also raises some concerns about the case studies. Whereas Pegahi writes of the Indian

[1] Robert Jervis, *The Illogic of American Nuclear Strategy* (Cornell: Cornell University Press, 1984) and "Why Nuclear Superiority Doesn't Matter," *Political Science Quarterly* 94:4 (1979), 617-633.

restraint in the Kargil crisis despite superiority, Whitlark notes the initial Chinese risk-acceptance in the Sino-Soviet Border War despite the USSR's nuclear superiority.

Whitlark also probes Kroenig's claim that "states might act as if nuclear superiority matters because leaders believe it does." Given her own work in studying what leaders believe, Whitlark would like to see us open the black box of state behavior and dig deeper into whether we can discern whether leaders do in fact believe superiority matters and why they do.

In his response to the reviewers, Kroenig comes back to this central point, arguing that the behavior of the United States in particular suggests that it believes superiority matters. Otherwise, why would the United States have built such a large nuclear arsenal during the Cold War, when a much smaller number of weapons on survivable platforms would have served to ensure the second-strike capability needed vis-à-vis the Soviet Union? Kroenig's theory of bargaining and his analysis of the cases he examines leads him to the policy conclusion that the United States is right to pursue superiority for the advantages accrued in crisis bargaining.

One of the key claims Kroenig makes is that most nuclear relationships are not those in which Mutual Assured Destruction exists, a point with which Glaser agrees. The United States' relationship with the Soviet Union was clearly marked by MAD, and the current U.S.-Russia relationship is a likely case as well even though the sides possess far fewer weapons than they did at the height of the Cold War. But a case like the United States and North Korea is decidedly not, given the limited numbers of nuclear weapons and delivery capabilities of the latter. Whereas Glaser sees bargaining in nuclear crises as relatively rare even among nuclear powers, Kroenig argues that "Every single day…the United States must be prepared to play up to thirty potential games of nuclear brinkmanship."

Ultimately, what makes Kroenig's study an important one to grapple with is the point he raises about U.S. nuclear strategy. If the logic of nuclear weapons is as Jervis and the reviewers describe, then why has U.S. policy for so long been to maintain superiority? As Whitlark notes, we want to know whether policymakers believe superiority gives them an advantage, particularly since most nuclear relationships are not marked by the possession of Mutual Assured Destruction capabilities. In addition to the beliefs of individual leaders, we also want to know more about the role that domestic politics and bureaucratic politics play in the development of these arsenals.[2] And in the case of the United States, which, since the Second World War has pursued a strategy of primacy in global affairs, we want to know more about the link between that strategy and the perceived need for nuclear superiority. If the United States no longer pursues primacy as its overarching strategy, would that affect policymakers' attitudes regarding the role of nuclear weapons?

The debate generated here is precisely the goal of the *Bridging the Gap* series co-editors: to use theory not only to explain policy but to argue for policy prescriptions that flow from the scholarship.

Participants:

Dr. **Matthew Kroenig** is a tenured associate professor of government and foreign service at Georgetown University and the deputy director of the Scowcroft Center for Strategy and Security at the Atlantic Council.

[2] See, for example, Scott D. Sagan, "Why Do States Build Nuclear Weapons?: Three Models in Search of a Bomb," *International Security* 21:3 (1996-1997): 54-86.

He is the author or editor of six books, including *The Logic of American Nuclear Strategy* (Oxford University Press, 2018), and his articles and opinion pieces have appeared in *American Political Science Review, Foreign Affairs, Foreign Policy, International Organization, The Wall Street Journal*, the *Washington Post*, and many other outlets. He previously served in several positions in the US government, including in the Strategy Office in the Office of the Secretary of Defense and the Strategic Assessments Group at the Central Intelligence Agency. He regularly consults with a range of U.S. government entities. He has previously worked as a fellow at the Council on Foreign Relations, Harvard University, and Stanford University. Dr. Kroenig provides regular commentary for major media outlets, including PBS, NPR, BBC, CNN, and C-SPAN. He is a life member of the Council on Foreign Relations and holds an MA and Ph.D. in political science from the University of California at Berkeley.

James Goldgeier is Professor of International Relations at American University, where he served as dean from 2011-17. He is the recipient of the 1995 Edgar Furniss Book Award in national and international security and the 2003 Georgetown University Lepgold Book Prize in international relations. He is the co-author (with Derek Chollet) of *America between the Wars: From 11/9 to 9/11* (Public Affairs, 2008), and he co-directs the Carnegie Corporation of New York-funded Bridging the Gap project.

Charles L. Glaser is Professor of Political Science and International Affairs and Director of the Elliott School's Institute for Security and Conflict Studies at George Washington University. He received the ISA International Security Studies Section Distinguished Scholar Award in 2018. His publications include *Rational Theory of International Politics: The Logic of Competition and Cooperation* (Princeton University Press, 2010) and *Analyzing Strategic Nuclear Policy* (Princeton University Press, 1990).

T. Negeen Pegahi is an assistant professor of strategy and the director of the Mahan Scholars advanced research program at the U.S. Naval War College. Her interests center on deterrence theory, nuclear strategy, and Southwest Asia and her work has appeared in *Foreign Policy*, *The National Interest*, *Small Wars Journal*, and *War on the Rocks*. The views expressed here are her own and do not necessarily reflect those of the Naval War College, the Department of the Navy, the Department of Defense, or the U.S. government.

Rachel Elizabeth Whitlark is an assistant professor in the Sam Nunn School of International Affairs at the Georgia Institute of Technology. Her research explores nuclear proliferation, counter-proliferation, and presidential decision-making. She is the author of "Nuclear Beliefs: A Leader-Focused Theory of Counterproliferation," *Security Studies* 26:4, 545-574, which won the 2019 International Studies Association's International Security Studies Section, Best Security Article Award. She is currently completing a book which explores how U.S. and Israeli leaders decided to use preventive military force against adversarial nuclear programs. Additional work investigates nuclear latency, nuclear crisis decision-making, and the provision of public goods in the international system. Her articles and commentary have appeared in such outlets as *Security Studies*, *International Studies Quarterly*, *The Washington Quarterly*, *The Monkey Cage*, and *The Week*, among others.

Review by Charles Glaser, George Washington University

Matthew Kroenig, in his *The Logic of American Nuclear Superiority*, takes on a big and important question: how does the nuclear balance of power affect crisis bargaining? More specifically, he focuses on whether and how nuclear superiority matters. In part he is trying to explain why the United States maintains a nuclear force that is much larger and more sophisticated than required to inflict 'assured destruction.' He frames U. S. nuclear force posture as a puzzle because prominent nuclear strategists have argued that once two states have assured destruction capabilities—that is, they are in situation of mutual assured destruction (MAD)—differences in force size and sophistication are not supposed to matter. Kroenig's bottom-line is that these established arguments are wrong: contrary to this conventional wisdom, differences in nuclear force size do matter, even in MAD; possessing ever-larger forces can increase a country's ability to deter and to prevail in crisis bargaining.

Although Kroenig presents his arguments clearly and systematically, his analysis suffers severe weaknesses. I address three key problems: contrary to his claim of innovation, Kroenig's bargaining theory is well-established and understood; his measures of nuclear damage from nuclear strikes are poor indicators of the true costs of large nuclear attacks; and the cases in Kroenig's medium-n test are poorly matched to his theoretical arguments.

First, Kroenig's assertion that his theory advances our understanding of nuclear deterrence and crisis bargaining is wrong. Kroenig offers his "superiority-brinksmanship synthesis theory" (15-27) as a new theory of nuclear deterrence and, related, as an important corrective to and extension of existing theories. Kroenig explains that theorists of nuclear strategy, and specifically of the 'nuclear revolution,' have argued that in MAD differences between the two countries nuclear forces do not affect bargaining outcomes. [1] Because the outcomes of all-out nuclear wars would be so damaging for both sides, the differences in outcomes would not be politically significant and, therefore, would not influence crisis bargaining. Consequently, in MAD the balance of resolve, not the balance of forces, will be the key factor determining bargaining outcomes: the state with greater resolve—essentially greater interests at stake—is more likely to prevail in a crisis.

Kroenig then argues that when one state would suffer less in an all-out war, that state is more likely to prevail in crisis bargaining than when both states would suffer extremely costly and essentially equal damage. This is correct, but hardly surprising or unknown. The general logic of bargaining holds that both a state's power and interests will influence bargaining outcomes. Depending upon how it is defined, resolve is either essentially equivalent to the extent of a state's interests or combines its interests and its power/capabilities into a single measure. Having greater power—economic, political, and/or military—will increase an actor's ability to achieve a desirable outcome. Having greater resolve will as well.

Nuclear strategists who fall within the nuclear revolution school accept this general bargaining logic, but explain that MAD is a special and extreme case. In the context of coercive nuclear bargaining, the ability to

[1] Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon* (Ithaca: Cornell University Press, 1990); Charles L. Glaser, *Analyzing Strategic Nuclear Policy* (Princeton: Princeton University Press, 1990); and Robert Powell, *Nuclear Deterrence Theory: The Search for Credibility* (Cambridge: Cambridge University Press, 1990).

inflict damage (and, more precisely, costs) is the measure of a state's power. These strategists believe that an all-out war in MAD would essentially be equally costly for both countries; even if one country has a larger survivable force, it will be unable to inflict larger costs. Consequently, difference in force size will not lead to different bargaining outcomes. Resolve, therefore, is all that is left.[2] The logic of MAD is thus a special case of the general bargaining logic. Put more carefully, MAD does not have its own logic. Rather, MAD is an extreme situation/condition that produces a special bargaining result. And, once bargaining no longer takes place in MAD, this result no longer applies. This is what Kroenig argues, but his theory is not novel; it is simply standard bargaining theory.

While prominent arguments in the nuclear debate employ the logic of MAD, there are many examples of the more general logic applied to non-MAD nuclear situations. The intuition is so clear that in the 1950s, U.S. leaders quickly appreciated that the Soviet Union's acquisition of the ability to launch a nuclear attack against the U.S. homeland reduced, if not eliminated, the credibility of U.S. threats of massive retaliation. With the end of the Cold War, analysts have addressed deterrence when MAD does not exist. For example, in 2003 Robert Powell presented a formal argument of brinksmanship under different levels of U.S. vulnerability that captures this logic. He explains that reduced U.S. vulnerability increases U.S. resolve, which in turn increases the expected outcome of bargaining for the United States.[3] In 2005 Steve Fetter and I assessed the potential benefits of counterforce capabilities against a country that deployed a small nuclear force and argued that "reducing U.S. vulnerability would limit the effectiveness of the adversary's deterrent, thereby increasing U.S. willingness to intervene in pursuit of its foreign policy interests."[4] In a more recent article, Fetter and I assess whether the United States should pursue a damage-limitation capability against China. We find that such a capability could at least in theory "increase the credibility of U.S. threats to retaliate in response to limited nuclear attacks against the U.S. homeland. Such a capability could also provide the United States with a bargaining advantage in crises that China might escalate to nuclear war."[5] I could add more examples, but believe these are sufficient to support my basic point that these arguments are well established.

[2] This is a bit of an exaggeration. For example, if states have different levels of skill in communicating their resolve, this too could influence outcomes. Much of Schelling's work is about tactics for communicating resolve; see for example Thomas C. Schelling, *Arms and Influence* (New Haven: Yale University Press, 1966).

[3] Robert Powell, "Nuclear Deterrence Theory, Nuclear Proliferation, and National Missile Defense," *International Security* 27:4 (Spring 2003): 86-118. Powell takes this argument a step further, explaining that increased U.S. resolve could result in the United States being more likely to suffer a nuclear attack because the United States would choose to press harder in nuclear crises.

[4] Charles L. Glaser and Steve Fetter, "Counterforce Revisited: Assessing the Nuclear Posture Review's New Nuclear Missions," *International Security* 30:2 (Fall 2005), 108; see also 104. We have also employed this basic logic in analyzing NMD against a country that deploy a small nuclear force; Charles L. Glaser and Steve Fetter, "Missile Defense and the Future of U.S. Nuclear Weapons Policy," *International Security* 26:1 (Summer 2001), 67 and explain why a variety of Cold-War arguments against NMD do not apply, 57-61.

[5] Charles L. Glaser and Steve Fetter, "Should the United States Reject MAD?: Damage Limitation and U.S. Nuclear Strategy Toward China," *International Security* 41:1 (Summer 2016), 81; see also 52, 61, and 84.

The second major problem with Kroenig's analysis concerns his estimates of the damage from a nuclear attack. He uses three measures to capture the damage a state would suffer: the number of enemy warheads that would hit the country; the number of cities attacked; and the number of people killed. Kroenig maintains that these numbers are a good indicator of nuclear damage and costs. This is clearly true for 'small' attacks. The damage that would result from one warhead is huge compared to no damage, and the damage from a single warhead is clearly smaller and significantly different from the damage from ten warheads. Thus, difference in force size should improve the U. S. bargaining position in a crisis with North Korea, which currently lacks the ability to attack the U. S. homeland. And, if North Korea does acquire that ability to hit the United States with a small number of warheads, then the ability to destroy most of these warheads in a preemptive attack or with ballistic missile defenses would improve the U. S. bargaining position.

Kroenig concludes that his analysis of attacks against the United States by Russia, China and North Korea provides support for his central hypothesis about the importance of force size for bargaining (52). But only one of these countries has an assured destruction capability, according to standard definitions of assured destruction.[6] Thus, this analysis tells us nothing about Kroenig's claim about the bargaining implications of different size forces *within* MAD.

The deeper problem with Kroenig's analysis arises in cases of very large attacks of different sizes. Once the United States suffers tens of nuclear explosions against major cities and critical logistical hubs, and certainly once it suffers hundreds, the differences in outcomes that are implied by differences in the size of the attacks are likely to be illusory.[7] In large part this is because a standard "cookie-cutter" model that estimates the number of people killed promptly by the blast of a nuclear explosion almost certainly severely underestimates the impact of a large nuclear attack.[8] Estimating the number killed by fire and fallout would raise the numbers. Likely more important, however, is the possibility, even likelihood, of societal collapse. Highly integrated modern economies may lack the ability to recover from large nuclear attacks. A nuclear attack that destroyed the United States' key energy systems, communication and information systems, major ports and other transportation nodes—in addition to immediately killing many tens of millions of people and the cities they live in—could lead to economic and social collapse.[9] In this case, a still larger nuclear attack would not

[6] Arguably none of these countries have an assured destruction capability according to Kroenig's calculations; he finds that 12 U.S. cities would be destroyed in a Russian retaliatory attack, which is below the standard assured-destruction requirement.

[7] A separate concern is that Kroenig provides estimates for current U.S. and Russian forces, but not for U.S. and Soviet forces at the height of the Cold War. He should have included such an estimate both because his data includes cases from this period and because these forces provide a hard test of his analysis.

[8] In an extreme version of this approach, Kroenig refers to a study that estimates the number of warheads that would be required to kill promptly 100% of the entire Russian population (17). This huge number is clearly misleading because killing the entire population promptly is not meaningful different from other highly destructive outcomes.

[9] As far as I know, this type of comprehensive analysis does not exist, at least in the unclassified literature. Cold War studies on the impact of large attacks include Arthur M. Katz, *Life after Nuclear War: The Economic and Social Impact of Nuclear Attacks on the United States* (Cambridge: Ballinger, 1982); and Office of Technology Assessment, *The Effects of Nuclear War* (Washington, D.C.: Government Printing Office, 1979).

cause significantly greater damage; difference in force size should not then matter for damage and, in turn, bargaining.

There are other possibilities that could reduce or eliminate the difference in damage between large and even larger nuclear attacks. A nuclear-winter type environmental catastrophe would have this effect. Kroenig argues that the early claims about nuclear winter were overstated and therefore that his measures of damage remain adequate (43-44). But current research still finds that the cooling effects of a large nuclear war could greatly increase the number of deaths resulting from a large nuclear attack, and that "modern climate models not only show that the nuclear winter theory is correct, but also that the effects would last for more than a decade."[10] In addition, even if more people would survive a large nuclear attack than a still larger one, we need to consider the quality of life of the surviving. These millions of survivors could be fated to lives of misery, famine, and disease, struggling for mere survival in a "smoking radiating ruin."[11] Saving those lives would have value, but far less than is implied by simply comparing the difference in survivors for large attacks. For all of these reasons—including the failure to address the possibility of societal collapse, of environmental catastrophe, and of exceedingly poor quality of life following massive nuclear war—Kroenig's measures of the damage from large nuclear attacks are inadequate and exaggerate the difference in outcomes.

A separable but related issue concerns whether the outcomes of all-out attacks in MAD, if found by reasonable measures to result in different levels of damage, with the United States suffering less damage, would provide the United States with a significant bargaining advantage. Whether this difference in damage would actually be politically significant, and thereby provide a bargaining advantage, then becomes the central question. An adversary that could inflict less damage on the United States than the United States could inflict on it, but that could nevertheless almost completely destroy the United States as a political and economic entity, might not see itself at a bargaining disadvantage. Facing a similar comparison, U.S. leaders might not believe they had a bargaining advantage. The levels of destruction for both countries would be so high and unprecedented, so difficult to evaluate politically and engage emotionally, that the differences in destruction would likely pale in comparison. In the end this is at least partly an historical empirical question. But I doubt that historical analysis will shed much light, as we have virtually no experience with this type of decision. Assessments will have to hinge on a combination of intuition and political judgment.

This brings us to the third major problem with Kroenig's analysis—his definition of nuclear crises, which determines the cases he explores for the impact of nuclear superiority. He defines a nuclear crisis as "a crisis in which both states in the crisis possess nuclear weapons" (66). Using the International Crisis Behavior data set, he then identifies 20 nuclear crises and 52 nuclear dyads (because some crises include more than two nuclear powers). The problem is that not all crises that involve states with nuclear weapons should be considered nuclear crises—that is, crises in which nuclear weapons influenced states' decisions and the outcome of the

[10] See the articles available on Alan Robock's website at http://climate.envsci.rutgers.edu/nuclear/. For example, see Alan Robock and Owen Brian Toon, "Self-assured destruction: The climate impacts of nuclear war," *Bulletin of the Atomic Scientists* 68:5, 66-74, quote at 68.

[11] The term is from David Alan Rosenberg, "'A Smoking Radiating Ruin at the End of Two Hours': Documents on American Plans for Nuclear War with the Soviet Union, 1954–1955," *International Security* 6:3 (Winter 1981/82), 3-38.

crises. When the stakes are sufficiently low and direct fighting between the states' conventional forces has not driven up the level of crisis, nuclear weapons are unlikely to play a role in the states' decisions.[12] Consequently, many of the cases that Kroenig includes in his data set do not belong. For example, among the U.S.-Soviet cases on his list, I would not include the Congo Crisis (1964), the Cienfuegos Submarine Base (1970), the War in Angola (1975), Able Archer (1983), and Nicaragua MIG-21S (1984). The possibility of escalation to nuclear war was simply too small, and likely not even imagined, to influence U.S. and Soviet decisions about these crises.[13] The remaining U.S.-Soviet crises were more serious (including Berlin and the Cuban Missile Crisis) and occurred before MAD was clearly established, sometime roughly in the mid-1960s or early 1970s. Thus, among other problems, Kroenig is left without U.S.-Soviet crises that can shed light on his central claim—that variation in force size within MAD influenced outcomes.

In sum, Kroenig's *The Logic of American Nuclear Strategy* does not advance our understanding of nuclear logic and risks generating confusion about how to analyze nuclear forces. His analysis does not support his central argument—that in MAD differences in force size and the ability to launch larger attacks matter, that is, influence bargaining outcomes. As such, Kroenig's book does not put a dent in the logic of the nuclear revolution. The logic he offers for when states are not in MAD is sound, but already well established both in standard intuition, and in careful formal and informal arguments.

A technical question that is elevated by Kroenig's analysis is how the damage caused by nuclear attacks varies with force size. Specifically, would systemic effects result in societal collapse for attacks that are large, but fall below the explosive threshold typically required to inflict assured destruction? And, similarly, would attacks that meet or exceed the standard assured-destruction criterion result in damage that is higher than predicted by current basic models? And for these very large attacks, would this additional damage blur or eliminate any apparent difference in the damage that would be inflicted by attacks of different sizes? Comprehensive analysis of this set of question would advance debates over nuclear superiority and damage limitation, as well as the danger posed by nuclear war.

[12] A related point is that when the stakes are high and when conventional forces would likely become directly engaged, recognition of the greater probability that the crisis/war would escalate to nuclear war contributes to deterrence of the crisis; that is, these cases do not occur. This helps to explain why the United States and Soviet Union did not engage in conventional conflicts during the Cold War.

[13] Consistent with this judgment, Richard K. Betts, *Nuclear Blackmail and Nuclear Balance* (Washington, D.C.: Brookings Institution, 1987) does not include these crises among the cases he analyzes.

Review by T. Negeen Pegahi, United States Naval War College

In *The Logic of American Nuclear Strategy: Why Strategy Superiority Matters*, Matthew Kroenig takes on an important subject and covers an extraordinary amount of ground.[1][2] Referencing the titles and seeking to rebut the arguments of Robert Jervis's classic works, *The Illogic of American Nuclear Strategy* and "Why Nuclear Superiority Doesn't Matter," Kroenig attempts to overturn decades of academic consensus on the foolishness of building nuclear arsenals beyond those required for secure, second-strike capabilities and to provide a justification for the United States to expand its own nuclear arsenal in the coming years.[3] The causal mechanism underpinning his theory seems implausible, however, and it is never tested, much less demonstrated. The choices Kroenig makes about how to conceptualize and measure key variables in his theory facilitate the gathering and analyzing of quantitative data but are a poor fit with the real world of nuclear operations, leadership thinking, and crisis decisionmaking.

Kroenig starts with a puzzle. He highlights a tension between the "widespread and long-standing academic conventional wisdom" that the United States needs only a secure, second-strike nuclear capability to meet its security needs on the one hand and the equally widespread and long-standing preference among U.S. policymakers for the country to build and maintain a nuclear arsenal well beyond that (2). Kroenig notes that U.S. leaders have demanded an arsenal that is "second to none," "stronger than anyone['s] in the world," and "at the top of the pack," quoting John F. Kennedy while he was president, Hillary Rodham Clinton while she was Secretary of State, and Donald J. Trump while he was a presidential candidate (2). Kroenig argues the policymakers have been right all along.

Kroenig's claim is straightforward: the nuclear balance of power between two states contributes to their relative resolve in a crisis, which shapes their relative likelihoods of achieving their preferred outcomes. The "nuclear superior state" is more likely to press hard in a confrontation and is thus more likely to get its way while the "nuclear inferior state" is less likely to press hard and is thus less likely to get its way. Kroenig argues that "the degree, and not simply the existence, of nuclear superiority may also shape crisis bargaining" and therefore offers the same argument in continuous terms as well as the dichotomous formulation referenced above (27). The bigger the gap in the nuclear balance of power between two states, the more and less likely the nuclear superior and inferior states are, respectively, to achieve their objectives.

Kroenig repeatedly references the standard 'Chicken' game in which two drivers speed toward one another, each trying to force the other to swerve first. The driver who stays the course will appear brave and the one who does not, weak-willed, or 'chicken.' If neither driver swerves, however, the cars collide and both players are killed. The game's equilibrium outcome is thus for one driver to swerve and the other to stay the course, though its standard formulation has nothing to say about which player will or should be the one to swerve. Kroenig offers a very different version of the classic contest, arguing "the logic … is simple: in a game of

[1] I thank Jon Caverley for incisive comments on an earlier draft of this review.

[2] Matthew Kroenig, *The Logic of American Nuclear Strategy: Why Nuclear Superiority Matters* (Oxford: Oxford University Press, 2018).

[3] Robert Jervis, *The Illogic of American Nuclear Strategy* (Cornell: Cornell University Press, 1984) and "Why Nuclear Superiority Doesn't Matter," *Political Science Quarterly* 94:4 (1979), 617-633.

chicken we might expect the smaller car to swerve first even if a crash would be disastrous for both" (4). But would we expect this? Why would the driver of the larger car more readily risk death simply because she would end up with the smaller posthumous bill at the auto shop?

Serious problems emerge when we turn to how the theory is operationalized and tested. Kroenig offers "nuclear superiority" as his theory's core concept. He defines this as "a military advantage over an opponent," by which he means the nuclear superior state can expect to suffer less than the other side in the event of a nuclear war (16). Kroenig chooses the relative number of nuclear warheads each side in a dyad has as his measure of nuclear superiority/inferiority: the state with more warheads is the nuclear superior one, the state with fewer, the inferior. He chooses this particular measure for his independent variable because, according to him, it "almost always" correlates with the expected cost of nuclear war; serves as "an important, if not the central, determinant of the expected cost of nuclear war;" and provides "a hard ceiling on the amount of damage a state can inflict" (16, 19, and 19). But the first and third justifications are equally true of a number of other factors and Kroenig does not demonstrate the second.[4]

Having chosen the relative numbers of nuclear warheads as his measure of nuclear balances, Kroenig is forced to use the same type of measure for the expected costs that flow from them. He calculates how many casualties each side would suffer according to targeting rules he has devised and compares those two numbers to predict which state is more likely to achieve its preferred outcomes.[5] So the 'expected' portion of expected cost is already of questionable validity since it refers to the costs expected by Kroenig's model, not by the relevant leaders of each side during the crises he examines. Coercion works, if it works at all, in the minds of relevant decisionmakers.

The 'cost' portion of expected cost is little better. The only justifications Kroenig offers for his particular conception actually point to different choices. He notes that U.S. leaders who do not protect Americans cities "would face intense political accrimination" (53). But this is an argument for leaders to focus on how many people they stand to lose, regardless of how that compares to their opponent.[6] If leaders are in fact driven by relative costs, as Kroenig holds, that would seem to be because what really concerns them is how easily their state could recover from a nuclear war relative to their opponent.[7] This in turn is an argument for leaders to focus on what proportion of their population they stand to lose compared to what proportion their opponent

[4] *Ceteris paribus*, a state with higher-yield nuclear warheads, longer-range delivery vehicles, a smaller population, a more dispersed population, etc., than its opponent would also likely almost always have a lower expected cost of nuclear war than that opponent. Similarly, the size of the opponent's population, the range of the state's delivery vehicles, etc., would all also provide clear upper boundaries on the amount of damage a state could inflict.

[5] To be clear, what he is actually counting as expected costs is not the number of people predicted to be killed or wounded in the nuclear war but rather the population of all the cities struck in it.

[6] This is an argument for each side to focus on their absolute costs vice the relative absolute costs Kroenig posits.

[7] Indeed, Kroenig cites U.S. Secretary of the Air Force Harold Brown making exactly this sort of argument in the late 1960s (17), though Stanley Kubrick had General Buck Turgidson do it several years earlier.

does.[8] Choosing differently across these competing conceptions could invert Kroenig's key coding of which state is the "nuclear superior" one and which the "nuclear inferior" in a given dyad at a given time, and therefore his predictions for the case.[9]

These conceptualization and measurement issues become very clear in the case studies. The qualitative chapter of the book would be the place to demonstrate that leaders actually think about nuclear balances and expected costs the way Kroenig's theory posits and that this thinking is what drives leaders' decisionmaking in crises. Indeed, Kroenig claims to use standard qualitative approaches such as process-tracing "to examine the causal logic of the argument" (10). He examines four case studies: the Cuban Missile Crisis, the U.S.-Soviet maneuvering during the 1973 Arab-Israeli war, the 1969 Sino-Soviet border conflict, and the 1999 Indo-Pakistani Kargil conflict. In each then, we should expect the relevant leaders in the nuclear superior state to reference their edge in warhead numbers and expected casualties in explaining their choice to press hard. And we should expect relevant leaders in the nuclear inferior state to cite their unfavorable position with respect to relative warhead numbers and expected casualties in explaining theirs to back down, accept less, etc.

The Cuban Missile Crisis is both the most important of the Cold War superpower crises and one for which an extraordinary amount of information is available. But Kroenig does not provide any of the kinds of support detailed above. Of the four quotations he does offer in support of his interpretation of the crisis, only one is from an American leader referencing an American edge in the nuclear balance, though no indication is given as to what that edge meant or looked like to him—i.e., whether it boiled down to relative numbers of nuclear warheads or something different. Two more quotations involve Americans speculating about the impact on the Soviets of the nuclear balance—and again, the nature of that balance is unspecified. The fourth quotation compares U.S. expectations of casualties in a war at the time to those in a war at a later date, not to Soviet expectations of theirs at the time, and as such is not relevant for Kroenig's theory. Kroenig nevertheless claims these quotations "are as close to 'smoking gun' evidence as one can reasonably expect to find in qualitative, social science research" (88).

Kroenig also examines the 1999 Kargil conflict between India and Pakistan, the most important of the post-Cold War crises involving nuclear powers, and finds it "consistent with the expectations" of his theory (110). Kroenig's treatment of the case again falls far short of what process-tracing would require, however, and the case itself began and unfolded in ways that directly contradict his theory. Pakistan initiated the conflict,

[8] This is an argument for each side to focus on their relative proportional costs vice the relative absolute ones Kroenig assumes.

[9] Imagine two countries, A and B, with populations of one billion and one hundred million people, respectively. Imagine that the leaders of A and B expected to suffer 34 million and 33 million casualties, respectively, in a nuclear war between them. Kroenig's theory would view B as the "nuclear superior" one since it would suffer one million fewer casualties than A and would thus predict that B would be more likely to press hard in bargaining and thereby achieve its preferred outcomes. This would be the case even though B would still be suffering 33 million casualties or casualties among one-third of its population, and doing so while A suffered them among only three per cent of its own population. Using this last conception of expected costs instead would invert the states' codings and thus their predicted outcomes. County B, suffering a 33% casualty rate to A's three per cent, would now be the "nuclear inferior" and Country A the "nuclear superior," meaning we should expect B to likely fail to achieve its preferred outcome and A to succeed.

sending paramilitary troops over the Line of Control into the Indian-administered portion of the former princely state of Jammu and Kashmir, despite Pakistan's likely possessing fissile material for fewer nuclear warheads than India at the time.[10] That a nuclear inferior state initiated a conflict need not be a problem in and of itself for Kroenig's theory; we should be examining the assessments, including of the nuclear balance, of the actual participants in the crises rather than those of American analysts anyway, and Pakistan's leaders have a long history of misreading Indian capabilities and will in Pakistan's favor.[11] But far from incorrectly assessing the Indo-Pakistani warhead balance or the two sides' likely relative casualties in a nuclear war, the group of Pakistan Army generals who planned and launched the incursions do not appear to have been thinking much about nuclear weapons at all in the run-up to the conflict.[12]

Pakistan Army leadership—again, despite their country's posited nuclear inferiority vis-à-vis India—had no interest in withdrawing even when Indian forces detected the incursions and counterattacked. The generals believed the country's forces could hold on until the onset of winter, at which point the front would be frozen in place until late the following spring, buying them time to strengthen their positions. It was Pakistan's civilian leader, Prime Minister Nawaz Sharif—generally uninterested in and ill-informed on security matters, kept largely in the dark by Chief of Army Staff General Musharraf and his top commanders on Kargil-related preparations, late getting up to speed on the conflict, and deeply concerned about his personal safety—who flew to Washington, DC, his family in tow, in hopes of extracting a face-saving way out of the conflict from President Clinton. As in, Sharif, too, was motivated by other-than-nuclear considerations. In short, nothing from the Pakistani side of the Kargil conflict supports Kroenig's theory.

India, which likely had fissile material for more nuclear warheads than Pakistan at the time, did not accept the incursions as the *fait accompli* the Pakistani generals had anticipated. Instead, India mounted what Kroenig calls "a major military operation" to drive the intruders back across the Line of Control (109). As the nuclear superior state, Kroenig's theory would predict a relatively bold India, its resolve bolstered by the expectation of fewer casualties than its opponent in any possible nuclear war. Instead, the biggest question among specialists regarding Indian decisionmaking during Kargil is what explains the *restraint* of the leadership's choice of counterattack.[13] Indian leaders prohibited the military from crossing the Line of Control, despite the presence of supply lines and depots the Indian Air Force could have struck in the Pakistani-administered portion of the former princely state of Jammu and Kashmir.[14] Indian forces also refrained from opening any

[10] The measure used to code the nuclear balance shifts here from the two sides' relative numbers of nuclear warheads to their relative amounts of fissile material.

[11] Altaf Gauhar, "Four Wars, One Assumption," *The Nation*, 5 September 1999.

[12] Feroz Hassan Khan, Peter R. Lavoy, and Christopher Clary, "Pakistan's motivations and calculations for the Kashmir conflict," in Peter R. Lavoy, ed., *Asymmetric Warfare in South Asia: The Causes and Consequences of the Kargil Conflict* (Cambridge: Cambridge University Press, 2009), 64-91.

[13] The biggest question on the Pakistani side is what role Pakistan's nuclear weapons tests the previous year played in the decision to launch the incursions in the first place.

[14] Air Commodore Suresh Badyal, Retd. (Piloted a MiG for the Indian Air Force in the Kargil conflict), in discussion with the author, 21 August 2018; Kargil War Memorial; Dras, India. This is at odds with Kroenig's contention that "Pakistan was unwilling to provide military reinforcements to the irregular troops in Kashmir on the

additional fronts, either further south along the Line of Control or further south still along the recognized international border—all steps taken by India in 1965 in response to Pakistan's last such effort in the region. A nuclear superior India thus dealt much more measuredly with Pakistani incursions in 1999 than a non-nuclear India did over three decades earlier.

In his memoir, Chief of Army Staff Ved Prakash Malik, who was present at almost every key meeting on the Indian side, summarizes what was influencing Indian thinking during the conflict. He first lays out the various tactical/operational and diplomatic considerations that convinced India's civilian leadership that a moderate response without crossing the Line of Control or opening any additional fronts elsewhere was the best way to handle Pakistan's incursions. He then adds, almost as an afterthought, "The nuclear factor too must have been weighing on the minds of the prime minister and his [Cabinet Committee on Security] colleagues, though this aspect was *never mentioned or discussed* in the meetings."[15] In an earlier case study, Kroenig downplays the importance of leaders' claims that the nuclear balance was not driving decisions, claiming that such statements show that the balance was nonetheless on their minds and viewed as worth discussing. As Kroenig himself argues, "The more damning evidence for [his theory] would have been if the topic of nuclear superiority had never even been broached" (89). In short, the Indian side of the Kargil conflict is as problematic for Kroenig's theory as the Pakistani side.

This review concludes with brief comments on several additional issues. Kroenig's theory is an awkward fit with both the academic literature and the policy debate. Kroenig is focused strictly on numbers of nuclear warheads whereas the secure, second-strike capability school he hopes to undermine is focused on a type of arsenal. There is little to no common theoretical or empirical ground here from which to have a debate, much less demonstrate that one's claims are superior.[16] Kroenig judges existing scholarship "not entirely incorrect"—indeed, he does not show it incorrect at all—but "merely incomplete" (6).

Kroenig's argument, though decidedly hawkish, is equally disconnected from those of modern-day nuclear hawks. Kroenig believes that being able to deliver large numbers of casualties provides coercive leverage whereas these analysts think that being able to threaten small numbers, such as through the development of improved low-yield nuclear warheads, is what increases leverage (by making them more usable and therefore threats to use them more credible).[17] And as with the academic debate above, the key variable here is not simple numbers of warheads but rather the type of arsenal a state maintains, how the state plans to use it, etc. Kroenig's argument in this respect is oddly astrategic.

Indian side of the [Line of Control]," which suggests there would have been no tactical/operational benefit to Indian forces from crossing the Line of Control (pp. 109-110). The existence of such a benefit, and yet Indian leaders' choosing not to pursue it despite their nuclear superiority over Pakistan, would be another strike against the theory in the Kargil case.

[15] V. P. Malik, *Kargil: From Surprise to Victory*, (New Delhi: HarperCollins, 2006), 126. Emphasis added.

[16] Kroenig's encouragement of "a both/and understanding of nuclear dynamics" rather than an "either/or" one suggests he may understand this (6).

[17] Keir A. Lieber and Daryl G. Press, "The Nukes We Need: Preserving the American Deterrent," *Foreign Affairs* 88:6, 39-51.

Kroenig also suggests a troubling role for scholars and scholarship. He claims "the job of social scientists is to explain the world as it is," but that constitutes only a small portion of the job (8). Social scientists are not stenographers. Beyond simply describing things as they are, we can, should, and do explain how they got that way in the first place, as well as assess whether there might be better alternatives available. If policymakers are devoting finite resources to acquiring additional nuclear warheads that serve no strategic purpose—or, worse, that actively undermine strategic goals—then it is the responsibility of scholars and scholarship to convey that.

Rigorous social science is a slow, precise process. There is no way of getting around that in order to meet policymakers' desires for quick answers with wide applicability and attempts to do so advance neither scholarship nor statecraft. There may be a case for continuing to build nuclear warheads once a state has achieved a secure, second-strike capability—it is doubtful but nonetheless possible. Kroenig's book suggests a number of avenues for future research in this vein.

Review by Rachel Elizabeth Whitlark, Georgia Institute of Technology

The *Logic of American Nuclear Strategy* argues that military nuclear advantages above and beyond a secure second-strike capability positively contribute to a state's national security goals. According to author Matthew Kroenig, this is the case because a robust nuclear force reduces a state's expected costs of nuclear war and increases its resolve in high stakes crises. This in turn provides the state coercive bargaining leverage, ultimately culminating in enhanced nuclear deterrence. According to this "superiority brinkmanship synthesis," military nuclear advantages will make states more willing to run risks and also more likely to win conflicts (3-4). By contrast, inferior states will face a relatively higher cost of war, will be less likely to run risks in a crisis, and should be likely to back down early in a dispute (15-27).

This is the provocative argument that Kroenig puts forth in a book likely to have lasting implications. Not one to shy away from bold claims or go against the grain, Kroenig is to be commended for the scale and scope of this theoretical and analytical undertaking. He moves beyond either-or debates that are all-too common within international security, and instead offers a more complex understanding of deterrence. In doing, so he seeks to demonstrate the limitations of traditional second-strike theory, conventional military balances, and other related explanations that have guided the nuclear revolution. To his credit, Kroenig is largely forthcoming when the alternative conventional wisdoms he seeks to disprove find support in his analysis. Indeed, he describes how his theory aims to complement and expand our understanding of the nuclear arena in order to offer a more complete, if also more complex, interpretation of this important space.

One of the strongest aspects of *The Logic of American Nuclear Strategy* is its creative and comprehensive research design. With its expansive aims, it explores a single explanatory variable (a state's nuclear posture) and its implications for a related set of dependent variables including war outcomes, crisis behavior, arms races, nuclear proliferation, and more. To do so, the author conducts a multi-method analysis that incorporates game theory, large-N statistical analysis, qualitative case work, and what Kroenig describes as policy tools including budgetary analysis, which explores the fiscal implications of superiority. I especially enjoyed the use of Alex Wellerstein's "nuke map" in the chapter on nuclear war outcomes:[1] the map is a fantastic research tool and teaching aid, and it is creatively deployed here. Finally, Kroenig is purposefully contributing to bridging the gap between the academy and policy communities.[2] There are many means of doing so, including publishing in policy relevant, scholarly outlets,[3] but tackling questions of both theoretical and policy import could arguably be top of the list.

Despite the book's sizeable goals, there are several unsatisfying elements and significant questions that remain unexplored. I cluster my comments below around three topics: first, issues related to measurement and evidence; second, weaknesses in the case studies; and, third, concerns on the topic of optimism.

[1] Alex Wellerstein, "NUKEMAP" (version 2.61), http://nuclearsecrecy.com/nukemap/.

[2] American University, School of International Service, "Bridging the Gap Project," http://bridgingthegapproject.org/.

[3] The Oxford series where this book is published is one such outlet: http://bridgingthegapproject.org/btgseries/

First, on the topic of of measurement and evidence, Kroenig uses simple warhead counts for his calculation of nuclear superiority, i.e. that a state is determined to have nuclear superiority if it has a greater number of nuclear warheads than its opponent. If it does, then the nuclear balance of power is said to rest in that state's favor (16). While this measurement offers the benefit of simplicity, it is not clear how warhead counts alone are a sufficient measure of superiority. For example, this measure fails to take into consideration the sophistication of a nuclear arsenal, the nature of a nuclear posture, or the development of related systems which might matter for substantive superiority more than numbers alone.[4] Despite its significance in the scholarship, it is not clear what exactly is most responsible for deterrence success – i.e. what specifically within the nuclear realm causes an adversary to back down in the face of the threat of significant nuclear punishment. Scholars have argued that it could be a particular weapons system, a specific leg of the triad, or something else.[5] While simple count figures may have the advantages of simplicity and objectivity, they could be augmented greatly with discussions of qualitative differences among arsenals or some other qualitative characteristic that helps distinguish among states' holdings.

Beyond the question of the precise causal mechanism of deterrence and the related measurement issue, a second challenge emerges from specific coding decisions concerning the number of warheads an individual state possesses. Most glaring perhaps is France's coding in chapter three where it is included in a list of nuclear states from 1960-1963, but does not get operational warheads until 1964, and North Korea, which is coded as having zero warheads capable of reaching the United States in chapter two. While in both instances Kroenig explains his decisions (216 n. 16), and they likely do not influence the overall findings of particularly the quantitative analysis, they seem problematic in conjunction with one another: France is given a seemingly higher than expected coding whereas North Korea is given a lower value. The lack of uniformity in such choices seems suspect.

My second broad concern regards Kroenig's use of case studies to explore critical nuclear crises in order to demonstrate how nuclear superiority has mattered historically. One of the ways Kroenig makes his argument about the causal impact of nuclear superiority is through a discussion of *superiority talk* – i.e. historical evidence that policy makers talked about superiority in ways that suggest they were paying attention to it. This follows "taboo talk" from Nina Tannewald's ground-breaking study of the nuclear taboo, in which Tannenwald uses evidence of from relevant conversations to show how American presidential administrations from Dwight Eisenhower to George H.W. Bush were constrained in their actions by this emerging taboo.[6]

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[4] Erik Gartzke, Jeffrey M. Kaplow, and Rupal N. Mehta, "Deterrence and the Structure of Nuclear Forces," *Working Paper*, 2018.

[5] Glenn Herald Snyder, *Deterrence and Defense: Toward a Theory of National Security* (Princeton: Princeton University Press, 1961); Thomas C. Schelling, *Arms and Influence* (New Haven: Yale, 1966); Vipin Narang, "What Does It Take to Deter? Regional Power Nuclear Postures and International Conflict," *Journal of Conflict Resolution* 57:3 (June 2013): 478-508, https://doi.org/10.1177/0022002712448909; Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict: Regional Powers and International Conflict* (Princeton: Princeton University Press, 2014); Ariel Levite, "Never Say Never Again: Nuclear Reversal Revisited," *International Security* 27:3 (April 2003): 59-88; Matthew Fuhrmann, "Influence without Bombs: The Logic of Latent Nuclear Deterrence," Working Paper, 2017.

[6] Nina Tannenwald, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons since 1945* (Cambridge: Cambridge University Press, 2007.

The examples Kroenig uses could just as easily be public relations or propaganda, and they lack clear demonstrations for how superiority matters causally instead of merely being cheap talk. Especially since these historical instances are given fairly superficial treatment, the end result is not compelling, and the reader is left questioning the causal weight of superiority. I found this most problematic in the Sino-Soviet Border War and Cuba cases, but it remains true elsewhere.

These very same historical episodes highlight the second limitation of the case studies: they often undermine the argument that the author is advancing. The evidence Kroenig marshals in the Cuban Missile Crisis case is mostly about brinkmanship (the deliberate manipulation of risk), not specifically superiority -- the focus of his argument (87). As one example, Kroenig describes methodical American employment of escalation risks to support their crisis objectives and points to such facts to support his argument that the U.S. was willing to take these risks because of its nuclear superiority. Unfortunately, the historical evidence itself does not demonstrate that causal connection: what would be necessary is the demonstration that decision-makers manipulated the crisis *because* of U.S. superiority; and that lacking such superiority, they would have been unwilling to do so. As is often the case with historical work, such evidence may not exist. It is therefore up to the author to discuss the instances where evidence is imperfect or open to alternative explanations.

Relatedly, there is also a tension between the measurement methods Kroenig lays out at the outset of the book and the evidence that he deploys in this instance—it is the distance and targeting capability that changed with Soviet missile placement in Cuba, not specifically the balance of power, though this is what the book's argument intends (91). Certainly, these are related issues, but they are not analytically the same. Indeed, the discussion on page 91 seems to suggest that Khrushchev's motivation for the placement of the missiles in Cuba was not about Soviet inferiority per se, but rather responding to the nuclear balance through augmenting his capabilities via proximity and targeting abilities close to US shores. This could not be affected from afar, so Khrushchev needed the missiles in Cuba to even the playing field. This is not numbers per se, which is how the author measures superiority; it is about other elements of capability, which could portend a mismatch between measurement and evidence. Undoubtedly, targeting abilities and missile ranges are related to superiority, but this is not how Kroenig describes and measures superiority in the initial exposition of his theory. Likewise, while brinkmanship is one part of the argument, nuclear superiority is the driving factor and its role here is not abundantly clear.

Another major tenet of Kroenig's superiority-brinkmanship theory is that inferior states do not initiate crises (explored in chapter 5). And yet, the Sino-Soviet Border War case (which Kroenig includes in an attempt to confirm his argument) reveals an important counterexample: an inferior China instigated a crisis against a superior Soviet Union. While in the end the Soviets won by compelling China to negotiate, China was more aggressive and risk acceptant than Kroenig's theory seems to expect (94-95). Moreover, the evidence Kroenig presents suggests that it is the *credibility* of the Soviet attack threat that ultimately caused the Chinese to back down, not their inherent inferiority. While the Chinese fought hard initially, when the credibility of the Soviet threat rose and Chinese leaders believed that "a nuclear strike may be imminent," Mao Zedong finally agreed to talks (97). Mao had been fighting hard throughout the episode, and the discussion leaves ambiguous what actually brought him to the table. Reading Kroenig's own account, the Sino-Soviet Border War was not obviously about superiority with threat credibility looming large instead.

The last case analysis to note here regards Iran. The non-proliferation chapter (chapter 8) argues that it is not the U.S. arsenal that drives the proliferation behavior of other states. While I agree with this argument, the Iran case as presented is not helpful in making this claim. Specifically, in order to advance the claim that

Iran's decision to seek nuclear weapons was not driven by the U.S. nuclear arsenal, it is necessary to explore evidence from the early and beginning years of Iran's nuclear program. Instead, Kroenig focuses on the recent years of the Joint Comprehensive Plan of Action or nuclear deal with Iran. Exploring this later period can certainly be illustrative of Iran's current and recent behavior and can illuminate the extent to which U.S. behavior – coercive or otherwise – has an impact on Iran's nuclear decision-making. But to the extent that the author wishes to describe how Iran's decision to proliferate does not center on U.S. capabilities, a discussion of the earlier program history is critical. This is especially the case given that there is existing evidence that the U.S. was but one critical factor in Iran's initial proliferation decisions, with rivalries with Iraq and Israel as much more central.[7] The current focus on only the more recent history fails to do justice to this case which could still demonstrate the point Kroenig wishes to make.

The third and final issue concerns the general level of optimism that pervades Kroenig's book and the author's certainty that the future will look similarly to the past. To the extent that one audience Kroenig is targeting is the Washington policy community, such certainty seems problematic for the purpose of strategic defense planning, which at minimum, should account for alternative potential future developments. First, Kroenig justifies describing North Korea as having zero nuclear weapons capable of hitting the U.S. mainland on the grounds that those officials who state otherwise are doing so "as almost certainly a planning assumption made out of an abundance of caution" (46). And yet, the broader analysis does not seriously account for the fact that in some near-term future, the North Koreans are quite likely to have weapons that can do exactly that. The broader conclusions from Kroenig's analysis should in some way account for this capability since Kroenig himself notes it is a real possibility.

Second, when discussing the cost and impetus for arms-racing, Kroenig describes how the U.S. has out-spent and gained strategic advantages over all previous historical adversaries and asserts that this is likely to continue without exception into the future. While plausible, there is also reason to believe that this may not be the future. Kroenig explains how Chinese leaders Mao and Deng Xiaoping thought smaller arsenals were sufficient for deterrence. From this, he concludes that future Chinese leaders will behave similarly (148). Unfortunately, there is little discussion of even the possibility that new or future leaders could think differently about deterrence or their strategic environment in ways that could lead them to alternative nuclear postures. This potential eventuality is certainly worth mentioning given how such a change could profoundly influence U.S. nuclear choices and security.

Third, when discussing the potential disadvantages of nuclear superiority, Kroenig describes how the 'use it or lose it' concern is likely overstated. He argues that foreign leaders facing a superior United States are unlikely to choose to strike first with their nuclear arsenal in order to avoid losing their arsenal to American retaliation. This is a common concern with small arsenals – when backed into a corner by a superior opponent, leaders might choose to launch their weapons first as opposed to being left with no arsenal to use to stave off their destruction. Indeed, scholars have made the case that it would be a rational strategy for a leader like Kim Jong Un to choose precisely this strategy and avoid the full might of the U.S. military.[8] Leaving aside whether or

[7] Colin Dueck and Ray Takeyh, "Iran's Nuclear Challenge," *Political Science Quarterly* 122:2 (2007): 189-205.

[8] "Perspective | Why Kim Jong Un Wouldn't Be Irrational to Use a Nuclear Bomb First," *Washington Post*, accessed 27 August 2018, https://www.washingtonpost.com/outlook/why-kim-jong-un-wouldnt-be-irrational-to-use-a-nuclear-bomb-first/2017/09/08/a9d36ca4-934f-11e7-aace-04b862b2b3f3_story.html.

not this is a rational strategy or likely in the North Korean case, it is at least conceivable that leaders could choose to strike first, perhaps especially given the possibility of misperceptions and risk-acceptant leaders. Kroenig's discussion gives little mention to such possibilities. Even if the risks are, relatively speaking, still small, they warrant further discussion (137).

Even if Kroenig's assessments are likely—North Korean nuclear and missile capabilities moving forward, the future of arms racing, and the 'use it or lose it' consideration—to yield a more balanced and compelling analysis, it is necessary to include a discussion of how else events could conceivably evolve. At present, the assessments appear too rosy, which is problematic for a study seeking to guide a smart, strategic future U.S. nuclear posture. Accounting for other possibilities seems prudent, especially given that doing so should not undermine the main argument. Especially for a book which deliberately targets a policy audience, discussing alternative possibilities should make for better policy deliberations.

Finally, I will conclude by highlighting a central theoretical tension that permeates *The Logic of American Nuclear Strategy*. On one hand, Kroenig's work reads like a state-centric approach where the national unitary state is the relevant actor. Frequently though, he opens the door to the possibility of leaders and their beliefs' being consequential for issues of superiority. The combined effect of such elision is a lack of clarity for the causal mechanism(s) Kroenig aims to highlight.

Kroenig notes repeatedly that states might act as if nuclear superiority matters because leaders believe it does. For example, he says, "many policy makers do seem to believe that 'simple' superiority somehow confers a crisis bargaining advantage" (8). In the introduction to chapter 4, Kroenig argues "we see that leaders paid close attention to the nuclear balance of power" (81). While these and other similar assertions about the importance of leaders appear frequently, this study's research design is not set up to test this proposition. Indeed, this may be a significant oversight given the abundant evidence that suggests leaders could in fact be consequential within this empirical realm.

International relations has over time returned to the notion that leaders are consequential for critical issues,[9] including within international security.[10] The nuclear literature has similarly incorporated important

[9] Alexander L. George, "The 'Operational Code': A Neglected Approach to the Study of Political Leaders and Decision-Making," *International Studies Quarterly* 13:2 (June 1969): 190-222; Daniel L. Byman and Kenneth M. Pollack, "Let Us Now Praise Great Men: Bringing the Statesman Back In," *International Security* 25: (April 2001): 107-146; Margaret G. Hermann and Joe D. Hagan, "International Decision Making: Leadership Matters," *Foreign Policy* 110 (1998): 124, https://doi.org/10.2307/1149281.

[10] For example see Elizabeth N. Saunders, *Leaders at War: How Presidents Shape Military Interventions* (Ithaca: Cornell University Press, 2011); Giacomo Chiozza and H. E. Goemans, *Leaders and International Conflict* (New York: Cambridge University Press, 2011); Jeff D. Colgan, "Domestic Revolutionary Leaders and International Conflict," *World Politics* 65:4 (2013): 656-690; Henk E. Goemans, Kristian Skrede Gleditsch, and Giacomo Chiozza, "Introducing Archigos: A Dataset of Political Leaders," *Journal of Peace Research* 46:2 (March 2009): 269-283; Michael C. Horowitz and Allan C. Stam, "How Prior Military Experience Influences the Future Militarized Behavior of Leaders," *International Organization* 68:3 (June 2014): 527-559; Keren Yarhi-Milo, "In the Eye of the Beholder: How Leaders and Intelligence Communities Assess the Intentions of Adversaries," *International Security* 38:1 (July 2013): 7-51.

discussions of leaders, first with studies on the causes of proliferation reliant on leaders,[11] and later to related arenas like arms control.[12] My own work shows that leaders have divergent beliefs about the consequences of nuclear proliferation and the likelihood of deterring nuclear-armed actors that are consequential for the use of preventive force as a counter-proliferation strategy.[13] Elsewhere, Julia Macdonald and I show how leaders have different beliefs about the utility of nuclear coercion that influences their crisis behavior once they enter executive office.[14]

Moreover, beyond this existing scholarship, there are a variety of potential mechanisms by which we could hypothesize that leaders could matter in the environment Kroenig explores. For example, it is possible that leaders have learned over time – i.e. they may have witnessed earlier nuclear history and concluded from it that nuclear superiority is consequential. Alternatively, it could be that leaders have individually held beliefs about superiority that explains their actions in crises as well as how they make nuclear planning decisions. It could also be something more fundamental like leaders' risk aversion or risk acceptance that is driving how hard states are willing to bargain that is actually underlying the behavior Kroenig is attempting to capture (90).

My point in raising this issue it not to say definitively that leaders matter for either why or how nuclear superiority is consequential for the outcomes under analysis in *The Logic of American Nuclear Strategy*. Instead, it is to note that this is a possibility Kroenig teases throughout the book and that demonstrates inconsistencies between the argument and much of the evidence brought to bear. We have reasons, both theoretical and empirical, to think that leaders could be consequential. Given the analytical tensions and evidence presented throughout the study, as well as the multiple competing explanations described above, additional analysis may be warranted. Especially to the extent that leaders' perceptions are consequential in the international security environment—beyond objective assessments of the technological capacity adversaries possess—this issue will remain of significance moving forward as autonomous weaponry, machine learning, and other technologies grow in relevance and complicate the existing nuclear landscape.

In conclusion, Matthew Kroenig has put forth an important book in its aims, though with certain questions left unexplored. That said, in addition to the scope and rigor of design, perhaps one of the largest contributions of *The Logic of American Nuclear Strategy*, will be its ability to generate a new wave of scholarship and analysis as a new generation of scholars seeks to follow in Kroenig's footsteps and scrutinizes

[11] Jacques E. C. Hymans, *The Psychology of Nuclear Proliferation: Identity, Emotions, and Foreign Policy* (New York: Cambridge University Press, 2006); Christopher Way and Jessica L.P. Weeks, "Making It Personal: Regime Type and Nuclear Proliferation," *American Journal of Political Science* 58:3 (July 2014): 705-719; Matthew Fuhrmann and Michael C. Horowitz, "When Leaders Matter: Rebel Experience and Nuclear Proliferation," *The Journal of Politics* 77:1 (2015): 72-87; Rupal N. Mehta, *The Politics of Nuclear Reversal* (Oxford University Press, 2018), Revise and Resubmit.

[12] James H. Lebovic, *Flawed Logics: Strategic Nuclear Arms Control from Truman to Obama* (Baltimore: Johns Hopkins University Press, 2013).

[13] Rachel Elizabeth Whitlark, "Nuclear Beliefs: A Leader-Focused Theory of Counter-Proliferation," *Security Studies* 26:4 (2017): 545-574.

[14] Julia M. Macdonald and Rachel Elizabeth Whitlark, "Presidential Beliefs in the Efficacy of Nuclear Coercion," *Working Paper*, 2017.

the logics of the nuclear revolution. Despite our seventy-plus years of living with nuclear weapons, much remains to be understood. Kroenig has done a great service in offering a thoughtful book that will catalyze additional scholars to conduct their own investigations in search of an improved understanding of these critically important matters.

Author's Response by Matthew Kroenig, Georgetown University

Imre Lakatos argued that scientific advances occur when "degenerative" research programs are replaced by a more progressive system of theories.[1] For Lakatos a "degenerative" research program is one in which the "auxiliary theories" constructed to explain anomalies no longer provide additional explanatory power, but serve only as a "protective belt" around the "hard core" of the theory.

For several decades, the dominant social scientific approach to nuclear deterrence has been a degenerative research program and it should be updated or replaced. Variously known as the theory of the nuclear revolution, Mutually-Assured Destruction (MAD) theory, assured retaliation theory, or second-strike theory, this research program maintains that countries provide nuclear deterrence by possessing a nuclear arsenal capable of absorbing a nuclear attack and responding with a devastating second strike.[2] So long as a country possesses such an assured retaliatory capability, no sane adversary will attack and nuclear deterrence will hold.

There is just one problem: this theory has never been able to explain the nuclear strategy and posture of the most important country in the international system. If the United States wanted a second strike capability, it would need only a few dozen nuclear weapons on survivable platforms, such as submarines. Instead, the United States has, for decades, possessed thousands of nuclear weapons and a wide range of delivery platforms, practiced counterforce targeting, and shown interest in strategic superiority over its rivals.

When confronted with this empirical anomaly, theorists in the reigning research program developed an auxiliary theory to explain it away. They invoked the irrationality of U.S. government officials. America's leaders do not understand nuclear deterrence theory, they argued. "Nuclear superiority doesn't matter."[3] This "illogic of American nuclear strategy," therefore, leads to an unnecessary U.S. nuclear "overkill" capability.[4]

Feel Lakatos's "protective belt" tightening around us. This explanation does not advance our understanding of U.S. nuclear strategy and serves only to shield the theory of the nuclear revolution from salient and disconfirming evidence.

In a situation like this, Lakatos argued that what is needed is a progressive "problem shift" in which new theories are developed which enable one to explain and predict more than a predecessor theory allowed.

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[1] Imre Lakatos, "Falsification and the Methodology of Scientific Research Programmes," in Sandra G. Harding, ed., *Can Theories Be Refuted? Essays on the Duhem-Quine Thesis* (Dordrecht: Springer Netherlands, 1976): 205-259.

[2] See, for example, Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon* (Ithaca: Cornell University Press, 1990); Charles L Glaser, *Analyzing Strategic Nuclear Policy* (Princeton: Princeton University Press, 1990).

[3] Jervis, "Why Nuclear Superiority Doesn't Matter." *Political Science Quarterly* 94:4 (1979): 617-633.

[4] Jervis, *The Illogic of American Nuclear Strategy* (Ithaca: Cornell University Press, 1985); David Alan Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1960." *International Security* 7:4 (1983): 3-71.

This is just what I provide in *The Logic of American Nuclear Strategy* with my "superiority-brinkmanship synthesis theory." Consistent with the theory of the nuclear revolution, this theory concurs that states are reluctant to intentionally attack a country with a second-strike capability. Similarly, consistent with past theory, this theory maintains that states often find themselves in conflicts of interest with other nuclear-armed states and what matters in these games of nuclear brinkmanship is a state's resolve, defined as its willingness to run risks of nuclear war. More resolved states are less likely to be challenged and more likely to get their way when they are challenged.

My theory goes beyond past scholarship and provides additional theoretical power, however, by explaining how a robust nuclear posture, above and beyond a second-strike capability, also contributes to national security. A robust nuclear posture reduces a state's expected cost of war, increases its effective resolve, and ultimately enhances nuclear deterrence. States which are more vulnerable to nuclear exchange are less willing to initiate or escalate international crisis; those that are less vulnerable are more willing to stand firm to achieve their objectives.

This logic is especially important to the United States for three reasons. The first is extended deterrence. Unlike other nuclear powers, the United States does not aim to deter attacks against itself only, but against the entire free world. It extends nuclear deterrence to over thirty formal treaty allies in Europe and Asia. Every single day, therefore, the United States must be prepared to play up to thirty potential games of nuclear brinkmanship: on behalf of Estonia against Russia, on behalf of Japan against China, on behalf of South Korea against North Korea, etc. When playing dozens of potential games of nuclear chicken every day on behalf of weaker allies in the face of formidable nuclear-armed foes, the bolstered resolve provided by a robust nuclear force is particularly valued. Second, as the largest and most technologically innovative economy in the nuclear era, the United States has been better able to afford and maintain nuclear advantages over its rivals. Third, the United States is a democracy and cares about compliance with international law. A doctrine of MAD (which means threatening to slaughter innocent civilians) would violate international law, but U.S. counterforce doctrine (aiming to destroy the nuclear arms-related targets of an adversary) is consistent with the principles of distinction and proportionality enshrined in the Law of Armed Conflict.

In sum, superiority-brinkmanship synthesis theory provides more theoretical and empirical explanatory power than the theory of the nuclear revolution. It explains the basics of deterrence in a way consistent with the previous research program, but increases our understanding of some states' recurrent interest in nuclear superiority and of the nuclear strategy of the most powerful state in the world for the past seventy years. If we follow Lakatos's guidelines, the theory of the nuclear revolution should be abandoned and replaced by, or updated with, superiority-brinkmanship synthesis theory.

I hope that superiority-brinkmanship synthesis theory will become the prevailing approach to understanding nuclear deterrence dynamics in the coming years. Indeed, the research article on which the book is based has been cited 78 times and it is assigned on course syllabi across the country,[5] and those most familiar with

[5] Matthew Kroenig. "Nuclear Superiority and the Balance of Resolve: Explaining Nuclear Crisis Outcomes." *International Organization* 67: 1 (January 2013): 141-171. Data on citations from the author's Google Scholar page at: https://scholar.google.com/citations?user=RI47flIAAAAJ&hl=en.

American nuclear strategy have already recognized the book's value. For example, it was selected for the U.S. Air Force's professional reading list.[6]

It should come as no surprise, however, that scholars steeped in the previous research program might resist challenges to their theories and this is evident in some of the responses the book has received, including in this H-Diplo/ISSF forum. Charles Glaser is one of the leading contributors to the theory of MAD and Neeghen Pegahi and Rachel Whitlark were Professor Glaser's Ph.D. students at the University of Chicago and George Washington University, respectively. With a primary intellectual antagonist and his students as my interlocutors, I cannot help but believe the deck is somewhat stacked against me in this forum. Still, I am pleased to have this opportunity to engage with my critics.

My work would not have been possible were it not for Professor Glaser's brilliant and ground-breaking scholarship. I am grateful for Professor Glaser's contributions to social science and his participation in this forum.

Indeed, Professor Glaser's first criticism of my book is perhaps the greatest praise it has ever received. Glaser claims that the theory I put forward is "correct," but already "well-established and understood." He also clarifies that his theory of MAD was never intended to provide a general theory of nuclear strategy, but rather "is a special and extreme case" to be applied only to "extreme situations/conditions" such as the United States and the Soviet Union at the height of the Cold War. Glaser acknowledges that none of the U.S. nuclear relationships today, including those with North Korea, China, or even with Russia (footnote 6) meet the boundary conditions for MAD to hold. For these and other nuclear deterrence relationships, Glaser concedes that the logic I spell out in my book "is correct…having greater power will increase an actor's ability to achieve a desirable outcome."

This is a gracious acknowledgement from one of the leading proponents of the theory of the nuclear revolution. If correct, then it follows that the logic articulated in my book should be viewed as the baseline model for understanding nuclear deterrence in the classroom, in scholarship, and in policy debates. If students, scholars, and policymakers want to understand how nuclear weapons affect politics among nations in all but the "extreme situations," then they need to know that "having greater power will increase an actor's ability to achieve a desirable outcome." The theory of MAD could be preserved for specialized courses and history lessons on the height of the Cold War, but it is a misleading model for understanding nuclear dynamics more broadly. We do a disservice to scholars, students, and policymakers by teaching and writing about MAD as the basic model of nuclear deterrence when it is, according to even its proponents, only an extreme and special case.

To be clear, I maintain that differences in the balance of power mattered even at the height of the Cold War and this is a debate that should and likely will continue. But it is an important sign of social scientific progress that Glaser and I appear to agree that the logic I spell out in my book is the better general explanation for most if not all other instances of nuclear deterrence and crisis bargaining.

[6] Chief of Staff of the Air Force Professional Reading List, available at https://static.dma.mil/usaf/csafreadinglist/warpin.html.

The central point of disagreement with Glaser, therefore, is not about the correctness or wide applicability of the model articulated in my book, but about its novelty. He states that this theory is already "well-established and understood." As evidence, Glaser cites a 2003 article on brinkmanship and missile defense by Robert Powell and two separate sentences from two of his articles with Steven Fetter.

To be sure, I am standing on the shoulders of giants in writing this book. Superiority-brinkmanship synthesis theory draws heavily on Powell's formalization of Schelling's concept of brinkmanship and I have great respect for Glaser and Fetter's scholarship.[7] But, unlike my work, Powell's has explicitly argued that the nuclear balance of power does not matter in games of nuclear brinkmanship.[8] And there is quite a difference between offering a claim in a sentence or two in an article about a different subject and devoting an entire book to developing and testing a theory. I develop a formal theoretical model, spell out the intuition with verbal argumentation, and provide systematic quantitative and qualitative evidence in support of the claim. My book, therefore, goes well beyond existing scholarship in attempting to describe, explain, and test how the nuclear balance of power affects international politics.

Glaser maintains that my theory is largely the same as the standard bargaining model of war, but this is incorrect. It is true that in the bargaining model of war, like in superiority-brinkmanship synthesis theory, the balance of military power matters for bargaining outcomes.[9] But, the bargaining model of war has never, to my knowledge, been used to explain nuclear deterrence dynamics. Moreover, in the bargaining model, players have the option to go to war as a deliberate choice. In nuclear brinkmanship theory, including my superiority-brinkmanship synthesis theory, they do not. The driving force behind nuclear brinkmanship is players' relative willingness to risk nuclear war. Past brinkmanship theory has claimed that the nuclear balance of power does not matter for a state's willingness to run risks. My theory maintains that it does. This is the novelty of superiority-brinkmanship synthesis theory; I synthesize brinkmanship theory with arguments about the importance of the nuclear balance of power.

I wish it were the case that my argument was "well-established and understood," but I do not believe this accurately describes the state of the scholarly discourse at present. It if did, I would not have needed to write this book and, if I had done so anyway, it would have not have been seen as provocative or controversial. If it were "well-established and understood," theories of nuclear superiority, and not MAD, would be presented as the standard model of nuclear deterrence in classrooms and in scholarship around the world. I am hopeful, however, that with the publication of my book, this model of nuclear deterrence will become the conventional wisdom in the near future.

Glaser's second major criticism is that I am incorrect to draw distinctions between nuclear war outcomes at high levels of destruction. To be clear, this is an issue that is germane only to whether superiority-brinkmanship synthesis theory applies to "extreme" cases, like the Cold War, but not to more common cases where Glaser and I appear to agree. Glaser concedes that at relatively low levels, (such as between one and ten

[7] Thomas C. Schelling, *Arms and Influence* (New Haven: Yale University Press, 2008); Robert Powell, *Nuclear Deterrence Theory: The Search for Credibility* (Cambridge: Cambridge University Press, 1990).

[8] Powell, *Nuclear Deterrence Theory*.

[9] James D. Fearon, "Rationalist Explanations for War." *International Organization* 49:3 (1995): 379-414.

warheads) there are meaningful differences in nuclear war outcomes, but once the scale of the attack increases to tens or hundreds of warheads, the destruction would be so catastrophic as to make attempts to find differences meaningless.

The precise nature of Glaser's criticism is not quite clear here, but there are two possibilities (one theoretical and one empirical), and none of them stand up to scrutiny. My theoretical argument is that the more vulnerable a state is to nuclear war, the less risk of nuclear war that state will be willing to run. At some given level of nuclear destruction (say tens or hundreds of warheads), a state would be willing to run some corresponding risk of nuclear war to achieve its geopolitical objectives. Theoretically, at an even higher level of nuclear destruction (such as thousands of warheads), the level of risk it would be willing to run would be lower still. Glaser argues instead that there is a critical threshold beyond which additional damage does not matter and would have no additional effect on a state's willingness to run risks of nuclear war, but he does not persuasively justify this claim. Why is the critical threshold at tens or hundreds of weapons? Much of the country would survive such an attack (Glaser himself puts the estimate of survivors in the millions of human beings). Why would national security officials not care about protecting these millions of lives? Glaser writes that these people would be "fated to lives of misery," but personally I would prefer a chance at survival and to see others live as well. Moreover, U.S. officials responsible for the national security of the country have a duty to protect the lives of their citizens. Granted, at a level of complete and utter annihilation, in which everything in a country is completely destroyed, then Glaser and I would agree. But we have never been in that situation historically and as Glaser allows, we are not in that situation today.[10] So, again, what is the logical, theoretical reason to believe that leaders are only interested in protecting their populations up to a point?

Further, what is the constant level of risk of nuclear war that leaders are willing to run once they go beyond Glaser's critical threshold of damage? Is it zero? We know this is not the case, as the United States and the Soviet Union ran nonzero risks of nuclear war at the height of the Cold War.

So, in sum, I make the straightforward and intuitive claim that states are more cautious in crises as the scale of potential nuclear devastation increases, and that this effect continues as long as there is something more left to lose. Glaser and theories of MAD make the somewhat more complicated and -non-intuitive argument that this relationship continues only to the point of tens or a hundred nuclear detonations, even though additional warheads beyond this point would continue to increase damage to their societies. Both theories are plausible, but the principle of Occam's razor bolsters my explanation.

As Glaser acknowledges, however, this is largely an empirical question. In fact the empirical aspect of this debate weighs even more heavily in my favor. What matters here is whether officials in the United States pay attention to the nuclear balance of power or attempt to limit the damage of nuclear war even at high levels of

[10] Glaser invokes nuclear winter as a possibility, but as I explain in my book, even early proponents of nuclear winter have disavowed their previous claims and the most recent scholarship, which relies on more sophisticated climate modeling, does not find evidence for a nuclear winter effect. See Jon Reisner, Gennaro D'Angelo, Eunmo Koo, Wesley Even, Matthew Hecht, Elizabeth Hunke, Darin Comeau, Randall Bos, and James Cooley, "Climate Impact of a Regional Nuclear Weapons Exchange: An Improved Assessment Based On Detailed Source Calculations." *Journal of Geophysical Research: Atmospheres* 123: 5 (March 2018): 2752-2772.

destruction. The answer is that they do. President Richard Nixon and U.S. National Security Advisor Henry Kissinger worried about America's waning nuclear superiority in the early 1970s at a time in which the Soviet Union had over ten thousand nuclear warheads.[11] In 1979, when the Soviet Union possessed over twenty thousand nuclear weapons, U.S. Secretary of Defense Harold Brown testified to Congress that he considered it important to employ counterforce targeting against Soviet nuclear forces in order to limit damage to the United States and its allies in the event of nuclear war.[12] In the 1970s and 1980s, when U.S. and Soviet nuclear arsenal sizes were quantitatively capped at high levels by nuclear arms control agreements, the United States continued to look for strategic superiority through qualitative advantages.[13] In the 1980s, when the Soviet Union possessed over thirty thousand nuclear weapons, U.S. defense officials and outside experts fretted over how arms control proposals would affect the nuclear balance of power.[14] These facts bring us back to the puzzle which motivated my study: if the nuclear balance of power does not matter at such high levels, then why do high-ranking government officials behave as if it does? MAD is simply not very useful for understanding the empirical record of U.S. nuclear strategy. My theory, on the other hand, explains it quite well.

Glaser's third criticism concerns case selection. He claims that it is inappropriate to examine all crises among nuclear-armed states because many of these crises did not escalate to the point at which a nuclear exchange seemed possible or imminent. Glaser is mistaken on this point. Superiority-brinkmanship synthesis theory states that the nuclear balance of power affects states' propensity to initiate and escalate nuclear crises. The proper universe of analysis, therefore, is all nuclear dyad-years. In Chapter Three, I conduct a statistical analysis on nuclear crisis outcomes among all nuclear crisis-dyads and, in Chapter Five, I examine the initiation and outcome of militarized compellent threats in all dyad-years. Selecting only cases that escalate to high levels, as Glaser recommends, would be a version of selecting on the dependent variable. These are cases in which both states were willing to run high risks of nuclear war. But, if brinkmanship theory, including superiority-brinkmanship synthesis theory, is correct, then we should expect that often states will look down the game tree, assess the balance of stakes and power, decide that they do not wish to run any risk of nuclear war, and back down immediately. My research design allows me to most effectively test this possibility. Glaser's suggested approach would not.

Glaser concludes that there are few cases of nuclear crises between the United States and the Soviet Union at the height of the Cold War which makes it difficult to test my theory against MAD. This is true and again returns us to the point that a main disagreement between Glaser and me is about nuclear dynamics at the height of the Cold War. This is a debate I hope to continue. For now, however, I consider it progress that

[11] Francis J. Gavin, *Nuclear Statecraft: History and Strategy in America's Atomic Age*. (Ithaca: Cornell University Press, 2012.)

[12] Kroenig, *The Logic of American Nuclear Strategy*, 19.

[13] Niccolò Petrelli and Giordana Pulcini, "Nuclear Superiority in the Age of Parity: US Planning, Intelligence Analysis, Weapons Innovation and the Search for a Qualitative Edge 1969-1976." *The International History Review* 40: 5 (October 2018): 1191-1209; Austin Long and Brendan Rittenhouse Green, "Stalking the Secure Second Strike: Intelligence, Counterforce, and Nuclear Strategy." *Journal of Strategic Studies* 38: 1-2 (January 2015): 38-73.

[14] Paul Lettow, *Ronald Reagan and His Quest to Abolish Nuclear Weapons*. (New York: Random House Trade Paperbacks, 2006).

Glaser and I agree that the logic of my theory better explains nuclear deterrence dynamics for other states and time periods.

Next, I will turn to the reviews of Whitlark and Pegahi. Whitlark praises the "scale and scope of the theoretical and analytical undertaking" in this "important book" and predicts that it will have "lasting implications," likely "generating a new wave of scholarship." I thank her for this assessment and hope that she is correct. Pegahi praises the clarity of the book's argumentation and also believes it will also inspire "avenues for future research."

Both scholars also express criticism. I discuss these reviews together because they raise similar issues. I will start with theoretical concerns, then move on to the quantitative and then qualitative analysis, and finish with the scholarly and policy implications of the book.

Pegahi states that the theory's causal mechanisms are "implausible" and never tested or demonstrated, but does not say more on this point. I believe my central causal claim, that states more vulnerable to nuclear war are less willing to run risks of nuclear war, is quite intuitive and plausible and is tested and demonstrated in a battery of qualitative and quantitative tests.

She states that measuring differences in nuclear war outcomes is akin to drivers in a game of chicken debating who will have the "smaller posthumous bill at the auto shop," insinuating that they will all be dead anyway. As discussed above, and as Glaser also attests, much would survive even the most catastrophic nuclear wars, including millions of human beings.

Pegahi also questions whether states are concerned about their absolute or relative vulnerability to nuclear war. Conceptually, this is a good question to ask, but in practice the concepts are inextricably intertwined. A state's risk tolerance for nuclear war depends on the absolute levels of expected damage it will suffer. But the outcome of political conflicts of interest depends on how each state's absolute vulnerability aggregates into the relative willingness to run risks between itself and its opponent. The more vulnerable and, therefore, less resolved a state is, the more likely it is, all else being equal, that the adversary will be more resolved. Moreover, each state's absolute level of expected damage depends critically on the relative balance of power between the states for a variety of reasons. First, the larger a state's arsenal relative to an opponent, the more warheads it has to blunt the enemy's arsenal with damage-limiting strikes. Second, the larger a state's arsenal relative to an opponent, on average, the fewer absolute numbers of warheads the enemy possesses to use in an attack. Third, a larger arsenal relative to an opponent means there are more counterforce targets the enemy must cover before it can turn to more damage-inflicting, counter-value strikes. I clearly demonstrate these logics with several concrete examples in Chapter Two. Holding U.S. nuclear forces constant, the expected damage to the United States increases with increases in adversary arsenal size. Holding enemy nuclear forces constant, the expected damage to the United States increases with decreases in U.S. arsenal size.

Turning to the statistical analysis, Whitlark and Pegahi raise questions about the appropriateness of my quantitative measure of nuclear superiority, but these objections miss the mark. Both at times appear to conflate inappropriately the concept of nuclear superiority and the quantitative measure I employ in the statistical analysis, but there is a difference between concepts and measures. The key concept in the book is not nuclear numbers, but nuclear superiority defined according to relative vulnerability to nuclear war. To measure a state's expected damage in the event of a nuclear war, one must model a likely nuclear exchange with an opponent. Such a calculation would take into account all available information, including

quantitative and qualitative aspects of both states' strategic forces. This is what I do in some detail in the chapters that permit more nuanced assessments, including the chapter on nuclear war outcomes (Chapter Two) and in the qualitative case studies.

For quantitative analysis, a simple quantitative proxy measure for the nuclear balance of power is needed and as I explain in the book, measures of relative numbers of nuclear weapons best serve this purpose. I use two measures. *Nuclear superiority* is a dichotomous variable and measures whether a state possesses more warheads than an adversary. *Nuclear ratio* is a continuous variable, ranging from 0 to 1, that measures the proportion of nuclear warheads possessed by a state as a share of the total nuclear warheads in a dyad. These are appropriate measures of my concept because, all else being equal, the quantitative nuclear balance is a good indicator of states' expected damage in the event of a nuclear war. Again, this is clearly demonstrated in Chapter Two where I show that the damage the United States would suffer in the event of a nuclear war varies greatly, depending on the U.S. nuclear arsenal size and the arsenal size of the adversary. Moreover, and importantly, I strongly suspect a comparison of quantitative warhead counts matches almost exactly what one would produce by conducting more sophisticated nuclear exchange calculations. According to the most detailed calculations, we would almost certainly find that Russia possesses superiority over China, Britain, and France. The United States possesses superiority over China and North Korea. China possesses superiority over India, and so on. These states also possess more warheads than their opponents, consistent with my measures. In cases where numbers of warheads are basically even, producing a *Nuclear ratio* score of roughly 0.50, such the United States and Russia since the mid-1970s or India and Pakistan today, these are also cases in which more sophisticated calculations would likely also be largely indeterminate as to which state has the advantage. Furthermore, the focus on nuclear numbers as an indicator of potential nuclear devastation is not unique to my project. Arms control negotiations have focused almost exclusively on limiting numbers of nuclear weapons for precisely this reason and less on other characteristics of arsenals. Finally, the statistical analysis reveals a strong correlation between these measures of nuclear superiority and nuclear crisis outcomes and the initiation of militarized compellent threats, demonstrating that there is a significant relationship between the quantitative nuclear balance and nuclear coercive bargaining.

Other measures, including the possibilities floated by Whitlark and Pegahi, would not be as suitable. The current standard in the literature for measuring nuclear status is a dummy variable, indicating whether or not a state possesses nuclear weapons, but this does not help us understand the nuclear balance of power among states.[15] The measure in this book, therefore, is already more sophisticated than pre-existing quantitative measures. In addition, other measures, such as warhead yield, or types or qualities of delivery vehicles, are not available for every nuclear state in every year and are not easily aggregated into a unified quantitative measure.[16] More importantly, they do not directly map onto the concept of interest. Theoretically, it is not clear how measuring a specific leg of the triad or delivery vehicle range or quality, as Whitlark and Pegahi suggest, would measure the expected damage of nuclear war. Yield is more closely related to expected damage,

[15] Todd S. Sechser and Matthew Fuhrmann, *Nuclear Weapons and Coercive Diplomacy* (Cambridge: Cambridge University Press, 2017).

[16] Scholars have produced a measure of force structure "diversity," but they do not break the measure into component parts, and there is no clear theoretical reason why platform diversity should directly affect expected damage in the event of a nuclear war. See Erik Gartzke, Jeffrey M. Kaplow, and Rupal N. Mehta. "The Determinants of Nuclear Force Structure." *Journal of Conflict Resolution* 58: 3 (April 2014): 481-508.

but it is a crude indicator because, as I explain in the book, most of the power of a large-yield warhead is wasted on most targets. I include population as a control variable and it does not reach standard levels of statistical significance.

So, in sum, I stand behind my quantitative measures of the nuclear balance of power. They represent the best quantitative measures of the nuclear balance of power between all states in all years that is available and, indeed, that I can conceive of. If other scholars believe they can develop a better measure to gauge quantitatively the nuclear balance of power among all nuclear-armed states in all years, then I encourage them to do so. Until then, the measures in this book are the best we have for gauging relative vulnerability to nuclear war.

Whitlark raises a separate question about consistency of coding, stating that it appears that I use different standards for coding the nuclear status of North Korea and France. This is incorrect. For the quantitative analysis, they are coded using exactly the same methods. They are both coded as becoming nuclear-armed states in the first year that they conduct a nuclear test (2006 and 1960, respectively) and the nuclear superiority variable is coded according to the size of their arsenal in each year, including zero, if a state, even after conducting a test, does not maintain warheads in its arsenal. North Korea then receives extra attention along with a small number of other states in Chapter Two's discussion of nuclear war outcomes, including assessments of the ranges of its delivery vehicles, because this is a different social science methodology, digging into the details of how a nuclear exchange might play out among nuclear-armed states.

Whitlark and Pegahi also raise concerns about the case studies. They note that, contrary to my theory, Pakistan and China started crises with India and the Soviet Union, respectively, despite their nuclear inferiority. This is true and I clear acknowledge these exceptions to my theory in the book. After all, this is social science, not physics. My theory is probabilistic, not deterministic, and the initiation of these cases is contrary to theoretical expectation. The quantitative analysis, however, shows that on balance, the data support my hypotheses and that these are outlier cases. Moreover, these case studies supported my theory in every other dimension: nuclear superior states were more willing to escalate the crises, leaders paid attention to the nuclear balance of power, and the superior state achieved its basic goals in the crisis.

Pegahi also incorrectly states that my theory would have expected India to be more risk acceptant due to its nuclear superiority in the Kargil Crisis, but this a mischaracterization of my theory. Like other brinkmanship theorists, I clearly state that leaders feel competing pressures; they want to avoid nuclear war, but they also want to avoid capitulating to an enemy. My theory predicts that nuclear superior states are more willing to run risks of nuclear war, but not that they do not worry about nuclear escalation at all. The fact that India was concerned about nuclear escalation and restrained its response accordingly, but was still ultimately willing to out-escalate Pakistan to achieve its objectives, is exactly what my theory would have expected.

Pegahi points out that Pakistan "was motivated by other-than-nuclear considerations." I agree. My argument is not that the nuclear balance of power is the only, or even necessarily the most important, consideration, but that it does matter and previous scholarship has been too quick to dismiss it out of hand.

Whitlark also questions whether the cases support my theory, stating that Cuba seemed to be more about brinkmanship and the Sino-Soviet Border War more about the credibility of the Soviet nuclear threat and less about nuclear superiority. This criticism stems from a misperception of superiority-brinkmanship synthesis theory, which is very much about both brinkmanship and credibility. As Schelling wrote decades ago, there is

a credibility problem at the heart of nuclear deterrence.[17] Since states cannot credibly threaten to fight nuclear wars, they instead credibly threaten to risk them through games of brinkmanship. My elaboration of this argument is that nuclear superior states will be more willing to run risks in games of brinkmanship, thereby increasing the credibility of the nuclear threat for their opponents. This is exactly what we see in both the Cuban Missile Crisis and the Sino-Soviet Border War. The dynamics Whitlark points to in these cases are, therefore, strongly supportive of, not in tension, with my theory.

Whitlark argues that I need to demonstrate that the "U.S was willing to take these risks *because* of its nuclear superiority." (Italics in the original). I believe that I do just that. The overall empirical patterns are consistent with this interpretation and there are several statements that are as close to "smoking guns" as one can reasonably expect to find in qualitative, social science research. For example, at the height of the Cuban Missile Crisis, General Maxwell Taylor, Chairman of the Joint Chief of Staff, wrote in a memo to Secretary of Defense Robert McNamara, that "we have the strategic advantage in our general war capabilities…this is no time to run scared" (88).

Whitlark also states that there is a mismatch between theory and evidence in the Cuban Missile Crisis because the Soviet decision to place missiles "was not about numbers per se" but about giving Moscow an increased ability to hold the U.S. homeland at risk with threat of nuclear attack. Again, Whitlark's argument confuses concepts and measures. The key concept throughout the book is vulnerability to nuclear war, nuclear numbers is simply the best available quantitative proxy measure of this concept. But, in case studies, like the Cuban Missile Crisis, I can and do go into a more detailed assessment of the nuclear balance. So, contrary to Whitlark's claims, the Soviet decision to place missiles in Cuba and the U.S. willingness to risk nuclear war to reverse these deployments offers concrete evidence that the nuclear balance of power mattered in this case and is consistent with the central argument of the book.

Both scholars raise questions about quotations from high-ranking officials in my case studies. Pegahi downplays my quotations from government officials in the Cuban Missile Crisis and the Kargil Crisis, but this again confuses concepts and measures. She states that, if my theory is correct, we should expect to see leaders specifically "reference their edge in warhead numbers and expected casualties," but this is incorrect. My theoretical concept of interest is nuclear superiority and relative vulnerability to nuclear war. Numbers of warheads is merely a quantitative measurement to operationalize these concepts. As she acknowledges, I do show several instances of high-level government officials discussing the nuclear balance of power as a consideration in their deliberations. In the Kargil Case, she quotes an Indian official who did not believe the nuclear balance of power mattered, but I quote others who thought that it did. The fact that several high-ranking U.S. and Indian officials invoked the nuclear balance of power as an important variable is itself support for my theory. If second-strike capability theory were correct, the issue should not have featured so prominently.

Whitlark maintains that the "superiority talk" I marshal as evidence could have easily been propaganda for public consumption or "cheap talk." This should always be a consideration when relying on the statements of participants, who may have an incentive to spin. Still, this concern does not seem especially warranted in these cases. The clearest evidence from the Cuban Missile Crisis were private and classified communications among U.S. government officials. These were not intended for public consumption or as threats to adversaries. In the

[17] Schelling, *Arms and Influence*.

Sino-Soviet Border War, Moscow issued clear nuclear threats against Beijing, but this was not mere cheap talk, as the USSR backed it up with costly signals, including increasing military alert levels. And Beijing's statements do not appear to be bluster for public or foreign consumption as at least one Chinese official essentially admitted to giving in to Soviet nuclear threats.

Whitlark also raises a question about my Iran case study in the chapter on whether a large U.S. nuclear arsenal causes nuclear proliferation in other states. I review the case of Iranian nuclear development and conclude that the size of the U.S. nuclear arsenal was not a cause of Iranian nuclear proliferation and U.S. nuclear reductions were not a salient feature in convincing Iran to park its program in the Joint Comprehensive Plan of Action. Whitlark agrees with my conclusion but claims that I focus too heavily on recent developments and do not go into enough detail on the origins of Iran's nuclear program. I do, however, discuss the origins of the program as a response to Iraq's use of Weapons of Mass Destruction (WMD) in the Iran-Iraq war and then, later, as a deterrent to American and Israeli military power (165-166). Perhaps I could have spent more space on this part of the history. But having spent much time studying this case, including writing a book on the subject, I know of no analysis or evidence that suggests that Iran decided to build nuclear weapons because the United States possessed a robust nuclear posture, or that, had the United States reduced its forces to a secure, second-strike posture, Iran would have abandoned its nuclear program.[18]

Whitlark criticizes the case studies for being short, but I consider this a virtue, not a vice. I could have overwhelmed the reader with extraneous historical detail, but instead, I focused on the key bits of evidence most relevant to determining whether the facts are more supportive of superiority-brinkmanship synthesis theory, or the alternative second-strike theory.

Turning to the conclusions and implications of the book, Whitlark charges that the overall tone is too optimistic and that I downplay the possibility that: China might one day decide to arms race with the United States; North Korea might have the ability to hit the continental United States with nuclear weapons; or that North Korea might use nuclear weapons due to "lose it or use it" fears. I was somewhat pleased to hear this criticism as other readers have made the opposite charge, that the book is too dark, bluntly discussing nuclear war and delving into the details of hypothetical nuclear exchanges. Perceptions of tone are somewhat subjective, but I did my best to strike the right balance. On the specific issues Whitlark mentions, North Korea's nuclear capabilities were and continue to be a moving target as I was writing the book and since it has gone to press. Today, my best assessment is that North Korea does not have the ability to reach the continental United States with nuclear weapons, but we cannot be certain and the trend lines are in the wrong direction. I allow that China may one day decide to arms race with the United States (189), although I believe that Washington is better positioned for any future strategic arms competition. And I also explain why the "use em or lose em" logic is in fact illogical, but concede that, although unlikely, some future leader may decide to behave in such an irrational fashion anyway (142).

As an area for future research, Whitlark raises the issue of leaders and their beliefs. She argues that there is a tension that runs throughout my book as to whether the unit of analysis is states or individual leaders.

[18] Matthew Kroenig, *A Time to Attack: The Looming Iranian Nuclear Threat*. (New York: St. Martin's Press, 2014).

Whitlark herself has done good research on how leaders view nuclear issues.[19] The role of states and individuals in my book is, however, clear. The theory operates at the state level of analysis. But, if the theory is correct, one observable implication is that senior government officials should pay attention to, and talk about, the balance of power. This is what I show in the book. Still, consistent with Whitlark's question, there may be room for future research into variation in leaders' beliefs about nuclear superiority. As an initial hunch, however, I am skeptical that there is much meaningful variation in this area. Rather, I suspect that just as many people get the idea to run out of a burning building, many leaders in superior states get the idea that superiority provides them with an advantage. And the reverse is true for leaders in inferior states. As just one prominent example, Chairman Mao Zedong may be the leader most well-known for his publically stated belief in the sufficiency of a minimum nuclear deterrent, yet even he backed down in the face of Soviet nuclear superiority in the 1969 Sino-Soviet border war.

This book, like much of my research, attempts to "bridge the gap" between academic and policy debates, but Pegahi claims it is an "awkward fit" for both.[20] I must disagree. How much is enough for deterrence? Is a secure second-strike capability sufficient? Or, does the possession of a robust nuclear posture further decrease the probability that enemies initiate or escalate military challenges? This is the central question in the academic debate and my book addresses it squarely.[21]

Pegahi points out that recent policy debates have focused more on low-yield nuclear weapons and limited nuclear war. She does not point out, however, that I have been a thought leader in these debates for several years and the conclusion of my book directly addresses these issues and explains how they are part and parcel of my superiority-brinkmanship synthesis theory (203-204).[22] Moreover, while they have not featured prominently in the recent past, questions about strategic superiority and overall nuclear numbers are making a comeback as analysts assess the future viability of the New START Treaty and US-Russian arms control more broadly.

Pegahi concludes by stating that I "suggest a troubling role" for scholars as "stenographers" who should only explain the world as it is and not consider "whether there are better alternatives available." I would contend that we can only suggest better alternatives once we have accurately understood the world around us. To this

[19] Rachel Elizabeth Whitlark, "Nuclear Beliefs: A Leader-Focused Theory of Counter-Proliferation." *Security Studies* 26: 4 (October 2017): 545-574.

[20] Daniel Byman, and Kroenig, "Reaching Beyond the Ivory Tower: A How to Manual." *Security Studies* 25:2 (April 2016): 289-319.

[21] For another recent entry in this debate, see Keir A. Lieber and Daryl G. Press, "The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence." *International Security* 41: 4 (April 2017): 9-49.

[22] See, for example, Matthew Kroenig, "Facing Reality: Getting NATO Ready for a New Cold War." *Survival* 57:1 (January 2015): 49-70; Kroenig, "The Renewed Russian Nuclear Threat and NATO Nuclear Deterrence Posture," *Atlantic Council Issue Brief* (February 2016); Kroenig, "Putin's Nuclear Trash Talk Needs a Serious Response." *The Weekly Standard* (14 October 2016); Kroenig, "A Strategy for Deterring Russian Nuclear 'De-Escalation Strikes," *Atlantic Council Issue Brief* (April 2018); Kroenig, "The Case for Tactical U.S. Nukes." *Wall Street Journal*, 24 January 2018, Opinion section.

point, political scientists have yet to seriously attempt to understand U.S. nuclear strategy. Rather, they have dismissed it out of hand as irrational. In this book, I have explained the logic of American nuclear strategy and this puts me in a better position to assess alternatives. And, indeed, there are alternatives available, but in my view they are not better.

The United States pursues a robust nuclear arsenal because it extends deterrence to the entire free world, because it can, and because it seeks to follow the Law of Armed Conflict. If Washington decided to pursue a more isolationist course, lost its economic and technological edge to rivals, or was willing to intentionally slaughter innocent civilians, then it could chose to drastically reduce the size of its arsenal and pursue an assured retaliation strategy. So long, however, as the United States wishes to continue to play its indispensable international leadership role, uphold international law, and provide geopolitical stability in Europe and Asia, it will continue to require a robust nuclear force.