1 *Introduction*

The history of international politics since 1945 is to a great extent the history of nuclear politics. A robust nuclear arsenal can obliterate an enemy's state and society in a matter of weeks, days, perhaps even hours. This staggering devastation potential is part of the background against which international politics are conducted. Considerations about nuclear weapons permeate diplomatic exchanges on a wide range of topics, from military deployments and alliance management, to technological cooperation, trade and economic integration, and even international finance. Above all, nuclear weapons have reconfigured the relationship between military power and international influence – in one word, they have reshaped statecraft. So profound is the transformation of world politics since the first nuclear device was detonated in the Trinity test of July 16, 1945, that we often refer to the historical period that started that day as the "nuclear" or "atomic" age. In the seven decades since their introduction, nuclear weapons have become the military equivalent of Adam Smith's "invisible hand": they regulate behavior, impose constraints, and shape preferences while remaining largely out of sight.[1]

The signal importance of nuclear weapons for international relations has gradually pushed one problem to the top of the U.S. foreign-policy agenda: nuclear proliferation.[2] From the inception of the nuclear age, the United States has been at the forefront of efforts to stymie the spread of nuclear weapons. In the domestic plan, the U.S. government has passed a wide array of legislation aimed at preventing the transfer

[1] For a contrasting view, see: Mueller (1989).

[2] By nuclear proliferation we mean "horizontal" proliferation, i.e., an increase in the number of political units (so far exclusively states) that possess nuclear weapons, not "vertical" proliferation, i.e., an increase in the capabilities of the political units that possess a nuclear arsenal, typically by building more or more sophisticated nuclear weapons. Throughout the book, we use "nuclear proliferation" interchangeably with "nuclear acquisition" and "nuclearization."

of sensitive nuclear technology to other states, going back to 1946 with the (McMahon) Atomic Energy Act. Internationally, the United States spearheaded numerous multilateral efforts aimed at limiting proliferation, also going all the way back to the Baruch Plan of 1946 and reaching its zenith in the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Furthermore, all through the nuclear age, Washington spent considerable effort engaging bilaterally with potential proliferators, friend and foe alike, attempting to lead them to abandon their nuclear aspirations in the military realm. Against unfriendly states, Washington has often contemplated preventive counterproliferation strikes.[3] High-ranking U.S. officials defended the need to attack the Soviet Union before it would acquire nuclear weapons – which it did in 1949.[4] Less than two decades later, U.S. officials considered a strike on the Chinese nuclear program.[5] After the Cold War ended, proliferation concerns led President Bill Clinton (1993–2001) to the brink of war with North Korea in 1994, were central to President George W. Bush's (2001–2009) case for invading Iraq, and pressed grave dilemmas on President Barack Obama (2009–2017) concerning Iran.[6] When dealing with U.S. allies, Washington has also vigorously tried to persuade and, when necessary, coerce most of its protégés not to nuclearize, either by making additional commitments to their security or by bluntly threatening to abandon them.

Today, it is difficult to identify a tenet of U.S. foreign policy more solid than the belief that nuclear acquisition by any state is intrinsically bad for U.S. interests and should be avoided at all costs, if necessary by threatening allies with abandonment and adversaries with

[3] For the purposes of this book, we label "counterproliferation" any attempt to prevent a country from acquiring nuclear weapons by threatening it (implicitly or explicitly) with military action. In contrast, we label "nonproliferation" any measure designed to deter proliferation without the threat of military action. Whereas counterproliferation tends to be used vis-à-vis adversaries, nonproliferation is the usual approach toward nuclearization attempts by allied and friendly states.

[4] See: Buhite and Hamel (1990).

[5] See: Burr and Richelson (2000–2001).

[6] See: "President Delivers State of the Union Address," January 29, 2002, White House Archives. Available at: http://georgewbush-whitehouse.archives.gov/news/releases/2002/01/20020129-11.html. Last accessed: April 29, 2016; Lee and Moon (2003).

military force. All in all, nuclear proliferation remains one of the deepest concerns and thorniest problems facing the United States.

Questions and Puzzles

The historical spread of nuclear weapons is riddled with puzzles. To begin with, why does the United States worry so much about the spread of nuclear weapons when the pace of proliferation is so slow – indeed much slower than most predicted?[7] More than seven decades after nuclear weapons were invented, only eight other states possess them, of which at least three (Britain, France, and Israel) are U.S. allies – five, if one includes friendly states such as India and Pakistan. Among U.S. adversaries, only China, North Korea, and Russia possess the bomb. Why does Washington devote so much attention to a foreign-policy problem that materializes so seldom?

Relatedly, this small number of nuclear powers is the result of many states having eventually given up their nuclear development efforts. But if most countries ultimately stopped their nuclear program, why did they at one point or another engage in nuclear development? Besides the ten states that ultimately built nuclear weapons – the nine current nuclear powers plus South Africa, the only state that so far dismantled its nuclear arsenal – more than a dozen other countries have possessed nuclear programs with a military dimension at some point in time. Why did they start if they eventually decided to stop?

Furthermore, it is puzzling that although security is intuitively the foremost reason why a state would seek nuclear weapons, there are many states facing serious threats to their survival that have, nonetheless, remained nonnuclear. West Germany, for instance, despite having been until 1989 on the front line of the Cold War, never acquired nuclear weapons. Saddam Hussein's (1979–2003) Iraq, notwithstanding consistent security threats, also failed to acquire the bomb. South Korea has eschewed nuclearization even after the North went nuclear during the last decade. Taiwan has forfeited nuclear weapons despite dwindling U.S. security guarantees in the face of a mightier China. What accounts for these puzzling cases of nuclear forbearance? Why is it that although nuclear weapons are weapons of the weak, few weak states possess them?

[7] See: Yusuf (2009, 4).

Existing scholarship is unable to make sense of these puzzling patterns in the spread of nuclear weapons. In fact, these paradoxical patterns of proliferation have led the scholarly literature to practically discard security as the primary motivation behind a state's quest to develop nuclear weapons, and turn instead to non-security motivations for proliferation in an attempt to make sense of these puzzles. This in itself is perplexing, for nuclear weapons are, after all, weapons. Shouldn't we expect security considerations to be the foremost driver in states' decisions to build or eschew them?

To solve these puzzles of nuclear proliferation, we must go back to basics and once again ask the fundamental questions: Why do states acquire nuclear weapons? How does the security environment shape a state's decision to go nuclear? Are there particular strategic conditions that make states more likely to go nuclear? Conversely, are there strategic circumstances that make nuclear forbearance more likely? When is a nuclear power, such as the United States, more likely to be successful at preventing another state – friend or foe – from acquiring the bomb? Our book answers these questions in a manner that solves the puzzles highlighted in the preceding text.

The Argument in Brief

This book is based on one simple insight: nuclear proliferation affects the security of the state acquiring nuclear weapons, as well as the security of its adversaries and allies, which may attempt to prevent it. This observation entails two elements. First, nuclear proliferation is shaped by a process of strategic interaction involving the state that is considering the development of nuclear weapons, its adversaries, and, when present, its allies. Second, this process is shaped mostly by the security interests of the states involved. These are the two key wagers we make in this book.

A Strategic Theory of Proliferation

Our first theoretical wager, then, is that in order to understand nuclear proliferation we need a strategic theory, one that focuses on the interaction between all the states involved in, and affected by, the spread of nuclear weapons. To grasp the proliferation process, we must consider not only the interests of the state that is deciding

whether to build a nuclear deterrent, but also those of the states whose security goals would be affected by such nuclear acquisition. We must then combine the interests of all these parties during the period in which one of them is considering nuclear acquisition, and analyze how their strategic interaction conditions a state's decision to build the bomb.

In looking at the interaction between all these actors, we follow in the footsteps of David Lake and Robert Powell, who invite scholars of international relations to take "the *interaction* of two or more states as the object to be analyzed," seeking "to explain how this interaction unfolds," thereby recognizing "the strategic interdependence of actors."[8] Focusing on only one of these strategic actors cannot but yield a partial view of the proliferation process – a problem common to much existing scholarship on the topic, which focuses either on the incentives of the state contemplating nuclearization or on those of the states that try to oppose its nuclear acquisition. Nuclear proliferation is a process through which a military technology spreads as the result of a strategic interaction between the state that wants it and those that have a say in whether it will get it: its adversaries, which would face a loss in relative power; and its allies, which might lose some of their influence and face higher odds of entrapment. Our strategic theory focuses on the interaction of these three sets of actors.[9]

[8] Lake and Powell (1999, 4), Lake and Powell's emphasis.

[9] Previous works on proliferation have claimed the label "strategic." See: Gartzke and Kroenig (2009); Kroenig (2010). What these authors mean by strategic, however, is that their work focuses on the consequences of nuclear proliferation for a particular state's "strategic" concerns. For example, key to some existing accounts of proliferation is the intuition that a state capable of projecting power over another state will face "strategic" losses if the latter acquires nuclear weapons, whereas a state that is unable to project power will have little to lose. See: Kroenig (2009a, 2009b, 2010, 2014). According to this line of reasoning, and we concur, states with great power-projection capabilities are more likely to oppose proliferation for "strategic" reasons. But in order to understand the conditions under which the opposition of power-projecting states will actually deter the spread of nuclear weapons, we need to allow their interests to interact with those of the would-be proliferator and determine which set of interests, so to speak, trumps the other. In other words, we need to take into account not the interests of one or another state taken separately, but their interaction within their strategic context.

A Security Theory of Proliferation

Our second key theoretical wager is, when analyzing this strategic interaction, to focus on security interests. Because proliferation is the process through which states acquire a particular *military* technology – nuclear weapons – it should come as no surprise that the most important factors conditioning it are the security interests of the states affected by it. Echoing Scott Sagan's words, we too believe that most proliferation cases "are best explained by the security model."[10] What we need – and what this book provides – is a more refined security-based theory of nuclear proliferation.

The Willingness and Opportunity Constraints on Proliferation

Proliferation only happens when a state has both the willingness and the opportunity to acquire nuclear weapons. A state will be willing to nuclearize only when it believes that a nuclear deterrent will yield a security benefit, leading to an improvement of its security outlook vis-à-vis its adversaries. In order to determine whether a state is willing to proliferate, we must compare this security benefit of proliferation to the cost of a nuclear program. A state will be willing to proliferate only when the security benefit of proliferation is greater than this cost.

Although willingness is a necessary condition for nuclear acquisition, it is not sufficient. An attempt to acquire the bomb could be thwarted by an adversary's counterproliferation effort – a credible threat of preventive attack or an actual military strike against the state's nuclear program. By striking preventively, an adversary can avoid the unfavorable shift in the distribution of capabilities that would result from the state's nuclearization. Whether a state will be able to nuclearize despite these preventive dynamics depends on the credibility of its adversaries' threats of attack against its nuclear-weapons program.

Preventive counterproliferation military action is always costly, however. Therefore, it will only be rational for an adversary to launch a counterproliferation preventive war if this action is less costly than the consequences of allowing the state to build nuclear weapons.

[10] Sagan (1996–1997, 85).

Moreover, when this is the case, the threat of preventive war will be credible, even if implicit. The potential proliferator may nevertheless attempt to develop nuclear weapons undetected, and may end up being targeted by an actual preventive strike.[11] Or it may drop its nuclear efforts for fear of being targeted. Either way, the state will lack the opportunity to acquire nuclear weapons. (These dynamics help account for the puzzling observation that many states start their nuclear efforts only to abandon them without having acquired nuclear weapons.) As the cost of prevention rises relative to the consequences of nuclear acquisition, threats of preventive action will become less credible. If these threats are not credible, the state will gain the opportunity to build the bomb and, having the willingness to do so, will nuclearize.

Whether a state satisfies the willingness and opportunity constraints, in turn, depends on three underlying strategic variables: the level of security threat it faces, its relative power vis-à-vis its adversaries, and the level and reliability of allied commitments to its security.

The Role of Security Threats

A state will attach a security benefit to nuclear weapons only when it faces a high level of threat to its security. A relatively benign security environment may lower the benefit of proliferation to the point at which it becomes smaller than the cost of a nuclear program, extinguishing the state's willingness to proliferate, and accounting for why most states have never attempted to develop nuclear weapons. Among states that have started down the nuclear development path, an improvement in their security environment may undermine their willingness to nuclearize, leading them to forfeit their nuclear ambitions and abandon their program.

[11] For an analysis of the conditions under which preventive strikes become more likely, see: Debs and Monteiro (2014). Theoretically, the only way a state could acquire the bomb under these conditions would be for its nuclear program to remain undetected such that it could present nuclear acquisition to its adversaries as a fait accompli. This scenario has never materialized historically and, given existing surveillance and inspection technology, is highly improbable in the future.

The Role of Conventional Power

The balance of conventional power between the potential proliferator and its adversaries prior to nuclear acquisition conditions both the state's willingness and its opportunity to build the bomb.

High relative power during the nuclear development phase dampens the security benefit of proliferation. Conversely, the weaker a potential proliferator is, the more nuclear acquisition would improve its security outlook. By lowering the security benefit of proliferation vis-à-vis the cost of a nuclear program, conventional power undermines a state's willingness to build the bomb. Among states that are strong vis-à-vis their adversaries, only those facing the direst security threats will attempt to acquire a nuclear deterrent.

At the same time, the balance of conventional power between the potential proliferator and its adversaries prior to nuclear acquisition also conditions the cost of preventive military action and, through it, the state's opportunity to build the bomb. If the state considering nuclear weapons is stronger relative to its adversaries, the cost of preventive war is greater. All other things being equal, it is less likely that a preventive attack will be the adversaries' rational option. Powerful states therefore rarely face credible threats of preventive counterproliferation military action launched by their adversaries. Consequently, whenever they face security threats dire enough to make them willing to build the bomb, powerful states will be more likely to have the opportunity to cross the nuclear threshold.

If the state contemplating nuclearization is weaker than its adversaries, in contrast, the cost of preventive counterproliferation military action is relatively lower. At the same time, the state's conventional weakness increases the security benefit that it would extract from nuclearization. This makes it more rational for an adversary to launch a preventive attack. Threats of counterproliferation military action are therefore more likely to be credible, removing the state's opportunity to nuclearize.

Proliferation among states without allies thus requires an empirically rare combination of strategic factors: high relative power plus a serious threat to the state's security. This logic accounts for one of the puzzling patterns of the spread of nuclear weapons – the absence of nuclear proliferation among weak unprotected states facing dire

security threats. Nuclear weapons may well be the weapons of the weak, but the weak (and unprotected) cannot get them.

The Role of Allies

Having characterized the strategic interaction through which a state's adversaries condition its ability to nuclearize, we then focus on the role a state's allies play in the proliferation process. Allies may affect a state's odds of proliferation in two ways.

First, an ally can help alleviate a security threat faced by its protégé. This would decrease the protégé's willingness to acquire nuclear weapons. In fact, if the ally reliably guarantees all of the protégé's security interests, the protégé should not be willing to nuclearize. Under these conditions, nuclear weapons would not present a security benefit that would justify their cost. A state protected by a security sponsor has the willingness to build the bomb only when this sponsor does not reliably cover all of the protégé's security interests.

Second, the presence of a security sponsor increases the costs that an adversary would face if it were to launch a preventive counterproliferation strike. Therefore, a security sponsor lowers the credibility of threats of military action against its protégé. Even when the protection of the sponsor is not sufficient to undermine the protégé's willingness to nuclearize, it may nevertheless be enough to give it the opportunity to build the bomb. When this combination occurs, proliferation will ensue.

Factoring in both of these effects, the presence of an ally suppresses proliferation when it reliably covers the protégé's security interests, undermining its willingness to build the bomb. At the same time, the presence of an ally enables proliferation when, absent the added deterrent power of the sponsor, the protégé would be vulnerable to preventive military action, and would therefore lack the opportunity to acquire nuclear weapons.

Sticks, Carrots, and Proliferation

Our theory of nuclear proliferation is also a theory of nonproliferation. In fact, our analysis of the role of allies in the proliferation process helps ascertain the relative effectiveness of different nonproliferation policy tools. We group all such tools into two broad

categories: sticks and carrots. A sticks-based approach to nonproliferation includes all coercive measures such as inspections of nuclear facilities, limits to the supply of nuclear materials and technology, sanctions, and so forth. Underpinning these coercive efforts is the threat of withdrawal of the sponsor's support. Such an approach aims at removing the protégé's opportunity to build the bomb. The effectiveness of a sticks-based nonproliferation policy therefore depends on the consequences of carrying out this threat. What would happen if the protégé would be left on its own? A protégé that is relatively strong vis-à-vis its adversaries would nevertheless retain the opportunity to proliferate even if abandoned by its sponsor. It would therefore be immune to sticks-based nonproliferation efforts by its sponsor. Only protégés that are relatively weak vis-à-vis their adversaries can be coerced into maintaining their nonnuclear status through a sticks-based nonproliferation policy.

Now consider a carrots-based approach. This includes the set of policies through which an ally boosts its security commitment to the protégé through public pledges of protection, troop and nuclear weapons deployments, military aid, and sales of conventional weapons. Such an approach aims at removing the protégé's willingness to build the bomb. Therefore, it will be easier to implement with a protégé that is already relatively strong vis-à-vis its adversaries, requiring less support to reach the point at which it no longer views an investment in nuclear weapons as worthwhile. Protégés that are weaker vis-à-vis their adversaries, in contrast, will require a greater level of support before they lose their willingness to build the bomb. As with power, so it is with the breadth of the protégé's security interests. If these are broader, the protégé will require a greater level of support before a carrots-based approach to nonproliferation leads it to abandon its nuclear ambitions. A protégé with narrower security interests will be easier to satisfy with this approach, making nonproliferation efforts more likely to succeed.

Taking stock, a sticks-based nonproliferation policy, entailing no additional security commitments on the part of the sponsor, is the most adequate to guarantee the continuation of the nonnuclear status of weak protégés. Costly carrots-based approaches to nonproliferation, which result in greater security commitments on the part of the sponsor, will be reserved for relatively strong allies, which cannot otherwise be deterred from acquiring nuclear weapons.