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Arms Control as Uncertainty Management

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Abstract

For decades or longer, policy-makers have sought to use arms control to reduce the uncertainty endemic to the international security environment. Because uncertainty is pervasive in these situations, however, practitioners themselves are naturally vulnerable to its effects. This paper seeks to help policy-makers optimize arms control outcomes by providing improved theory and best practices for goal-setting and strategy selection using the judicious application of decision theoretic concepts. The paper first lays out a suitable role for decision theory in the study and analysis of arms control, arguing that “uncertainty” is a more appropriate concept for description and analysis here than is “risk.” Prior approaches that rely on “risk” have tended to drive the search for arms control best practices, but “risk” requires the use of probability estimates that are frequently not available or not a good indicator of potential outcomes. Second, the paper argues that decision-makers are vulnerable to the effects of missing information and the uncertainty it causes in the run-up to and during arms control negotiations. Consequently, they are subject to biases and resort to the use of security-specific heuristics, including worst-case scenario thinking, limited-theater-of-war thinking, and low-dimension (or non-complex) thinking when setting goals and employing strategies for negotiating arms control agreements. The paper discusses the origins of this uncertainty and the strategies that states could employ as a result of these security-specific heuristics, arguing that they can best be grouped into two types—risk reduction versus uncertainty management. Finally, the paper makes recommendations for optimizing outcomes—for getting efficient negotiations that result in robust, durable agreements, capable of managing uncertainty about security, despite the effects of missing information.

Introduction

Arms control can remain an important tool for the security of states, but it needs to be modernized in order to remain an effective security tool now and in the future. Arms control has always been about increasing security and lowering uncertainty. What that means, however, is evolving. Whereas successful arms control agreements were once defined almost exclusively by the limits they imposed on the arsenals of states and the stability that they provided, successful arms control endeavors are increasingly defined by the access to information—the “transparency”—they afford. To manage uncertainty about security, arms control must also now be able to keep pace with the rapidly evolving nature of military technologies.

A business-as-usual approach to arms control that advocates new agreements resembling those of the past, therefore, risks relegating arms control to a tool of the Cold War, inefficient at managing contemporary security threats, and thus potentially unworthy of the large-scale diplomatic effort required to negotiate and implement agreements. Arms control agreements ought to continue to be used as a tool to help ensure the security of states if they are pursued on their own merits today—not as legacy projects—and if they can continue to make a meaningful contribution to improving state security and lowering uncertainty.

Pursuing arms control on its own merits means first establishing goals for arms control that are conducive to achieving long-term peace and stability. To accomplish this, it is critical to look beyond sweeping mantras associated with the elimination of nuclear weapons, set aside frameworks established by prior agreements, and abandon directives dictated by “what we think we can get.” I argue that policy-makers ought to do the following to enable arms control to continue to make meaningful contributions to improving security and lowering uncertainty: 1) optimize their proposals to improve the efficiency of negotiations; 2) actively work to counter the systematic biases that tend to derail negotiations and produce inefficient agreements; 3) and take into account the constantly changing nature of real security threats and evolving norms for treaty parameters.

This paper suggests strategies for managing the effects of uncertainty on the negotiation of arms control agreements in order to overcome bias induced by uncertainty and to optimize proposals for efficiency. In order to be an effective tool for increasing security, arms control deliverables need to be able to manage uncertainty about security from multiple sources, and for as long a period as possible. Acknowledging the effect of missing information (uncertainty) on goal-setting—understanding how it causes biases and forces the use of heuristics—will go a long way toward modernizing both the theory and practice of arms control, and is a first step toward optimization.

Negotiations take place under varying conditions of uncertainty caused by missing information about factors from both within and outside of the negotiations. This includes missing information about capabilities (what states have in their arsenals), intentions (whether and how they plan to use those capabilities, and the sincerity with which they come to the negotiation table), and from the external environment (e.g., political or economic instability). Implicit responses to the resulting uncertainty can adversely affect both the negotiation process and the agreements reached.

Uncertainty and Arms Control

Because uncertainty is pervasive throughout security situations, including arms control, implicit responses to it can adversely affect both the negotiation process and agreements reached. Negotiators, operating under uncertainty, are often forced to make tradeoffs and adjudicate between what they see as potential losses. Consequently, they seek to minimize potential losses—or, risk—through risk-reduction strategies, like pursuing arsenal reductions.

The pedigree of the wisdom that arsenal reductions, for example, are the best solution to the problem of missing information about capabilities and the intention to use them is derived from and consistent with threads that run through three related literatures: 1) game theory and rational choice theory; 2) international relations (IR) and arms control theory; and 3) coarse or broad applications of decision-theory to the study of international politics.

In general, however, we should be wary of approaches that lean too heavily on the concept of risk in order to understand and predict state behavior. Whereas “risk” is the combination of unknown information about the state of the world combined with known probability, “uncertainty” results from unknown information about the state of the world combined with unknown probability. I argue that, during the negotiation of arms control agreements, decision-makers and negotiators exist under conditions that more closely resemble uncertainty than risk. Furthermore, without information about probability, risk cannot provide prescriptive guidance—and this information is often missing, or when present, it is artificially or subjectively derived. While relying on risk to determine the goals for arms control negotiations can facilitate agreement under conditions of high uncertainty, the agreements are not necessarily good, durable, or robust.

An overreliance on the concept of risk in existing approaches to arms control negotiations has obscured how arms control efforts impact and are impacted by uncertainty. While recommendations based on these approaches may be aimed at maximizing security, they can also cause negotiations to falter or produce suboptimal agreements. Consequently, processes for setting goals and establishing strategies for reaching agreements have, at a minimum, remained incomplete and suffered from a lack of optimization. And they have, by and large, failed to yield the kind of goals and strategies capable of contributing to long-term security.

Game Theory and Rational Choice Theory. As an approach used to analyze state behavior, game theory is largely predicated on the concept of risk. In its most narrow or strict definition, “risk” describes a scenario in which a decision-maker must choose from a set of potential actions, each of which leads to an outcome that has a *known probability* (Luce and Raiffa 1957, 13). Conceptualizing risk in this way assumes that probabilities associated with specific outcomes are assessable, estimable, or somehow *a priori* or otherwise known to the decision-maker.¹ When

¹ Decision theory treats human beings and organization (and everything in between) as an individual decision-maker because they can be understood as having a ‘unitary interest’ that is driving decisions (Luce and Raiffa 1957, 13). A collection of individuals who have potentially conflicting interests are considered a group. This approach is adopted here.

these probabilities are available, a decision-maker can employ a decision-making procedure to choose the option that has the highest expected value.²

To use risk in this way, a decision maker needs to know the probability distribution over the set of potential future states of the world, or behave “as if” that probability distribution is known (Luce and Raiffa 1957, 277). When a decision-maker isn’t privy to reliable information about probability, they can conduct a “risk assessment” by gathering information, estimating likely outcomes, and ascribing potential likelihood to estimate or calculate risk.

Game theory approaches go hand-in-hand with utility-based and rational choice theories of politics that emphasize “self-help” behaviors (see below). Generally, applications of game theory and rational choice theory to arms control have focused on addressing capabilities (weapons) through an analysis of the risks (narrowly defined) they pose. Scholars have applied risk analysis to international negotiations, making a number of recommendations for best practices.³ But it is not clear that decision-makers can always get “under risk” in a scenario with assessable outcomes, so as to make it possible to deliberately use game theory or another decision-making procedure to make a choice.

Arms control negotiators and decision-makers typically rely on intelligence estimates to provide information about the likelihood that rival states have certain capabilities or intentions to use them. While these estimates furnish the probabilities required for technically being “under risk,” the high level of uncertainty caused by missing information and additional sources of missing information that affect these decisions make it difficult, if not impossible, to provide any risk assessment with great confidence.

The presumption of being under risk, and therefore in possession of sufficient information about the probability of potential states of the world, actually leads to biases in goal-setting that produce suboptimal agreements. Work that explores how international agreements are reached, for example, tends to focus on how states can lower the possibility of experiencing potential losses through “risk reduction” by minimizing the likelihood of certain outcomes (Rotfeld and Anthony 1999). In order to accomplish this for arms control specifically, these approaches commonly recommend that factors posing particular threats or augmenting the likelihood of negative outcomes be reduced or eliminated (Adelman 1984; Rotfeld and Anthony 1999; Goldblat 2002). This kind of thinking has also frequently led to recommendations for arms

² In formal game theoretic terms, risk refers to a scenario in which “a choice must be made from a set of acts $A1, A2, \dots, Am$, but the relative desirability of each act depends on which ‘state of nature’ prevails, either $s1, s2, \dots, sn$ ” (Luce and Raiffa 1957, 276). The term “states of nature” describes a “mutually exclusive and exhaustive listing of those aspects of nature which are relevant to this particular choice problem and about which the decision maker is uncertain” (Luce and Raiffa 1957, 276-277). Because states of nature are unknown, the outcome resulting from a particular action or choice option is also unknown. The use of a decision-making procedure thus requires risk for ascribing “utilities” to particular outcomes. “Utility” is the value of a choice option when its likelihood of coming to be is factored into its overall potential value. Utility is thus calculated as a function of both the probability of a potential future state of the world *and* the numerical valuation of that outcome given the likelihood of its occurring. Utilities allow actions to be ranked ordered (according to an optimality criterion), making it possible to choose the best course of action from a set of possible actions.

³ See, for example, the following works: Starkey, Boyer and Wilkenfeld 2005; Luce and Raiffa 1957; and Raiffa 2002.

control best practices that largely consist of setting thresholds or ceilings for arsenals through formal, legally binding agreements (Larsen 2002; Gottemoeller 2002; Pifer and O’Hanlon 2012).

In the abstract, these are not poor practices, per se, but they do not necessarily facilitate reaching an agreement, nor do they assist with navigating the tradeoffs for reaching an agreement and getting a “good” agreement, capable of standing the test of time.⁴

International Relations and Arms Control Theory. Game theory approaches go hand-in-hand with international relations’ (IR) utility- and rational choice-based theories of politics that emphasize “self-help” behaviors. Many veins of IR theory are derived from a rational choice framework, and seek to maximize utility for the survival of states. Discussion of arms control in these theories tend to focus squarely on addressing capabilities through an analysis of the threats they pose to states. Realist IR theory, for example, treats the kind of self-help behavior that results in conflict as a product of uncertainty about capabilities and intentions (Mearsheimer 1994; Morgenthau 2009; Waltz 2001). States, in turn, respond to uncertainty in a manner that assists them in maximizing their own relative power.

However, whether the route to self-help maximization best occurs through an attenuation of uncertainty about capabilities or about intentions is the subject of much debate. John J. Mearsheimer, for one, argues that addressing uncertainty about *intentions* is more critical than addressing uncertainty about capabilities because uncertainty about intentions makes capabilities (whatever they may be) threatening. By contrast, realist Charles Glaser describes Kenneth Waltz’s position on the importance of reducing uncertainty about capabilities rather than intentions. For Waltz:

[i]ntentions are unknowable, and even if known, could be different tomorrow...States must not overlook the possibility that potential adversaries will use their full capabilities against them, and they therefore must focus on adversaries’ capabilities rather than their intentions (Glaser 1994, 56).

Meaning that, according to Waltz’s structural-realist view, states should avoid reductions to their capabilities in order to maintain military advantage, because they are naturally competing with other states for their survival.⁵

These kinds of ontological commitments to uncertainty about capabilities and intentions are also found in other branches of IR theory. Brian Rathbun (2007) explains that the concept of uncertainty is actually a “microfoundation”—not just of realism—but of *all* strains of IR theory. Although the various schools of thought employ the concept of uncertainty differently, Rathbun argues that the concept is pervasive. For realists, it is associated with anarchy-induced “fear”; for rationalists as the “ignorance” that comes from incomplete information; for cognitivists (or behavioralists) as “confusion” or obfuscation; and for constructivists as the “indeterminacy” of a socially constructed international system.

Applications of IR theory to arms control mirror these lines of causal reasoning and lead to the conclusion that reducing the threat of war means reducing capabilities and/or the intention to use them. For example, Waltz believed that arms control (defined as reductions to capabilities)

⁴ They also have not been informed by data. Welcome advice—alluding to unpublished data of mine.

⁵ Reductions to a state’s own capabilities should only occur when reductions to an adversary’s arsenal lowers uncertainty about capabilities, improving the overall security situation of a state.

should only occur when reductions to an adversary's arsenal lowers uncertainty about capabilities, preserving the state's "relative capabilities" and therefore confidence in its ability to defeat an adversary—all in all, maintaining or improving the security situation of a state.

With Schelling and Halperin (1961), theorizing about the function of arms control took a more nuanced turn, focusing instead on the reduction of the likelihood of the onset of war as well as reducing the level of destruction should war occur—not on the reduction of capabilities and the maintenance of relative power, *per se*. Schelling and Halperin advocated for ways to use "limited" arms control to reap absolute benefits by enhancing strategic stability or further stabilizing mutual deterrence. To reduce the risk of war and the level of destruction should war occur, they argued for reducing incentives to strike first or to escalate rapidly if war broke out. Agreements that advanced these goals, argued Schelling and Halperin, were more valuable than agreements that focus on reducing numbers or weapons without regard to characteristics.

In the new edition of their book, Schelling and Halperin (1985) describe the unfortunate tendency of scholars to suggest that the rational response to uncertainty about intentions is to reduce uncertainty about capabilities. They explain how many believe erroneously that because "estimates of each other's *intentions* will necessarily be uncertain, measures reciprocally to reduce *capabilities* for preclusive attack may help both" (Schelling and Halperin 1985, 13, emphasis mine). They further lament what they see as a detrimental preoccupation with limitations to capabilities as the goal of arms control:

There has been a tendency since SALT I to focus on numerical limitations across the board rather than on banning specific systems or seeking to prohibit particular qualitative improvements that would make war more likely. There is also a tendency to seek agreements for their own sake whether or not they reduce the risk of war in specific ways and to deplore new deployments simply because they make agreements more difficult (Schelling and Halperin, 1985, xii).

For Schelling and Halperin, the Anti-Ballistic Missile (ABM) Treaty represents the gold standard of arms control, inasmuch as the defensive systems the agreement limited are capable of increasing the risk of a first strike. The ABM Treaty restricted the U.S. and Soviet Union to one defensive system each, reducing the incentive to strike first, with the added benefit of preventing an arms race designed to amass capabilities to overrun the capacity of these systems.

All told, Schelling and Halperin's methods suggest a more nuanced approach to goal setting for arms control, beyond a parochial adherence to quantitative reductions. They explain: "The overall level of potential destruction might be substantially reduced by arms arrangements that did not focus on numbers and sizes of weapons *per se*" (Schelling and Halperin 1985, 18). States should instead seek to directly reduce the threat of war by reducing the incentives that lead to war, rather than by necessarily reducing national capabilities. These incentives should be determined by the nature of military technology of concern and military expectations.⁶

Joseph Nye's work (1985) also supports the idea that weapons reductions are not necessarily the best path to lowering uncertainty about security. The choice of the best method for reducing the threat of nuclear war depends on an understanding of all the possible paths through which a nuclear war may begin (Nye 1985, 10). Nye describes five paths to the onset of a nuclear war:

⁶ They suggest that invulnerable retaliatory systems would work better as a deterrent and might also lead to reductions in number naturally.

escalation from a conventional conflict, preemption during a crisis situation, accidental or unauthorized use, initiation by a third party, and surprise attack.

Reducing the likelihood of nuclear conflict resulting from escalation, for example, necessitates arms control that results in maintaining a balance of forces to ensure mutual perception of equivalence, as well as the use of additional tools like crisis prevention management, the hardening of nuclear forces, and improved command and control. However, reducing the likelihood of nuclear conflict initiated by a third party requires arms control that yields significant reductions in the number of nuclear weapons worldwide. This would inhibit nuclear proliferation, which can facilitate a rogue actor's tampering with or theft of a nuclear weapon. Assistance on crisis prevention or management would also be useful in this context.

In setting goals for arms control, we must also pay attention to the uncertainty about security that results from uncertainty about intentions, independent of uncertainty about capabilities. Donald G. Brennan uses U.S. assessments of Soviet intentions throughout the 1960s as evidence of this need. Brennan writes: "We ourselves do not know how we might respond to certain crises or provocations, and the Soviets do not know in detail just what actions they would take in support of their national goals" (Brennan 1961, 31).

Similarly, Schelling and Halperin's work is consistent with the notion that a reduction of uncertainty can come from many sources beyond the characteristics of nuclear capabilities on both sides, including better information through improved military coordination and information sharing. In the language of decision theory, we could say: the reduction of capabilities alone does not adequately mitigate the effects of all sources of uncertainty that arise during arms control negotiations, but that provisions for more complete information lead to more effective decision-making.

Decision Theory and the Study of State Behavior. Another line of research within the IR literature focuses on interpreting state behavior by incorporating early insights from the decision sciences. These generally descriptive approaches tend to elide over the technicalities of risk in applying decision theory to the study of state behavior. Work in this vein often employs a kind of layman's interpretation of the concept of risk, eschewing the use of formal risk assessments, and relying on categories of gains and losses instead. This coarser use of the concept of risk—generally imprecisely or not quantified "potential losses"—is frequently employed by approaches that work to apply expected utility and prospect theories to state behavior (Farnham 1992, Farnham 1997, 1997b; Kanwisher 1989; Levy 1992, 1997; McDermott 1992, 1998; McInerney 1992).

The use of this kind of less formal interpretation of risk has led to the recommendation that states avoid potential losses during negotiations through the use of "risk reduction" and "threat elimination" strategies in order to achieve stability and security. Legal scholar Richard B. Bilder (1981), for example, identifies the many risks associated with entering into international agreements and creates a kind of typology of losses, or areas of potential loss. He also uses risk to refer to the potential losses associated with reaching an international agreement (regardless the availability of information about probability) and then makes recommendations based on eliminating those risks. For arms control, he advocates risk reduction and threat elimination in order to limit the likelihood of potential losses. For arms control, this means setting goals for

treaty negotiations that consist of establishing thresholds or ceilings, or reducing holdings of weapons or arsenals because lowering numbers lowers potential destruction.

Although Bilder's typology of potential losses is helpful, he also implies that a kind of straightforward utility maximization will necessarily lead to the optimal outcome. To minimize losses through risk reduction, Bilder writes: "a nation may reduce its risks by limiting the size or scope of its agreement with another nation" (Bilder 1981, 43). As a description, his words are accurate: states often do seek to minimize risk through related strategies.^{7,8} But, that's not to say that states *should* do this. Without information about probability, risk cannot provide prescriptive guidance. Bilder can't actually make recommendations for best practices based on the presence of risk. This kind of approach to forming best practices for negotiation actually tends to facilitate reaching an agreement under conditions of high uncertainty, but not necessarily a good, durable and robust agreement. [My unpublished data.]

These kinds of layman's approaches to risk skate over the ways in which uncertainty *affects* or determines behavior. Not only do decision-makers try to manage risks through arms control, they are also affected by missing information. Generally, when probability information is missing, people respond in a manner that can be technically "irrational," but variably systematic. As argued above, probability information is actually often missing or held in low confidence during arms control negotiations.

Problems with avoiding the ways in which uncertainty affects behavior also tend to arise when applying concepts from decision theory directly to state behavior because processes for generating foreign policy and processes for generating human decisions are fundamentally different. The bureaucratic structure of the processes that provide guidance for setting goals for arms control often impedes the straightforward use of this kind of estimation process. Choice options are often ultimately determined by interagency consensus or accommodation. Finally, while state leaders often make decisions using likelihood estimates from the intelligence gathering and analysis processes, these processes are subject to their own biases (Jervis 2010, 158-160).

A Role for Uncertainty in Arms Control Theory

Game theory and game theory-inspired approaches to the study of state behavior reveal a discomfort with (or a reluctance to accept) the fact that uncertainty is present and even pervasive when making decisions. When we rely on risk estimation to essentially "get out" of uncertainty, we collapse uncertainty into risk. This is not a good idea in security-specific scenarios because it obscures aspects of the scenarios that contribute to uncertainty, idiosyncrasies that can determine

⁷ Indeed, there is evidence that states do this somewhat systematically for high uncertainty type negotiations. Barbara Koremenos (2005) reveals that for security negotiations, all of which she categorizes as "high uncertainty," states tend to sign onto agreements of shorter durations.

⁸ Bilder himself acknowledges the distinction. "While risk presupposes uncertainty, uncertainty does not in itself necessarily involve risk. Thus, a nation will often be uncertain as to whether another nation will perform its obligations under an agreement or as to other events relating to the agreement. But these uncertainties will not in themselves involve risk unless, under the most pessimistic assumptions, a nation's participation in that agreement could result in that nation's experiencing a net loss, leaving it in a worse position than if it had not entered into the agreement" (Bilder 1981, 13).

outcomes, and the patterns of behavior that characterize responses to uncertainty under these conditions. Security scenarios are necessarily and unavoidably too complex to be reduced in this way. In many cases, understanding a risk is impossible—it can neither be quantified, nor calculated.

Other scholars have also observed that risk is not an appropriate concept in political or security scenarios. In his book on models of politics and uncertainty, Claudio Cioffi-Revilla (1998) argues that “ubiquitous” uncertainty plays a defining role of political life, which is composed of “non-linear” political events. Indeed, Cioffi-Revilla explains that absent an understanding of how to treat this uncertainty, “politics is reduced to a system of utilitarian reductionism” (Cioffi-Revilla 1998, 13). Mitzen and Schweller (2011) have also argued that the risk model frequently employed by IR scholars does not accommodate this kind of fundamental uncertainty. And, Barry O’Neill (2001) has argued that scholars are forced to make unjustified assumptions about the “inflection points” of states, which forces the division of all potential outcomes into gains and losses for the purpose of applying prospect theory, which describes individuals’ risk preferences for choice options over a range of gains and losses while under risk, to state decision-making. In other words, the concept of a state’s “decision-making inflection point” is an awkward and unnatural fit.

Because international arms control negotiations take place under conditions that more closely resemble uncertainty than risk, a risk-based approach (and risk-reduction strategy) can be detrimental to crafting durable agreements that are able to manage uncertainty effectively. Instead of avoiding or collapsing out of uncertainty, we would do well to embrace it. Best practices for arms control should be derived from alternative assumptions—ones that rely on “uncertainty” instead of risk.

In order to get a better understanding of how the goals we set for arms control can be most effective in the long run, we need, first, to understand the effect of uncertainty on the negotiation of arms control agreements. Negotiations are generally an ideal setting in which to study the effects of uncertainty, because states frequently negotiate to reduce or get out of uncertainty. Realist IR theory offers a well-known explanation for why there is so much uncertainty in international affairs: the international system is anarchic with no discernible hierarchy (order) or system for the enforcement of rules. This is the root or structural cause of uncertainty (Waltz 1959). Additionally, the social world and international relations within it can be exceptionally complex, erratic, and volatile. These factors augment the uncertainty from which states seek relief. IR theory describes how states seek to reduce uncertainty about adversaries’ capabilities and intentions, in particular, by filling in missing information over the course of the negotiation process.

Research on decision theory shows how individuals often use decision-making shortcuts when forced to make decisions under conditions of uncertainty, which can result in biased estimations and responses. The project at hand, however, is not to look for evidence of the same kinds of shortcuts and biases in state behavior. This paper instead seeks out the patterned responses to various conditions of uncertainty that are specific to arms control negotiations and the security environments that motivate the need for them. For arms control, uncertainty comes from numerous sources, including: 1) factors endemic to arms control security situations; 2) the negotiation process itself; 3) the external, global environment; and 4) from the structure and format of the negotiations. Each is considered below.

Endemic Sources of Uncertainty. There are a number of factors endemic to arms control negotiations and security situations that contribute to uncertainty. These include: 1) uncertainty about capabilities and intentions; 2) general complexity and calculation intensity, which have many contributing factors; and 3) difficulty estimating gains and losses.

First, states enter into negotiations when they are uncertain about the capabilities and intentions of other states. This may mean states are unsure about another state's inventory of weapons, or whether other states intend to use the weapons they have.

Second, arms control and security negotiations can actually be more complicated and calculation-intensive than other types of international negotiations. Not only may states be uncertain about another state's holdings or intention to strike, policy-makers and analysts may also struggle to quantify security improvements. Mitzen and Schweller (2011) describe how large quantities of information make it difficult to process all relevant information in security scenarios. This "calculation complexity"⁹ can make states uncertain about how to: a) quantify inventories, b) compare weapon effectiveness, and c) calculate parity across the arsenals of different states/variable weapons systems.

Difficulty comparing weapon effectiveness, in particular, presents a challenge for calculating military strength. Negotiators can have trouble, for example, grasping the units of measurement associated with the degree and effect of yield of nuclear bombs. This affects their ability to estimate the effects of megaton-class weapons (Brennan 1961, 33). Likewise, defensive weapons pose a unique problem for calculating security. While the destructive power of most weapons is, in theory, estimable, the potential gains that would result from the use of defensive weapons in their own arsenal to limit damage can be relatively more difficult to estimate.^{10, 11}

Moreover, calculating parity for weaponry, or the "functional equivalence" essential to deterrence, can also present difficulty when weapons differ across negotiating parties. For example, both U.S. and Soviet negotiators were uncertain about how many Soviet SS-20s were equivalent to one U.S. Pershing missile, and negotiations stalled. In general, these factors contribute to the difficulty of comparing one state's holdings to another, which makes determining relative strength and what constitutes parity difficult.

Finally, gains and losses are difficult to calculate in security-specific situations, particularly when the estimation of the outbreak of conflict is involved. There is often no good method for estimating the kinds of outcomes that arms control negotiations are intended to help prevent, which makes setting goals for arms control negotiations even trickier. This difficulty calculating

⁹ While the concepts of uncertainty and complexity are distinct, the two concepts are highly associated with one another. For Pamela Chasek, complexity results from conditions of uncertainty. Complexity in the context of international negotiations, therefore, can be "created under conditions of uncertainty, when information needed for decision making is difficult or costly to obtain or is simply unavailable" (Chasek 1997, 442). For organizational theorist Frances Milliken, the concepts of uncertainty and complexity are actually one and the same: complexity (along with volatility and heterogeneity) makes environments, and therefore future states of the world, less predictable, causing individuals to perceive greater uncertainty in these kinds of environments than in more stable ones (Milliken 1987, 137). The approach taken here is consistent with Milliken's.

¹⁰ This was the case for discussions over antiballistic missile technology during the SALT I talks.

¹¹ Despite cuts to offensive strategic weapons, this is one justification for continued development of ABM technology—to hedge against the rapid change of offensive technologies, despite these cuts. This was an issue during Reagan and Gorbachev's discussions during the Reykjavik Summit.

future gains and losses can cause negotiators to pursue short-term gains that may prove detrimental in the long term. Donald Brennan sums up well the conundrum this introduces: “Both the hazards [arms control] may protect us against or reduce and the hazards it may introduce are often subtle, complicated and difficult to understand” (Brennan 1961, 32).

Sources of Uncertainty from the Negotiation Process. In addition to endemic sources of uncertainty in potential arms control scenarios, the negotiation process itself can inject a dose of uncertainty, augmenting a state’s perceived vulnerability or susceptibility to loss. Factors associated with the negotiation process that can augment uncertainty include the following: 1) doubt over the trustworthiness of data presented; 2) suspicion that another state is using the negotiations to either extract information (has sinister intentions); or 3) suspicion a state is using the negotiations to codify asymmetry in their holdings (and generally lacks the intention to reach a mutually beneficial agreement). The first Strategic Arms Limitation Treaty (SALT I) talks, in particular, were plagued with these doubts and suspicions.

Fourth and finally, the structure and format of arms control negotiations can contribute to complexity at the negotiation table. Factors like the participation of a large number of negotiating states, the inclusion of numerous substantive issues on the agenda, or issue linkage contribute to heightened complexity and have the capacity to augment uncertainty and its impact on the negotiation process (Chasek, 1997, 442).

Sources of Uncertainty from the External Environment. Factors external to the arms control negotiation process and nations’ security scenarios can also add uncertainty to the negotiation process: environmental factors have the potential to affect the future in a way that impacts the anticipated benefits of any agreement. Although the ideal would be for any negotiation to be able to “limit the free play of certain variables in the future,” explains negotiation scholar Gilbert Winham (Winham 1977, 94), certain factors are beyond the scope of what can be controlled or managed. These environmental-uncertainty-contributing factors include: 1) regional and economic volatility, 2) potential for regime change, and 3) technological change.

First, regional or economic sources of volatility, like another state’s involvement in a conflict external to the negotiations, can create uncertainty that hinders the pace of the negotiations and the agreement ratification process. For example, although SALT II negotiators reached an agreement, the U.S. did not ratify the resulting treaty due to uncertainty stemming from the Soviet invasion of Afghanistan, which the U.S. perceived to be destabilizing.

Second, uncertainty about who will lead in the future can influence a state’s goals for arms control negotiations. Reagan referred to this kind of uncertainty on the margins of his negotiations with Gorbachev during the Reykjavik Summit when he sought to take negotiations over his defensive weapons program (strategic defense initiative, or “SDI”) off the table. “Who knows?” asked Reagan, in explaining his refusal to place limitations on SDI, “Governments change” (Reagan 1990, 678; Reykjavik Transcripts).

Third, changing weapons technology can make it difficult to set goals for arms control negotiations. “Technology creep,” rarely appears in the discourse about the effect of uncertainty on capabilities, yet it could alter the strategic landscape and drive competition for new weapons

(Newhouse 1978).¹² Winham described the significance of increasingly rapid changes in military technology for both arms control negotiators and society as a whole at the height of the Cold War in 1977:

Negotiators today spend more time discussing technology than did their predecessors because technology—whether it takes the form of information systems, industrial processes, or nuclear weapons—has a proportionately greater impact on human existence now than it did in the past. And technology is in a state of rapid change, often at an exponential rate; it creates an enormous problem of comprehension and adaptation for contemporary society” (Winham 1977, 88).

Uncertainty about the Security Benefits of the Agreement Reached. Aspects of the agreements themselves, once reached, can also heighten uncertainty about security. This occurs, for example, when treaty terms “[set] lower levels of arms than would otherwise appear prudent based on a strict threat assessment” (Larsen 2002, 5). Additionally, when states commit themselves to a legally binding agreement with other states, most commonly in conjunction with verification measures, they must at some level trust other states to uphold a kind of mutual and reciprocated cooperation. In this way, they become dependent upon other states for their own national security and self-preservation.¹³ This trust cannot be taken for granted and leaders and negotiators may experience uncertainty about whether negotiating partners will sincerely implement and uphold an agreement, rather than cheat, withdraw, or fail to ratify.

Consequences of Uncertainty for Arms Control

Having discussed the types of uncertainty likely to affect arms control negotiations, we can now turn to understanding uncertainty’s effects. To determine the effect of uncertainty on arms control negotiations, we can first consider how individuals behave under uncertainty with the aim of identifying some signposts of decision-making under uncertainty. Regardless of what causes uncertainty, individuals tend to respond to it in particular ways—largely systematically, albeit individually. States or delegations do something analogous, although highly specific to their security environment, bureaucratic structure, and the kind of information that is missing.

The Ellsberg Paradox¹⁴ is a classic economic thought experiment that illustrates the consequences of making decisions under uncertainty. It reveals how people avoid choosing options that are “ambiguous,” or that are missing information about probability when a potential loss is possible. People tend to prefer “risky” ones instead, which have probability information available. This is true even though the availability of probability information doesn’t necessarily make the most desired outcome more likely. In this way, choice options that lack information about probability are perceived as less desirable options.

¹² This was a factor during SALT I with MIRV technology, for example.

¹³ An analysis of cooperation under anarchy is beyond the scope of this paper. For further information on the subject, see Jervis 1978 and Wallander and Keohane 2002.

¹⁴ The Ellsberg Paradox reveals how missing information about the actual distribution of red and black balls in an urn of 100 balls causes uncertainty in the decision-maker. The decision-maker can *interpret* or *judge* the likelihood of choosing a red ball in any one of a number of ways (from 0 to 100 reds). Each of these potential red-ball-configurations corresponds to a potential state of the world (Ellsberg 1961).

When a more certain choice option is not available and people are *forced* to choose from ambiguous choice options, they tend to delay or avoid making a decision altogether. When delaying is not an option and people are forced to choose from the ambiguous options available, they tend to rely on heuristics, which are decision-making rules or shortcuts, in order to make the most accurate judgments possible.

It is believed that the three decision-making shortcuts most commonly used under ambiguity are: “representativeness,” when a person judges that the probability that one object or event belongs to a particular category based on similarity; “availability,” which relies on the strength of associations in memory or imagination to make a prediction; and “anchoring and adjustment,” which is the formation of predictions based on initial values insufficiently adjusted to new information (Kahneman, Slovic, and Tversky 1982).

Just as the decision sciences have revealed how people delay, exhibit implicit biases, and rely on the use of heuristics under conditions of uncertainty (Ellsberg’s ambiguity) (Tversky and Kahneman 1974), political scientists have argued that the same pattern appears to be true for decisions and behaviors associated with improving the security of states (McDermott 2001, Kanwisher 1989).¹⁵ Precision of concepts and levels of analysis are key here: biases and heuristics occur at the level of individual decision-making, and are evident at particular points in the decision-making process. The sources of uncertainty relevant to arms control (identified above) effect notable, patterned responses that are evident across negotiations.

During arms control negotiations, missing information about capabilities and intentions results in uncertainty about security. Consequently, to establish goals for arms control negotiations proposals and agreements, decision-makers and negotiators use “security-specific heuristics” to anticipate the outcomes of a potential conflict. These security-specific heuristics include “worst-case scenario thinking,” “limited-theater-of-war thinking,” and “low-dimension (non-complex) scenario thinking.” All are prominent during the negotiation of arms control agreements; each is described in turn.

Worst-Case Scenario Thinking. Individuals who set goals for arms control negotiations tend to rely on the use of worst-case scenarios to identify specific potential losses or threats. These include outcomes that result in devastating losses like those suffered from a surprise attack, for example. The potential for suffering the losses from a nuclear attack leads to similar planning. It is difficult to think of a nuclear war as a “limited war,” and therefore difficult to anticipate *non-worst-case-scenario* outcomes. George Brennan explains that people are “disinclined” to do so as a result of the imagery of human destruction associated with atomic bombs, and find it abhorrent to describe such large-scale human devastation in any kind of limited terminology.

Worst-case scenario thinking can also inspire fears that lead to extreme positions or biases. Steven Kull provides an illustration of this kind of “doomsday thinking” in his discussion of President Dwight D. Eisenhower’s efforts to grapple with the new reality posed by nuclear weapons during the 1950s. Eisenhower said:

¹⁵ Suboptimal approaches to establishing goals are largely implicit or subconscious.

Atomic War will destroy civilization... If the Kremlin and Washington ever lock up in a war, the results are too horrible to contemplate... It would literally be a business of digging ourselves out of the ashes, starting again (Kull 1990, 6).

As a result of this concern, Eisenhower came to advocate for unilateral reductions to the U.S. nuclear arsenal, independent of Soviet commitments to reduce the size of theirs. An alternative, and perhaps more measured approach, would have been to maintain arsenals at parity, which would have had the added benefit of being consistent with the logic of deterrence theory and thus perhaps more stabilizing. Unilateral reductions, in this way, are an example of the biased policy recommendations that can result from the use of worst-case scenario thinking about nuclear weapons.

Limited-Theater-of-War Thinking. Limited-theater-of-war thinking refers to the use of scenarios involving the limited use of weapons, specific categories of weapons, or a geographically contained conflict. This kind of compartmentalized thinking commonly occurs when decision-makers look to manage the threat of conflict—it can lead to a focus on the use of particular weapons. During the Reykjavik Summit, for example, President Ronald Reagan and General Secretary Mikhail Gorbachev sat face-to-face and debated the reduction of missiles based on scenarios involving the exclusive use of these particular nuclear weapons—as if no other weapons would be deployed in a conflict that went nuclear. Entire sets of weapons, such as Britain’s and France’s intermediate range weapons in Europe, were mentally set-aside during the negotiations, and left out of the tally of total weapons to be reduced. Though the decision to omit these weapons from the negotiation agenda may have been, in part, politically motivated, evidence suggests that their possible addition was making the negotiation space overly complex and too difficult for making the expedient progress called for in the two-day summit.

This kind of compartmentalized thinking—which ignores the likelihood of escalation from conventional to nuclear threat under high uncertainty and high-tension situations, for example—leads to establishing thresholds for particular categories of weapons, rather than across a full range of capabilities. Such practices are not advantageous for achieving long-term security goals because they fail to manage additional sources of uncertainty that can derail security agreements—like escalation. It is interesting to note that the Conventional Forces in Europe (CFE) Treaty only limits conventional arms because efforts to establish a parity of forces across both conventional and nuclear weapons failed miserably during the long drawn-out precursor Mutual and Balanced Force Reduction (MBFR) Talks.

Likewise, the changing or evolving nature of weapons technologies is frequently ignored in arms control negotiations, which has negative impacts on decisions made about agreements. Legal scholar Edwin Smith discusses the downside of this: “Static arms control provisions become obsolete because they fail to provide for changing weapons technologies,” he writes (Smith 1991, 1562).

Low Dimension (Non-Complex) Thinking. Finally, the inability to compare a state’s own capabilities with those of another state can result in uncertainty about how to achieve parity due to the complexity of the calculation required for this comparison. Robert Jervis explains that this can lead to a kind of preoccupation with the number of weapons each side may have, as well as a focus on who is trailing whom by how many (Jervis 1993, 350). An effort to “simplify the complex negotiating space” tends to lead to setting thresholds for weapons holdings.

In addition, the complexity of security scenarios involving weapons can make calculating potential gains (benefits) and losses (costs) exceedingly difficult. Decision-making scholar Arild Underdal writes: “The calculus of benefits can in some cases be so complex that only very crude estimates can be given” (Underdal 1991, 110). Jervis likewise explains how the effort to overcome difficulty with calculations about gains and losses in a future state of the world leads to a focus on states’ holdings:

In general, it is very difficult to estimate what would happen in the event of a war—the ‘outputs of the weapons.’ The interaction of what each side will do is terribly complex. It is much easier to measure the ‘inputs’—what weapons each side has—even though the relationship between inputs and output is tenuous (Jervis 1993, 351).

Risk Reduction versus Uncertainty Management

Use of the shortcuts detailed above can result in biased responses. The codification of potential outcomes as risks (which have precise probability estimates) causes decision-makers and negotiators to establish goals for arms control that are aimed at lowering these risks (or the probability of potential losses).

This desire to lower the likelihood of potential losses can lead negotiators to employ risk reduction and threat elimination strategies for negotiations. These strategies, in turn, result in negotiation goals and proposals that include the following: 1) setting thresholds for existing weapons; 2) eliminating whole categories of weapons; 3) focusing on the ability of verification regimes to reduce risk of defection; and 4) limiting scope, scale, and duration of agreements. Interestingly, these goals may facilitate reaching an agreement by narrowing the dialogue of the negotiations to focus on precise, substantive, and easily quantified targets. However, I argue that durable, long-term agreements actually require the effective management of uncertainty rather than the effective limitation of the likelihood of potential losses—even though the latter objectives can make it easier to reach an agreement.

Not only do arms control treaties require the effective management of uncertainty about capabilities, they also require the effective management of additional sources of uncertainty, which is why risk reduction strategies are not effective in the long run. A good model for this kind of uncertainty management comes from the field of organizational behavior. Whereas individuals tend to avoid uncertainty, firms, by contrast, tend to actively engage with it in order to manage it. They do this by identifying and prescribing ways to reduce or absorb the negative consequences of uncertainty about the future state of the world, under “state uncertainty” (Milliken 1987). The effective management of state uncertainty is considered critical for both organizational stability and firm performance (Perminova *et al* 2008).

For individuals, uncertainty about the future state of the world makes it difficult or even impossible to go through the steps of a linear decision model that relies on risk. Likewise, missing information about probability is responsible for a variety of outcomes associated with firm behavior. At the firm level, the behavioral consequences of state uncertainty are said to include: “muddling through” (Lindblom 1959); the use of the garbage can or multiple streams model (Cohen, March and Olsen 1972); and protective responses, such as hedging against loss,

preventing loss (avoiding committing resources), and doing anything that may diminish firm vulnerability (Milliken 1987).

We see something like these kinds of organizational responses to uncertainty at the level of the state in some security situations. Consistent with the multiple streams model, Gilbert Winham has described the “proliferation of bureaucracy” to create structure under uncertainty (Winham 1977, 93). Wallander and Keohane (2002) also describe how cooperative security regimes deal with these issues: security institutions evolve in response to changing threats, which keeps security regimes relevant and durable. Brian Rathbun (2007) also explains how international organizations reduce uncertainty for states by providing “technical knowledge” about the complex international system in which they function. Arms control negotiations and agreements can serve a similar function for the related security concerns by providing effective “uncertainty management,” or the successful management of multiple sources of uncertainty in the long run.

Uncertainty management in arms control, can be achieved through a variety of measures that already exist as best practices for international negotiations writ large. These measures are discussed in their likely order of use.

First, prior to coming to the table, David Lax and James Sebenius advise the consideration of possible unknowns. Although people tend to carefully consider all available information, they often fail to consider future confounding factors. Lax and Sebenius explain:

Parties should anticipate the possible later problems. They should carefully analyze the chances of self-destruction from considerations of ex-post unfairness, surprises, new information, illegitimacy, or changed alternatives. They should compare the value of continued agreement for all parties with the value of alternatives to continued agreement under a variety of possible contingencies” (Lax and Sebenius 1989, 289).

In essence, Lax and Sebenius advise a kind of advanced scenario planning—beyond the scope of military strategy.¹⁶ Some might refer to this as a consideration of “unknown unknowns” in addition to a full spectrum “known unknowns” (Daase and Kessler 2007).

Other prescriptions for uncertainty management in international negotiations address the negotiating process itself. Winham, for example, suggests that “process” be privileged over “outcome” in international negotiations through the use of a strategy that consists of a kind of trial and error search, which can be used to distill out salient information and organize existing knowledge (Winham 1977, 97 and 101). He further explains:

The principle problem for contemporary negotiators is not to outwit their adversaries, but rather to create a structure out of a large mass of information wherein it is possible to apply human wit (Winham 1977, 89).¹⁷

¹⁶ Such tactics are actually quite rare in arms control negotiations, for which incidents of noncompliance evoke little reaction (Smith 1991), likely due to a lack of anticipated consequences and countermeasures.

¹⁷ It follows that negotiations that are guided by an estimate or desired outcome would not do very well. It also implies that use of “hard bargaining” techniques that are thought to be so successful in inducing patterns of concessions are not likely to be optimal in these situations. . . the search for information, however, is. Winham advises that the “development of common perceptions” ought to supersede the “exchange of concessions” in the process of negotiations. When this process goes well, therefore, we would not expect to see the patterns of compromise and convergence advocated by some negotiation scholars (Winham 1977, 100, also citing Iklé and Leites).

There is evidence of the use of negotiation as a process designed to reduce uncertainty from President Gerald Ford's meeting with Soviet leader Leonid Brezhnev during the 1974 Strategic Arms Limitation Talks (SALT II) in Vladivostok, for example. The U.S. position was to use the negotiation to acquire information about the composition of the USSR's arsenal (and what would constitute parity to U.S. forces) at the cost of an agreement designed to ensure security. The leaders were able to establish an understanding conducive to crafting a basic framework for the SALT II agreement that was characterized as a "major breakthrough" (although their meeting did little to manage the threat of Soviet first strike, according to hardliners) (Newhouse 1989, 300). Despite this, the U.S. bureaucracy opted to pursue the agreement in order to try to curb the threat, which would later be subject to further "erosion," they argued, via future efforts and agreements (Newhouse 1989, 300).

Dynamic Obligations. Even when we privilege process over outcomes and treat negotiation as a forum conducive to the search for more information, we must still identify goals for treaty-making—parties must come to the table with substantive proposals for negotiations to continue. Recommendations for uncertainty management, therefore, are also directed at goals that states pursue and the terms to which they agree during arms control negotiations. One guiding principle for establishing goals for arms control that are consistent with uncertainty management is to establish "dynamic obligations." Legal scholar Edwin Smith explains that treaty making includes adequate provisions for uncertainty management when the resulting agreements are structured to allow for "evolving commitments" that permit adaptation to "uncertain or unpredictable circumstances" (Smith 1991, 1549). The dynamic international obligations that result from agreements that are "structured to allow consensual changes in the obligations imposed in order to fulfill the object of the treaty in *uncertain* conditions" (Smith 1991, 1557, emphasis mine).

The need for dynamic obligations thus arises directly from conditions of uncertainty. For Smith, uncertainty leads to the desire to "mutually adjust commitments while maintaining a shared perception of reciprocal responsibility" (Smith 1991, 1557). He explains that agreements crafted this way are more durable, and therefore conducive to future cooperative endeavors (Smith 1991, 1560). In this way, the use of dynamic obligations for setting treaty-making goals results in more successful agreements, because they allow for the relationship between treaty parties to evolve naturally. Dynamic obligations can help facilitate reaching agreement if all parties see how the potential agreement will be more beneficial in the long run.

Lax and Sebenius (1989) would seem to concur. In their discussion of how flexibility leads to more durable agreements they write:

Perhaps the most effective contingent mechanism is a long-term relationship in which the parties trust each other. Needed changes can be renegotiated in the context of their many dealings over time (Lax and Sebenius 1989, 288).¹⁸

Lax and Sebenius (1989) would also appear to agree with the notion that uncertainty is prevalent in these situations:

¹⁸ If this notion were true, we would expect that the U.S. and Russia would develop increasingly robust agreements over time. Alternatively, we might instead expect changes in leadership and environmental uncertainty to continue to have the capacity to derail agreements, despite the trust and confidence that come from long-term cooperation.

Change is a given,” they write, and “the environment, the organization, the needs of other actors, and all manner of unforeseen circumstances can sometimes require that agreements be modified. *Renegotiation may be avoided if the initial agreement includes a way to handle unforeseen contingencies* (Lax and Sebenius 1989, 287, emphasis mine).

Lax and Sebenius (1989) also suggest that measures that allow for this kind of flexibility include mechanisms for dispute resolution through an arbitrating body, or the use of issue linkage and contingencies (see below).

Limited Versus Comprehensive Agreements. The scope of arms control agreements can range from “limited” (narrow) to “comprehensive” (broad). Agreements that function solely to establish thresholds for capabilities are often characterized as “limited.” As one might expect, comprehensive approaches tend to cover more ground, or have a broader scope. According to George Brennan, limited agreements may be ineffective because they seek to “examine current and projected armament policies, to isolate their major unnecessary hazards, and to attempt to reduce or eliminate these, one at a time, leaving the basic armament policies largely unchanged” (Brennan 1961, 37). For Brennan, absent a change in armament policies, agreements like these actually do little good towards improving the security situation. For an arms control agreement to be adequately comprehensive, Brennan argues, it must meet the following criteria:

[It must] attempt a survey of the basic requirements for armaments to implement the various types of deterrence that must be provided for the participating nations, and to adjust all types of armament to fit these basic needs in such a way as to give *maximum net security* (Brennan 1961, 38, emphasis mine).

Such agreements are more effective in the long run though more difficult to negotiate.

Limited arms control agreements can be useful for achieving certain goals like inhibiting the use of existing armaments, functioning as a kind of targeted deterrence or dis-incentive. This may be useful, according to Richard B. Bilder, in dealing with conflicts involving escalation or “catalytic nuclear war,” which are conflicts initiated by the provocations of a smaller power. However, he cautions that: “Such ceilings can work only when the competitive situation can be defined in terms of numbers alone” (Bilder 1981, 86). This would seem to be a rare scenario. Limited agreements are also useful for nonproliferation because they hinder the ability of nuclear weapons to spread to non-nuclear powers (Bilder 1981, 86), and for reducing costs associated with larger arsenals.

While the minimization of potential losses associated with limited agreements would seem to point to specific, detailed, pared-down outcomes (per risk reduction practices), the paradox is that successful security ambitions actually require broad, comprehensive agreements to manage uncertainty.

Duration provisions. Much like an agreement’s scope, its duration can also present a real dilemma for arms control negotiators. A treaty with a potentially long duration means a state must tie its hands for a longer period. A longer duration can also heighten uncertainty during negotiations by lengthening the shadow of the future and increasing opportunities for cheating or defection as a function of time elapsed. Perhaps this is why high uncertainty negotiations tend to

be correlated with treaties of shorter durations.¹⁹ The shorter durations may limit risk or potential loss (Koremenos 2005).

However, shorter agreements designed to limit risk do not tend to manage multiple, specific forms of uncertainty effectively and are not necessarily conducive to obtaining goals of long-term peace and stability. At best, they may be viewed as short-term trust-building measures. At worst, they can be seen as Band-Aid agreements with limited utility. Alternatively, they may function merely as temporary provisions when states have the intention to renegotiate later on. In some cases, though, shorter and limited agreements may be the best for which one can hope.

Special Tribunals. In recent years, it has become increasingly common to establish special tribunals for the purpose of maintaining formal agreements, resolving ambiguities, and dealing with non-compliance issues for arms control treaties. Examples include the Standing Consultative Commission (SCC) for the ABM Treaty, the Special Consultative Groups (SCG) for the Intermediate-Range Nuclear Forces Treaty, the Joint Consultative Group (JCG) for the Conventional Forces in Europe Treaty, and the Open Skies Consultative Commission (OSCC) for the Open Skies Treaty.

An alternative mechanism for resolving disputes, in theory, could be the use of an international criminal court or general international tribunal. Traditionally, however, noncompliance with arms control treaties almost never results in adjudication through international courts or tribunals. The United States has historically instead sought to maintain “national control” over dispute management through direct state-to-state diplomacy or the use of these special tribunals (Smith 1991, 1563).

Such tribunals help facilitate dynamic obligations because they provide both the flexibility and control that help ameliorate or manage the effects of uncertainty. This feature is prominent in the effective use of the Joint Commission to resolve disputes and provided additional interpretation for the Joint Comprehensive Plan of Action (JCPOA or Iran deal).

Verification and Compliance Measures. Verification and compliance provisions comprise a set of treaty terms that are, by and large, unique to arms control relative to other kinds international agreements. They consist of provisions that allow states party to an agreement to “observe and evaluate the other parties’ behavior in relation to treaty obligations” (Smith 1991, 1563). As such, they provide early warning of cheating or aggression, and also minimize risks of defection by non-complying parties to an agreement (Bilder 1981, 119-120; Smith 1991, 1582). They also facilitate transparency on a regular, ongoing basis. Examples of such provisions include systems of inspections of states parties’ holdings, and protocols for the exchange of data concerning arsenals and advanced warning of military exercises.

Withdrawal Provisions. Withdrawal provisions detail how and under what conditions states party to an agreement may renounce their obligations. They do represent a double-edged sword for arms control: While withdrawal provisions facilitate dynamic obligations and help individual states manage their own uncertainty, the codified ability to withdraw from an agreement can

¹⁹ My empirical findings.

reduce trust between negotiating parties (Lax and Sebenius 1986, 288). This may, in turn, impact the likelihood of future cooperative agreements by augmenting uncertainty about cooperation.

The Anti-Ballistic Missile (ABM) Treaty is an example of an agreement with a withdrawal provision. Although the treaty was of unlimited duration, each party had the right to withdraw from the agreement if “extraordinary events” threatened its “supreme interests,” and provided notice of such six months prior to withdrawal. The U.S. did indeed withdraw from the ABM Treaty under President George W. Bush in 2002 in order to pursue plans for a global, layered missile defense system, which did not have a positive impact on the state of U.S.-Russian relations. President Barack Obama later scaled back those plans to pursue regional missile defenses, including the European Phased Adaptive Approach. Despite the downscaling (and Obama’s attempt at a “reset”), the Russians were still none too pleased.

Conclusion

In this paper, I’ve presented an argument for effective uncertainty management within and via arms control, allowing arms control to be used as a meaningful security tool. In so doing, the paper has identified the shortcomings of risk-based approaches and the challenges posed by the application of decision theory to state behavior. It has also revealed how a better understanding of uncertainty can help inform best practices for arms control negotiation. Ultimately, the paper suggests more fruitful approaches for reaching durable arms control agreements by means of uncertainty management, which consists of strategies and treaty-making goals for arms control negotiations and agreements predicated on the idea that uncertainty is pervasive and should be embraced.

Consideration of these issues is critical to a comprehensive vision for the future of security in which weapons play a role in determining that security. It is also necessary groundwork in the run-up to any potential future reductions, or arms control negotiations or endeavors of any kind. Arms control can continue to be an effective security tool for our time. But a truly skilled diplomat must be capable and artful in navigating the tradeoff between short-term goals that can facilitate reaching agreements and long-term ones that facilitate getting flexible, dynamic and adaptable ones that are durable and can stand the test of time.

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