NUCLEAR POLITICS:

THE STRATEGIC CAUSES

OF PROLIFERATION

Alexandre Debs

Associate Professor

Department of Political Science

Yale University

(alexandre.debs@yale.edu)

Nuno P. Monteiro

Associate Professor

Department of Political Science

Yale University

(nuno.monteiro@yale.edu)

Draft date: May 4, 2016

Book manuscript prepared for Cambridge University Press.

Word count: 207,247 including footnotes

À mon père, Chaouki (1945-2016).

---*AD*

Para a minha mãe, Odete da Piedade.

---*NPM*

"Building an atomic bomb here would be stupid. We have no threats."

---Admiral Maximiano da Fonseca

Minister of the Navy of Brazil, 1979-84

"If we are satisfied with our security requirements in conventional armaments, … we would not hazard our economic future and promote an economic and social upheaval by diverting vast resources for a nuclear program."

---Zulfikar Ali Bhutto

Prime Minister of Pakistan, 1974

Table of Contents

PREFACE

This book is the product of a wonderful intellectual journey that started when we both arrived at Yale as assistant professors in 2009. Coming from backgrounds that could hardly be more different—Alexandre had been trained as an economist at MIT; Nuno as an IR theorist at Chicago—we quickly found overlapping interests. Substantively, we were both keen to understand the dynamics of the nuclear age—the long shadow cast by nuclear weapons on world politics since 1945. Conceptually, we both wanted to refine existing theories of international politics by placing states' security interests in their strategic context and analyzing their interaction. Methodologically, we both sought to further the use of historical research to test theoretical propositions, especially causal mechanisms. Professionally, we both aimed to encourage further dialogue between formal and informal approaches to theorizing world politics, as well as between theory and history. More than a half-dozen years later, we're both happy to realize that our objectives have remained largely the same. (And we take that as evidence that we are on to something important, rather than as proof that we have so far failed to achieve our goals!)

What started as a series of brief discussions over lunch quickly turned to informal chats in front of a white board, then to research memos bouncing back and forth, until by early 2010 we thought it was time to work on something together. Neither of us was happy with the literature on power transitions. So we set out to write a paper on the question of when power shifts lead to preventive wars.[1] After work-shopping it around, we realized that we had focused on only half of the broader problematique that interested us. While focusing on preventive wars, our theoretical framework also offered predictions on when power shifts actually happen, despite these preventive dynamics. We therefore decided that after wrapping up our original paper, we should write another, looking at this second question in greater depth. At the same time, it gradually became clear to us that the magnitude of the power shift introduced by a state acquiring nuclear

[1] This ultimately became Debs and Monteiro (2014).

weapons—in the jargon, horizontal proliferation—is qualitatively different from most (perhaps all) other shifts in military power. This in turn, made us realize that our real interest was in the causes of nuclear proliferation, a topic on which neither of us had done any serious thinking.

By 2011, then, our work together was expanding to cover the question that animates this book: under which conditions do states acquire nuclear weapons? We started modestly—or was it hubristically?—thinking that one more paper would allow us to "say our piece" and move on.[2] Alas, as often happens, the more we dug, the more we realized we had more to learn and more to say. To begin with, the literature on the topic was, well, sizeable. There was a multitude of theoretical arguments to grapple with. This was less of a problem, as we had clear views on what we wanted to do: to place the security interests of all states affected by one state's possible nuclear acquisition within a strategic interaction context and analyze the conditions under which proliferation was more likely to occur. The bigger problem was the gradual realization that nuclear studies occupies this middle ground between the study of rare events (such as, say, hegemonic wars) of which the number of cases is small enough that there is little doubt the researcher can (and is expected to) master all of them; and the study of frequent events (such, as say, interstate crises) of which the number is large enough that no researcher could (or would be expected to) master the historical details of them all. In between these two positions, nuclear studies covers enough historical ground that a researcher can spend a lifetime struggling to master its historical domain; while not including a sufficiently large number of cases that mastery of the historical record is unthinkable—or, some might say, unnecessary—and instead most research consists of uncovering regularities in large-n data using statistical tools. In short, nuclear studies, when properly done, require the researcher to master the history of the nuclear age. Perhaps this explains why most experts on the topic devote their entire careers to it. It certainly explains why this book was four years in the making.

[2] This paper became Monteiro and Debs (2014).

This issue manifested itself in practice as a scholarly version of the infamous "Nth country" problem in nuclear politics. Just like policymakers have long worried about "the possibility that more and more countries might acquire nuclear weapons," we found ourselves worrying about the possibility that more and more countries might acquire a place in our book.[3] Whenever we presented our already burgeoning drafts or sent them out to someone who had kindly volunteered to read them, we almost invariably received a comment of the form: "What about country N, on which you have no case study? How does N fit into your theory?" So we started trying to preempt these criticisms by attempting to guess which would be the Nth country that people would ask about next. If we wanted to bring together theory and rich empirical accounts, we needed to wrestle with a seemingly unending number of cases of (attempted as well as actual) nuclear proliferation. In the end, this dynamic accounts for the considerable length of the book.

Looking back, and much as we may have despaired along the way every time someone brought up another case and, with it, another large set of materials to master, this was the right thing to do. Our theory matured considerably as a result of being exposed to this expanding set of cases. Our understanding of the nuclear age also changed appreciably. But it took us a while. In the end, this need to cover a relatively large universe of historical cases—the more than two dozen states that, at one point or another, had an active nuclear program with a military component—dictated the need to write a book. And so we started writing the pages that follow. Four years later, we are thrilled to finally abandon them. (As Paul Valéry said of poems, so with books: they are never finished, only abandoned.)

A book always involves fighting many battles, some larger, others smaller. (We hope to have won the one we fought against the particularly stubborn auto-correct function in our word processor, which insisted in giving France a *force de frappé*.) Nevertheless, we are happy to report that our overall experience was a joy for both of us. Perhaps this is owed to our own approach to co-authorship. Seen from the outside,

[3] Iklé (1960, 391). See also: Wohlstetter (1961).

one might be led to guess that one of us does "the math" and the other brings in the historical knowledge; or that "the math" drives the theory and the other does "the chatty bits;" or that one puts "numbers" on the other's arguments or ideas; or that each of us covers half the ground; or whatever. Instead, we decided to do it in what is perhaps an inefficient method: each of us read and summarized existing work; dug up archival materials; helped manage our platoon of intrepid research assistants; then together we debated and refined our theory, while discussing its fit with the cases; finally we each drafted different sections of the manuscript, then swapped our rough drafts back and forth and edited each other's writing, until—we hope—the whole thing has a coherent style, such as it is. This process was not the result of a particularly conscious decision. Rather, it emerged organically from our shared interests in writing the book: each of us was determined to learn more about the politics of the nuclear age—and about the workings of the dialogue between formal theory, natural-language theory, and history. In our view, this approach to co-authorship may take longer to get things done, but it also, at least in our case, makes for a better final product. And it was certainly more fun.

We hope this will be the first of many books we write together—and already have ideas for at least a couple more, on nuclear matters and beyond. The obvious sequel would be another book covering nuclear politics after proliferation. How do states react to another state's acquisition of nuclear weapons? How do nuclear weapons—and the omnipresent danger of escalation—shape state behavior in and beyond crises? We have started exploring these matters in a working paper and feel that we will soon have enough to say on this to make for a second volume on nuclear politics.[4] So, do stay tuned.

This book would not have seen the light of day without the support of many—indeed, so many that the first order of business here is to apologize in advance to any whose names we may have unwittingly omitted in these pages.

[4] See: Anderson, Debs, and Monteiro (2015).

For having graciously agreed to read different sections of the manuscript, and for sending us helpful comments and suggestions, we thank: Dimitris Bourantonis, Jonathan Caverley, Andrew Coe, Martha Crenshaw, James Fearon, John Lewis Gaddis, Richard Gillespie, Eliza Gheorghe, Feliciano Sá Guimarães, Jolyon Howorth, Robert Jervis, Thomas Jonter, David Kang, Jonathan Kirshner, Jiyoung Ko, Matthew Kocher, Andrew Kydd, Adria Lawrence, Christine Leah, Philip Lutgendorf, Sean Lynn-Jones, John Mearsheimer, Costanza Musu, Vipin Narang, Behlul Ozkan, David Palkki, Carlo Patti, Benoît Pelopidas, Barry Posen, Robert Powell, Or Rabinowitz, Samuel Rajiv, Frances Rosenbluth, Andrew Ross, Joshua Rovner, Bruce Russett, Scott Sagan, Nicholas Sambanis, Jayita Sarkar, Anne Sartori, Kenneth Schultz, Duncan Snidal, Matias Spektor, Aaron Stein, Oliver Stuenkel, Milan Svolik, Michael Tomz, Panagiotis Tsakonas, Jessica Varnum, Hikaru Yamagishi, and Anne-Mart Van Wyk.

We also received excellent comments and suggestions from the discussants, participants, and audiences at workshops held at Cornell University, George Washington University, Harvard University, MIT, Stanford University, the University Chicago, the University of São Paulo, the University of Wisconsin-Madison, Yale University, the October 2013 conference of the Nuclear Studies Research Initiative, the annual joint conference of the International Security Studies Section of ISA and the International Security and Arms Control Section of APSA, the International Studies Association annual convention, the American Political Science Association's annual meeting, and the Peace Science Society annual meeting.

For providing us with a great working environment here at Yale, and with valuable feedback on many bits and bobs in the book, we thank our colleagues David Cameron, Allan Dafoe, Samuel DeCanio, Thomas Donahue, John Lewis Gaddis, Susan Hyde, Sigrun Kahl, Stathis Kalyvas, Paul Kennedy, Paulina Ochoa, John Roemer, Ian Shapiro, and Steven Wilkinson. Our life was also made much easier by the excellent staff we were lucky to have supporting us, including, in the Department of Political Science, Lani Colianna, Mary Sue FitzSimons, Blaine Hudson, and Karen Primavera; and at the Jackson Institute for Global Affairs, Elizabeth Gill, Alice Kustenbauder, Larisa Satara, and Cristin Siebert.

The pages that follow were made much better by feedback we received over two days in New Haven back in May 2014, during which an earlier draft was subjected to unrelenting (though gentlemanly delivered) criticism by Frank Gavin, Charlie Glaser, Colin Kahl, Robert Powell, Daryl Press, Scott Sagan, and our editor, Robert Dreesen. We are tremendously grateful to all of them—as well as to David Holloway, Leopoldo Nuti, and Marc Trachtenberg, who could not be present but sent us detailed comments on the whole manuscript. This workshop would not have been possible without significant financial support from the Leitner Program in International and Comparative Political Economy and the The Edward J. and Dorothy Clarke Kempf Memorial Fund, at the Whitney and Betty MacMillan Center for International and Area Studies, Yale University. We thank both for their generous funding.

For superb research assistance, without which we would not have been able to write this book even in the long time we feel that it took us, we thank our principal research assistant, Nicholas Anderson, as well as all the other members of our research team: Jonathon Baron, John Bentley, Gabriel Botelho, Will Bruno, Jackson Busch, Julia Butts, Omegar Chavolla-Zacarias, Elisabeth Cheek, Richard Chung, Cole Citrenbaum, Stefan "Reed" Dibich, Kelsey Ditto, Edmund "Ned" Downie, Alexander Ely, Emmet Hedin, Stephen Herzog, Donna Horning, Connor Dezzani Huff, Alexander Jacobson, Umm-e-Amen "Amen" Jalal, Mason Ji, Matthew Kim, Jiyoung Ko, Jéssica Leão, Bonny Lin, Jacob Lundqvist, William Nomikos, Chad Peltier, Mark Pham, Mehmet Saka, Matthew Sant-Miller, Noah Siegel, Teodoro Soares, Hayden Stein, David Tidmarsh, Vivian Wang, and Mujtaba Wani. All errors remain, of course, our own.

For providing hospitable environments during part of the drafting of this book, Alexandre thanks the Center for International Security and Arms Control at Stanford University; and the Berkeley Center for Economics and Politics at the University of California Berkeley. Nuno, for his part, thanks the warm welcome he received as a visiting scholar at the Center for Advanced Study in the Social Sciences at the Juan March Institute, in Madrid, Spain; the Center for Research and Documentation on the Contemporary

History of Brazil of the Getúlio Vargas Foundation, in São Paulo and Rio de Janeiro, Brazil; and the Institute for International Relations at University of São Paulo, also in Brazil.

Finally, we would like to thank all those who helped put this book between covers at Cambridge University Press, starting with Robert Dreesen, a model of efficiency and a true supporter, and including also…

An earlier, compressed version of the arguments laid out in Chapter 2, as well as shorter versions of our case studies on the Soviet Union, Iraq, Pakistan, South Korea, and West Germany, and some of our conclusions in Chapter 7 appeared in Nuno P. Monteiro and Alexandre Debs, "The Strategic Logic of Nuclear Proliferation," *International Security*, Vol. 39, No. 2 (2014), pp. 7-51. Furthermore, an earlier version of the model discussed in Chapter 2 and the Appendix, as well as a shorter version of our case study of Iraq appeared in Alexandre Debs and Nuno P. Monteiro, "Known Unknowns: Power Shifts, Uncertainty, and War," *International Organization*, Vol. 68, No. 1 (2014), pp. 1-31. We gratefully acknowledge permission from MIT Press Journals and the IO Foundation to elaborate on those ideas here.

Personally, Alexandre would like to thank Daron Acemoglu, his Ph.D. thesis supervisor, for generous feedback throughout his graduate studies, and for helping him discover that his passion for political economy lay more in the "political" than the "economic." Alexandre would also like to thank his wife Mira, and children Francesca and Gabriel, for filling his life with love and laughter. He observes that when reviewing the major events of the day at the dinner table and dividing them up into happy, hopeful, and challenging moments—the "rose," the "bud," and the "thorn"—he always has an abundance of choices for the "rose" from his time spent with them. Finally, Alexandre would like to thank his mother Diane and sister Marie-Estelle for their unconditional love and support.

Alexandre dedicates this book to his father, Chaouki (1945-2016), who is most responsible for Alexandre's love of history and ideas. While he did not have a chance to see the book in its final form, he was very much present at its creation.

While finishing this book, Nuno became even more deeply indebted to John Mearsheimer, mentor and friend, who generously provided unfaltering support through trying times. Nuno hopes he will one day be able to pay this forward; he is sure he will not be able to pay it back. Nuno also wishes to thank his wife, Audrey Latura, for always finding a way to prevent the lid on the pressure cooker from sealing him inside. He can only hope to reciprocate when her turn to write a book arrives, he trusts soon. Finally, Nuno wants to express his gratitude to his son, Sebastian Miguel, whom, having arrived as we were putting the finishing touches on this manuscript, was far more cooperative than his early age warranted us to expect.

Nuno dedicates this book to his mother, Odete da Piedade, who taught him the central role that dreams play in life, and provided him with unflinching support in pursuing his own.

---Alexandre Debs and Nuno P. Monteiro

New Haven, April 2016

CHAPTER 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 state-craft. 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 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

[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."

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 have 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

[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 towards nuclearization attempts by allied and friendly states.

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

[5] See: Burr and Richelson (2000/01).

[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).

by threatening allies with abandonment and adversaries with 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 stop 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 non-nuclear. West Germany, for instance, despite having been until 1989 on the frontline 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

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

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?

Existing scholarship is unable to make sense of these puzzling patterns in the spread of nuclear weapons. In fact, the 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, well, 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 above.

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 its nuclear acquisition. We must then interact the interests of all these parties during the period in which one of them is considering nuclear acquisition, and analyze how this 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

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

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]

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

[9] Previous works on proliferation have claimed the label "strategic" for their approach. 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); Kroenig (2009b); Kroenig (2010); Kroenig (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.

[10] Sagan (1996/97, 85).

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. 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.

[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.

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 commitment.

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.

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 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

only has the willingness to build the bomb 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 groups: 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, etc. 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 non-nuclear 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 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 non-nuclear 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.

Empirically, proliferation occurs in a limited range of strategic environments. Specifically, we find two sets of strategic circumstances—or pathways—to nuclear acquisition. First, a high level of security threat combined with high relative conventional power on the part of the proliferating state. Second, a high level of security threat combined with the presence of an ally that is deemed unreliable. All other strategic settings result in the maintenance of a state's non-nuclear status.

Empirical Patterns

Our theory highlights the deep continuity in the strategic logic of proliferation that has governed the spread of nuclear weapons since the dawn of the atomic age in 1945. Despite frequent claims about the changing dynamics governing proliferation in different historical periods—say, before and after the NPT, or before and after the end of the Cold War—a focus on the strategic environment reveals the enduring role of power, threats, and allied commitments in conditioning the odds of nuclear acquisition.

In doing so, the strategic logic of nuclear proliferation sheds light on several hitherto underappreciated historical patterns. First, states that do not face a high-level security threat have not acquired the bomb. The presence of a significant security threat is a necessary condition for nuclearization. Historically, no state has acquired nuclear weapons without perceiving its security environment as highly threatening, regardless of how strong other pressures to acquire the bomb—including considerations of domestic or international prestige, the psychology of leaders, or the economic preferences of ruling elites—may be.

Second, among states that are not protected by a great-power sponsor, only those that are strong vis-à-vis their adversaries have acquired the bomb. There is no historical case of a relatively weak state without a nuclear ally committed to retaliating against a preventive counterproliferation strike ever succeeding in nuclearizing. We should therefore be cautious about claims that nuclear weapons are the "weapon of the weak," the "great equalizer" in international relations.[12] No doubt, the atomic bomb would enable a weak state to stand up to more powerful adversaries. So far, however, no weak unprotected state has ever managed to obtain it.

Third, among states that possess a powerful ally, only those whose security goals are not entirely covered by this security sponsor have acquired nuclear weapons. Put differently, states whose security goals

[12] Paul (1999); Paul (2012).

are subsumed by their powerful allies' own aims do not possess the willingness to acquire the bomb. This means that among weak states proliferation only occurs under two narrow sets of strategic circumstances: either the state's security sponsor is unwilling to ensure reliably the future protection of the protégé's territory; or the protégé has secondary security goals that the sponsor does not share.

Fourth, threats of abandonment issued by a security sponsor—what we call a "sticks-based" non-proliferation policy—are effective in curtailing proliferation only by protégés that are relatively weak vis-à-vis their adversaries. If a protégé is strong vis-à-vis its adversaries, it has the opportunity to proliferate on its own, even if its security sponsor were to abandon it. In this case, the sponsor can only effectively deter proliferation by taking away the protégé's willingness to acquire nuclear weapons, which it can do by extending additional security assurances—what we call a "carrots-based" nonproliferation policy. In other words, whereas sticks can deter proliferation by weak protégés, only carrots will prevent stronger protégés from building nuclear weapons. This, in turn, means that when Washington is faced with a strong protégé that is willing to acquire the bomb (because some of its security interests are not reliably guaranteed by the United States), U.S. decision-makers must choose between extending additional security commitments to that state or allowing for the spread of nuclear weapons.

Fifth and finally, the spread of nuclear weapons slowed down after the end of the Cold War in 1989. Despite much concern about "nuclear cascades" and proliferation "tipping points,"[13] only two states—Pakistan and North Korea—have acquired nuclear weapons in the era of U.S. military power preponderance.[14] U.S. allies face few if any significant security threats that nuclear weapons could placate

[13] See: Campbell et al. (2004); Potter and Mukhatzhanova (2008); Bracken (2012); Miller (2014b).

[14] By all accounts, Pakistan already possessed nuclear weapons before the Cold War ended. For example, the list of nuclear programs we use in the empirical sections of this book places Pakistani nuclear acquisition in 1990, while the Soviet Union still existed. See: Way (2012). Still, since Pakistan only tested a nuclear device in 1998, we prudently list it here as a "post-Cold War" proliferator. If we were to categorize it as having proliferated during the Cold War, this empirical pattern would be even more pronounced.

and on which they do not trust Washington's continued protection. U.S. adversaries, lacking a nuclear patron, risk a preventive strike against their nuclear program.[15] As long as U.S. conventional power preponderance endures, therefore, we should expect the rate of proliferation to remain low.

Existing Scholarship

Concerns about nuclear proliferation are not only one of the foremost topics in the U.S. foreign-policy agenda. They have also percolated through the scholarly world. Although during the early Cold War most thinking in nuclear studies was devoted to avoiding escalation between nuclear powers, an increasing effort has been devoted to understanding the motivations and constraints driving the spread of nuclear weapons. Particularly since the end of the Cold War, which lowered the likelihood of nuclear conflict involving the United States, the causes of nuclear proliferation have been the object of much theorizing and empirical study. The scholarly literature on the causes of nuclear proliferation evolved in three waves, which we discuss in turn.

Security Sources of Demand

The first wave of proliferation scholarship focused on security explanations, arguing that a state's nuclearization results from its need to mitigate threats to its survival.[16] As Bradley Thayer put it in an early work on the topic, "security is the only necessary and sufficient cause of nuclear proliferation."[17] The higher the threat level a country faces, the more it is likely to acquire nuclear weapons. Furthermore, and given the threat posed by an adversary's nuclear acquisition, proliferation might itself beget more proliferation,

[15] For a survey of such attacks, see: Fuhrmann and Kreps (2010). This option became more attractive and effective since the end of the Cold War and has been used to account for the Iraq War. See: Debs and Monteiro (2014).

[16] See: Epstein (1977); Mearsheimer (1990); Betts (1993); Frankel (1993); Thayer (1995). For a literature review of early security explanations of nuclear proliferation, see: Sagan (1996/97).

[17] Thayer (1995, 486).

leading to predictions of nuclear "dominos" or a "strategic chain reaction."[18] Reviewing this literature in the mid-1990s, Sagan noted:

> Although nuclear weapons could also be developed to serve either as deterrents against overwhelming conventional military threats or as coercive tools to compel changes in the status quo, the simple focus on states' responses to emerging nuclear threats is the most common and most parsimonious explanation for nuclear weapons proliferation.[19]

This line of reasoning stemmed from neorealist approaches to the study of international politics, which emphasize the role of the security environment in conditioning state actions.[20] Prominent neorealist scholars such as Kenneth Waltz argued that, because nuclear weapons offer great security benefits in the self-help international environment, efforts to deter proliferation are doomed to fail. In Waltz's own assessment, "in the past half-century, no country has been able to prevent other countries from going nuclear if they were determined to do so."[21]

The pessimistic predictions made by these early security-based theories of proliferation did not come to pass, however. The number of nuclear states remained relatively steady over time and "the pace of proliferation has been consistently *slower* than has been anticipated by most experts."[22] Today, only nine states possess nuclear weapons.

The realization that these early security arguments over-predicted the pace of proliferation led to a shift in focus toward explaining nuclear "forbearance"—*i.e.*, why states forego nuclearization. Mitchell Reiss argued that when the security threats that prompt a nuclear program wane, so will the program itself,

[18] See: Epstein (1977, 19).

[19] Sagan (1996/97, 57).

[20] See: Waltz (1979).

[21] Waltz (2003, 38).

[22] See: Yusuf (2009, 4), Yusuf's emphasis.

resulting in nuclear abandonment.[23] But some countries—such as Iraq, South Korea, or Taiwan—faced continued threats and have nonetheless maintained their non-nuclear status. In another account of nuclear forbearance, T.V. Paul argued that nuclear forbearance happens when a state anticipates that nuclearization will generate negative externalities for its own security. Specifically, a state will eschew its nuclear ambitions when it fears that proliferation will worsen its security outlook by causing abandonment by an ally or triggering an arms race with an adversary.[24] This line of reasoning is an important step in the direction of incorporating into our analysis of nuclear proliferation the interests of all the states it affects. Yet, some countries—*e.g.*, the Soviet Union and Pakistan—chose to proliferate even though their nuclear acquisition was likely to trigger an arms race. Furthermore, whereas in some cases great powers have been able to persuade their protégés to remain non-nuclear by threatening them with abandonment (*e.g.*, the United States vis-à-vis Taiwan), in other cases such threats were ineffective and the protégé ended up acquiring nuclear weapons (*e.g.*, the United States vis-à-vis Israel). Finally, whereas Paul predicts that states located in high-conflict regions and which do not possess robust allied security guarantees will tend to proliferate, in some cases (*e.g.*, Iraq and Sweden) they have not.

Overall, the arguments put forth by Reiss and Paul represent important advances towards understanding how a state's security incentives may push both towards *and against* nuclearization.[25] Nonetheless, existing security-based arguments are unable to account for why some states build the bomb while others choose to remain non-nuclear.

Non-Security Sources of Demand

[23] See: Reiss (1995).

[24] See: Paul (2000, 15-27).

[25] See: Reiss (1995); Paul (2000).

Reacting to these limitations of security arguments in accounting for the patterns of nuclear proliferation, scholars in the 1980s started to search for other, non-security "sources of the political *demand* for nuclear weapons," resulting in a second wave of literature.[26] Just like the first wave of explanations for nuclear proliferation stemmed from a broader research program, this second wave itself derives from alternative approaches to the study of international relations. Specifically, this second wave of proliferation research stems from neoliberal theories of world politics, which focus on the role of domestic and international institutions in driving, or constraining, state behavior; and from constructivist theories of international relations, which focus on the role of identities, culture, and norms in shaping state action.[27]

In what is perhaps the most directly neoliberal account of proliferation, Etel Solingen's work offers an account of the spread of nuclear weapons based on the political and economic preferences of ruling elites.[28] Arguing that existing security-based arguments are unable to account for variation either in states' nuclear behavior or in their responses to U.S. efforts to stem the spread of nuclear weapons, Solingen explains these behaviors based on how ruling coalitions believe state security and prosperity can best be produced, namely through inward-looking military means or outward-looking economic integration. Inward-looking elites who favor import-substitution or purely autarchic developmental models will favor militarization and, often, nuclearization. In contrast, outward-looking, internationalizing elites who favor economic integration and growth through interdependence will frown upon nuclear acquisition, which is likely to bring with it regional isolation and geostrategic instability. The odds of proliferation—as well as decisions about starting and stopping nuclear development—depend on the relative power of these two types of elites within a country's political system.[29] In Solingen's own words, open "internationalizing

[26] Sagan (1996/97, 56), Sagan's emphasis.

[27] On neoliberalism, see: Keohane (1984); Moravcsik (1997). On constructivism, see: Wendt (1999).

[28] See: Solingen (2007).

[29] See: *Ibid.*, 40-47.

models" are "likely to be sufficient for denuclearization except under two circumstances: (a) when neighboring inward-looking regimes seek nuclear weapons (or other weapons of mass destruction [WMD]); and (b) when nuclear weapons were acquired prior to the inception of internationalizing models."[30]

Solingen makes a valuable contribution to our picture of the nuclear proliferation process. Certainly, economic integration may bring with it better security relations with one's neighbors and alleviate security concerns.[31] Nonetheless, Solingen's theory, as noted, includes caveats that introduce serious questions about its broader applicability. First, per caveat (a) above, the presence of an inward-looking neighboring state developing nuclear weapons is sufficient to dissolve the predicted power of her model, by making even an outward-looking ruling coalition likely to attempt to develop nuclear weapons. But clearly not all states that are faced by inward-looking neighbors that are trying to nuclearize have themselves attempted to develop nuclear weapons. In fact, one of Solingen's case studies focuses on a country, South Korea, that did not attempt to develop nuclear weapons even though its inward-looking neighbor North Korea nuclearized in the 2000s. Second, per caveat (b) above, Solingen exempts her theory from explaining cases of proliferation that occurred while an inward-looking elite ruled a country. As we just saw, the general prediction of Solingen's theory for these cases is that they will be likely to develop nuclear weapons. Still, what explains the decision to acquire the bomb made by some inward-looking regimes (the Soviet Union in 1949, China in 1964, South Africa in 1979, Pakistan in the late 1980s, and North Korea in the mid-2000s), whereas many other such regimes (such as Egypt, Iraq, or Libya) never built a nuclear weapon? In our view, to understand better the conditions under which states that are threatened by a nuclearizing neighbor will themselves develop a nuclear arsenal we need to look at their strategic interaction. In effect, Solingen's theory itself points to this need, by allowing for a state's nuclear decision-making to be affected by the nuclear behavior of a state's neighbors. Our theory generalizes this insight.

[30] *Ibid.*, 46.

[31] Polachek (1980); Crescenzi (2003); Martin et al. (2008); Polachek and Xiang (2010).

Inspired by constructivist theories of international relations, Maria Rublee puts forth an alternative account of why states acquire or eschew nuclear weapons that focuses on emerging international nonproliferation norms.[32] For Rublee, the nonproliferation regime that emerged in the 1960s, and the international norms it has helped spread, have influenced the nuclear behavior of states, bringing the pace of proliferation close to a halt.

Certainly, nonproliferation norms have frequently been invoked by states that decide to eschew nuclear weapons. Furthermore, these norms are often part and parcel of nonproliferation efforts led by the United States and others. But it is hard to see how one could build a general theory of the spread of nuclear weapons by focusing on nonproliferation norms. To begin with, much of the history of how the current nuclear states acquired their nuclear arsenals took place before those norms emerged. Of the nine current nuclear states, six (the United States, Soviet Union, United Kingdom, France, China, and Israel) nuclearized before the NPT went into force in 1970. A theory of proliferation based on the spread of nonproliferation norm has little to say about why these six states acquired nuclear weapons between 1945 and 1970 whereas many others did not. Furthermore, to state the obvious, the remaining four states to have acquired nuclear weapons (South Africa, India, Pakistan, and North Korea) have done so after the NPT regime was already in place. What explains their failure to internalize nonproliferation norms? Finally, could it be that the norm of nonproliferation itself and the regime that was setup to enforce it result from strategic considerations made by the nuclear powers?[33] There is considerable evidence that the emergence of the NPT was to a great extent driven by the determination of both superpowers to guarantee the non-nuclear status of the Federal Republic of Germany (FRG).[34] In fact, much of what Rublee describes as persuasion and norm-

[32] See: Rublee (2009). For other treatments of norms in the context of nuclear studies focusing on the question of nuclear use, see: Paul (1995); Tannenwald (1999).

[33] See: Craig and Ruzicka (2013).

[34] See also: Swango (2009); Coe and Vaynman (2015).

internalization could easily be redescribed as coercion or manipulation by nuclear states of their non-nuclear brethren. To understand a state's decision to acquire or eschew nuclear weapons we need to place the emerging norm against proliferation in the strategic environment that proliferators face.

In another view on the non-security sources of nuclear proliferation, Jacques Hymans' work draws on the tradition of political psychology to account for the spread of nuclear weapons based on the psychology of leaders and their conception of their nation's identity. Specifically, Hymans argues, leaders that have an oppositional nationalistic identity conception will be more prone to drive their countries toward nuclear acquisition.[35] This oppositional view makes leaders feel both fear and pride, his argument goes, resulting in "a higher threat assessment, which motivates a serious commitment to enhance the nation's defenses," along with "a greater urgency to act, to do something to improve the security situation," all the while wanting to impress themselves, "a goal that can hardly be better achieved than through the terrible beauty of a home-made mushroom cloud."[36]

We have little doubt that a leader's psychological makeup and national-identity conception may encourage certain behaviors and discourage others. But whence do these conceptions come? Could it be that they are insulated from the strategic environment the state faces? To be sure, a leader's threat assessment, though perhaps liable to be shaped by their psychological makeup (to say nothing of multiple other factors), must be at least somehow related to the strategic circumstances their state faces, including the presence of adversaries and allies, and their relative military capabilities. We wager that more explanatory leverage can

[35] See: Hymans (2006). For a different—institutional rather than psychological—take on how autocratic leaders may be more inclined to pursue the bomb, see: Way and Weeks (2014). This study differs from ours in that it focuses on leaders' propensity to pursue nuclear weapons, whereas we are interested in nuclear acquisition, not just pursuit. On how leaders' conceptions of national "roles" condition the odds of proliferation, see: Chafetz et al. (1996); Grillot and Long (2000).

[36] Hymans (2006, 35).

be obtained by focusing on the features of the security environment a state faces than on the psychological makeup of its leaders.[37]

Finally, building on organizational theory, Hymans lays out a second argument accounting for the patterns of proliferation centered on "nuclear weapons project efficiency." Hymans focuses on varying levels of managerial acumen and types of macro-institutional environment in order to explain why some of them have been able to acquire nuclear weapons whereas others pursue them for decades to no avail.[38] Using this theory, Hymans shows that since 1970 states that attempt to develop nuclear weapons have taken a great deal of time to achieve their nuclear ambitions.

In our view, these managerial and institutional constraints on nuclear development may affect proliferation in three ways. First, they increase the cost of nuclear acquisition, making it less likely that a state deems a nuclear investment to be productive in terms of yielding a security benefit. Second, by delaying nuclear acquisition, these constraints may facilitate nuclear forbearance if the security environment improves during this longer nuclear development period. Third, they augment the period during which the state is vulnerable to preventive action by its adversaries. In short, managerial and institutional constraints explain why states may take longer to proliferate but they cannot account for a state's decision to abandon the pursuit of nuclear weapons, which requires a transformation in its security environment during the period of nuclear development; nor for an adversary's decision to act preventively, which requires a strategic evaluation that a counterproliferation strike is preferable to proliferation.

Taking stock, this second wave of proliferation has put forth such a wide variety of non-security explanations for states' nuclear decisions that today "the overwhelming majority of scholarly work on nuclear proliferation argues that states do not directly respond to the international environment in making their

[37] Solingen (2007, 104).

[38] See: Hymans (2012, 27).

nuclear weapons choices."[39] This burgeoning wave of scholarship on the causes of nuclear proliferation has no doubt added much to our knowledge of how these non-security variables may contribute to a state's willingness to nuclearize. Yet, this wave of literature finds itself in an ironic situation. Having emerged from a sense that security-based theories could not explain proliferation because they led to contradictory predictions, non-security based explanations are now themselves the source of myriad different predictions about what causes different nuclear behaviors.[40] We wager that this predicament is a consequence of the premature turn away from what is intuitively the most important determinant of nuclear acquisition: a state's security environment.[41] Surely, the economic, political, psychological, institutional, or normative preferences of leaders and ruling elites are conditioned by the security environment they face. To understand their role in the proliferation process, then, we must determine how the security context in which they operate shapes the incentives to pursue or forfeit nuclear weapons. The theory we lay out below gives this strategic context its due importance, placing it at the center of the proliferation problem.

Supply Constraints and Strategies of Inhibition

More recently, a third wave of scholarship on proliferation has focused on "strategies of inhibition."[42] These are the strategies great powers employ to inhibit the spread of nuclear weapons.[43] This wave of research

[39] Hymans (2011, 154).

[40] For an extensive criticism of security-based arguments on the causes of nuclear proliferation based on the observation that they make different predictions, see: Solingen (2012, 24-28).

[41] See: Solingen (2007); Hymans (2006); Rublee (2009); Way and Weeks (2014).

[42] For an overview of the literature on these strategies, see: Gavin (2015).

[43] For a provocative argument on U.S. nonproliferation efforts, see: Maddock (2010). For a review of different states' attitudes towards the treaty, written soon after its implementation, see: Quester (1973).

shifted the analytic focus from a state's willingness to its opportunity to proliferate, being largely responsible for a renaissance in nuclear studies.[44]

This line of scholarship started out by applying quantitative research methods[45] and focusing on supply-side constraints on nuclear proliferation.[46] The resulting "supply-side" literature emphasizes the role of powerful states in limiting access to nuclear technology and materials as key in determining the odds of proliferation. The higher a state's power projection capability, the more likely it is to oppose attempts to assist others' nuclearization efforts, undermining them.[47] Supply-side explanations correctly emphasize how nuclear acquisition is also a supply problem. In order to obtain nuclear weapons, a state must want them, but it must also be able to get them. In highlighting this second half of the proliferation problem, supply-side theorists make an important contribution.

Yet, existing supply-side explanations of proliferation suffer from several notable shortcomings. To begin with, an exclusive focus on restrictions to the supply of nuclear materials and technology ignores other tools states use to limit proliferation, including threats to withdraw support from an ally or to use military force against an adversary. In fact, restrictions to the supply of nuclear materials will rarely be applied on their own. To the contrary, they usually are accompanied by sanctions or threats of military force in the case of attempted proliferation by an adversary, or by inspections and threats of abandonment in the cases of attempted nuclearization by an ally. Given that the success of supply restrictions may depend on them being underpinned by these other efforts, the efficacy of the toolkit deployed to deter proliferation must be evaluated *in toto*.

[44] See: Sagan (2014).

[45] See: Singh and Way (2004); Jo and Gartzke (2007).

[46] See also: Fuhrmann (2009a); Fuhrmann (2009b); Kroenig (2009a); Kroenig (2009b); Kroenig (2010); Fuhrmann (2012); Kroenig (2014).

[47] See: Kroenig (2010).

Moreover, supply-side theories cannot account for the slower pace of proliferation of the past two-and-a-half decades when compared with the Cold War. By these theories' own logic, as the Soviet Union lost much of its power-projection capability, it "became more willing to provide sensitive nuclear assistance."[48] Additionally, states such as Pakistan were for part of the post-Cold War period suspected of supplying would-be nuclear powers with technology and materials.[49] Therefore, it is unclear whether the supply of nuclear materials and technology is more restricted today than in the past. And even if we were to grant that this supply is more restricted today than in the past, it is not clear why this would slow down the rate of proliferation. If one takes the demand-and-supply framework seriously, a reduction in supply would only alter the rate of proliferation if demand for nuclear weapons were elastic. A small number of nuclear weapons, however, has a large effect on a state's ability to guarantee its own survival. Therefore, few security-related goods should have a *less* elastic demand. Attempts to restrict nuclear supplies may thus lead only to an increase in the cost that states have to pay for nuclearization. Indeed, looking at the empirical record we see that several of the states that have acquired nuclear weapons were the target of consistent supply-side efforts to restrict their ability to make progress towards the bomb. They nonetheless managed to build a nuclear deterrent, showing how an exclusive focus on the supply of nuclear technology and materials is insufficient to predict the patterns of proliferation.

Finally, supply-side restrictions—and, conversely, offers of nuclear assistance—are often endogenous to demand-side considerations. In other words, a power-projecting state is likely to put greater effort to curtail the availability of nuclear technology and materials to a state that exhibits a high demand for nuclear weapons and is making a great effort towards acquiring the bomb. Conversely, a non-power projecting state is more likely to offer assistance to a state developing the bomb if this state asks for assis-

[48] Kroenig (2009a, 128). Kroenig notes that China's rise may counter the effect of Russian decline, but this is theoretically indeterminate.

[49] See: Corera (2006).

tance because of its high level of interest in acquiring nuclear weapons. Demand and supply are, in nuclear weapons as in the production of any other security or non-security good, inextricably linked. Which of the two forces "trumps" the other in a particular case—resulting in nuclear proliferation or forbearance—can only be established by analyzing both.

Overall, although supply-side theories of nuclear proliferation are useful to explain which states are more or less likely to offer or withdraw nuclear assistance to aspiring nuclear states, they are unable to account for why some states go nuclear whereas others do not. After all, many nuclear states developed their program while circumventing others' efforts to limit their access to nuclear technology and materials—by finding alternative suppliers or doing most development effort themselves. At the same time, many other states received a great deal of nuclear assistance and yet never acquired the bomb.

Beyond restrictions to the supply of nuclear materials and technologies, this latest wave of scholarship on proliferation has also looked at other policies through which powerful states attempt to deter proliferation. Specifically, the latest scholarship has tried to tackle the role of alliances on proliferation, analyzing the effectiveness of different nonproliferation tools available to a security sponsor such as the United States when one of its protégés displays an interest in acquiring the bomb.[50] This work looks both at the policy instruments with which security sponsors attempt to undermine their protégés' demand for nuclear weapons (*e.g.*, public pledges of protection, troop deployments, nuclear-weapons deployments, and sales of conventional weapons) and at the tools with which security sponsors attempt to curtail their protégés' opportunity to develop nuclear weapons (*e.g.*, inspections of nuclear facilities, efforts to limit their access to nuclear materials and technology, threats of ending support, and sanctions). Overall, the resulting scholarship has yielded a multiplicity of predictions about what are the most effective ways to deter proliferation among allies, reinforcing the criticism that earlier opponents of security explanations had

[50] See: Kogan (2013b); Lanoszka (2013); Fuhrmann and Sechser (2014); Miller (2014a); Reiter (2014); Gerzhoy (2015).

advanced: security factors, such as the presence or absence of an ally, have no simple predictive effect on nuclear proliferation.

For example, whereas according to one study U.S. troop deployments to a protégé's territory have no effect on the protégé's nuclear status,[51] a close examination of important historical cases (*e.g.*, South Korea and Taiwan in the 1970s) highlights the role of concerns about U.S. troop withdrawals as a crucial motivation behind the willingness of a U.S. ally to pursue nuclear weapons.[52] Similarly, whereas some recent work finds little support for nonproliferation as a rationale driving the foreign-deployment of U.S. nuclear weapons,[53] other scholarship finds that the deployment of U.S. nuclear weapons to allied territory has an overall dampening effect on the odds of proliferation.[54] Finally, although one recent study claims that intrusive U.S. inspections of nuclear facilities have led some U.S. allies (such as Taiwan in the 1970s and 80s) to abandon their nuclear program, other U.S. allies (*e.g.*, France in the 1950s, Israel in the 1960s, or Pakistan in the 1980s) have proliferated without being exposed to such intrusive inspections regimes.[55] In sum, the debate on the effect of alliances on proliferation remains wide open.

Although this most recent wave of empirical work advances our knowledge of the effects of alliances on nuclear proliferation, in our view a better understanding of this question requires a combination of rigorous historical analysis with additional theoretical development. Specifically, only by developing a strategic theory of nuclear proliferation—one that takes into consideration the security interests of a protégé considering nuclear acquisition, its security sponsor, and their common adversary—will we be able to understand the conditions under which the protection offered by a security sponsor will deter or, to the contrary, encourage nuclear acquisition by the protégé. Put differently, we need a theory that allows us to

[51] See: Reiter (2014).

[52] See: Lanoszka (2013).

[53] See: Fuhrmann and Sechser (2014).

[54] See: Reiter (2014).

[55] See: Kogan (2013b).

understand when alliances will lower the protégé's willingness to proliferate more than they increase its opportunity to do so, and vice versa.

Summing up, we possess a multiplicity of scholarly views on what accounts for the patterns of nuclear proliferation. To be sure, this scholarly debate has spilled over to the policy world, where different communities echo different arguments. Perhaps unsurprisingly, the U.S. defense community tends to endorse security explanations for why states want nuclear weapons. Members of the U.S. defense establishment, moreover, spend a great deal of effort deliberating about the most appropriate policies to deter further nuclear proliferation, if necessary by military means. But without a proper understanding of the role played by the strategic environment in the process of nuclear proliferation, U.S. policymakers lack a basic framework within which to compare the relative effectiveness of different policy tools. At the same time, the arms control community is largely motivated by neoliberal and constructivist arguments about the role of institutions and norms in shaping the proliferation process. Well intentioned as its efforts often are, their success will be more likely if they incorporate a strategic-interaction perspective into their analysis of the motivations each state has to acquire or forfeit nuclear weapons.[56]

Today's scholarly debate on the causes of proliferation, for its part, is largely organized between demand- and supply-side explanations.[57] Each of these perspectives contributes to our understanding of the proliferation process. Yet, they each suffer from the same limitation: they focus either on a state's willingness to acquire nuclear weapons (demand-side explanations) or the motivations of other states to prevent it from having the opportunity to do so (supply-side explanations). That each existing theory accounts for only one aspect of the proliferation process—demand or supply—explains why despite having developed a multiplicity of arguments on economic, political, sociological, organizational, technological, and psychological variables, we are still not capable of accounting for the overall pattern of the spread of nuclear weapons.

[56] For a skeptical view of the arms control community, see: Craig and Ruzicka (2013).

[57] See: Gartzke and Kroenig (2009); Montgomery and Sagan (2009); Muller and Schmidt (2010); Sagan (2011).

At the same time, although most scholars agree that security matters greatly as a driver of proliferation, we possess no systematic treatment of how security concerns and, more broadly, the strategic environment shape the spread of nuclear weapons. In our view, these two problems are connected: to understand the role played by security concerns on the odds of proliferation, we need to look at how both demand *and* supply interact in a state's strategic environment, analyzing their net effect.[58] Only when we do so will we be able to develop a theory of nuclear proliferation that (i) accounts for why some states acquire nuclear weapons whereas other eschew nuclear ambitions and (ii) compares the relative effectiveness of different tools with which the United States can try to deter other states from acquiring nuclear weapons. This book sets out to present and test one such theory.

Implications of Our Argument

It should be clear by now that our theory of proliferation is also a theory of non- and counterproliferation. As such, our argument has implications for policymakers. To begin with, one might be tempted to think that given the low rate of nuclear acquisition, the United States should not rank proliferation among its most pressing international problems. We show how this view has it backwards. Consistent U.S. efforts to stymie the spread of nuclear weapons underpin the low rate of proliferation, accounting to a great extent for the surprisingly small number of nuclear-weapons states seven decades after the beginning of the nuclear age.

Furthermore, we show how despite rare *explicit* U.S. threats of military action or allied abandonment, the military dimension plays a key role in preventing the spread of nuclear weapons. Threats rarely need to be implemented or even issued explicitly because their targets internalize them and give up nuclear development efforts. As the historical record shows, in many of the cases in which U.S. policy played a role

[58] See: Sagan (2011, 240).

in successfully stopping the spread of nuclear weapons, credible threats of military force (against, *e.g.*, Iraq and Libya) or allied abandonment (vis-à-vis, *e.g.*, Taiwan or West Germany) were key in producing this outcome. As in many other domains of international politics, credible threats tend to be internalized by their targets and therefore do not need to be carried out, producing successful coercion.[59] Specifically, the effectiveness of counterproliferation threats largely accounts for why there is no historical case of proliferation by a relatively weak state that does not have the protection of a great-power sponsor. In this sense, our theory lends support to the claim that leaving "all options on the table" when dealing with potential proliferators decreases their odds of nuclear acquisition even when no explicit threat of military attack is ever made.

While emphasizing the importance of military threats in shaping proliferation, our theory also underlines the risks inherent in a forceful counterproliferation approach. Particularly in an era of U.S. military power preponderance, the costs of a preventive counterproliferation strike on an adversary of the United States may be seen as sufficiently low to justify an attack even when it is doubtful that the target is indeed pursuing nuclear weapons. As we saw in the case of the Iraq invasion of 2003, this strategic setting is likely to result in mistaken preventive wars against presumed proliferators that are not, in fact, developing nuclear weapons.

Moreover, our theory sheds light on how, in order to understand the effect of alliances on proliferation, we need to determine the baseline ability that a state would have to acquire nuclear weapons in the absence of protection from an ally. U.S. threats of abandonment are unlikely to prevent nuclear acquisition by a protégé that would, because of its high relative power vis-à-vis its adversaries, have the opportunity to nuclearize anyway even if Washington terminated its support. With such a relatively strong protégé, a successful U.S. nonproliferation effort would likely require taking away its willingness to go nuclear by

[59] For the seminal treatment of this issue in relations among nuclear states, see: Schelling (1960); Schelling (1966).

providing it with more robust security guarantees, up to and including troop and nuclear-weapon deployments. In contrast, proliferation by a protégé that is relatively weak vis-à-vis its adversaries—and would therefore not have the opportunity to acquire nuclear weapons if U.S. security guarantees were withdrawn—can be deterred by threats of U.S. abandonment. In short, our theory provides insight into the circumstances in which efforts to stymie proliferation by U.S. allies are more likely to be successful using carrots or sticks. While dispelling arguments in favor of this or that particular policy—say, inspections or sanctions—as a silver bullet in all cases, we provide a nuanced picture of the strategic conditions under which different U.S. nonproliferation tools are more or less likely to be successful.

Roadmap of the Book

The remainder of this book proceeds as follows. In Chapter 2, we lay out our strategic theory of nuclear proliferation. The chapter describes how the key features of a state's security environment—its relative power and security goals, plus the level and reliability of the support it may enjoy from a great-power security sponsor—condition its willingness and opportunity to acquire nuclear weapons and, ultimately, its odds of nuclear acquisition. After laying out the causal logic of our argument, we examine the different nonproliferation tools that allies can use, and characterize the conditions under which each of them is more likely to succeed in preventing nuclear acquisition—a topic of particular interest for U.S. policymakers. We then analyze different paths to nuclear acquisition, explaining how in each case the decision to acquire nuclear weapons or abandon the state's nuclear ambitions is shaped by the strategic environment surrounding it. After highlighting the strategic conditions more likely to lead to nuclear proliferation or forbearance, the chapter concludes by laying out the observable implications of our argument.

In Chapter 3, we bring these observable implications to bear on the overall historical record on the spread of nuclear weapons. We begin by laying out our empirical research design and justify our decision to test our theory using case studies. Then, we highlight five hitherto underappreciated patterns of prolifera-

tion. First, we show how facing a dire security threat is a necessary condition for nuclear proliferation. Second, we demonstrate how no weak state without a great-power ally has ever acquired nuclear weapons. Third, we emphasize how, among states that possess a powerful ally, the only ones to build nuclear weapons are those that have security goals not entirely covered by their security sponsor. Fourth, we underline how threats of abandonment are an effective nonproliferation tool only when they target protégés that are relatively weak vis-à-vis their adversaries. Protégé that are relatively strong, in contrast, require additional security assurances in order to remain non-nuclear. Finally, we shed light on the slowdown in the pace of nuclear acquisition since the end of the Cold War.

Then, in Chapter 4, we present an initial set of case studies, exploring the first pathway to proliferation delineated by our theory, which focuses on states that do not enjoy the protection of a security sponsor and for which, therefore, the odds of proliferation are conditioned by their interactions with their adversaries. The cases in this chapter demonstrate two claims. First, we look at the Brazilian nuclear program to illustrate how a serious security threat is a necessary condition for nuclear proliferation. Possessing abundant natural uranium reserves and sizeable industrial and technical capabilities, Brazil worked relentlessly until it mastered the technology necessary to produce weapons-grade fissile material by the 1980s. Still, absent a serious security threat—and despite having great motivation to accrue international prestige—Brazil never built a nuclear weapon. Instead, under benevolent strategic circumstances, Brazil opted for maintaining its non-nuclear status, as our theory predicts. Second, we use three case studies—of the Soviet Union, Iraq, and Iran—to demonstrate how, among states that face a serious security threat and do not benefit from the protection of a security sponsor, only those strong enough to deter an attack on their program ultimately acquired nuclear weapons. The Soviet Union was sufficiently strong to raise the costs its adversaries would incur in case they decided to launch a preventive counterproliferation attack on its program. The combination of a clear national security threat—emanating from the United States, which enjoyed a nuclear monopoly since 1945—with sufficient relative power to deter a preventive U.S.-

launched counterproliferation attack was enough to lead to nuclearization in 1949. In contrast, neither Iraq nor Iran possessed sufficient relative power to be able to cross the nuclear threshold without being targeted by a counterproliferation strike. Both countries were relatively weak and isolated. Iraq, despite facing significant security threats coming from Iran, Israel, and, later, the United States, was ultimately coerced into maintaining its non-nuclear status by a series of measures—including preventive strikes, sanctions, and ultimately a ground invasion—taken by its adversaries. Iran, for its part, faced a serious nonproliferation effort spearheaded by Israel and the United States, which included the threat of military action, and ultimately agreed to a negotiated settlement by which it suspended the components of its nuclear program that might enable it to build an atomic bomb.

Chapters 5 and 6 analyze another set of case studies, this time focusing on the second pathway to proliferation described by our theory. Chapter 5 introduces eight cases of "loose" allies, states that enjoyed some degree of protection from a great-power sponsor. We start with Sweden, which illustrates that a serious security threat, and concerns about the reliability of support from a security sponsor, are necessary conditions for proliferation amongst allies. While Sweden abided by an official policy of neutrality, in practice it worried mostly about a Soviet threat, the only contingency for which nuclear weapons might prove useful. Despite having been at the forefront of nuclear technology in the 1950s, Sweden forfeited nuclearization when tensions receded in Europe and when it realized that U.S. protection would be forthcoming in case of a Soviet attack. We then turn to the case of China, which nuclearized in 1964 as a consequence of the vital threat to its regime posed by the United States, particularly after the loss of Soviet support ensuing the Sino-Soviet split of the late 1950s. Our third case Israel, which faced a hostile security environment and in the 1950s and 60s was unable to obtain robust U.S. security guarantees. Given the limited level of U.S. protection it enjoyed, Israel proceeded with its nuclear development, acquiring nuclear weapons in the late 1960s. We then analyze the case of India, which developed nuclear weapons in the run-up to its 1974 test, while fearing Chinese aggression and lacking reliable protection from the Soviet

Union. Next, we turn to the case of South Africa, which faced a growing regional threat after the rise of pro-Soviet regimes in Angola and Mozambique in 1974. Unable to rely on U.S. support, particularly after the Carter administration took office in early 1977, Pretoria proceeded to develop a nuclear weapon by 1979. North Korea, for its part, nuclearized in the 2000s, in the face of a serious security threat coming from South Korea and the United States, along with a deteriorating—but nonetheless robust—ability to inflict damage in South Korean territory by conventional means (and independently of its unreliable ally, China), thereby deterring a counterproliferation strike launched by either Washington or Seoul. Taiwan is our seventh case. Given its weakness vis-à-vis China and the dwindling support it enjoyed from the United States after the 1970s U.S.-China rapprochement, Taiwan was keen to acquire nuclear weapons. Still, its weakness made it dependent on U.S. support, however small, allowing Washington to coerce Taipei into remaining non-nuclear. Finally, we examine the case of Pakistan, another relatively weak state that was willing to build the bomb to deter the security threats emanating from its powerful neighbor, India. During the 1980s, while enjoying a moderate degree of protection from the United States and doubting that it would last, Pakistan pushed towards nuclear acquisition, building the bomb in the later part of that decade.

Our last empirical chapter—Chapter 6—looks at four states possessing "close" allied support. We start out with Japan, a country, that, like Sweden illustrates how a serious security threat, and concerns about the reliability of support from a security sponsor, are necessary conditions for proliferation. Japan had limited foreign policy objectives and remained firmly in the non-nuclear camp as a result of robust U.S. security guarantees, which effectively addressed security threats from the Soviet Union and, later, from China. We then turn to the case of South Korea, which seriously considered the nuclear option against North Korea, in part because of a reduction of U.S. commitments to East Asia announced by the Nixon Doctrine, but remained non-nuclear due to reinvigorated U.S. security guarantees. Next, we deal with West Germany, which remained non-nuclear as a result of U.S. coercive pressure. German nuclearization raised serious concerns among European North Atlantic Treaty Organization (NATO) allies and, especially,

in Moscow. This hostile reaction led Washington to fear that German nuclear pursuit would unravel its alliance and lead to entrapment in a war with the Soviet Union, prompting a serious U.S. nonproliferation effort targeting Bonn's nuclear aspirations. In contrast, France, our concluding case in this chapter, acquired nuclear weapons in 1960 determined to achieve greater foreign-policy autonomy from the United States in pursuit of its broader strategic goals. French nuclearization happened despite its NATO membership because it did not prompt a Soviet reaction strong enough to lead Washington to fear entrapment as a result of Paris's nuclear pursuit. In fact, both the Soviet Union and the United States acquiesced to France's nuclear acquisition.

The main body of the book concludes with Chapter 7, in which we lay out the theoretical and policy implications of our argument. Additionally, we include four appendices. Appendix I lays out our rules for coding each case of nuclear development in terms of relative power and the presence of a security sponsor. Appendix II contains brief vignettes of all cases of nuclear development that do not feature in the main text: Algeria, Australia, Egypt, Italy, Libya, Romania, Switzerland, Syria, the United Kingdom, the United States, and Yugoslavia. Appendix III presents abbreviated cases of four states that, according to existing theories of proliferation, should have attempted to develop—or even acquire—nuclear weapons and yet did not: Greece, Saudi Arabia, Spain, and Turkey. Finally, Appendix IV formalizes our argument with a game-theoretic model and presents proofs of the formal results.