China’s Search for Coercive Leverage:

Space Weapons, Cyber Attacks, and Precision Missiles in the Information Age

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**Draft: please do not cite or circulate**

Note to NDISC seminar participants: I am circulating a portion of my draft book manuscript. The introduction gives an overview of the whole book. I have also included the theory chapter, which expands on a recent article I published in International Security. That article also includes some of the empirical material drawn from the chapter on China’s offensive cyber capabilities. I will present empirics from the empirical chapter on China’s conventional missile capabilities, which is available on request. I do not expect participants to read everything and warmly welcome feedback on any aspect of the project.
Abstract

How do nuclear-armed adversaries use force to pursue their political aims without triggering a catastrophic nuclear war? In the post-Cold War era, China has taken a distinctive approach to this dilemma. Rather follow in the footsteps of its nuclear-armed peers to rely on threats of a conventional military victory or nuclear weapons use, China has defied the expectations of scholars and practitioners by searching for other military means to gain coercive leverage against its enemies. Instead, it has pursued information-age weapons—accurate missiles carrying conventional payloads, counterspace weapons, and offensive cyber capabilities—which it plans to use strategically to manipulate the risk of escalation to nuclear war.

*China’s Search for Coercive Leverage* develops a theory of strategic substitution to explain Beijing’s unprecedented gamble on information-age weapons. China pursued these capabilities when it faced leverage deficits. China’s best option to address a leverage deficit was to search for substitutes because its leaders doubted the credibility of issuing nuclear threats and its military could not prevail in a conventional conflict in the near term. By contrast, information-age weapons emerged as attractive substitutes because they promised to provide quick and credible coercive leverage. Drawing on hundreds of original Chinese language sources and interviews from fieldwork in China, this book provides a rare and candid glimpse of the view from Beijing. It offers important insights for scholars and practitioners into China’s current military trajectory, and how other states might seize upon the promise of emerging technologies to fix weaknesses in their own military strategies.
Table of Contents

Introduction (included)

Chapter 1: A Theory of Strategic Substitution (included)

Chapter 2: China’s Nuclear Forces—The Credibility Problem

Chapter 3: China’s Conventional Missiles—A Tiger with Wings (available on request)

Chapter 4: China’s Cyber Forces—Winning from a Position of Inferiority

Chapter 5: China’s Space Weapons—Punishment to Teach a Lesson

Conclusion
Introduction

The end of the Cold War heralded the beginning of what China’s leaders called a “strategic opportunity period.” Threats to China’s survival from a superpower invasion, which had defined the country’s strategic environment since its establishment in 1949, had evaporated. China’s leaders could concentrate on growing richer, more powerful, and achieving their longstanding goal of rejuvenation, although they still faced some security threats. China continued to dispute borders with a number of its neighbors. Its leaders were alarmed by a growing desire for more independence in a newly-democratic Taiwan. They also faced the possibility of a more hostile United States now that Washington longer needed China’s support to balance its Cold War foe. Besides, the U.S. military had just handed Saddam Hussein a punishing defeat, shocking China’s People’s Liberation Army (PLA) with its conventional military prowess. Nevertheless, the PLA abandoned its preparations for a war in which the survival of the PRC was at stake to prepare for local wars. Despite these challenges, China’s security outlook was good—good enough for its leaders to prioritize economic development over military modernization.

Preparing for local wars posed a tough new dilemma for China’s military—a limited war dilemma that did not fully take shape until the 1995-6 Taiwan Straits crisis. In 1995 the United States granted a visa to Taiwanese President Lee Teng-hui, which the mainland protested with missile tests. The crisis ended in March 1996 when the United States deployed two aircraft carriers within 100 miles of the Taiwan Strait, a show of force that vividly demonstrated Washington’s support for Taiwan. The crisis was a watershed for two reasons. First, it signaled to China’s leaders and military planners that they needed to urgently prepare for one particular local war: a war to prevent Taiwan from achieving de jure independence from the mainland. Second, it confirmed that the United States would intervene in any war between the mainland and Taiwan. In short, China needed to urgently prepare for a limited war with a nuclear power fielding the most advanced conventional military forces on the planet.
From that point onwards, China’s leaders confronted one of the most insoluble dilemmas of the nuclear age for the first time: how could they achieve limited political objectives using military force without triggering a catastrophic nuclear war? At the crux of this limited war dilemma is an uncomfortable balancing act between achieving political aims and avoiding nuclear war in peacetime, crises, or conflicts. No state has yet found the silver bullet that solves this dilemma, enabling it to achieve its political aims without having to worry about large-scale nuclear attacks on its homeland.

This book is about the puzzle of China’s search for coercive leverage in the information age that began with the 1995-6 Taiwan Strait crisis—a search that looked unlike that of any other nuclear power. In 1995, when the Taiwan Strait Crisis began, China did not have an answer to the limited war dilemma. The crisis made it abundantly clear to China’s leaders that they did not have sufficient coercive leverage to stop Taiwan from seeking independence if the United States intervened. Unlike its nuclear peers, China did not have either a strategy for nuclear first-use or war-winning conventional capabilities as a legacy of its war preparations during the Cold War that it could re-fashion to gain coercive leverage in a local war.

China’s search for coercive leverage to answer the limited war dilemma in the post-Cold War era led China’s leaders to information-age weapons—offensive cyber operations, counterspace weapons, and precision conventional missiles—which it threatened to use on strategic targets. This “strategic substitution” approach gave China a way to compensate for its inadequate conventional military capabilities without having to threaten nuclear use. It is a surprisingly bold departure from the answers favored by other nuclear-armed states, who have opted to rely either on winning the war with conventional capabilities or threatening to go nuclear. Instead, China has gambled on the novel, coercive use of information-age military technologies to redress its leverage deficits.
China’s strategic substitution approach to coping with the limited war dilemma, which gives information-age weapons a starring role, is not a silver bullet. It may prove to be at best a stop-gap and at worst a failure that China’s leaders discard in the future. But the PRC is far too important an actor in international politics—economically, militarily, diplomatically—for its deliberate and puzzling choice of strategic substitution to be dismissed as a folly. This book offers a theory of strategic substitution to explain the strategic logic of China’s search for coercive leverage in the information age and its choice of information-age weapons.

The Limited War Dilemma

Nuclear weapons have fundamentally altered the relationship between foreign policy and military force. But they have not erased the basic political conflicts of interest among states that have sparked military conflict for centuries. When two states have sufficient nuclear capabilities to survive each other’s nuclear attacks and retaliate with a second strike, a situation of mutual vulnerability prevails. This nuclear stalemate might deter the use of force at lower levels of conflict intensity, but states can also exploit it to achieve their political aims. They could either coerce an adversary that is fearful of an all-out nuclear war using nuclear threats, or attack an adversary with conventional military forces and rely on its fear of nuclear war to constrain its response.

Achieving political objectives using military force without triggering an immensely destructive nuclear exchange poses a limited war dilemma. If a state uses too much military force, whether conventional ground, air and naval forces, nuclear threats, or even nuclear use, it might trigger an all-out nuclear exchange. But if a state is too cautious in its use of force for fear of that nuclear exchange, it will fail achieve its objectives. This dilemma is vividly illustrated by Pakistan’s willingness to lean heavily on nuclear threats during armed clashes with India and India’s

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hesitation to use the full force of its conventional capabilities to punish Pakistan. The dilemma is most acute when a state can survive even if it fails to achieve its political objectives in a war.

Existing Answers to the Limited War Dilemma

Most nuclear-armed states have adopted one of two answers to the limited war dilemma in their peacetime military strategies. The first involves threatening to employ nuclear weapons in an otherwise conventional war to coerce an adversary to cede to the state’s demands. The second involves threatening to employ conventional military force to seize their objective (or deny an adversary its objectives). These peacetime strategies shape the options that are available to states in a crisis or conflict because they influence the capabilities and forces a state develops, and the operations it prepares for, which cannot be improvised on the brink of war.

During the Cold War, U.S. scholars and policymakers focused overwhelmingly on how threats of nuclear first-use could provide an answer the limited war dilemma. As the Soviet Union’s nuclear arsenal grew to match that of the United States in the early 1960s, U.S. leaders could no longer lean on their nuclear superiority to threaten massive nuclear retaliation. Instead, scholars argued that the United States could engage in a competition in nuclear risk taking to coerce the Soviet Union despite the deepening nuclear stalemate between the two superpowers.

Scholars argued that threatening nuclear strikes using short-range, low-yield tactical nuclear weapons would give a nuclear-armed adversary an incentive to exercise restraint in its response. But the limited use of nuclear weapons would raise the risk that longer-range, higher-yield nuclear weapons suitable for destroying cities would be used in the future. Neither state could be sure exactly when and how a tactical nuclear exchange could escalate, nor would they be able to stop it. This “threat that leaves something to chance” of an all-out nuclear war rested on the likelihood of accidents, mistakes, and misperceptions inherent in warfare. Facing the prospect of a nuclear

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war that would be catastrophic for both sides, strategists expected that one side would be less willing to accept the risk and end the crisis or conflict.

Both the United States and Soviet Union developed the capabilities for limited nuclear strikes to back their threats of nuclear first-use. Fortunately, the lack of direct conflict between the two superpowers ensured that this answer to the limited war dilemma was never put to the test. Indeed, the gravity of the dilemma drove both states to try their best to avoid such a test. When the two states’ interests clashed outside of the European theater in Vietnam and Korea, wars that neither saw as threatening their survival, they sidestepped the limited war dilemma by supporting proxies and keeping the full extent of their involvement a secret.⁶ The United States also made persistent but ultimately unsuccessful efforts to acquire counterforce capabilities that could destroy the Soviet arsenal and solve the dilemma by escaping mutual vulnerability.⁷

Other states, including France, Pakistan, and Russia in the post-Cold War era, have also embraced this nuclear answer to the limited war dilemma. In the early 2000s, Russian strategists debated whether nuclear weapons could be used for limited strikes to “escalate-to-deescalate” a regional war on the European continent.⁸ Concerns that Russia might use a limited nuclear strike to coerce Ukraine into capitulating to Russian invaders during the 2022 Ukraine war illustrate the long shadow cast by Russia’s nuclear strategy over a local war with a non-nuclear adversary. Pakistan’s deployment of battlefield nuclear weapons to local commanders to threaten rapid nuclear use against invading Indian troops is yet another example of the nuclear answer to the limited war dilemma.⁹ During the Cold War, France’s independent nuclear capability—its force de frappe—also relied on rapid nuclear escalation to deter a Warsaw Pact invasion.¹⁰

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¹⁰ Narang, chap. 6.
In the post-Cold War era, the conventional answer to the limited war dilemma, which involves threatening to use war-winning conventional capabilities to seize military objectives and impose one’s will on a nuclear-armed adversary, has gained prominence. The U.S. used conventional military capabilities with devastating effectiveness against non-nuclear adversaries in Afghanistan, twice in Iraq and in the Kosovo air war. In each of these conflicts Washington was pursuing lesser objectives than its survival, although the same could not be said for its adversaries. Those adversaries were not nuclear-armed, so the United States did not face a limited war dilemma when fighting them. But the United States also relied on its formidable conventional military power to deter its nuclear-armed competitors China, Russia, and North Korea throughout the post-Cold War era.

Other states have also pursued war-winning conventional capabilities to answer the limited war dilemma. The United States’ conventional military preponderance has taken this conventional answer to the limited war dilemma off the table for its adversaries. But India has relied on its conventional military superiority to deter Pakistan. France and the United Kingdom have also pooled conventional capabilities through NATO to deter Russia in a dramatic departure from the alliance’s heavy nuclear reliance during the Cold War. Although Israel does not face a limited war dilemma in confronting its non-nuclear regional adversaries, it has also relied on muscular conventional military capabilities to protect its interests rather than the first-use of its nuclear weapons.

*The Puzzle of China’s Answer to the Limited War Dilemma*

Existing theories of limited war among nuclear powers cannot explain China’s approach to coping with the limited war dilemma. Based on the above empirical record, scholars assume that nuclear-armed states have a black-and-white choice: they can either threaten to win limited wars with conventional military power or adopt nuclear first-use postures to offset their conventional weakness. For this reason, they have been either puzzled or suspicious of China’s decision to stick
with a No-First-Use policy for its nuclear weapons, and a force structure to match it, given its backward military capabilities throughout most of the Cold War era.\textsuperscript{11}

Are states’ options for coping with the limited war dilemma really this black-and-white? Have those options really stayed the same since the dawn of the nuclear age, despite dramatic changes in military technology, international politics, and membership of the nuclear club? These questions have not been fully explored in the existing international relations literature, but they are key to understanding China’s decision not to adopt either the nuclear or conventional option.

China’s search for coercive leverage in the information age demonstrates that there is a third answer to the limited war dilemma: strategic substitution. Military technologies that have matured into offensive capabilities in the information age can be postured to coerce adversaries under the nuclear shadow. They can substitute for both threatening nuclear first-use and conventional military victory. What explains China’s puzzling departure from the choices of its nuclear peers?

**The Argument in Brief**

In this book, I develop a theory of strategic substitution to explain how China addressed leverage deficits when it faced the limited war dilemma in the post-Cold War era. The theory makes three core claims. First, China search’s coercive leverage to plug leverage deficits was a search for substitutes. Second, that search led its leaders to pursue the promise of using information-age weapons strategically. Third, information-age weapons only provide a country with coercive leverage if they are explicitly postured for coercion.

China faced serious constraints in its search for coercive leverage once its leaders realized that they faced a limited war dilemma. Like other nuclear-armed states, China searched for additional leverage when it faced leverage deficits. Leverage deficits occur when a state’s threat environment changes and its leaders discover that their existing military capabilities are ill-suited for the type of adversary and war that they are most likely to confront. Ignoring a leverage deficit would mean

that, in the future dispute, a state would either have to make serious diplomatic concessions on vital interests or fight a conventional war that it would very likely lose. But other unlike nuclear-armed states, China’s legacy capabilities from the Cold War included backward conventional military capabilities and a rudimentary nuclear posture optimized for retaliation. These constraints shaped its search for coercive leverage, which was effectively a search for substitutes for nuclear first-use and conventional war-winning capabilities.

Second, in response to leverage deficits, China pursued substitutes for nuclear first-use or conventional victory that also promised to provide it with coercive leverage: offensive cyber capabilities, precision conventional missiles, and counterspace capabilities to coerce its adversary. China’s “strategic substitution” answer to the limited war dilemma gives these information-age weapons used strategically a starring role because they promised to revive the threat that leaves something to chance of an all-out nuclear war even under conditions of nuclear stalemate. The dangerous and very likely consequences of threatening limited nuclear strikes—nuclear retaliation and further escalation—diminish the credibility of nuclear threats when a nuclear stalemate prevails in all situations other than when a state is fighting for its survival. Information-age weapons could raise risks of nuclear escalation and generate coercive leverage because they promise to cause large scale damage and are difficult to defend against, their use crosses salient thresholds in a limited war, and they increase the probability of inadvertent nuclear escalation. But genuine uncertainty surrounds whether information-age weapons would actually deliver on their promise to generate coercive leverage. That uncertainty lowers the bar for states to use them and creates a genuine threat that leaves something to chance.

Third, information-age weapons only generate leverage in peacetime, crises, or conflicts if they are explicitly postured for coercion. Information-age weapons must be postured to attack strategic targets to generate a risk of escalation to nuclear war that neither side can fully control if they are to be used as sources of coercive leverage independent of conventional military operations. A state can harness the escalatory risk created by information-age weapons in two distinctive ways to coerce an adversary. First, they can stoke escalation risks using a brinkmanship posture for any given information-age weapon: a high risk, high reward posture that reduces the cost of achieving coercive bargaining leverage. Second, states can try to smother these escalation risks, without
snuffing them out entirely, using a calibrated escalation posture. This posture requires a state to pay a higher cost to generate leverage, but places safeguards around the strategic use of information-age weapons to partially control and hence lower escalation risks. A variety of factors influence a state’s choice of force postures, which reflect its risk-cost trade-off for each type of for information-age weapon, including the availability of technology, civil-military relations, domestic politics, military adaptation, and, for space and cyber capabilities, a state’s own vulnerability to space and cyber attacks, respectively.

To test the theory of strategic substitution against alternative explanations derived from the literature on military innovation and diffusion, the book uses comparative case studies of China’s decisions to pursue space, cyber, and precision missile capabilities after experiencing leverage deficits in the Taiwan Straits Crisis in 1995-6 and NATO’s bombing of China’s embassy in 1999 during the Kosovo war. The book also examines China’s choices about its military capabilities in periods before, between, and after those years, when it did not face a leverage deficit revealed by a crisis with a nuclear-armed adversary, but continued to prepare for limited wars. Each case study is paired with a shadow case of another capability that China did not pursue for coercive leverage, although it has similar operational effects to the capabilities China did pursue as strategic substitutes: bomber aircraft armed with conventional payloads, electronic warfare and special operations forces. These shadow cases demonstrate the contingency in China’s decisions to bet on certain capabilities for strategic substitution but not others.

**Contributions**

This book weaves together theories of coercion, nuclear weapons, and information technology to enable scholars and practitioners to better understand how nuclear-armed powers plan to coerce each other with military capabilities in contemporary international relations. The book provides a basis for understanding the search for coercive leverage in contemporary great power competition, including a rare and candid view from Beijing of the options available. It makes three important contributions to the international relations literature.
First, the theory of strategic substitution updates theories of coercion among nuclear-armed states to account for technological change in the information age. Existing theories focus on how states can threaten limited nuclear wars to coerce each other. But technological change equips states with more coercive military capabilities today than in previous decades. Pioneering work on “cross-domain deterrence” by Erik Gartzke and John Lindsay began to look at the impact of those changes in a broad sense, identifying the potential for states to use the advantages of different military technologies and the state’s individual advantages to play to their strengths and cover their weaknesses. This book takes a narrower focus and is therefore able to make a more specific, original argument about the interactions of military technologies. Put simply, information-age weapons revive the significance of threats that leave something to chance even in the presence of seemingly robust mutual nuclear deterrence between two great powers. No existing scholarship has articulated this consequence of technological change for wars fought under the nuclear shadow.

Second, this book demonstrates how states can seize upon the promise of emerging technologies to plug gaps and weaknesses in their military strategies, and the results of those choices. It breaks new ground by identifying and explaining a novel “strategic substitution” answer to the insoluble dilemma of limited wars in the nuclear age. In doing so, it also updates the existing literature on coercion among nuclear-armed powers to account for cross-national variation in nuclear postures. Theories of limited nuclear war cannot explain how states with retaliatory nuclear postures like China and India coerce their nuclear-armed adversaries. Both countries face conventionally superior, nuclear-armed adversaries (the United States and China, respectively) and cannot rely on

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their conventional capabilities for coercive leverage. But strategic substitution has advantages and disadvantages such that, while China has embraced this approach, India might not.16

Third, this book bridges the gap between the skeptics in the academy who have raised questions about the effectiveness of offensive cyber, counterspace, and precision guided missiles as tools of coercive leverage, and states who continue to rely on them for coercive uses despite their questionable effectiveness. Existing literature has cast doubt on whether both cyber and conventional missile capabilities are sufficiently damaging to coerce adversaries.17 But all nuclear-armed states have shown a keen interest in developing counterspace weapons, offensive cyber capabilities able to attack strategic targets, and precision-guided conventional missiles. The book identifies why these weapons might give states coercive leverage against their adversaries even if they are not very destructive. I argue that states must deliberately configure these information-age capabilities to threaten escalation and gain coercive leverage. Whether these weapons generate escalatory risks or not will depend on whether and how they are postured for coercion, rather than innate characteristics of the technology.

Fourth, this book offers the most comprehensive and theoretically informed account of China’s approach to strategic deterrence and compellence in the post-Cold War era. In a world increasingly defined by U.S.-China rivalry, understanding China’s behavior, which often does not conform to existing theories informed by the experience of Western powers, is essential. This book draws on hundreds of original Chinese-language sources, many of which have not been cited before in Chinese or Western scholarship. Those written sources are supplemented by interviews with

Chinese experts conducted between August 2015 and January 2017. Given the increasing restrictions on academic research within the PRC, these sources are likely to remain among the best available on these sensitive topics for some years to come. Together, the written sources and interviews provide an unprecedented level of detail about China’s decisions concerning some of its most hyped but least understood military capabilities.

This book is the first study to identify China’s strategic substitution of threats of nuclear first-use and conventional inferiority for threats to escalate a conflict using information-age weapons attacks. Existing accounts of China’s space, cyber, and conventional missile capabilities have not explained the decision-making behind these weapons programs.\(^{18}\) With a few notable exceptions, these studies have tended to examine China’s space, cyber, and conventional missile programs in isolation from each other and China’s nuclear posture.\(^{19}\) This book also makes an original


contribution to the literature explaining China’s nuclear strategy. Scholars have pointed to ideational, material, and organizational reasons for the continuity in China’s retaliatory nuclear posture despite changes in its threat environment. The theory of strategic substitution identifies another reason: the availability of more credible substitutes for coercive leverage. This book also exploits newly available sources to shed further light on internal debates over China’s nuclear posture.

Finally, this book aims to inform debate at the intersection of scholarship and policy on how the United States and its allies to deal with the formidable security challenge posed by China’s rise. Gaps in U.S. and its allies’ understanding of China’s approach to strategic deterrence will only make misperceptions in any future crises or conflicts more likely and dangerous. This book aims to fill those gaps to better inform the policies towards China, whether they seek strategic stability or to counter China’s plans to use force across the Taiwan Strait.

**Plan of the Book**

Chapter 1 develops the theory of strategic substitution in three steps, to familiarize readers with the relevant technologies before explaining why China pursued them to address its leverage deficits. First, the chapter explains why and how information-age weapons can provide states with coercive leverage. These weapons can be used strategically to coerce an adversary if they are deliberately postured to create a threat that leaves something to chance of escalation to nuclear war. Force postures for information-age weapons vary in their approach to risk of uncontrolled escalation, from stoking it on one end of the spectrum, reflecting a brinkmanship posture, to

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smothering that risk (but not entirely extinguishing it) on the other end, reflecting a calibrated escalation posture. Second, the chapter describes the advantages and disadvantages of the established nuclear and conventional options for gaining coercive leverage, and compares them with the advantages and disadvantages of strategic substitution relying on information-age weapons coercion. The third step is to explain why a state would favor those advantages and accept those disadvantages to pursue information age weapons for coercive leverage, the dependent variable of the theory. The chapter introduces the independent variable of the theory, the presence or absence of a leverage deficit, and its mechanism, the search for coercive leverage under the constraints of conventional inferiority and doubts about the credibility of nuclear threats. These constraints led China to recognize the advantages of information-age weapons as substitutes.

In addition to building the theory of strategic substitution, Chapter 1 has three other functions. It identifies some key factors influencing a state’s choice of force posture to implement strategic substitution. It also introduces alternative explanations for China’s pursuit of information-age weapons derived from the military innovation and diffusion literature. Finally, it outlines the research design employed in the empirical chapters to follow.

Chapter 2 shows that threats of nuclear first use and conventional victory were off the table in China’s search for coercive leverage in the post-Cold War era. The most significant conflict it was likely to fight was a war to prevent Taiwanese independence in which the United States intervened. China’s leaders did not face the limited war dilemma before 1995 because they were unsure whether the United States would intervene in a future cross-Strait war. At that time, China lacked legacy capabilities from the Cold War that could easily be repurposed to threaten nuclear first-use or a conventional victory in a limited war. Its leaders also doubted the credibility of nuclear first use and needed decades to modernize the PLA’s conventional military capabilities. Because the PRC lacked the conventional forces to seize Taiwan in 1996, nuclear first use was the only established way it could to gain coercive leverage against a nuclear-armed enemy. But China’s leaders rejected that option because threats of nuclear first use are hard to make credible against an adversary who could retaliate in kind. The chapter exploits newly available sources to update accounts of China’s debates and repeated rejection of the nuclear first-use option when it faced
leverage deficits: after the 1995-6 Taiwan Strait crisis and after the 1999 bombing of China’s embassy in Belgrade by NATO forces during the Kosovo air war.

Chapter 3 documents China’s first search for coercive leverage after the 1995-6 Taiwan Strait crisis, which resulted in its pursuit of a precision conventional missile force capable of coercing its adversaries. This chapter explains China’s first attempt to address the strategic problem laid out in the previous chapter with an information-age weapon as a substitute for changing its nuclear posture or building up its conventional military power. Chapter 3 also exploits new sources to tell the story of why China’s leaders had a ready-made option to address their leverage deficit in the wake of the Taiwan Strait crisis. China’s nuclear missile force had made the case for the promise of conventional missile coercion and requested that new units be equipped with missiles originally intended for export because it feared irrelevance in a local war. After the 1995-6 Taiwan Strait crisis, Chinese leaders also recognized the promise of conventional missiles to redress the leverage deficit they faced. They pursued precision technology to take advantage of information-age advances in missile guidance, and expanded the range and size of the force. Accurate conventional missiles could be used to intimidate Taiwan and conduct provocative attacks on enemy bases and ships if a war broke out. The chapter documents the gradual shift from a brinkmanship to a calibrated escalation posture as China’s missile accuracy improved in the first two decades of the 21st century. It concludes with a brief discussion of why China did not pursue a conventional strategic bomber force because of its weaknesses in aircraft technology.

Chapter 4 examines offensive cyber operations with strategic effects—one of the information-age weapons that China pursued after the 1999 bombing of its embassy in Belgrade. China faced a second leverage deficit in the wake of that incident because its leaders did not accept U.S. claims that the bombing was an accident. The chapter shows the robustness of China’s preferences for substitutes when it faced a leverage deficit, even when its vulnerability to information-age attacks increased over time. In 1999, China’s leaders concluded that the precision conventional missile force it was already pursuing would not be enough to coerce the United States to stay out of a cross-Strait war. Rather than revising its nuclear No First-Use policy, China’s leaders tasked the PLA with establishing a “strategic deterrence system bringing together many means”. The PLA identified offensive cyber operations as an accessible means of attacking a technologically
advanced adversary. It initially adopted a brinkmanship cyber force posture to exploit China’s low
dependence on information networks. But China’s leaders abruptly changed that posture to
calibrated escalation in 2014 because the country’s vulnerability to retaliatory cyber attacks had
grown. The chapter concludes with a brief discussion of why China did not orient its electronic
warfare capabilities to gain coercive leverage, despite their similar military effects to cyber attacks.

Chapter 5 examines counterspace weapons, China’s third information-age weapons capability,
which it also pursued after the Belgrade embassy bombing. This chapter offers the clearest
evidence of the strategic substitution logic that underpinned what the top leader at the time, Jiang
Zemin, called China’s “strategic deterrence system bringing together many means.”22 For the PLA,
counterspace weapons offered superior coercive leverage to nuclear threats because of their greater
credibility and ability to target military assets more discriminately. But they also saw counterspace
weapons as useful for deterring attacks on China’s own space capabilities, since the PLA was
already planning a large satellite fleet to support its conventional military operations. Debates over
China’s space force posture highlight the escalatory risks these weapons create and their resulting
ability to generate coercive leverage. Some PLA officers aspired to a calibrated escalation space
posture in the early 2000s, influenced by China’s own vulnerability to retaliatory attacks against
its assets in space, while others were more interested in warfighting applications of counterspace
weapons. In 2015, China’s leaders sided with those who recognized the escalatory risks of
counterspace weapons when they decided to establish a new military organization, the PLA
Strategic Support Force, to operate space capabilities. Chapter 5 compares China’s pursuit of
counterspace capabilities with the development of special operations forces, which it pursued for
the similar operational effect of denying enemy militaries access to information in a future conflict,
but without the escalatory potential of counterspace attacks.

The conclusion summarizes the key arguments of the book, evaluates the effectiveness of China’s
search for coercive leverage, and considers the future evolution of China’s approach to coping
with the limited war dilemma. China’s information-age weapons have now matured and entered
service in its military, with a mixed record of success. Accurate conventional missiles have caused

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22 Jiang Zemin, *Jiang Zemin Wenxuan (San Juan) [Selected Works of Jiang Zemin (Volume 3)]* (Beijing: Zhongyang
Wenxian Chubanshe, 2006), 585.
major headaches for U.S. military planners, but significant uncertainty remains as to whether China’s offensive cyber capabilities provide it with coercive leverage. Meanwhile, Chinese leaders might now be reluctant to use counterspace weapons, even with a calibrated escalation posture, fearing unacceptable retaliatory damage to their own space assets. All of China’s information-age weapons have created more uncertainty about nuclear escalation risks than its leaders could have anticipated when they decided to pursue them. The conclusion examines three possible trajectories for China’s answer to the limited war dilemma in the future: continuity, change to nuclear first use, and greater reliance on conventional capabilities. China continues to pursue nuclear and conventional modernization that could remove the constraints that shaped its search for leverage in prior decades. 2022 also brought two rare opportunities for China to evaluate the effectiveness information-age weapons coercion: the Ukraine War, in which Russia has employed similar capabilities, and the largest PLA military exercises around Taiwan since 1995-6 in the wake of U.S. House of Representatives Speaker Nancy Pelosi’s visit to the island.
Chapter 1

A Theory of Strategic Substitution

Nuclear weapons have not eliminated the desire of states to pursue their political objectives using military force, but they have made warfare more dangerous when both sides possess them. Nuclear-armed states that pursue political objectives using military force against their nuclear-armed adversaries confront an insoluble dilemma: how can they achieve those objectives without triggering a catastrophic nuclear war? This chapter develops a theory of strategic substitution to explain how and why one important nuclear-armed state, the People’s Republic of China (PRC), has coped with this limited war dilemma. China has seized on new technologies with coercive military applications, which have expanded the menu of options available to states to address the limited war dilemma in the post-Cold War era.

When China faced leverage deficits it pursued information-age weapons to increase its coercive leverage. If unaddressed, those leverage deficits would have left China incapable of achieving its political objectives in a future war. Leverage deficits propelled China’s leaders into a search for quick and credible leverage to plug these gaps in its existing capabilities. But China’s options were tightly constrained by doubts about the credibility of nuclear threats and its backward conventional military capabilities. It searched for substitutes for changing its nuclear posture or war-winning conventional capabilities that it simply could not field for decades into the future.

Precision conventional missiles, offensive cyber operations, and counterspace weapons can be used strategically to provide quick and credible coercive leverage in a limited war, which makes them attractive substitutes to the nuclear or conventional option. These weapons promised to revive the threat that leaves something to chance of a limited conventional conflict escalating into an all-out nuclear war, which becomes more difficult to generate with limited nuclear strikes once two states are in a nuclear stalemate. To achieve this effect, information-age weapons must be deliberately postured as slippery slopes or ladders between conventional and nuclear war using a brinkmanship or calibrated escalation posture. But significant uncertainty remains as to whether these weapons would deliver on their promise to generate coercive leverage in a crisis or conflict.
This chapter unfolds as follows. The first section provides an introduction to information-age weapons and coercive leverage to familiarize readers with the relevant technologies and concepts. It describes the dependent variable of the theory of strategic substitution—the pursuit of information-age weapons postured for coercive leverage—and force postures necessary to implement them. The second section explains the advantages and disadvantages of three different answers to coping with the limited war dilemma: nuclear first-use, conventional war-winning capabilities, and strategic substitution relying on information-age weapons. The third section outlines a theory to explain why a state would choose strategic substitution. It introduces the independent variable, a leverage deficit, and the mechanism, the search for coercive leverage. The fourth section outlines the research design employed in this book to test the theory of strategic substitution against alternative explanations for information-age weapons pursuit derived from the military innovation and diffusion literature.

**Key Concepts and Technologies**

Coercive leverage refers to costs that a state can threaten to impose to influence an adversary’s decision-making about its future actions. Unless otherwise stated, this book uses the term to refer to the coercive leverage that states gain from military means to influence an adversary’s behavior in a dispute that could result in armed conflict. States can and do use a variety of non-military means to gain coercive leverage. They can threaten to inflict reputational damage, shame their adversaries, deny them membership of international organizations and groupings, or isolate them diplomatically. Those non-military means do not lose their effectiveness once an armed conflict begins. Nevertheless, when a state faces a dispute that could result in the use of force, military means of gaining coercive leverage are the most salient.

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States want coercive leverage against their adversaries to achieve their desired outcome in a dispute with threats of violence that induce an adversary’s compliance, rather than having to bear the cost of fighting a war to impose that outcome on an adversary. Coercive threats are a cheap but uncertain way of achieving political aims in a dispute with an adversary. Their success depends on an adversary’s cooperation and compliance with a threat, which is by no means a given.4

Coercive leverage enables a state to engage in coercive bargaining with an adversary over a dispute that could become an armed conflict in peacetime and crises, as well as during an armed conflict. A state’s military capabilities equip it with the leverage to bargain for a better outcome, regardless of whether it is making compellent or deterrent demands.5 In peacetime, coercive leverage contributes to general deterrence such that an adversary might refrain from taking actions that adversely affect a state’s interests in a dispute and provoke a crisis.6 In crises states rely on their coercive leverage for immediate deterrence or compellence. They often use military means to actively signal resolve to an adversary and warn of the consequences of noncompliance with the state’s demands. Once a political dispute spills over into armed conflict, a state’s coercive leverage contributes to intrawar deterrence and compellence by shaping an adversary’s decisions at the strategic level of war, where political aims are matched to the use of military force.7 Military capabilities held in reserve equip the states with coercive leverage to achieve war aims without decisively defeating an adversary’s military forces.8

This book focuses on the role of coercive leverage in limited wars. I define limited wars as wars in which states pursue political objectives that do not threaten their survival, such as seizing segments of territory, preventing weapons proliferation or enforcing humanitarian principles.9 By

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4 Schelling, *Arms and Influence*, 4. Brute force means can also yield unpredictable results because a cannot be certain of its military performance on the battlefield, but it has more control over those outcomes than an adversary’s decision-making.


contrast, total wars require the complete destruction of an adversary’s military, capture of its center of political power, and defeat of its more powerful allies. Limited political aims usually lead states to restrict their brute force efforts to fight, whether by limiting the means, intensity, geographical scope, parties, or targets of the conflict. Total wars were rare in the pre-nuclear age and no nuclear dyad has yet fought a total war, which would be an all-out nuclear war.

States gain coercive leverage using two different types of threats: to win wars or to escalate them. These different types of coercive threats alter adversary behavior through distinct mechanisms. A threat to win the war alters an adversary’s behavior through its direct military effects. If a state has the conventional military power to achieve its war aims, its adversary might give in to its demands to avoid the cost of fighting yet still failing to achieve its objectives. Escalation involves “an increase in the intensity or scope of a conflict that crosses threshold(s) considered significant by one or more of the participants.” A threat to escalate alters an adversary’s expectations about the future course of a crisis or conflict. Escalatory attacks serve as “a tacit proposal by one belligerent for new ground rules” about aspects of the conflict such as its intensity, the weapons used, parties to the conflict, or geographical scope. Nuclear weapons are typically used to make threats of escalation, while conventional weapons are typically used to threaten a military victory.

Introducing Information-Age Weapons

I use the term “information-age weapons” throughout this book to refer to offensive cyber operations, counterspace weapons, and precision conventional missiles because dependence on

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10 Clausewitz, 596.
14 Fearon, “Rationalist Explanations for War.”
17 Smoke, 242.
18 Both conventional and nuclear weapons can be used to make both types of threats. Snyder, Deterrence and Defense, 9.
information networks is a core, shared feature of all three capabilities. Each of these weapon types have their roots in the “information-age,” which was popularized in the post-Cold War as computers, the internet, and other digital technologies diffused throughout societies, economies, and militaries. In this book, this term is narrowly defined to refer to these three weapons technologies only, rather than broadly defined to include other military technologies that are often described as information-age weapons, such as electronic warfare and cyber-enabled influence operations.

A state conducts an “offensive cyber operation” (or “cyber attack”) when it takes actions to affect the integrity and availability of an adversary’s systems, devices, or the information on them.19 “Offensive cyber capabilities” are the tools states use to carry out those attacks.20 A cyber attack does not include intruding into (“hacking” or “exploiting”) another state’s computer networks to gather intelligence or steal data.21 A cyber attack could involve implanting malicious lines of computer code into a target’s information system to stop it from functioning properly, changing information on that system, or erasing information. Some cyber attacks do not require the coercer to intrude into the target’s system, such as denial of service attacks that flood a target’s website with requests such that it cannot respond to legitimate requests.

A counterspace attack is any action a state takes to inhibit an adversary’s ability to use outer space for civilian or military purposes. These actions either to disrupt or destroy systems in space, or the transmission of information or objects between space and earth.22 Counterspace weapons include jammers, lasers, microwaves, electromagnetic pulse weapons, or objects used to collide or interfere with a target’s assets in space, including “direct ascent” anti-satellite missiles launched

20 Following conventions in the cyber conflict literature, the term “cyber weapon” is avoided where possible. The term “cyber weapon” does not accurately reflect the process by which a cyber effect on a target system is created or the lack of fungibility of offensive cyber capabilities, which are tailored to their specific target.
21 Cyber intrusions could have a coercive effect on an adversary if they are mistaken for a prelude to an attack because a target that discovers an intruder in its networks would not be able to tell whether the intrusion is for espionage or attack preparations. Ben Buchanan, The Cybersecurity Dilemma: Hacking, Trust and Fear Between Nations (New York, N.Y: Oxford University Press, 2017); Ben Buchanan and Fiona S. Cunningham, “Preparing the Cyber Battlefield: Assessing A Novel Escalation Risk in a U.S.-China Crisis,” Texas National Security Review 3, no. 4 (2020).
from earth. Space weapons can also affect the transmission of information between space and earth, such as electronic or cyber attacks that interfere with communications between satellites and ground stations. Conventional weapons used to destroy a target’s terrestrial space infrastructure are excluded from the definition of a counterspace weapon.

A precision conventional missile refers to any cruise, ballistic, or hypersonic missile capable of delivering a conventional payload within 50 meters or less of a target. A precision conventional missile may be dual-use, meaning that the same platform can switch its conventional payload for a nuclear, chemical, or biological payload. The U.S. Department of Defense defines precision-guided munitions as weapons “intended to destroy a point target and minimize collateral damage.” Missiles use both inertial guidance and guidance systems that rely on information external to the missile itself. Unless they rely on inertial guidance only, precision missiles typically receive information about the target location before launch, and updates during flight, from information networks that fuse data gathered from a variety of sensors external to the missile. That information includes positioning data from navigation satellites, laser marking of a target, infrared, radio-frequency or electro-optical sensors, and pre-programmed flight paths for cruise missiles. Attacking moving targets at long ranges poses particular challenges for conventional missiles because of their small blast radius. Information networks that provide updates about the target’s location while the missile is in flight are particularly important for moving targets. Information networks are also critical to the task of finding and tracking a moving target before a missile is launched.

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23 This definition is broader than the definitions used in legal proposals to ban space weapons. James Clay Moltz, *Crowded Orbits: Conflict and Cooperation in Space* (New York, N.Y: Columbia University Press, 2014), 125.
24 A circular error probability (CEP) of 50 meters is relatively generous, as some experts use a CEP of 10 meters or less to classify precision-guided missiles. I use this definition for purely empirical reasons—the United States government has classified a class of Chinese conventional intermediate-range ballistic missile (IRBM), the DF-26, as a precision strike capability. That missile has a smaller CEP than an older missile, the DF-21, which is believed to have a CEP of 40-50 meters.
Some information-age weapons are particularly well-suited to making threats of escalation because they create additional pathways for a limited conventional war to become a nuclear war. These information-age weapons are promising for strategic uses, which are distinct from operational uses to engage an adversary’s military capabilities. Although these weapons differ from each other in important ways, they share three key features that enable them to threaten escalation: large-scale effects that are hard to defend against, the ability to cross salient thresholds in limited wars, and entanglement with nuclear arsenals. These three mutually reinforcing features of information-age weapons enable a state to revive the threat that leaves something to chance of an all-out nuclear war when two states are locked in a nuclear stalemate.

Effects and Mutual Vulnerability

Large-scale cyber attacks, counterspace attacks, and missile strikes could be used strategically to hold hostage an adversary’s homeland, military, or allies using threats of significant damage until a state’s demands are met. Offensive cyber operations, counterspace weapons and precision conventional missiles are significantly less destructive than a nuclear weapon. But they can perform a similar hostage-taking function to nuclear weapons because they share their ability to inflict rapid, large-scale effects regardless of distance and terrain, and are difficult of defend against. A state armed with counterspace, cyber and precision conventional missile weapons is unlikely to be able to escape mutual vulnerability to attacks of strategic significance with a similarly-armed adversary.

A large-scale cyber attack could rapidly—albeit temporarily—disrupt a society with coordinated attacks to disable the information networks that operate its critical infrastructure. A sophisticated offensive cyber operation requires significant advance preparation but quickly disrupts a target system once executed. Cyber attacks are also difficult to defend against, although scholars debate the cyber offense-defense balance (whether it is cheaper and easier to organize cyber attacks than

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it is to field adequate defenses to thwart them).

Regardless, a state cannot be completely confident that its critical infrastructure networks are protected against a persistent, well-resourced hacker. A state might concentrate cyber defense efforts on its most valuable networks, but there are simply too many networks in most advanced industrial economies to secure all of them with confidence, especially if some are operated by the private sector. Malware can spread to damage systems it was not intended to infect, causing significant collateral damage, as demonstrated by Russia’s 2017 NotPetya attack, which wiped data on the Ukrainian systems it was intended to target as well as countless corporate networks worldwide. Nevertheless, even a sophisticated, coordinated cyber attack might only inflict limited damage. The effects would be difficult to sustain if the operators of the attacked systems are able to eliminate the malicious code or vulnerabilities enabling the attack.

A few ASAT missiles, launched from earth to destroy a satellite in lower earth orbit (LEO) could create enough space debris to make the orbit unusable for any country. Those attacks would disrupt the communications, intelligence, weather, financial networks and navigation functions of space for militaries and civilians. Counterspace weapons can inflict either temporary or permanent damage on their targets. They are also difficult to defend against. Satellites in LEO would have at best about 30 minutes of warning time to alter their flight path if a ground-based ASAT weapon were detected heading towards it. Satellites in higher orbits are harder to reach with ground-based weapons and have more time to maneuver out of the way. ASAT weapons deployed in outer

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29 Lindsay, “Tipping the Scales: The Attribution Problem and the Feasibility of Deterrence against Cyberattack.”


space inflict damage even more quickly than their ground-based equivalents. Gaining advance warning of a co-orbital attack is more difficult if the attack platform also serves peaceful functions such as satellite repair.

A conventional missile attack could destroy an adversary’s military and civilian infrastructure and terrorize its civilian population. Precision conventional missiles enable states to strike high-value targets including key nodes of critical infrastructure, military sensors, weapons equipment, mobile military platforms like road-mobile missiles or ships at sea, and an adversary’s leadership. Conventional missiles can also intimidate civilians, as illustrated by Russia’s punitive, retaliatory missile strikes on Ukrainian cities in October 2022. Unlike conventional strategic bomber aircraft, precision conventional missiles do not need to overcome an adversary’s air defenses.\(^\text{33}\) Missile defenses are more expensive and less effective than air defenses, especially against missiles traveling intercontinental ranges, flying hypersonic trajectories, fired in large salvos, or equipped with sophisticated penetration aides. Precision conventional missile strikes are less efficient at delivering munitions than bomber aircraft and cause significantly less damage than missile strikes using nuclear warheads.\(^\text{34}\) For example, the nuclear variant of the U.S. Navy’s Tomahawk land attack cruise missile, retired in 2010, had a yield of 200 kilotons, while conventional Tomahawks generally carry a 1000-pound warhead.\(^\text{35}\)

Scholars have raised doubts about whether these capabilities could cause enough damage to coerce an adversary, since they threaten less damage than some conventional military campaigns, not to mention a nuclear attack.\(^\text{36}\) These arguments tend to overlook the signal that limited effects send about a state’s willingness to expand a limited war towards an all-out nuclear war. Moreover, effects are only one of three mutually reinforcing reasons why they create threats that leave something to chance that a state can exploit for coercive leverage. That said, these arguments do highlight that some space, cyber and conventional missile attacks have smaller-scale effects that

\(^{33}\) Fetter, “Ballistic Missiles and Weapons of Mass Destruction.”
\(^{34}\) Fetter.
are local, temporary, or less damaging in their effects, such as jamming an opponent’s satellite receiver. These small-scale attacks have no strategic significance on their own.

Information-age weapons attacks with strategic and tactical effects can be distinguished by the scale of effects and importance of the target. For example, Schneider defines strategic cyber attacks as “cyber attacks that create violent strategic effects on civilian populations (either intentionally or unintentionally)” and “cyber attacks that threaten the control of nuclear forces.”37 I add cyber attacks that affect command and control networks for conventional forces at the theater level to this definition. Because this strategic-tactical attack threshold looks somewhat different across the three types of information-age weapon, I describe it in more detail in each empirical chapter.

**Salient Thresholds**

Some cyber attacks, counterspace attacks, and missile strikes would cross salient thresholds that define the boundaries within which a limited war is fought, while leaving other thresholds intact. Salient thresholds are “obvious places to draw the line, for reasons more related to psychology or custom than to the mathematics of warfare.”38 Crossing a salient threshold generates coercive leverage at the strategic level of war because it changes the adversary’s expectations about the state’s willingness to violate remaining conflict thresholds in the future.39

No shared understandings have yet emerged among states that these weapons sit in a class of their own such that using them would cross a salient threshold. Shared understandings have formed around other weapons, including the taboo on nuclear use and normative prohibitions on chemical and biological weapons.40 Shared understandings regulating the use of information-age weapons may emerge in the future as a result of great power efforts to promote such norms. The United

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37 Jacquelyn G. Schneider, “A Strategic Cyber No-First- Use Policy? Addressing the US Cyber Strategy Problem,” *The Washington Quarterly* 43, no. 2 (Summer 2020): 166. Schneider excludes cyber attacks affecting intelligence, surveillance, reconnaissance and warning not because they are not “dangerous to overall nuclear stability,” but rather because they are difficult to distinguish from attacks intended to affect a state’s conventional operations only.
States has led efforts to build norms against peacetime cyber attacks on critical infrastructure. U.S., European, Russian and Chinese diplomats have also advanced competing proposals to regulate counterspace weapons.

The use of an information-age weapon can still cross a salient threshold if it violates limits that are tacitly agreed on by the belligerents in a limited war. The effects of large-scale offensive cyber operations, counterspace attacks and precision missile strikes would expand a conflict geographically on earth, into new domains, harm civilians, and might cause collateral damage to third-party states. States generally impose boundaries on a case-by-case basis in limited wars, which in turn define which thresholds are salient. In past limited conflicts, states have defined salient thresholds in terms of the conflict’s geographic scope, parties, intensity, attacks on civilians, and public acknowledgment of violations of any of these thresholds.

Information-age weapons also preserve some thresholds that are likely to be salient in a limited conflict. First, offensive cyber operations and counterspace weapons do not directly causes loss of life, but could indirectly lead to deaths among civilians or armed forces that rely on the networks or satellites that are disrupted. Second, both offensive cyber operations and counterspace attacks can be conducted in secret. An adversary with space situational awareness capabilities and cyber attribution capabilities would understand that it had been attacked, but those attacks can be concealed or denied if revealed by a third party. That secrecy increases the adversary’s flexibility to decide how to respond. An attacking state can, of course, always publicly claim credit for an attack. Third, precision conventional missiles increase a state’s ability to discriminate between

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44 Smoke, War, 15–16, 35–36; Kahn, On Escalation, 4; Osgood, Limited War: The Challenge to American Strategy, 244; Carson, Secret Wars, 30; Alexander B. Downes, Targeting Civilians in War, 1st ed. (Cornell University Press, 2008), 33–35.
45 Carson, Secret Wars.
civilian and military targets, enabling a state to avoid crossing the threshold of attacking civilians unless it deliberately seeks to do so.

**Nuclear Entanglement**

Information-age weapons could significantly increase the risk of nuclear war if an adversary believes they might degrade its nuclear arsenal, whether the state intends to have that effect or not, because some information-age weapons or their targets are entangled with nuclear arsenals. Information-age attacks could therefore raise the risk of an all-out nuclear war more than conventional weapons that avoid damaging nuclear arsenals but have equally or more destructive effects. A state can intentionally use its information-age weapons to attack an adversary’s nuclear arsenal and manipulate the risk of nuclear escalation. Space weapons could be used to damage nuclear early warning and communications satellites.\(^{46}\) Cyber operations could be used to damage nuclear command, control and communications (NC3) systems, as well as intelligence, surveillance, reconnaissance, and warning systems that ensure the survivability and timely launch of nuclear weapons.\(^{47}\) Precision conventional missiles could be used to destroy an adversary’s nuclear arsenal without using nuclear weapons.\(^{48}\)

Information-age weapons give states new means to conduct counterforce operations against an adversary’s nuclear arsenal, but few good options for credibly signaling that they do not intend to use their information-age weapons for such purposes. Precision conventional missiles and counterspace weapons can be re-targeted at nuclear weapons or their support systems in a crisis or conflict. Some precision conventional missiles may be indistinguishable from nuclear missiles to an adversary’s early warning sensors. Meanwhile, preparations for non-kinetic space attacks and cyber attacks are generally unobservable to an adversary. An adversary might assume that their

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nuclear support systems are being targeted by these soft-kill weapons because they cannot verify otherwise.\textsuperscript{49}

Space, cyber, and conventional missile weapons raise the specter of inadvertent nuclear escalation because their use, whether for coercive purposes or to support conventional military operations, might inadvertently damage parts of an adversary’s nuclear arsenal.\textsuperscript{50} For example, an adversary’s nuclear support capabilities in space might be hit by space debris or its nuclear command, control and communications systems might be infected with malware intended for another target. The state might have incomplete or incorrect information about an adversary’s NC3 systems, and attack its space and cyber components, under the mistaken belief that they support conventional operations only. If the state itself fields dual-use precision conventional missiles an adversary might inadvertently damage components of its nuclear arsenal while trying to destroy conventional missiles.\textsuperscript{51}

\textbf{Reviving the Threat that Leaves Something to Chance}

The pathways that link strategic attacks using information-age weapons with an all-out nuclear war are not as direct as the pathways linking tactical nuclear weapons use to strategic nuclear war. At some point, one state or its military officers would need to decide to employ a nuclear weapon in response to an information-age weapons attack. There are a variety of plausible pathways leading to that decision. An adversary might see the information-age attack as a prelude to nuclear first-use that it chooses to preempt. Information-age weapons attacks might damage an adversary’s nuclear support systems and it might seek to retaliate for that provocation to deter further attacks. Information-age weapons attacks might blind an adversary’s sensors in a theater of conventional conflict, contributing to the fog of war, and to mistakes and accidents that result in leaders authorizing nuclear use. An adversary might view large-scale information-age attacks as a signal that the state’s war aims have changed and it now poses an existential threat.


\textsuperscript{51} Talmadge, “Would China Go Nuclear?”
All of these scenarios involve a high degree of uncertainty about the actual effect of the information-age attack, as well as the adversary’s reaction, on which the potential for nuclear escalation rests. Because of that uncertainty, information-age weapons used strategically generate a genuine “threat that leaves something to chance” of nuclear war similar to limited nuclear weapons use, because of “autonomous” risks that neither party can fully control. But the likelihood of that chance becoming a reality in the case of information-age weapons is lower than for threats of a tactical nuclear weapons attack. To achieve this effect, these information-age weapons need to be deliberately postured to ensure their use creates autonomous risks of a conventional conflict escalating to nuclear war.

**Coercive Force Postures**

A decision to pursue information-age weapons to gain coercive leverage can be distinguished from a choice to merely research and develop that capability, or to pursue information-age weapons to enhance conventional operations. That decision is taken by top military and political leaders, sets a timeline for the capability to become operational, and explicitly recognizes that the purpose of this new capability is to gain coercive leverage. Following that decision, the military must establish a force posture that enables the weapon to be used to make credible threats to escalate a conflict.

Information-age weapons only provide credible coercive leverage if they are explicitly postured for coercion: simply possessing an information-age weapon is not enough. I adopt Vipin Narang’s definition of a force posture as a state’s plans for using its weapons in a conflict, the capabilities it deploys, its command-and-control arrangements and force structure, and the signals it sends to adversaries about those plans. Postures geared towards in-kind retaliation for strategic attacks using information-age weapons will not give states coercive leverage either. A retaliatory

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52 Schelling, *Arms and Influence*, 55.
posture dissuades an adversary from using the same information-age weapons for coercive leverage, but does not provide the state itself with coercive leverage in a conventional conflict.

Existing literature does not describe coercive force postures for information-age weapons used strategically, so I derive them from two common logics of coercion in the international relations literature. There are two distinctive information-age weapons force postures that states can adopt to gain coercive leverage: brinkmanship and calibrated escalation.56 A state can have different force postures for all three of its information-age weapons. The same force posture looks slightly different across the different weapons types because of differences in the technologies. Both brinkmanship and calibrated escalation postures enable states to generate leverage by threatening large-scale counterspace, cyber, or precision conventional missile attacks, even if carrying out that attack could invite damaging retaliation.57

Brinkmanship and calibrated escalation postures are distinguished by their approach to the autonomous risk of escalation created by information-age weapons. Brinkmanship force postures stoke autonomous risk, while calibrated escalation postures try to smother it without snuffing it out entirely. Some autonomous risk of escalation to nuclear war is essential for these weapons to provide coercive leverage. But those autonomous risks must be sufficiently tamed to assure an adversary that the state threatening information-age attacks can prevent further escalation if the adversary complies with its demands. In brief, brinkmanship and calibrated escalation force postures exist on a sliding scale in their approach to autonomous risk, but they take opposite approaches to the trade-off between costs and risk.

**Brinkmanship**

A brinkmanship force posture threatens to use information-age weapons to generate a high risk of uncontrolled escalation to nuclear war, which enables a state to gain coercive leverage at a lower cost. It exploits an adversary’s fear that a large-scale counterspace, cyber, or conventional missile attack could cause a conflict to spin out of control. The attack might even trigger nuclear weapons


use. A brinkmanship force posture is a high risk, high reward approach to gaining coercive leverage.

Brinkmanship force postures stoke the autonomous risk of escalation to an all-out nuclear war by building a slippery slope between limited conventional conflict and nuclear war. The four features of the state’s force posture encourage the adversary to assume the worst—that the state has postured its capabilities to create a serious risk that both sides could imminently slide down the slippery slope to large-scale information-age attacks. For example, the state might have delegated authority to use information-age weapons on high-value targets down the chain of military command, or to civilian hackers or private space companies. This risk increases the incentive for the adversary to take the “last clear chance” to avoid disaster by acquiescing to the state’s demands.

An example of a state employing a counterspace brinkmanship posture to gain coercive leverage in a conflict helps to illustrate how the posture might coerce an adversary. At the outset of the conflict, a state would threaten to use its ground-based ASAT weapons to destroy the target’s navigation satellites if an adversary refuses to acquiesce to its demands. If an adversary does not comply with the threat, the state uses one of its ASAT weapons to trigger a process of escalation that it cannot fully control because of the debris caused by the attack, possible collateral damage to other space assets, and unpredictable second-order consequences on earth, such as the death of civilians relying on the satellite constellation for navigation. To avoid these outcomes, the adversary might negotiate an end to the war rather than keep fighting.

A credible brinkmanship force posture only requires a clear capability to carry out a strategic attack using an information-age weapon. It does not require a state to signal any other aspects of force posture to its adversary. That opacity—and the ambiguity it creates—enables the state to claim that it has tied its hands when making threats such that using its information-age weapon strategically could trigger uncontrolled escalation. The credibility of an opaque brinkmanship posture depends on the adversary’s assessment of the level of autonomous risk generated by the state’s force posture. If a state does build, command or structure its forces in ways that stoke autonomous risk, actively signaling those features of its force posture could enhance the credibility of its brinkmanship posture.
North Korea’s opaque and reckless approach to cyber operations suggests a brinkmanship posture, although little is known about its plans for using cyber attacks in a conflict. DPRK operators take few steps to prevent collateral damage. Military officers carrying out cyber operations for the state are subject to poor oversight and appear to be permitted to freelance for their own profit. These features of North Korean cyber posture were on display during its WannaCry ransomware operation in 2017. WannaCry generated profits, either for the regime or the operators of the military intelligence bureau that carried out the attack (or both), and endangered lives as collateral damage when the ransomware shut down hospital information systems in England and Scotland.  

Calibrated Escalation

A calibrated escalation force posture relies on guardrails to lower the risks of escalation to nuclear war from information-age attacks, but requires a state to pay a high cost for generating coercive leverage. A calibrated escalation posture threatens attacks of increasing intensity, starting with small-scale attacks, to give both sides plenty of clear chances to avoid disaster. By adopting this posture, a state signals that it is willing to carry out and absorb large-scale attacks using information-age weapons, if necessary, but it would prefer to achieve its war aims before coercive bargaining escalates to that point.

Calibrated escalation postures attempt to smother the autonomous risk of escalation to an all-out nuclear war by building a ladder between a limited conventional conflict and nuclear war. The state envisions coercive bargaining as a process in which the parties ascend the rungs of that ladder. As they ascend each rung, they reveal how much damage they are willing to absorb to achieve their aims. To keep control of the bargaining process, the state attempts to minimize the risk of uncontrolled escalation from small- to large-scale attacks, although that risk cannot be entirely eliminated.


An example of a state employing a counterspace calibrated escalation posture to gain coercive leverage in a conflict illustrates how the posture might coerce an adversary. A state threatens to carry out a small-scale space attack if the target refuses to acquiesce to its demands, such as using a laser on a co-orbital satellite to burn a small, permanent spot in the optical sensor of an imaging satellite. The small-scale attack demonstrates the state’s resolve since there is a good chance that the adversary will retaliate with equivalent, low-intensity attacks, most likely on its space assets, although the adversary would ideally respond by negotiating a settlement to avoid further attacks on its space assets. The state calibrates the intensity of further counterspace attacks to both the intensity of an adversary’s counter-attacks and how much it values its political aim. The pathway from this exchange of attacks to nuclear war becomes more plausible the further up the escalation ladder the two states climb.

A calibrated escalation posture for information-age weapons is technologically, organizationally and diplomatically demanding. Technologically, the state needs to be able to credibly threaten to carry out information-age attacks of varying intensity, including small-scale information-age attacks to add rungs to the lower end of the ladder. This posture also requires the state to have attribution capabilities to identify the source of space attacks or cyber attacks to avoid mistaken retaliation against a mis-identified perpetrator. Organizationally, it requires top leaders to maintain authority over the use of large-scale attacks, which in turn requires infrastructure and procedures to prevent accidental or unauthorized use. Diplomatically, a calibrated escalation posture requires a state to actively signal these aspects of its force posture to an adversary. The state might also try to minimize an adversary’s misperceptions that could spark uncontrolled escalation through diplomatic messaging. For example, it might publicly or privately communicate its red lines that define the rungs of the escalation ladder to ensure that an adversary understands the likely consequences of any in-kind counter-attacks.


France’s recent space and cyber strategies include features of a calibrated escalation posture. Paris has publicly articulated a strategy for offensive cyber operations that minimizes collateral damage, centralizes command and control, and aims to manage escalation risks.\textsuperscript{63} Although France’s 2019 Space Defence Strategy is oriented towards defending its space assets rather than gaining coercive leverage,\textsuperscript{64} it indicates that France will operate a range of offensive and defensive counterspace weapons and emphasizes space situational awareness as “essential in order to attribute an internationally wrongful act to a State and permit an appropriate response.” It includes declaratory policy threatening counterspace operations to “preserve freedom of access to and action in space” and to “discourage and thwart action by any ill-intentioned third party.” It also indicates that international law will guide French counterspace operations, which could include strictly proportional responses to “hostile acts” to bring them to an end, or self-defense actions in response to more serious “aggressive acts.”\textsuperscript{65}

Significant uncertainty remains as to whether both brinkmanship and calibrated escalation postures would actually succeed in coercing an adversary. An adversary might discount the possibility that a brinkmanship force posture generates autonomous risk, retaliate for the provocative attack, and find that no uncontrolled escalation follows. A calibrated escalation posture might trigger uncontrolled escalation because of the autonomous risks that the state does not smother. An adversary could also over-react to a carefully calibrated attack or doubt the state’s restraint once a conflict breaks out. Even if each force posture performs as intended, an adversary might absorb the state’s most destructive and provocative information-age weapons attacks and still refuse to back down. These force postures cannot solve more general challenges that states encounter when they rely on coercion rather than brute force.\textsuperscript{66}

Coping with The Limited War Dilemma

Nuclear-armed states face a limited war dilemma if they want to achieve political objectives using military force against a nuclear-armed adversary, but want to avoid an all-out nuclear exchange that would destroy both parties. Despite the best efforts of states to sidestep the dilemma using proxies or escape it using nuclear counterforce capabilities, this dilemma remains insoluble. Most nuclear-armed states have chosen to rely primarily on either threats of a conventional military victory or nuclear threats to gain coercive leverage, both of which have advantages and disadvantages. Nuclear-armed states have a third option of “strategic substitution” to answer the limited war dilemma because new weapons technologies have expanded the menu of options for nuclear-armed states to gain coercive leverage against each other. But strategic substitution of information-age weapons also has advantages and disadvantages. China remains the only country to have selected this option for coping with the limited war dilemma. Strategic substitution, war-winning conventional capabilities, and nuclear first-use are mutually exclusive answers to coping with the limited war dilemma.

Conventional War Under the Nuclear Shadow

When two adversaries both possess a secure capability to carry out nuclear retaliatory strikes, the resulting nuclear stalemate has a profound impact on how they match political ends and military means. Some recent studies have questioned that claim, citing evidence that the nuclear stalemate between the United States and Soviet Union during the Cold War was actually quite delicate. Yet neither Moscow nor Washington behaved as if the nuclear revolution was a myth or a failure in a crisis, which they worked hard to avoid after the Soviet Union attained a secure second-strike capability in the mid-1960s. As Brendan Rittenhouse Green concludes, “we ought to expect that the farther away a political phenomenon is from the decision to detonate a nuclear weapon, the less powerful the pacifying effect of the nuclear revolution.”

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68 Green, The Revolution That Failed: Nuclear Competition, Arms Control and the Cold War, 252.
There are two distinct theories of how the nuclear stalemate would influence a conventional war, should one occur, in the existing international relations literature. The first, Glenn Snyder’s “stability-instability paradox,” argues that the nuclear stalemate creates stability at the level of strategic nuclear war, such that neither state has an incentive to initiate a strategic nuclear strike. But stability at the strategic nuclear level could make states more willing to initiate conventional wars and even tactical nuclear weapons use. The second, which is associated with scholars like Thomas Schelling and Robert Jervis, emphasized a “long nuclear shadow” cast over conventional conflicts by the ever-present risk of nuclear escalation, which ensures that conventional conflicts among nuclear-armed powers are never entirely safe.

These theories are distinct but not mutually exclusive, and both can be relevant to the same political dispute. Whether and when the risk of nuclear escalation becomes relevant to the conduct of a conventional conflict varies empirically depending on the stakes of the conflict, as well as the military force postures of the belligerents and their judgments about the credibility of nuclear threats. These last two factors are reflected in the two answers to the limited war dilemma recognized in the existing literature: nuclear first-use and conventional victory.

The Nuclear Answer
The nuclear answer to the limited war dilemma involves a state threatening to use nuclear weapons first in an otherwise conventional conflict to gain coercive leverage against an adversary. The aim of this answer to the limited war dilemma is to extend the nuclear shadow as far as possible over limited conventional conflict. To do so, a state makes threats to carry out limited nuclear strikes, usually with its shortest-range, lowest-yield tactical nuclear weapons. Those threats signal resolve and willingness to further escalate a conflict if the adversary does not comply with the state’s demands, while withholding the use of strategic nuclear weapons gives an adversary an incentive to exercise restraint if it does choose to retaliate. An adversary fearful of an all-out nuclear war

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69 For a helpful summary of these two theories, see Christensen, “The Meaning of the Nuclear Evolution,” 449–51.
70 Snyder, “The Balance of Power and the Balance of Terror.”
71 Schelling, Arms and Influence; Jervis, The Meaning of the Nuclear Revolution.
72 For a similar argument, see Mark S. Bell and Julia Macdonald, “How to Think about Nuclear Crises,” Texas National Security Review 2, no. 2 (February 2019): 40–64.
would ideally choose to acquiesce quickly because it is not willing to bear the cost or risk of further nuclear escalation.

To make credible threats of nuclear first-use, states can rely on the autonomous risk of escalation that remains under nuclear stalemate because of the potential for misperceptions, accidents, or mistakes. States can stoke those autonomous risks by delegating authority for the rapid, limited use of nuclear weapons on the battlefield to theater commanders using an “asymmetric escalation” posture. An asymmetric escalation posture would bid up the risk of “an explosive escalation to general nuclear war.” Alternatively, the state might rely on a “spectrum of violence” logic in which limited nuclear options demonstrate its “willingness to endure more future destruction to achieve its goals than its opponent is willing to endure,” rather than its risk tolerance.

The nuclear answer to the limited war dilemma has both advantages and disadvantages. Its principal advantage is that any nuclear-armed state is capable of making credible threats of nuclear first-use. Indeed, states that face nuclear-armed adversaries with stronger conventional militaries frequently adopt this answer to the limited war dilemma, including Pakistan, Russia, NATO during the Cold War, France, and North Korea. A second advantage is that nuclear threats involve the most destructive weapons a state can possess, which demonstrates a high level of resolve to an adversary. A state that is willing to risk its own destruction to achieve a political aim is as resolved as it gets. It also gives an adversary few options to escalate further.

The principal disadvantage of the nuclear answer to the limited war dilemma is, however, that nuclear threats are difficult to make credible for any lesser objective than a state’s survival. Second, the mechanisms for making nuclear threats credible often involve a state’s leaders relinquishing control over authority to use them by delegating that authority to theater commanders. Leaders tie their hands such that they cannot blink in a crisis. But these arrangements elevate the risk of

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73 Narang, *Nuclear Strategy in the Modern Era*.
74 Powell, “The Theoretical Foundations of Strategic Nuclear Deterrence,” 78.
75 Powell, 81.
mistaken or accidental use.\textsuperscript{77} These arrangements are difficult but not impossible for political leaders who do not trust their militaries,\textsuperscript{78} worry about nuclear terrorism, or even just want to retain some flexibility in responding to a crisis or conflict.\textsuperscript{79} Third, the nuclear first-use answer could trigger a more intense security dilemma than other options.\textsuperscript{80} A first-use nuclear posture might threaten an adversary such that it alters its political goals, builds capabilities or devises strategies that worsen the state’s security environment.\textsuperscript{81} For example, one of the principal reasons that the United States has developed low-yield “supplemental” nuclear capabilities was to deter a perceived Russian strategy to use nuclear weapons first in limited, local wars.\textsuperscript{82}

The Conventional Answer

The conventional answer to the limited war dilemma involves a state threatening to win a conventional victory to gain coercive leverage against an adversary. This option takes advantage of the adversary’s fears of nuclear escalation, which are key to the stability-instability paradox, to dampen an adversary’s incentives to threaten nuclear use to overturn the state’s conventional victory. The state threatens to seize its political objectives using conventional military force or deny the adversary its objectives if it does not comply with the state’s demands.\textsuperscript{83} An adversary that has little chance of prevailing in a conventional conflict would ideally choose to acquiesce because it cannot achieve its objectives if a war breaks out.\textsuperscript{84} If that adversary nevertheless chooses to initiate a conflict, the state could still use its conventional military capabilities to achieve its political objectives using brute force.\textsuperscript{85}

For a state to select this answer to the limited war dilemma, it is essential to have conventional military superiority in the region in which it is most likely to fight. Local superiority—rather than

\textsuperscript{77} Narang, “Posturing for Peace?”
\textsuperscript{78} Narang, \textit{Nuclear Strategy in the Modern Era}.
\textsuperscript{83} Mearsheimer, \textit{Conventional Deterrence}; Shimshoni, \textit{Israel and Conventional Deterrence}; Heginbotham and Samuels, “Active Denial.”
\textsuperscript{84} Fearon, “Rationalist Explanations for War.”
\textsuperscript{85} Snyder, \textit{Deterrence and Defense}, 9.
parity—reduces the risk that an adversary could miscalculate and overestimate its ability to achieve its political objectives in a conventional war. A state with conventional superiority could attempt a coercive campaign such as a blockade. But coercive conventional campaigns have a poor record of success unless they are paired with a brute force option to seize a state’s objective if coercion fails.

The two principal advantages of the conventional answer to the limited war dilemma are its credibility and the insurance of a brute force option if coercion fails. If a state uses conventional military operations to achieve its interests in a political dispute, it does not face a high likelihood of severe retaliation unless an adversary chooses to escalate to nuclear use. A state with a capable conventional military is therefore able to make credible threats to carry out those operations without having to absorb costly retaliation against its homeland. If coercive threats fail to bring about an adversary’s compliance, the state has a back-up option to seize its objectives or deny an adversary its military objectives using brute force offensive or defensive operations. Since the end of the Cold War the United States has relied on the conventional answer to the limited war dilemma to gain coercive leverage against its nuclear-armed adversaries. India has also relied on conventional military threats to seize Pakistani territory for coercive leverage.

The most important disadvantage of the conventional answer to the limited war dilemma is its limited availability. States who are conventionally weaker than a nuclear-armed opponent simply cannot adopt it. Second, conventional military capabilities able to deliver victories require substantial amounts of money, technology, and manpower. Some states will have difficulty allocating sufficient funding to their militaries, supporting compulsory military service, or incentivizing citizens to volunteer to serve in their armed forces. Third, a nuclear-armed adversary

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86 There are no examples of conventional strategic bombing between adversaries locked in a nuclear stalemate, which suggests that bombers provide states with coercive leverage through a different answer to the limited war dilemma than conventional victory.


can always threaten nuclear escalation to overturn a conventional defeat even if the state exercises its brute force conventional military option.

Strategic Substitution
A third answer to the limited war dilemma has been overlooked in existing international relations literature: substituting both nuclear first-use and war-winning conventional capabilities with other weapons that can be used strategically to threaten escalation. Information-age weapons are particularly promising substitutes because they revive the threat that leaves something to chance under conditions of nuclear stalemate without requiring a state to threaten nuclear weapons use. Other capabilities could also be used as substitutes, such as conventionally-armed bomber aircraft, which have similar characteristics to precision conventional missiles. As China, the one state that has selected this answer to the limited war dilemma, has relied on information-age weapons, I describe the logic of this option in terms of those substitutes.

Strategic substitution attempts to walk a fine line between threatening enough cost and risk to coerce an adversary, but not so much to provoke it into fighting a nuclear war. The promise of striking this balance is what makes information-age weapons attacks so appealing for a state looking to coerce an adversary in a limited war while avoiding nuclear catastrophe. Information-age attacks increase the risk of nuclear war without threatening to employ a nuclear weapon, which extends the nuclear shadow to much lower levels of conflict intensity than tactical nuclear weapons. At the same time, however, a state uses the stability created by the nuclear stalemate as a shield for carrying out escalatory non-nuclear attacks. It exploits an adversary’s fear of nuclear war by pairing strategic attacks using information-age weapons with a retaliatory nuclear posture, to place the burden of escalating a conflict to the employment of nuclear weapons on the adversary. In this manner, strategic substitution combines elements of the stability-instability paradox with the long nuclear shadow.

Strategic substitution relying on information-age weapons has advantages in credibility and speed. First, uncertainty surrounding the consequences of using these weapons and an adversary’s reaction, but certainty that their effects will be less serious than a nuclear attack, enhances the credibility of threats to use them. Rather than making information-age weapons poor sources of
coercive leverage, states might view this uncertainty about the consequences of information-age weapons use as desirable under conditions of mutual nuclear vulnerability. Information-age weapons promise to revive the threat that leaves something to chance of a limited conventional conflict escalating into an all-out nuclear war, which became more difficult to generate with limited nuclear strikes in a nuclear stalemate.

Robert Powell’s seminal work on the theoretical foundations of nuclear deterrence helps to explain why it is difficult for states to bargain along a spectrum of risk under conditions of nuclear stalemate. Prior to the Soviet Union and United States fielding mutually invulnerable nuclear forces, Powell argued that any crisis would involve a “threat that leaves something to chance” because both states could credibly threaten to launch a preemptive, all-out nuclear war in the hope that “something of social value might escape destruction.” Powell labeled this foundation for nuclear deterrence a “spectrum of risk.” But once both states were entrenched in a nuclear stalemate the prospect of either state launching an unrestricted nuclear attack diminished because there was no advantage to be gained by attacking first. The only “threat that leaves something to chance” under mutual nuclear vulnerability resulted from accidents and mistakes. Instead, Powell argued, under conditions of mutual vulnerability, nuclear deterrence rested on a “spectrum of violence” in which limited nuclear strikes left little uncertainty about the consequences of their use: further nuclear weapons use until the costs of further destruction outweigh the benefits of whatever the adversary is seeking. But the uncertainty of whether information-age weapons use will push a conventional conflict to become a nuclear war gives states another option to bargain along the spectrum of risk.

The second advantage of strategic substitution is that information-age weapons are relatively quick, cheap and easy to acquire for any state with an existing nuclear weapons capability. Those states already possess ballistic missiles capable of delivering nuclear warheads, which provide them with the missile technology for precision conventional missiles and ground-based ASAT weapons. Rudimentary cyber capabilities also have relatively low barriers to entry.

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91 Powell, 81.
92 Sophisticated cyber attacks with lasting effects are, however, slower, more expensive, and more difficult for states to develop. Gartzke and Lindsay, “Conclusion: The Analytic Potential of Cross-Domain Deterrence,” 352.
The principal disadvantage of strategic substitution is that it does not diminish an adversary’s ability to either continue fighting a conventional war, or threaten nuclear escalation, in response to the state’s information-age attacks. Second, there are downsides to the uncertainty surrounding the consequences of information-age weapons use. An adversary might be dismissive of information-age weapons threats if it expects their effects to be limited. An adversary might interpret strategic substitution as a signal of accommodation if the effects of attacks are indeed limited. But strategic attacks using information-age weapons might prove to be much more provocative than intended. For example, offensive cyber operations could threaten an authoritarian regime’s grip on power or a conventional precision strike could kill a leader.

There is no silver bullet to solve the limited war dilemma. All three answers to it—nuclear first-use, conventional victory, and strategic substitution—have advantages and disadvantages, which are summarized in Table 1.1 below. This comparison of the options states have to cope with the limited war dilemma does not answer the question of why a state would favor strategic substitution. Although it has some advantages, it is the least popular answer and has not been put to the test in crises or low-level conflicts like the nuclear and conventional options. In the next section, I develop a theory to explain why China nevertheless selected this answer to the limited war dilemma in the post-Cold War era.

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<thead>
<tr>
<th></th>
<th>Nuclear First-Use</th>
<th>Conventional Victory</th>
<th>Strategic Substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>Availability</td>
<td>Credibility</td>
<td>Availability</td>
</tr>
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<td></td>
<td>Resolve</td>
<td>Insurance against failed coercion</td>
<td>Credibility</td>
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<td></td>
<td>Limits adversary options to continue bargaining</td>
<td></td>
<td>Speed</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>Credibility</td>
<td>Limited Availability</td>
<td>Adversary retains all options to continue bargaining</td>
</tr>
<tr>
<td></td>
<td>Leadership control</td>
<td>Resource intensive</td>
<td>Resolve</td>
</tr>
<tr>
<td></td>
<td>Security dilemma</td>
<td>Adversary retains nuclear option to continue bargaining</td>
<td>Unexpected provocations</td>
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</tbody>
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93 Mearsheimer, *Conventional Deterrence*, 56.
The Theory of Strategic Substitution

China chose strategic substitution as its answer to the limited war dilemma, and pursued information-age weapons for strategic use, because of the severe constraints it faced in its search for coercive leverage in the information-age. Both backward conventional military capabilities and doubts about the credibility of nuclear threats led China to prioritize the speed and credibility of additional coercive leverage in that search. Like other nuclear-armed states, China searched for coercive leverage when crises or conflicts changed its threat environment, exposing a gap in its existing coercive capabilities. These gaps, which I call “leverage deficits,” meant that its existing military capabilities were inadequate for the type of adversary and war it was preparing to fight. If China were to have any hope of achieving its political aims using military force, it needed to fix a leverage deficit as soon as possible.

The presence or absence of a leverage deficit is the independent variable of the theory of strategic substitution, while the decision to pursue a coercive information-age weapon or not is the dependent variable. When leverage deficits were present, China pursued information-age weapons to redress them, which affirmed its strategic substitution answer to the limited war dilemma. In the absence of a leverage deficit, China did not pursue new coercive capabilities or consider other answers to the limited war dilemma. Instead, it focused on implementing past decisions to pursue information-age weapons for coercive leverage, long-term conventional military modernization, and a robust nuclear capability to assure retaliation for an adversary’s nuclear strike.

The search for coercive leverage, the mechanism linking leverage deficits to decisions to pursue information-age weapons, solves the puzzle of why China diverged from its nuclear peers to select strategic substitution as its answer to coping with the limited war dilemma. Unlike other nuclear-armed states, China’s search for coercive leverage in the presence of leverage deficits was shaped by the legacy of its Cold War capabilities, which provided no existing conventional or nuclear capabilities that could be re-fashioned into an answer to the limited war dilemma. The credibility and speed disadvantages of the nuclear and conventional answers to the limited war dilemma were especially problematic for China. The advantages of information-age weapons are the exact opposite, which made them attractive substitutes for a state that prioritized speed and credibility.
in its search for coercive leverage. The theory of strategic substitution is summarized in Figure 1.1 below.

Figure 1.1: The Theory of Strategic Substitution

Assumptions

Three assumptions underpin the theory of strategic substitution. First, it assumes that China is a rational unitary actor. This assumption has been appropriately critiqued as an inaccurate description of how individuals—let alone states—make decisions, given that individual and subnational variables also influence state behavior in international affairs. I nevertheless adopt this assumption because it allows for the possibility that China’s approach to the limited war dilemma is strategic, rather than attributing its divergence from the behavior of other great powers as non-strategic behavior.\footnote{For example, Lindsay attributes China’s embrace of coercive and preemptive roles for offensive cyber operations as reflecting a “cult of the cyber offensive” rather than the actual potential of those capabilities. Lindsay, “The Impact of China on Cybersecurity,” 36–37.} There is no reason to assume that China has it wrong and other states have it right when coercive military capabilities remain untested in a great power war. Second, I assume
that China is able to accurately assess the conventional military balance and its own strengths and weaknesses, but I do not assume it has perfect information. Uncertainty around questions such as the consequences of using information-age weapons and an adversary’s willingness to use nuclear weapons are key to the theory. Third, I assume that China and its adversary would prioritize avoiding a certain, all-out nuclear war (but not the risk of one) over achieving all political objectives except for their survival.

*Leverage Deficits*

A leverage deficit is a gap in the coercive capabilities a state needs to achieve existing objectives in a political dispute, which emerges suddenly when a state’s threat environment changes. States seek to address those deficits as quickly as possible by searching for additional coercive leverage. Changes to a state’s threat environment might include a crisis that increases the intensity of the threat posed by an existing adversary, the emergence of a new adversary, or the emergence of a new type of conflict that a state needs to prepare for. These changes reveal that the state’s existing military capabilities are ill-suited for the type of adversary and war that it is most likely to fight. Unless and until a leverage deficit is addressed, the state would either have to make serious diplomatic concessions on important interests or fight a conventional war that it would very likely lose in a future dispute. There are other reasons why states might want to increase their coercive leverage, for example if they become wealthier or expand their foreign policy goals and assign new missions to their military forces.98 But these changes do not produce leverage deficits because a state can set its own timelines for gaining additional leverage it desires but does not require.

In the absence of a leverage deficit, a state lacks the incentive to search for additional coercive leverage. It has no reason to doubt the adequacy of its existing military capabilities or plans to bolster its coercive leverage that have not yet been realized. Rather, a state focuses on implementing past decisions about the different roles that nuclear, information-age, and conventional weapons play in its answer to the limited war dilemma.

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Nuclear-armed powers facing nuclear-armed adversaries can plug a leverage deficit by making threats of nuclear-first use more credible, engaging in a conventional build-up, or pursuing substitutes such as information-age weapons. Their search for coercive leverage might lead to either continuity or change in their existing answer to the limited war dilemma. For example, in the wake of Russia’s 2022 invasion of Ukraine, NATO has bolstered its existing capabilities for conventional victory rather than increasing reliance on nuclear first-use. Each state is likely to weigh the advantages and disadvantages of each option differently, depending on their existing capabilities and any constraints on their search for coercive leverage.

Constraints on the Search for Leverage

When a nuclear-armed state faces a leverage deficit in a new type of war against a new adversary, its existing conventional or nuclear capabilities often favor one answer to the limited war dilemma over the others. But that was not the case for China in the post-Cold War era. Any option would require investment in new capabilities, doctrines, and organizational structures. China’s distinctive choice of strategic substitution was shaped by this combination of a tabula rasa combined with constraints on its search for coercive leverage. Once China faced a leverage deficit, it recognized the advantages of pursuing information-age weapons and the disadvantages of either switching to a nuclear first-use posture or relying solely on a conventional build-up that could eventually equip it with war-winning conventional capabilities in its search for leverage.

Conventional Inferiority
The first constraint that China faced in its search for leverage was its inability to field war-winning conventional capabilities for decades into the future. States that are too weak to match an adversary’s conventional military power are constrained in their options for addressing a leverage deficit to pursuing substitutes or threatening nuclear first-use. They directly confront one of the key disadvantages of the conventional answer to the limited war dilemma: its accessibility and speed. Some states have no hope of marshalling the resources to challenge their adversary’s conventional military power such that they can seize their political objectives in a limited war or deny that adversary its objectives. Other states might have the latent power resources to catch up with an adversary in the medium to long term. But building up war-winning conventional forces
is slow, expensive, and likely requires difficult organizational change.99 A state cannot wait to correct the conventional balance through a long-term build-up of its military forces to address a leverage deficit and risk losing a war that happens in the interim.

A conventionally weaker, nuclear-armed state searching for leverage in the short-term is likely to prioritize weapons that threaten escalation even if they do little to improve its prospects for fighting a limited war. States that lack a conventional military option to increase their coercive leverage often pursue asymmetric means of coercion to offset their conventional inferiority, such as sponsoring terrorist attacks,100 supporting proxies, or threatening to use weapons of mass destruction.101 Pursuing information-age weapons for strategic uses can serve the same purpose. They are available to states with no hope of catching up with an adversary conventionally, and a faster option for states whose hopes of catching up conventionally lie decades into the future.

A nuclear-armed state searching for additional leverage could also adopt a nuclear first-use posture to offset its conventional inferiority. Whether it chooses to do so will depend on how it weighs the advantages of nuclear first-use for signaling resolve versus its credibility, control, and security dilemma disadvantages. The security dilemma disadvantage is quite serious for a state with a retaliatory nuclear posture. Adopting a nuclear first-use posture in response to a leverage deficit could do more to hurt than help a state’s ability to secure its political objectives in a dispute. An adversary might interpret the state’s nuclear posture change as a signal that it has abandoned limits on its war aims and revealed its aggressive, unlimited intentions.102 The adversary might react by altering its nuclear capabilities and doctrine or expanding its political objectives, which could create yet another leverage deficit that puts the state’s political objectives even further out of reach.103 The credibility disadvantage is, however, perhaps the most intractable problem with nuclear first-use as an answer to the limited war dilemma.

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Nuclear Credibility

The second constraint China faced in its search for leverage was its doubts about the credibility of making threats to initiate the use of nuclear weapons in a conventional war with a nuclear-armed adversary. This constraint reflects the challenge of persuading an adversary that the state is not bluffing. A state that harbors doubts about the credibility of its threats to use nuclear weapons first in a limited conventional war is unlikely to view a first-use nuclear posture as capable of addressing a leverage deficit. As Todd Sechser and Matthew Fuhrmann observe, “the combination of low stakes and high costs will render nuclear weapons impotent in most coercive [compellent] contexts, despite their unparalleled destructive power.”

If a state can survive without a segment of territory or defending a political principle, it will have a hard time convincing an adversary that it is willing to accept nuclear attacks on its homeland to deter an adversary from taking that territory or demolishing that principle. In a conventional war over limited political objectives, the costs nuclear use are likely to exceed the value of achieving those objectives.

Information-age weapons used strategically promise to provide more credible leverage than nuclear first-use for two reasons. First, as described in the previous section, they revive the significance of the threat that leaves something to chance even when a nuclear stalemate prevails. Information-age weapons use signals a willingness to accept and manipulate the risk that both sides will lose control of the process of escalation. Second, they shift the burden of crossing the threshold of nuclear weapons use to the adversary if it wishes to continue coercive bargaining. Nuclear retaliation for an information-age weapons attack would likely be interpreted as disproportionate. Information-age weapons used strategically are not so damaging or risky that they lack credibility, but nor could an adversary be sufficiently certain of their limited damage or manageable risk to dismiss a state’s coercive threats to use them.

Information-age weapons used strategically were promising substitutes for nuclear threats as well as conventional victories. If promising substitutes were not available, however, China might have approached the credibility disadvantage of nuclear weapons differently. The logic of the theory

105 Sechser and Fuhrmann, 50–51.
does preclude the possibility of China adopting a nuclear first-use posture in the absence of promising substitutes, despite its doubts about the credibility of its nuclear threats.

China’s pursuit of substitutes for nuclear first-use or conventional victory to gain coercive leverage also involved some contingency in its focus on information-age weapons. Another state facing the same constraints on its search for leverage might have pursued other capabilities as substitutes. China’s nascent conventional missile force, stood up in the early 1990s because of the organizational interests of its missile force provided it with a ready-made option to gain coercive leverage when it first faced the limited war dilemma in 1995-6. The PLA had broader interests in space capabilities that made counterspace weapons an attractive substitute as well. The coercive potential of offensive cyber operations was hyped but largely unproven when the PLA pursued them as China’s overall investments in information technology were accelerating. China could have easily bet on other unproven capabilities such as electronic warfare or non-nuclear weapons of mass destruction for coercive leverage. Another nuclear-armed state with a mature nuclear bomber force might have stood up a conventional bomber capability to gain coercive leverage, which was not a quick option for China because of longstanding weaknesses in aircraft technology.

Implementing Strategic Substitution

A search for coercive leverage does not end with a decision to pursue an information-age weapon (or any other substitute) because that capability must also be postured to threaten escalation. Selecting a force posture for an information-age weapon is an essential step to successfully complete a search for coercive leverage. Below I identify some of the key factors influencing force posture decisions that are relevant to China, although I do not propose a theory of force posture choices. Those factors include variables well-recognized in the existing literature on military strategy choices: civil-military relations, the availability of technology, and adaptation as armed forces gain experience with a new capability. One factor is, however, not recognized in the existing literature: a state’s vulnerability to counterspace and offensive cyber operations. Below I highlight the relevance of these factors to China’s posture choices.
Civil-military relations influence posture choices because brinkmanship and calibrated escalation postures involve different degrees of control that civilian leaders assert over the use of information-age weapons. States with assertive civil-military relations are likely to prefer calibrated escalation postures, all things being equal. Assertive civil-military relations include features such as centralized command authorities, civilian intervention in the formulation of military strategy and conduct of operations, frequent rotation of officer corps, rewarding of loyalty rather than skill in promotion decisions, and monitoring structures such as a commissar system. Calibrated escalation postures provide leaders with the authorities and infrastructure to maximize their control and minimize the military’s autonomy to use information-age weapons for strategic effects. Civil-military relations are unlikely to have a strong influence over posture choices in states that delegate more autonomy to their armed forces for the management of military affairs. China is likely to favor calibrated escalation postures because the Communist Party of China (CPC) exercises strict control over the PLA, and has a tendency to centralize party control over capabilities with strategic effects such as its nuclear weapons.

The availability of technology is likely to influence both initial force posture choices and their evolution over time. Capacity-based explanations of the diffusion of weapons technology suggest that a state’s access to technology influences its force posture choices. While information-age weapons capabilities are readily accessible to nuclear-armed states, calibrated escalation force postures demand technologies that might take time to develop. An ideal-type calibrated escalation

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109 Fravel, *Active Defense*.

posture requires a state to possess a capability to carry out low-intensity information-age attacks, limit collateral damage, deploy attribution and situational awareness capabilities in space and cyberspace, as well as set up command, control and communications infrastructure linking top leaders with operators of these weapons that would survive throughout in a high-intensity conflict. States who do not possess these capabilities may select a brinkmanship posture and might shift towards a calibrated escalation posture if they acquire them later.

Over time, militaries gain experience with new capabilities like information-age weapons and might adapt their force postures accordingly. Scholars of military innovation describe processes of “bottom up innovation” or “adaptation” in which the military operators of technology adapt it to their needs and preferences.111 Those adaptations might then gain influence and acceptance within the broader military community relevant to the capability.112 While adaptation is most likely to occur when a state has employed information-age weapons in a conflict, such as Russia’s use of its information-age weapons in Ukraine, states also have opportunities to use, test, and experiment with information-age weapons in peacetime. Military operators have learned more about offensive cyber operations as they prepare for them in peacetime and employ similar tools, techniques and practices for espionage. States also engage in testing and experimentation with missile and counterspace capabilities in peacetime. This experience may prompt operators to advocate for new capabilities, doctrinal revisions, and alterations to command-and-control arrangements that shift a state from one force posture to another.

Information-age weapons and their targets also evolve over time in ways that influence posture choices. For example, the nature of cyberspace and cyber attacks have evolved over time. The networks they target have also changed. The “internet of things” presents a much larger number of smaller-value targets for cyber attacks. The shift to cheap, large, distributed satellite constellations and away from small numbers of exquisite satellites changes the target set for counterspace operations. Meanwhile, advances in hypersonic missile technology create new opportunities to either manipulate nuclear risk or evade missile defenses. These changes to

information-age weapons and their targets alter the nature of autonomous risk of nuclear escalation for each weapon type in ways that might make one posture more challenging to implement than the other.

A state’s vulnerability to counterspace and cyber attacks influences force posture choices because it affects the credibility of a state’s threats to carry out its most damaging strategic attacks using information-age weapons. Vulnerability to counterspace and cyber attacks varies from state-to-state as a function of both military and civilian dependence on cyber and space capabilities. For example, a state has high vulnerability to cyber attacks if its society, government, and military provide many valuable assets that an adversary could target using offensive cyber operations. The United States, Western Europe, Japan, and South Korea all have high degrees of cyber vulnerability. A state has low vulnerability to cyber attacks if it presents only a small set of low-value targets that could be damaged with a cyber attack, such as North Korea, where less than 0.5 per cent of people have access to the internet. Similarly, the vulnerability of major spacefaring states to counterspace operations is high while states with little dependence on space for military or civilian functions have low vulnerability to counterspace attacks.

A state’s space or cyber vulnerability determines the cost of retaliation it might face if it relies on offensive cyber operations or counterspace attacks to gain coercive leverage. The more damaging an adversary’s retaliation, the less credible the state’s threats to use those weapons will be. The prospect of in-kind retaliation for a state with high vulnerability to cyber attacks reduces the credibility of its threats to conduct the kind of damaging, risk-acceptant cyber attacks envisaged by a brinkmanship posture. A calibrated escalation posture addresses this credibility problem by starting with small-scale attacks, which provides the adversary with an opportunity and an incentive to keep an exchange of cyber attacks limited. As a result, the higher a state’s cyber vulnerability is, the stronger its incentives to adopt a calibrated escalation cyber force posture. The same is true for space vulnerability. By contrast, the lower a state’s vulnerability is the more willing it might be to take the high risk, high reward brinkmanship approach to coercive bargaining with

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counterspace weapons or cyber attacks. While an adversary could always threaten cross-domain retaliation to impose costs on a state with low vulnerability, doing so could cross other escalation thresholds, generating additional costs and risks for an adversary that also faces the limited war dilemma and must remain conscious of the nuclear shadow.\textsuperscript{116}

\textit{Alternative Explanations}

The theory of strategic substitution could be falsified in two ways. The first possibility is that China’s response to a leverage deficit is something other than the pursuit of substitutes. The theory would be falsified if China planned to threaten nuclear first-use to gain coercive leverage, chose to do nothing and live with the leverage deficit, or only poured resources into conventional modernization. The second possibility, derived from the literature on military innovation and diffusion, is that China pursued information-age weapons for reasons other than to fix its leverage deficits. The theory would be falsified if China pursued information-age weapons to bolster its conventional military capabilities or to emulate states who were the first to adopt them. The first possibility is outlined in the previous section. Below I describe the second possibility, the military innovation and diffusion alternative explanations for information-age weapons pursuit.

Developing space, cyber, or conventional missile capabilities and selecting force postures for those weapons are military innovations. Rosen defines a major innovation as “a change in one of the primary combat arms of a service in the way it fights or alternatively, as the creation of a new combat arm.”\textsuperscript{117} Theories of military innovation and diffusion point to a number of variables that could explain the pursuit of information-age weapons for coercive leverage. Theories that apply to both first-movers and second-movers in adopting military innovations are relevant to China’s pursuit of information-age weapons. China was not the first-mover state to adopt information-age weapons for military missions but it is the first state to give them a starring role in its answer to the limited war dilemma.


\textsuperscript{117} Rosen, \textit{Winning the Next War}. 

58
Scholars argue that military innovation among first-mover states results from a complex interaction between the organizational interests of its military and military services, relations between its military and civilian leaders, and its external threat environment. They draw on the insights of organization theory to make three distinctive arguments about peacetime innovation. First, organizational interests make militaries status-quo oriented and uninterested in new capabilities, even if those capabilities would help the state to better respond to its threat environment. Any decision to adopt a new capability or force posture that is necessary to counter the military threats the state faces therefore requires civilian intervention. Second, self-interested militaries or services within them might pursue a new information-age weapons capabilities as a pathway to maintaining or increasing their influence, autonomy and resources.

The literature on emulation and diffusion offers two main reasons for second-mover states to pursue similar capabilities to first-mover states. First, emulation can be a safe and quick option for responding to a deterioration in the second-mover state’s threat environment because it has been tried and tested by more powerful states. These arguments do not, however, specify how the emulator selects among the leading state’s demonstrated military capabilities or strategies to bolster its security. Second, Horowitz argues that a first-mover state’s demonstration of the efficacy of a major military innovation inspires diffusion of a new capability throughout the international system, but a second-mover state’s financial and organizational capacity can act as a brake on its ability to adopt the innovation. Some innovations are so expensive and organizationally challenging to adopt, such as carrier warfare, that second-mover states instead opt to counter the new innovation with existing capabilities.

Theories of innovation suggest that a state’s pursuit information-age weapons could be explained by the military organization’s interest in the new capability. If those capabilities threaten existing organizational interests, civilian intervention might be necessary for the state to adopt them. But if the new capability can aid the military or a service within it to survive and thrive, the military

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118 Posen, The Sources of Military Doctrine.
121 Horowitz, The Diffusion of Military Power.
organization’s interest might explain information-age weapons pursuit. Theories of emulation and diffusion suggest that changes in threat environment or the demonstration of a new innovation by a first-mover state could inspire China to pursue information-age weapons, provided that it has the financial and organizational capacity to do so. An emulation and diffusion explanation would be most persuasive if China assigned its information-age capabilities a similar role in its military strategy to first-mover states.

**Testing the Theory**

This book uses in-depth, comparative case studies of Chinese information-age weapons decision-making to test the theory of strategic substitution against alternative explanations derived from the literature on military innovation. As the theory applies to China only, the research design focuses on explaining China’s approach to gaining coercive leverage when it faced a limited war dilemma. Temporally, the argument is scoped to the period from the 1995-6 Taiwan Strait Crisis until the present when China faced the limited war dilemma. That crisis confirmed that a nuclear-armed power, the United States, would intervene in China’s most important local war, the type of war that China had been preparing for since 1988. There is ample justification to focus on China’s approach to strategic coercion. Explaining the distinctiveness of China’s choices contributes to a broader international relations research agenda on limited wars, nuclear weapons and coercive bargaining, new technology and military strategy. More generally, China’s foreign and security policy is not well integrated into the international relations literature. It is also poorly understood in popular and scholarly debates, despite its centrality to contemporary international affairs.

**Methods of Inference**

This book examines the full universe of cases for China, where a case is a military capability used to gain coercive leverage as a substitute for nuclear first-use and conventional victory. I compare three cases of China’s decisions to pursue information-age weapons: precision conventional missiles, counterspace weapons, and offensive cyber capabilities for coercive leverage. I also compare these decisions with three shadow cases of capabilities that China chose not to pursue for coercive leverage, whether because of technological constraints or because the PLA did not view
them as capable of generating strategic effects: conventionally armed bomber aircraft, electronic warfare and special operations forces. These shadow cases demonstrate the contingency in China’s choice of which weapons to pursue as substitutes. The cases examined in the book are summarized in Table 1.2 below.

Table 1.2: China’s Decisions to Pursue Information-Age Weapons and Shadow Cases

<table>
<thead>
<tr>
<th>Weapon</th>
<th>Year of Pursuit</th>
<th>Leverage Deficit</th>
<th>Posture Choice(s)</th>
<th>Year</th>
<th>Shadow Case</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision Conventional Missiles</td>
<td>1996</td>
<td>Taiwan Strait Crisis</td>
<td>Brinkmanship</td>
<td>1997</td>
<td>Bomber Aircraft</td>
<td>Technology Civil-military relations</td>
</tr>
<tr>
<td>Offensive Cyber Capabilities</td>
<td>2000</td>
<td>Belgrade Embassy Bombing</td>
<td>Brinkmanship</td>
<td>2001</td>
<td>Electronic Warfare</td>
<td>No Perceived Strategic Effect</td>
</tr>
<tr>
<td>Space Weapons</td>
<td>2002</td>
<td>Belgrade Embassy Bombing</td>
<td>Calibrated</td>
<td>2006</td>
<td>Special Operations Forces</td>
<td>No Perceived Strategic Effect</td>
</tr>
</tbody>
</table>

I use congruence testing and process tracing to explain how China addressed leverage deficits when it faced the limited war dilemma in the post-Cold War era.\footnote{James Mahoney, “Strategies of Causal Inference in Small-N Analysis,” \textit{Sociological Methods & Research} 28, no. 4 (May 2000): 387–424.} Congruence testing examines whether the timing of Chinese decisions to pursue information-age weapons or not, the dependent variable, match the presence or absence of a leverage deficit, the independent variable. Specifically, I examine whether the presence of a leverage deficit is followed by the pursuit of information-age weapons to gain coercive leverage. I also examine whether China’s leaders altered their approach to gaining coercive leverage when they did not face leverage deficits, and specifically whether they made decisions to pursue information-age weapons or other substitutes. China engaged in research and development activities for information-age weapons technology from at least the 1980s onwards. As such, it is possible to detect any steps the PLA took to exploit those capabilities for military purposes before China faced the limited war dilemma.
Process tracing China’s search for coercive leverage after experiencing leverage deficits allows me to make stronger claims about the causes of China’s pursuit of information-age weapons. Specifically, I look for evidence of the search for leverage mechanism hypothesized by the theory of strategic substitution. Process tracing also offers a particularly thorough test of the explanatory power of my framework compared to alternative explanations because they have different observable implications about the process of China’s search for leverage and decisions to pursue information-age weapons.

**Measurement**

Leverage deficits are triggered by changes in a state’s threat environment such as a crisis or conflict that increase the intensity of threat posed by an adversary, or reveal a new adversary or type of conflict. In China’s case, leverage deficits are triggered by crises in U.S.-China relations. China both faced the limited war dilemma for the first time and experienced its first leverage deficit the 1995-6 Taiwan Strait Crisis. It then faced two additional crises with the United States. NATO bombed the Chinese embassy in Belgrade in May 1999 during the Kosovo air war. In the wake of the Embassy bombing, cross-Strait tensions remained high until 2002. A third U.S.-China crisis erupted in 2001 when a U.S. spy plane collided with a Chinese fighter jet near Hainan Island. Since the early 2000s, no major U.S.-China-Taiwan military crisis has occurred, perhaps with the exception of the PLA’s large-scale military exercises around Taiwan in August 2022 in the wake of U.S. House of Representatives Speaker Nancy Pelosi’s visit. To confirm the presence or absence of a leverage deficit, I also examine the assessments of Chinese leaders and military officers of the adequacy of China’s coercive leverage before and after changes to its threat environment.

To measure the conventional inferiority constraint on China’s search for leverage, I looked for leadership assessments of the conventional military balance in the aftermath of crises involving China and the United States. I also triangulate Chinese leadership assessments of the conventional military balance with an objective measure of the conventional inferiority mechanism: Western scholars’ assessments. There was a scholarly consensus in the early 2000s that China could not

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invade Taiwan and defeat U.S. forces in the East Asian theater. More recent assessments confirmed that the PLA could not seize Taiwan with conventional war-winning capabilities through 2015. Today, few experts believe that China could conduct an amphibious invasion of Taiwan, although PRC conventional forces could make it very costly for the U.S. military to intervene.

To measure the nuclear credibility constraint on China’s search for leverage, I looked for leadership assessments of the credibility of nuclear threats throughout the post-Cold War era. Chinese debates about its nuclear forces are particularly useful for eliciting those views. Two of them are correlated with the presence of a leverage deficit. The first debate, from approximately 1986 until 1993, settled the role of China’s nuclear forces in a local war and elicited leadership views doubting the credibility of first-use threats. The second debate concerned whether China should sign the Comprehensive Nuclear Test Ban Treaty (CTBT) in late 1995, which restricted China’s options for testing warheads for tactical nuclear weapons that would make a first-use posture much more credible. A third debate, from approximately 2000 until 2005, explored the possibility of adding conditions to China’s nuclear No First-Use policy. These debates show that China’s leaders did not formulate a secret plan for nuclear first-use to gain coercive leverage in response to leverage deficits. But they also show that China’s retaliatory nuclear posture was not so entrenched that it alone explains China’s embrace of strategic substitution.

I identify a decision to pursue an information-age weapon for coercive leverage using three criteria: they are taken by a leadership-level body, indicate that the capability will be used for strategic leverage, and involve a timeline for weapons deployment. In China’s case, decisions to pursue must be made by the top military decision-making body, the Central Military Commission (CMC), if not the Politburo, the top political decision-making body, as well. In the post-Cold War era, the CMC Chairman also holds the position of the General Secretary of the Chinese Communist Party.

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(CCP) and the head of the PRC’s state bureaucracy. The CMC Chairman often telegraphed a decision to pursue a coercive information-age weapons capability by mentioning the capability for the first time in speech to the CMC. To increase confidence in my assessments that decision to pursue has occurred, I also look for post-decision indicators such as the establishment of a weapons development and production capability, doctrinal development, and establishment of experimental units to test a new information-age weapons capability.

To identify China’s choice of force posture and establish whether China pursued information-age weapons for strategic purposes, I constructed a set of indicators for ideal-type brinkmanship and calibrated escalation postures for each weapon. These four indicators—capabilities, doctrine, command and control arrangements, and signaling—are inspired by Vipin Narang’s typology of nuclear force postures, but adapted to the information-age weapons technology and different force posture options. These indicators are summarized in Table 1.3 below. Each empirical chapter begins with a detailed description of the ideal-type force postures for that particular information-age weapon, traces any changes in force posture, and identifies the influences on force posture choices.

Table 1.3: Indicators of Brinkmanship and Calibrated Escalation Postures

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Brinkmanship</th>
<th>Calibrated Escalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctrine</td>
<td>Early large-scale use possible</td>
<td>Early small-scale use only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intent to control escalation</td>
</tr>
<tr>
<td>Required Capabilities</td>
<td>Strategic weapons</td>
<td>Tactical weapons</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strategic weapons</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Testing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attribution</td>
</tr>
<tr>
<td>Command and Control</td>
<td>Strict or delegated but unclear to adversary</td>
<td>Strict for strategic weapons and signaled to adversary</td>
</tr>
<tr>
<td>Signaling</td>
<td>Offensive capability only</td>
<td>Active signaling</td>
</tr>
</tbody>
</table>

Data

Explaining China’s decisions about nuclear and information-age weapons, and conventional weaknesses, is a challenging methodological task. As the Chinese government does not publicly

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126 When Jiang Zemin handed leadership of the state and Party bureaucracies to Hu Jintao in 2002, he retained the post of CMC Chairman for two years before turning it over to Hu in 2004.

acknowledge its possession of offensive cyber capabilities and counterspace weapons, merely identifying the year that China’s leaders made decisions to pursue coercive information-age capabilities requires a large number of Chinese-language sources. The gold standard of qualitative research on contemporary Chinese security policy combines the extensive use of written Chinese-language sources with expert interviews.\textsuperscript{128} That said, bias and censorship are to be expected in both types of sources where sensitive topics are concerned.

This book relies on more than two hundred Chinese-language written sources, many of which have not been cited before in Chinese or Western scholarship. Those sources include official government documents, speeches, memoirs, papers, official biographies and chronicles of the lives of top military and civilian decision-makers in China. They also include books, journal articles, and teaching texts from Chinese military and civilian research organizations. Those written sources are supplemented by more than 70 interviews with more than 50 Chinese experts conducted between August 2015 and January 2017.

I assessed the reliability of each written source cited in this book by reference to the identity of the author and authoritativeness of the publisher. Sources considered reliable enough to be cited on their own without a second, corroborating source include leadership speeches published by official publishers such as the Central Party Documents Press (\textit{Zhongyang Wenzian Chubanshe}), chronicles (\textit{nianpu}) of a decision-maker’s important engagements published by the PLA Press (\textit{Jiefangjun Chubanshe}), or uncensored memoirs. I assessed the reliability of other sources according to best practices among the Chinese foreign policy scholarly community and PLA studies community.\textsuperscript{129} Wherever possible, a second source was used to corroborate the claims in these less reliable sources.


\textsuperscript{129} I classify official government documents such as White Papers, and publications of the Party Central Documents Press, as the most authoritative statements of Chinese policy. Memoirs, chronologies and selected of key decision-makers are taken as the most authoritative evidence of the decision-making process. Official news reports from the \textit{PLA Daily} and \textit{People’s Daily} are also treated as highly authoritative. Publications edited, published, or commissioned by the PLA’s four general departments (and their successors after the 2015-6 reforms), services or branches, such as the \textit{Science of Second Artillery Campaigns} are highly influential, although not authoritative on all matters they might describe. Less authoritative but still influential are edited research publications of the Academy of Military Sciences (AMS), China’s premier research organization for doctrine reporting directly to the Central Military Commission prior
I interviewed experts from organizations in China such as universities, government-affiliated research institutions, PLA educational and research institutions, defense industry research institutions, and weapons laboratories. No decision-makers concurrently holding office or military officers with operational duties were interviewed for this book. To avoid the pitfalls of transparency and replicability associated with anonymous interviews on sensitive topics, I used written sources to support empirical claims wherever possible. Interviewees nevertheless provided essential background information about Chinese assessments of the similarities, differences, coercive uses, and escalation dynamics of the weapons covered in this book. They provided assessments of China's vulnerability to space and cyber attacks and feedback on the list of events that changed China's threat environment. Interviewees also helped to assess the reliability of some written materials and provided advice on their interpretation.

The most common form of bias in the data results from the omission of explicit references to information-age weapons capabilities from Chinese texts, although omissions are not uniform across publishers and over time. Information-age offensive capabilities might be referred to obliquely or vaguely, for example “information attack capabilities” can refer to cyber weapons, while shashoujian (“assassin’s mace”) weapons might refer to conventional missiles in certain contexts. Elite interviews can also produce biased data. To guard against bias in written sources, this book draws on a variety of publications acquired either in the PRC or from U.S. university libraries to exploit inconsistencies in censorship. The most common forms of bias in interviews stem from the fact that interviewees were limited in what topics they could discuss, have incentives to distort their answers, and, if they lack the knowledge to answer a question, may be reluctant to inform the interviewer.

to the 2015-6 PLA reforms, and the National Defense University (NDU), the top professional military education organization. These edited publications include various editions of the Science of Military Strategy published by both organizations. Books authored by individuals, opinion articles in the PLA Daily, and academic research published in two AMS journals, China Military Science and Foreign Military Arts, or the NDU Academic Journal, are generally not authoritative but may be influential, depending on the identity of the author.
Conclusion

This chapter has introduced a theory of strategic substitution to explain why China chose to pursue information-age weapons as substitutes for nuclear first-use or conventional military victories to cope with the limited war dilemma. Information-age weapons can be used strategically to coerce an adversary if they are deliberately postured to create a threat that leaves something to chance of escalation to nuclear war. All three answers to coping with the limited war dilemma—nuclear first-use, conventional victory, and strategic substitution—have advantages and disadvantages. The theory of strategic substitution explains why China favored the speed and credibility advantages of strategic substitution and accepted its disadvantages to pursue information age weapons for coercive leverage when it faced leverage deficits. China’s search for coercive leverage to redress those leverage deficits took place under the constraints of conventional inferiority and doubts about the credibility of nuclear threats, which led it to recognize these advantages of information-age weapons as substitutes. This chapter also outlined some key factors influencing a state’s choice of force posture to implement strategic substitution. In the empirical chapters that follow, I test the theory of strategic substitution against alternative explanations for China’s pursuit of information-age weapons derived from the military innovation and diffusion literature, using the comparative case study research design described in this chapter.