The Constraining Effect of Arms Control Treaties

An International Studies Quarterly Online symposium

Scott Wolford
Rupal N. Mehta
Alexandre Debs
Matthew Fuhrmann and Yonatan Lupu

DeRaismes Combes, Managing Editor

Published Online, 19 April 2019 v2.0

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

Introduction

Scott Wolford
University of Texas, Austin

Matthew Fuhrmann and Yonatan Lupu's "Do Arms Control Treaties Work?" offers an optimistic take on the Nuclear Nonproliferation Treaty (NPT), as they present evidence consistent with the claim that ratifying the NPT reduces the chances that signatories pursue nuclear weapons.

In this symposium, two other experts on nuclear politics weigh in on the study. Rupal Mehta, after indicating that the results can be consistent with several different causal stories, notes that the NPT's very effectiveness, especially in clarifying what actions will and won't provoke preventive action, may incentivize more states to pursue latent nuclear capability than otherwise might, with unclear consequences for future peace and stability. Alexandre Debs looks at the theoretical underpinnings of the empirical model, (a) questioning the required assumption of similarities between the NPT and other global treaties and (b) emphasizing the limits of selection on observables in achieving causal identification. In their response, the authors offer a defense of their matching strategy and, prompted by Mehta's and Debs's comments, discuss future lines of inquiry.

Fact or Fiction: The Constraining Effect of the NPT on Nuclear Proliferation

Rupal N. Mehta
University of Nebraska-Lincoln

In their recent ISQ piece, *"Do Arms Control Treaties Work? Assessing the Effectiveness of the Nuclear Nonproliferation Treaty,"* Matthew Fuhrmann and Yonatan Lupu make significant strides in understanding the effectiveness of the Nuclear Nonproliferation Treaty (NPT) in curbing proliferation. Fuhrmann and Lupu offer a strong and empirically-novel approach that reconciles findings from a broad set of theoretical and large-n, quantitative studies. In navigating differing assessments of the impact of the NPT on proliferation, Fuhrmann and Lupu make two significant contributions to existing scholarship: 1) they employ a novel, three-stage research design that has generally been employed only in other disciplines; 2) they reach a consensus on the role that the NPT can play in influencing nuclear decision-making. As a contributor to the scholarship on the causes and consequences of nuclear proliferation myself, I am motivated by Fuhrmann and Lupu's approach that invokes more carefully constructed research designs and modeling choices for causal inference. I am also more persuaded that our field can continue to improve upon the existing work by emulating this study's nuanced data and novel design.

Yet, my primary critique of this piece stems from two potential theoretical questions that emerge from Fuhrmann and Lupu's analysis. The first rests with the limitations of the theoretical design to assess the causal mechanism leading states to curb their proliferation attempts. Second, I question one implication of this study that suggests the benefits of NPT in constraining nuclear proliferation, but which may, in fact, encourage other related nuclear activity.

While previous studies about the role of the NPT have long suffered from selection biases and mixed theoretical and empirical implications, this piece yields significant progress in causal inference - an already challenging task in observational studies but maybe a greater challenge still in the context of nuclear scholarship. Yet, as stated in the study, other important questions emerge about what exact causal mechanism is at work here. Are potential proliferators constrained by the NPT because the NPT's institutional design provides benefits for forgoing the pursuit of nuclear weapons? Article IV of the NPT, for example, encourages the "fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy." Or are states motivated by the fear of abandonment or alliance punishment, by the United States or other major patrons, if they were to engage in riskier behavior and pursue nuclear technology outside the confines of the nonproliferation regime (as codified by the NPT) (Bleek and Lorber 2014; Coe and Vaynman 2016; Gerzhoy 2015; Narang and Mehta 2017; Mehta 2018)? Lastly, are states discouraged from proliferating nuclear weapons in contravention of their treaty obligations, for fear of preventive force (Fuhrmann and Kreps 2010; Whitlark 2018)? As noted by the authors, the causal mechanism is not readily clear through this analysis.

These multiple plausible causal stories suggest the need for further examination. One potential approach to get at these competing causal explanations may include the use of more disaggregated, systematic data on the treaty ratification process, such as incorporating content analysis of the negotiations with members of the International Atomic Energy Agency (IAEA), or data collection on other related nuclear decision-making such as access to civilian energy programs or investment in missile technology which may also be impacted in some way by the NPT. For example, by creating an index of possible development steps along the nuclear pathway (Mehta and Whitlark 2018b), we may begin to assess what strategies these states are pursuing and *how* exactly the NPT influences these processes. With this, the goal of assessing which causal mechanism is at play in how the NPT curtails proliferation, may be less daunting.

Second, this study suggests cause for some much-needed optimism in the proliferation space: international institutions may curb undesired behavior, especially about something as important as the decision to pursue nuclear weapons. Yet, the implications from this study may not be as uniformly positive as predicted. While the NPT may reduce the likelihood of nuclear weapons proliferation, it legally allows for and indeed encourages the development or acquisition of other forms of nuclear technology, including nuclear latency (e.g. dual-use enrichment and reprocessing technology). To the nuclear weapons states that manage the nonproliferation regime, this technology may be seen as useful compensation or incentive for forgoing nuclear weapons. But is this actually good news?

New research is just beginning to understand the impact and significance of nuclear latency, this technological precursor to nuclear weapons, on weapons proliferation and international security (Fuhrmann and Tkach 2015). Whether as a hedge to nuclear weapons or a capability that itself yields important bargaining and political advantages (Mehta and Whitlark 2017; Fuhrmann and Tkach 2015; Narang 2016/2017; Volpe 2017; Levite 2002/2003), its development in lieu of nuclear weapons, may result in a new set of challenges to the nonproliferation regime. States may pursue nuclear latency to gain access to the 'nuclear' club for prestige, as a result of shifting security priorities, or potentially just to diversify their energy sources (Mehta and Whitlark 2018a; Miller 2017). Yet, the nature of dual-use technology and the ability for states to conceal their true ambitions makes the pursuit of latency similarly concerning. If this is a second-order implication of the NPT's constraining impact on nuclear proliferation, how do we reconcile this with other benefits? Further research may attempt to examine the impact of the NPT on the decision to acquire nuclear latency employing a similar three-stage design as that in Fuhrmann and Lupu's study. If that analysis finds that the NPT may similarly curb investment in clandestine nuclear latent technology or prevent the progression from latency to nuclear weapons, we may be even more optimistic about the positive impact that the NPT has on constraining nuclear interest and activity throughout the international system. If, however, such work reveals that while the NPT discourages weapons out of the gate, but rather encourages hedging on the road to nuclear weapons, our optimism in nonproliferation institutions may be short-lived.

The ambition of good social science research is to answer significant puzzles in our field, use strong evidence to question or examine theoretically-driven hypotheses, and potentially amend what we 'know' about the international community. Fuhrmann and Lupu's study does exactly that. This piece, and its empirical approach, is an especially salient exemplar for nuclear scholars that face a critical set of challenges for causal inference. While, as their study reveals, there is still much work to be done to accomplish this aim on this and related issues (including incorporating domestic decision-making processes), I am comforted, and

encouraged, by the progress we've made to date and by the important precedent set by this study.

Strategies, Set, and Match: Scoring Preferences for Nuclear Weapons in Analyzing the Effect of the NPT on Proliferation

Alexandre Debs
Yale University

In his 2011 piece for the *Annual Review of Political Science*, Scott Sagan lamented the fact that relatively little was known about the effect of international security treaties, and the Non-Proliferation Treaty (NPT) in particular (Sagan 2011, 238). The recent article by Fuhrmann and Lupu (FL) in *International Studies Quarterly* is a welcome addition to this literature.

FL's main objective is to address concerns over strategic selection in estimating the effect of the NPT on proliferation. If we find that states that ratified the NPT are less likely to proliferate, we may not be able to assign a causal role to NPT ratification; states may ratify the NPT because they already decided to forego nuclear weapons. FL argue that by estimating a state's preference for ratifying the NPT in a given year, based on their decision to ratify other universal treaties, they weaken the assumptions needed to estimate the causal effect of the NPT. The set of observations can be divided into a treatment and control group, based on whether or not the state ratified the NPT. Matching observations with similar preferences for ratifying the NPT, we can isolate the effect of NPT ratification. Using this method, FL conclude that the ratification of the NPT reduces the odds of a state pursuing nuclear weapons (531).

This analysis provides a fresh perspective on the effect of the NPT, a welcome contribution given that the literature has so far failed to reach a consensus (531-533). Here, I focus on the assumptions needed to perform the analysis, the causal claim of the paper, and potential avenues for future research.

One important assumption of the approach is the idea that a propensity score based on a wide variety of issue areas, including human rights, transportation, the environment, and communications, meaningful captures a state's preference for ratifying the NPT. Unfortunately, FL give little theoretical justification for this assumption. "Although it may not be immediately obvious why treaties covering other policy areas can help us to predict NPT ratification," they state, "this is the case empirically." (533).

It is difficult to understand how a state's decision to ratify other universal treaties represents its preferences for the NPT. The treaty means different things to different states, as it is both universal and discriminatory. The NPT indeed divides the world into nuclear-weapons states (NWS) and non-nuclear-weapons states (NNWS), forbidding any state in the latter category from joining the former. Some states may view the NPT as a universal treaty that any respectable member of the international system should ratify. Other states may view it as an abhorrent treaty for its discriminatory nature, and argue instead that any respectable member of the international system should oppose it. Such was the rationale of key NNWS during the negotiations for the treaty, including India, Brazil, and West Germany (see, e.g.,

Maddock 2010). Observing that a state signed many universal treaties may not tell us how they would interpret the NPT. It would be good to understand which treaties best approximate the NPT's dual features, and which states are likely to view the NPT as attractive for its universal features or repulsive for its discriminatory nature.

Next, we can question whether the approach convincingly addresses the concerns over strategic selection that motivated the analysis. If a country decided that it should forego nuclear weapons and ratify the NPT, then we would not want to assign a causal effect of the ratification of the NPT on this state's nonproliferation. Yet the FL approach would do so, matching the pre-ratification country-year observation with the post-ratification observations, and assigning the latter's nonproliferation behavior to the "treatment" of ratification.

It may be unfair to ask any quantitative study to address this problem, but that is precisely the point. The fundamental assumption of an identification strategy based on the selection of observables is that all differences between treatment and control groups are observable (Keele 2015, 321-322). Yet states self-select into the NPT, based on their strategic situation, their expectations about the behavior of other states, etc. Some of these factors are observable, but omitted from FL's analysis, others are not observable. When looking for the reasons why states sign the NPT, and the effect that the NPT may have on their behavior, we may want to prioritize an analysis of their strategic thinking on nuclear proliferation itself. Though such a qualitative inquiry is difficult, it can be very fruitful, and there are luckily very few cases where the NPT could have had a causal effect on proliferation.

Looking ahead, FL's approach could be used to answer interesting questions on the effect of NPT ratification. Sagan (2011, 238-240) pointed out that no democracy had reneged on its NPT commitments, while several non-democracies had done so, and challenged the scholarly community to understand why this may be the case. One possible mechanism is that the preferences for a universal treaty may be more transparent and stable over time in a democracy than in a non-democracy. We could argue that the former hold relatively open debates on political questions and follow the will of the median voter, while the latter are more heavily influenced by the preferences of their leader. It would be interesting to see if there is any evidence for this mechanism. FL's estimate of state preferences could shed some light on this hypothesis.

A Response to Responses

Matthew Fuhrmann and Yonatan Lupu
Texas A&M University and George Washington University

We thank Alexandre Debs and Rupal Mehta for their thoughtful and constructive engagement of our article "Do Arms Control Treaties Work? Assessing the Effectiveness of the Nuclear Nonproliferation Treaty" (Fuhrmann and Lupu 2016). In this rejoinder, we respond to four important issues raised in their essays: (1) our measurement of treaty commitment preferences; (2) the assumptions needed to draw causal inferences; (3) the mechanism linking NPT membership with nonproliferation; and (4) the net effect of the treaty.

The Measurement of Treaty Commitment Preferences

Debs raises the question of what our preference estimate actually measures. To recap, we use a process outlined by Lupu (2013 a,b) to estimate each country-year's preference toward the treaty. We begin with data on the treaty ratifications decisions for about 300 universal treaties. Using W-NOMINATE, we then estimate the location of each country and each treaty (in each year) in a two-dimensional preference space. The model fits the countries and treaties in the space such that (1) countries with more similar ratification choices are closer together; and (2) treaties with more similar sets of members are closer together. The closer a country is to the NPT, the larger the estimated probability of NPT ratification. So, this probability is not based on *how many* other treaties that country has ratified, but rather *which* treaties it has ratified and which other countries have ratified those treaties. Thus, if the model estimates that Country A has a large probability of ratifying the NPT, this means that NPT members have tended to ratify the same other treaties that Country A has ratified.

As Debs correctly points out, we do not provide a theoretical justification for estimating this model using treaties on a broad set of substantive areas including trade, human rights, the environment, and so on. The justification is empirical – and the assumptions behind this choice are testable. From an empirical perspective, this comes down to predictive accuracy. It could have been the case that a model that includes only arms control treaties would provide more accurate predictions of NPT ratifications than a model that includes treaties from other areas, but this is not the case. The W-NOMINATE model fits the data better and predicts more NPT ratifications correctly if we include treaties covering a broad range of substantive areas. That means there is latent information in those treaty ratification decisions about countries' tendency to ratify the NPT. As Lupu (2016) notes, "if treaty commitment decisions are driven by many different latent dimensions of state preferences, then the results of the W-NOMINATE models will demonstrate this. That is, if every policy area is affected by a different latent dimension, then a W-NOMINATE model that only estimates two latent dimensions will fit the data poorly. On the other hand, if a two-dimensional model fits the data well, this would be a strong indication that, although there are many substantive areas of treaty making, states have preferences with respect to treaty commitment that cut across these policy areas."

Consider the analogy to the legislative context in which W-NOMINATE was first developed (Poole and Rosenthal 1997). In that context, analysts use roll-call votes on a wide array of policy areas to estimate legislators' ideal points because they have recognized that there is latent information about a policymakers' preferences toward issue A contained in their votes about issue B. Similarly, our assumption is that countries' treaty ratifications in issue A can help us predict treaty ratifications in issue B, and this turns out to be the case. Overall, the W-NOMINATE model fits (i.e., generates accurate predictions for) our treaty data as well as it fits the roll-call data in the U.S. House of Representatives. As we note in our paper, including this measure in our propensity score models (in addition to more readily observable variables) improves our ability to predict NPT ratifications by 21%.

Assumptions Needed to Draw Causal Inferences

Another key point Debs raises concerns causal inference. Any causal inference requires assumptions, and our task as researchers is to weaken those assumptions to the extent possible. Unlike tools such as instrumental variables, matching is not, in and of itself, a causal inference tool. Inferring causation from our matching model requires us to assume (a) selection is based only on observables; and (b) that we have included all the observables in our model. These are similar to the strong assumptions we would need to infer causation from a simple (unbalanced) regression. Not only are these assumptions strong, they are likely not true. There are, as Debs points out, likely some reasons for NPT ratification that are not included in our model, some potentially observable and some unobservable, some case-specific and some general. This is the nature of quantitative models, as he recognizes. It would be unreasonable to pretend we could rule out this problem.

One way to address this problem is to consider whether, supposing we could theorize about, measure, and include those other factors in the model, the result would change. On this point, we hope the sensitivity analysis included in the article may be helpful. The intuition behind the Rosenbaum (2002) analysis is to estimate how large the effect of an omitted variable would have to be change our inferences. The parameter Γ quantifies this estimate. We estimated Γ to be 3.4 for the pursuit of nuclear weapons and 6.7 for a nuclear weapons program. The rule of thumb used in most studies is that a Γ between 1 and 2 is sufficient to express confidence in an estimated effect. The fact that this is a rule of thumb may make some readers uncomfortable, but we note that, in the sense of being a rule of thumb, this is analogous to the rule of thumb that $p<0.05$ is sufficient to express confidence in the sign of a regression coefficient. Thus, while we cannot be absolutely certain of the effect we estimate, and welcome further research that improves on our work, our analysis does give us sufficient confidence in our estimate that NPT ratification reduces the risk of nuclear proliferation.

The Causal Mechanism

Mehta notes that the causal mechanism linking NPT membership and nonproliferation remains unclear. We agree. Our study shows that membership in the NPT reduces the likelihood that a country will seek nuclear weapons, but it was not designed to determine why this is the case. We presented several conceivable mechanisms – the monitoring of compliance by the International Atomic Energy Agency (IAEA), superpower enforcement, ideational factors, and domestic politics. Mehta raises other interesting possibilities, including an incentive provided to NPT members in the form of assistance in developing nuclear technology for basic research or electricity production. Ultimately, the discipline needs to carry out more research in order to identify the sources of NPT effectiveness.

Debs suggests one fruitful path forward. Democracies have not cheated on their NPT commitments, while non-democracies have done so (Sagan 2011). Fuhrmann and Berejikian (2012) show that countries are unlikely to knowingly violate nonproliferation commitments when executives are highly constrained domestically, as they are in most democracies. Most attempts to prey on the NPT by making a disingenuous commitment have been by unconstrained autocratic leaders such as Saddam Hussein or Kim Il Sung. Domestic political institutions likely play a key role in explaining the efficacy of the NPT, and we encourage other scholars to explore this issue further.

Net Effect of the NPT

The NPT is a multifaceted treaty. In addition to prohibiting nonnuclear countries from obtaining nuclear weapons, it encourages the spread of technology and knowledge for peaceful purposes and calls for eventual disarmament by the existing nuclear powers. Mehta correctly points out that we need to examine the net effect of the treaty in order to reach conclusions about its normative appeal. We have produced evidence that the NPT lowers the risk that its members will seek nuclear bombs, but this does not automatically imply that the treaty is uniformly good for peace and stability.

Like Mehta, we encourage scholars to devote more attention to the problem of nuclear latency. Countries that have the underlying infrastructure and know-how to build bombs quickly in the event of a crisis, such as Iran and Japan, represent a class of states known as latent nuclear powers (see Fuhrmann and Tkach 2015, Mehta and Whitlark 2017, Volpe 2017). Does the NPT encourage states to develop latent nuclear capabilities? If so, the treaty may have strategic (and potentially negative) implications that were not fully captured in our analysis.

Conclusion

We appreciate the opportunity to respond to the interesting critiques of our study by Debs and Mehta. We welcome similar engagements in the future. Our article should not be the last word on this subject. There is still much that we do not know about the NPT. We encourage scholars to continue studying the sources and effects of nonproliferation agreements in international relations. We believe that our approach brings us closer to understanding the causal effects of the NPT on state behavior, compared to previously published research. At the same time, we hope that scholars will continue to develop methodological tools that might permit better empirical analyses in the future.

References

Bleek, Philipp C., and Eric B. Lorber. 2014. "Security Guarantees and Allied Nuclear Proliferation." *Journal of Conflict Resolution* 58 (3): 429–54

Coe, Andrew J., and Jane Vaynman. 2015. "Collusion and the Nuclear Nonproliferation Regime." *The Journal of Politics* 77 (4): 983–97.

Fuhrmann, Matthew and Jeffrey D. Berejikian. 2012. "Disaggregating Noncompliance: Abstention Versus Predation in the Nuclear Nonproliferation Treaty." *Journal of Conflict Resolution* 56(3): 355–81.

Fuhrmann, Matthew, and Sarah E. Kreps. 2010. "Targeting Nuclear Programs in War and Peace: A Quantitative Empirical Analysis, 1941-2000." *Journal of Conflict Resolution*. 54 (6): 831–59.

Matthew Fuhrmann, Yonatan Lupu. 2016. "Do Arms Control Treaties Work? Assessing the Effectiveness of the Nuclear Nonproliferation Treaty," *International Studies Quarterly*, 60(3): 530–539.

Fuhrmann, Matthew, and Benjamin Tkach. 2015. "Almost Nuclear: Introducing the Nuclear Latency Dataset." *Conflict Management and Peace Science*. 32 (4): 443–61.

Gerzhoy, Gene. 2015. "Alliance Coercion and Nuclear Restraint: How the United States Thwarted West Germany's Nuclear Ambitions." *International Security* 39 (4): 91–129.

Keele, Luke. 2015. 'The Statistics of Causal Inference: A View from Political Methodology'. *Political Analysis* 23(3): 313-335.

Levite, Ariel. 2002/2003. "Never Say Never Again: Nuclear Reversal Revisited." *International Security* 27 (3).

Lupu, Yonatan. 2013a. "Best Evidence: The Role of Information in Domestic Judicial Enforcement of International Human Rights Agreements." *International Organization* 67(3): 469–503.

_____. 2013b. "The Informative Power of Treaty Commitment: Using the Spatial Model to Address Selection Effects." *American Journal of Political Science* 57(4): 912–25.

_____. 2016. "Why Do States Join Some Universal Treaties but not Others? An Analysis of Treaty Commitment Preferences." *Journal of Conflict Resolution* Vol 60, Issue 7, 1219 – 1250.

Maddock, Shane J. 2010. Nuclear Apartheid: The Quest for American Atomic Supremacy from World War II to the Present. Chapel Hill: The University of North Carolina Press.

Mehta, Rupal N. *The Politics of Nuclear Reversal*, Revise and Resubmit, Oxford University Press.

Mehta, Rupal N. and Rachel E. Whitlark. 2017. "The Benefits and Burdens of Nuclear Latency." *International Studies Quarterly*, 61 (3): 517–528.

_____. 2018a. "The Determinants of Nuclear Latency." Working Paper.

_____.2018b. "Strategies of Nuclear Latency." Working Paper.

Miller, Nicholas A. 2017. "Why Nuclear Energy Programs Rarely Lead to Proliferation," *International Security,* Forthcoming.

Narang, Neil, and Rupal N. Mehta. 2017. "The Unforeseen Consequences of Extended Deterrence: Moral Hazard in a Nuclear Protégé." Online First, *Journal of Conflict Resolution.*

Narang, Vipin. 2016/2017. "Strategies of Nuclear Proliferation*," International Security*, 41 (3): 110-150.

Poole, Keith T. and Howard Rosenthal. 1997. Congress: A Political-Economic History of Roll Call Voting. New York: Oxford University Press.

Rosenbaum, Paul R. 2002. *Observational Studies*. Leipzig: Springer.

Sagan, Scott. 2011. 'The Causes of Nuclear Weapons Proliferation'. *Annual Review of Political Science* 14: 225-44.

Volpe, Tristan. 2017. "Atomic Leverage: Compellence with Nuclear Latency," Online First, *Security Studies.*

Whitlark, Rachel Elizabeth. 2017. All Options on the Table? Nuclear Proliferation, Preventive War, and a Leader's Decision to Intervene. Book Manuscript in Preparation.