Inducing Nuclear Reversal:

Foreign Policy Effectiveness and Deproliferation

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DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of
DOCTOR OF PHILOSOPHY

in
Political Science
Department of Graduate Studies
UNIVERSITY OF CALIFORNIA DAVIS

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June 2019
Political Science

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The international community has worked for decades to combat the spread of nuclear weapons, but new proliferators continue to emerge despite these efforts. While scientific research has helped explained when and why states seek the bomb, scientists and policymakers still disagree over how to reverse that pursuit once it has already begun. This project therefore asks: what foreign policies most effectively induce nuclear reversal in proliferating states, and under what conditions will those policies be most effective? I present a theory of policy effectiveness that considers both the explicit punishment or rewards associated with any foreign policy, and the implicit security signals of these policies to the proliferator. I then develop a testable definition of policy effectiveness and test the implications of the theory through a mixed methods research design, using a mix of quantitative methods on cross-national panel data (1945-2012), and within-case comparisons of Iran and North Korea. This analysis finds that cooperative inducements are more effective than coercive strategies, leading to nuclear reversal more often and with a lower risk of perversely inciting greater proliferation instead. The effectiveness of these policies is mediated by the power and rivalry of the sending states, however. Cooperation from nuclear-armed rivals is more effective at inducing reversal than similar policies from non-nuclear allies, but coercive policies from these same nuclear-armed rivals also carry the greatest risks of perverse proliferation. The results provide insight into current nuclear reversal dilemmas, as well as implications for research and statescraft in foreign policy more generally.

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Acknowledgements

This dissertation represents the culmination of a large research project that would not have been possible without the generous support and valuable feedback from a number of people.

First and foremost, I would like to thank my committee, all of whom spent valuable time and plenty of ink editing and commenting on prior drafts. Brandon Kinne well overshot his duties as chair, and made himself regularly available, even working around my inflexible schedules and technology restrictions during my years at the Lawrence Livermore National Laboratory. His patience working through methodological bugs, data frustrations, and presentation tricks shaped both this work and my scholarship more generally in lasting ways. Ethan Scheiner has been a patient friend and advisor since my first days in graduate school, and I am continuously grateful for his faith and positive presence through this project. Jeannette Money helped work through multiple drafts on case studies, gave detailed line by line comments, and provided persistent guidance far beyond what could be expected. Finally, Brad Roberts (Center for Global Security Research, CGSR) agreed to join the committee late in the process, taking a leap of faith on one of his many research associates despite his full plate as director of a busy center at Lawrence Livermore National Lab. His insight was critical in helping hone the nuclear-specific dimensions of this project, and his steady support was a great motivator.

Beyond this committee, a number of people also generously gave their time and energy to providing feedback and thinking through puzzles in this project. Miroslav Nincic was a great friend and formative instructor, mentoring early interests in this topic and providing direction in new approaches. Brad Jones met regularly to tweak research designs, discuss data problems, and strategize marathon training plans. Zachary Davis (CGSR) went out of his way to make time to talk through cases, and made a number of introductions critical to the case research interviews. I am grateful to these interview subjects for their willingness to share their experiences, including Tom Countryman, Sigfried Hecker, Colin Kahl, William Tobey, Richard Nephew, and Mitchell Reiss (and others who preferred to be kept confidential). Friends in the Center for International Security and Cooperation (CISAC) – notably Scott Sagan and members of the Nuclear Reading Group -- at Stanford University, the Nuclear Policy Working Group at UC Berkeley and others at CGSR listened to practice presentations, read drafts, and were supportive friendly faces throughout. A special thank you to Sarah Laderman, Andrew Reddie, and Jaime Jackson for their help on previous versions and fun working dinners that often dealt as much with running, dogs, and food discussions as they did with nuclear proliferation.

Finally, thank you most of all to David Petrovics, for his unwavering support, his wonderful computer skills, and his wiliness to do more than his fair share of dishes, dog walks, and coffee runs.

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Terms and Definitions

Sender or Sending State: The state seeking to induce deproliferation through its choice of a foreign policy. A sender may select coercive or cooperative policies, meaning it may be coercive adversary or it may be cooperative donor, but can be called a policy sender more generally.

Proliferator or Target State: The nuclear weapons seeking state, and the subject of the sender's deproliferation foreign policies. A target is occasionally called a recipient state when facing foreign aid or inducement, but target states more generally

Engagement Type or Foreign Policy: A specific deproliferation action taken by the sending state in order to bring about nuclear deproliferation in the target. These could be

Deproliferation: Also known as nuclear reversal, or roll-back, deproliferation refers to an observable reduction in the nuclear weapons capability of a proliferating state. This can be a freeze of ongoing weapons pursuit, or the partial incomplete roll-back of existing capability, up to and including complete denuclearization.

Denuclearization: This term is used here to refer to the complete end of a nuclear weapons program. This includes eliminating existing arsenals and end of any further nuclear weapons development.

Counterproliferation: This term refers here to efforts aimed at preventing, ending, or reverse nuclear weapons pursuit. This may include *ex post* deproliferation of existing programs, but may also include *ex ante* prevention of new programs.

Nonproliferation: This term here refers to the *ex ante* prevention of new nuclear weapons programs, as well as the prevention of further proliferation activity in existing programs. It does not necessitate the reversal of existing programs *ex post.*

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List of Key Acronyms

AP: Additional Protocol, optional supplementary treaties to the NPT

IAEA: International Atomic Energy Agency, established as an autonomous agency in 1957, and reports to the UN General Assembly Security Council

JNCC: North-South Joint Nuclear Control Commission established in 1992 in order to coordinate bilateral nuclear inspections

KEDO: Korean Peninsula Energy Department Organization, a joint organization between DPRK and ROK in order to coordinate building and overseeing new nuclear enrichment sites in the DPRK. Established in 1995 to implement Agreed Framework

LWR: Light Water Reactor, a nuclear reactor that is more proliferation-resistant meaning it is harder to convert partially enriched fissile material to highly enriched weapons-grade material in such facilities

NPT: Non-Proliferation Treaty, opened for signature in 1968 and signed into force in 1970

TRR: The Tehran Research Reactor, a uranium enrichment reactor located in Tehran, Iran.

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Chapter 1: Introduction

Why Care About Deproliferation?

In October of 2015, the United States along with China, France, Germany, Russia, and the United Kingdom concluded a comprehensive agreement with the Islamic Republic of Iran to reduce the latter's nuclear enrichment activities and bring its program under international nonproliferation safeguards. In doing so, it concluded the first such agreement with the past proliferator,[1] bringing it into compliance with its Nonproliferation treaty obligations and concluding years of negotiations and decades of deproliferation[2] foreign policy efforts. Meanwhile, North Korea as the world's newest and poorest nuclear-armed state, continued testing its burgeoning arsenal and increasingly powerful delivery systems. In doing so, it has thwarted decades of comprehensive international sanctions and resisted global pleas to accept international safeguards[3] and nonproliferation norms. These recent cases are just the newest in a long history of international efforts to reverse ongoing nuclear proliferation activity, but are unlikely to be the last.[4] As such, concerned states and political science research continue to ask:

[1] Until at least 2003, Iran actively pursued a clandestine nuclear weapons program in contravention of its Nonproliferation Treaty obligations (made clear by documents secreted out of Iran in 2018. See Arnold, A., M. Bunn, C. Chase, S. Miller, R. Mowatt-Larssen, and W. Tobey (2019) *The Iran Nuclear Archive: Impressions and Implications* (Cambridge, Mass: Belfer Center for Science and International Affairs, Harvard Kennedy School). The extent of Iran's nuclear-weapons-specific activities is unproven after Iran halted its weapons program in 2003, though its unsafeguarded expansion of the nuclear program continued until the 2015 JCPOA.

[2] I use the terms deproliferation, denuclearization, nuclear roll-back, and reversal interchangeably throughout the paper, all meaning a reduction in progress toward a nuclear weapon.

[3] According to the International Atomic Energy Agency (IAEA), the arms of the United Nations tasked with monitoring international nuclear activity, "safeguards are activities by which the IAEA can verify a State is living up to its international commitments not to use nuclear programmes for nuclear-weapons purposes." These generally rely on in-person and camera inspections of nuclear facilities and any of its associated fissile material. ("IAEA Safeguards Overview: Comprehensive Safeguards Agreements and Additional Protocols", *International Atomic Energy Agency*, https://www.iaea.org/publications/factsheets/iaea-safeguards-overview)

[4] Many scholars suggest that newly minted nuclear-armed states can incite reciprocal proliferation in their neighbors and rivals. See recent cases in Hughes, C. W. (2007). (North Korea's nuclear weapons: implications for the nuclear ambitions of Japan, South Korea, and Taiwan. *Asia Policy*, (3), 75-104) or cross-national work in Jo, D. J., and Gartzke, E. (2007). (Determinants of nuclear weapons proliferation. *Journal of Conflict Resolution*, *51*(1), 167-194.)

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what are the determinants of the success of nuclear reversal efforts, and how can concerned states work to roll back the spread of these weapons of mass destruction?

Nuclear weapons remain the single most destructive military tool ever developed, and as such the international community has worked for decades to control their spread. Despite increasing attention to global nonproliferation norms, states still seek the power and security they provide. Proliferators of the modern era like Iran and North Korea each resisted international engagement for years, contravening international treaties and destabilizing non-proliferation efforts. As a result, the success of deproliferation efforts has significant ramifications for international security. Despite clear implications for current international security and foreign policy, systematic analysis of nuclear reversal policies has only recently begun and many questions remain on the determinants of deproliferation policy effectiveness. What are the determinants of deproliferation policy effectiveness, and what conditions the response of proliferating states to the foreign policies they face?

Deproliferation tactics can range from negative coercion like economic sanctions or military force, to positive inducements like cooperation agreements and foreign aid, all aimed at encouraging the proliferating state to roll back its nuclear weapons program.[5] However, these policies are often complex, costly, and time-consuming, with at best imperfect records of success. Given these potential benefits coupled with the significant risks, choosing the most effective deproliferation policy has important implications for international security and the welfare of the sending states that impose these policies. Recognizing this, states choose their

[5] While sending states that impose these deproliferation policies often hope to entirely dismantle the nuclear program, they often must be satisfied with the cessation of weapons-related enrichment in a program fully under International Atomic Energy Agency enforcement and the associated nonproliferation safeguards. (For more information on safeguards see: "IAEA Safeguards Overview: Comprehensive Safeguards Agreements and Additional Protocols", *International Atomic Energy Agency*, https://www.iaea.org/publications/factsheets/iaea-safeguards-overview)

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tools strategically, selecting the policies they hope will maximize their chances of success while minimizing the associated costs. This is especially true when the issue under dispute is a potential threat to international security, of which nuclear proliferation is a particularly relevant example.

Though no policy option is guaranteed to succeed, concerned states facing ongoing nuclear proliferation still choose from these imperfect engagement options, meaning a coherent theory is needed to explain when and why deproliferation policies succeed and when they fail – or even worse, when they inadvertently risk inciting further proliferation instead. This project addresses this strategic choice by examining the effectiveness of foreign policy tactics, asking when and under what conditions will deproliferation policies most effectively induce nuclear reversal in weapons-seeking states. It proposes a framework for assessing the effectiveness of available foreign policies, and employs that framework to compare the use of common engagement tools in countering ongoing nuclear proliferation.

Understanding Nuclear Reversal:

Weapons proliferation presents an ongoing threat to international security and has been a regular subject of policy-maker and scientific debate for many decades. Since 1945, over 30 states have explored nuclear weapons technology (see Figure 1.1 below). Research has made significant progress in explaining why states choose to weaponize, and why they may choose nuclear abstinence, finding that in the past, prospective proliferator's technical capabilities, as well as its security and domestic political environment, are strong determinants of their decision to pursue a weapon.[6] Research on reversing that process is early and less developed, but initial

[6] See, for example, seminal works like: Epstein, W. (1976) *The Last Chance: Proliferation and Arms Control*. New

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Figure 1.1: Nuclear Proliferators and their outcomes

Nuclear Weapons States	**Relinquished Indigenous Weapons Program**	**Relinquished Inherited Arsenal**	**Still Developing Nuclear Weapons**
NPT *de jure* NWS USA UK France USSR/Russia China ***de facto* NWS** Israel India[a] Pakistan North Korea[c]	Algeria Argentina Australia Brazil Canada Egypt Germany India[a] Indonesia Iran[b] Iraq Italy Japan Libya Netherlands Norway South Africa Sweden Switzerland Taiwan Yugoslavia[a]	Romania Belarus Kazakhstan Ukraine	North Korea[c]

[a.] India and Yugoslavia both froze their programs at one time but later restarted them. India stalled in 1974, and restarted in 1986, culminating in its existing nuclear arsenal. Yugoslavia temporarily ended its first pursuit in the 1960s, and permanently ended its second in 1987.
[b.] Iran signed the Joint Comprehensive Plan of Action with the P5+1 (UN permanent members plus Germany) in April 2015. Some experts and policymakers contend that it continues clandestine enrichment activities to date. See Chapter 5 for further discussion of this case.
[c.] While North Korea has successfully tested several nuclear weapons, it is still developing an effective delivery system, and its program is still highly contested by many states. North Korea has occasionally indicated it may be willing to reverse its program in exchange for certain inducements. See Chapter 6 for further discussion of this case.

York: Free Press; Sagan, S.D. (1996/7) "Why do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security* (21) (3), 54–86; Sagan, S.D. (2000) "Rethinking the Causes of Nuclear Proliferation: Three Models in Search of a Bomb" In V.A. Utgoff (ed.) *The Coming Crisis: Nuclear Proliferation*, *US Interests, and World Order*. Cambridge, MA: MIT Press, pp. 17–50; Solingen, E. (1994) "The Political Economy of Restraint," *International Security* 19(2), 126–69.

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scholarship suggested that some of the most common policies – such as threats imposition of economic sanctions – are not as effective as the sanction sending states might hope.[7] And yet we still see these potentially costly and surprisingly ineffective policies dominating the nuclear reversal landscape. A larger body of literature has examined the determinants of foreign policy success more generally, of which deproliferation policy could be one particular application. For example, this work widely finds that coercion is most successful when used by powerful sending states,[8] and yet examples like North Korea demonstrate that even the weakest proliferators can resist the most powerful senders to acquire a nuclear arsenal. Another branch of foreign policy research suggests that cooperation is a viable alternative to conflict, and is facilitated by a history of trust and shared interests.[9] However, some of the best examples of nuclear reversal agreements -- like Iran's 2015 JCPOA or Brazil and Argentina's 1980 joint reversal – rely on cooperation between rivals. This project seeks to further our understanding of deproliferation tactics by asking what foreign policies most effectively induce nuclear reversal in proliferating states?

Existing research has demonstrated that states that choose to seek a nuclear weapon assume considerable financial burden and contravene many international treaties.[10] This decision

[7] See for example: Solingen, E. (2007) *Logics: Contrasting Paths in East Asia and the Middle East*. Princeton: Princeton University Press; Reardon, R. (2010) *Nuclear Bargaining: Using Carrots and Sticks in Nuclear Counterproliferation* Boston: Massachusetts Institute of Technology Press; Mehta, R. (2014) *Deproliferation Dynamics: Why States Give Up Nuclear Weapons*, San Diego, CA: University of California, San Diego

[8] This power is widely agreed and can be seen in sanctions, political engagement, and military coercion: Art, R. J. (1980). To what ends military power?. *International Security*, *4*(4), 3-35; Shambaugh, G. E., and Shambaugh IV, G. E. (1999). *States, Firms, and Power: Successful Sanctions in United States Foreign Policy*. SUNY Press; Nye Jr, J. S. (2004). *Soft power: The means to success in world politics*. Public affairs.; Gompert, D. C., and Binnendijk, H. (2016). *The power to coerce.* The RAND Corporation: Santa Monica, CA

[9] This branch of work tends to find that familiarity breeds trust, and trust facilitates cooperation, See further discussion in: Kydd, A. (2005) *Trust and Mistrust in International Relations*, Princeton, NJ: Princeton University Press; Gulati, R., and Sytch, M. (2008). Does familiarity breed trust? Revisiting the antecedents of trust. *Managerial and Decision Economics*, *29*(2-3), 165-190.

[10] Meyer, S.M. (1984) *The Dynamics of Nuclear Proliferation*. Cambridge, MA: MIT Press; Levite, A.E. (2002/03)

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to proliferate is not taken lightly, and modern proliferators like Iran and North Korea have proven highly resistant to existing non-proliferation safeguards. As a result, the choice of engagement tactics is more crucial today than ever for states hoping to reverse this process. The decision to proliferation reflects a complex cost-benefit analysis. While the pursuit of nuclear weapons poses costs: material acquisition, technological expertise, and potential international censure—the benefits can also be great: deterrence and national security, international status, and domestic rally effects.

Theory and Methods:

Recent research suggests that proliferators' nuclear pursuits are especially influenced by their beliefs about their international security environment,[11] and that those beliefs are informed by their interactions with other states.[12] This project builds on the large body of nuclear proliferation, bargaining, and foreign policy literature to develop a theory of engagement as a means of interstate signaling, affecting proliferation behavior by influencing the security motivations of weapons-seekers.[13] I argue that when sending states choose to employ coercive tactics, they risk increasing the proliferator's perception of international threat and thereby its

"Never Say Never Again: Revisited," *International Security* 27(3), 59–88; Rublee, M.R. (2009) *Nonproliferation Norms: Why States Choose Nuclear Restraint*. Athens, GA: University of Georgia Press

[11] Reiss, M. (1995). *Bridled ambition: Why countries constrain their nuclear capabilities*. Woodrow Wilson Center Press; Sagan, S.D. (1996/7) "Why do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security* (21) (3), 54–86; Singh, S., and Way, C. (2004) "The Correlates of Proliferation: A Quantitative Test," *Journal of Conflict Resolution* 48(6), 859–85; Jo, D.-J., and Gartzke, E. (2007) "Determinants of Nuclear Weapons Proliferation," *Journal of Conflict Resolution* 51(1), 167–94; Kaplow, J. (2017) "The Changing Face of Nuclear Proliferation" Working paper presented at APSA: San Francisco, CA;

[12] Kydd, A. (2005) *Trust and Mistrust in International Relations*, Princeton, NJ: Princeton University Press; Nincic, M. (2011) *The Logic of Positive Engagement,* Ithica, NY: Cornell University Press

[13] Like much of the proliferation literature, I adopt a rationalist theory and assume states (and their regimes) are security-seeking and balance against threats (see for example Jervis 1978, Walt 1987, and Glaser 1994/5 for further discussion).

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desire for a nuclear deterrent. When these sending states choose cooperative inducements instead, they signal a non-threatening intent, thereby reducing the proliferator's fears and its motivation for investing in further proliferation. As a result, cooperative inducements should be more effective than coercive strategies, leading to nuclear reversal more consistently and with lower risks of inciting perverse proliferation instead. In particular, engagement from powerful adversaries will elicit the strongest responses – generating the most effective deproliferation from cooperation, but also the greatest risk of proliferation from coercion – as these senders have the greatest capacity to either quell the proliferator's security fears or further incite them.

Testing these hypotheses requires a comprehensive definition of foreign policy effectiveness that reflects the needs of the sending states. This project therefore analyzes two related but distinct aspects of deproliferation policy effectiveness: 1) the likelihood of reversing proliferation, and 2) the risk of perversely increasing proliferation instead. Examining these changes requires a nuanced measure of proliferation activity that disaggregates the final outcome of either achieving a nuclear weapon or complete denuclearization.

Some early research on nuclear reversal has evaluated whether a proliferator eventually achieved a nuclear weapon or dismantled its program, but using these programmatic indicators loses the temporary reversal or acceleration that can occur in the interim as a result of international engagement.[14] Other work aggregates all policies into positive inducements versus negative coercion – meaning respectively rewards for reversal or punishment for proliferation.[15]

[14] This reliance on programmatic indicators results from a lack of more nuanced data in the past. Some excellent work on the subject can be seen in Mattiacci, E. and B. Jones (2016) "(Nuclear) Change of Plans: What Explains Nuclear Reversals?" *International Interactions* 42(3); 530-558. Work of this sort largely relies on the seminal data by Singh, S., and Way, C. (2004) ("The Correlates of Proliferation: A Quantitative Test," *Journal of Conflict Resolution* 48(6), 859–85).

[15] This has been another necessary simplification when facing limited data on foreign policies. Some interesting results from this research can be seen in Reardon, R. (2010) *Nuclear Bargaining: Using Carrots and Sticks in Nuclear Counterproliferation* Boston: Massachusetts Institute of Technology Press; Mehta, R. (2014)

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However, this likewise imposes limitations, if some policies within each general type could be more effective or more risky than others, thus clouding the effect of each policy with the competing effects of others. As a result, further analysis can help shed light on which specific policies are most effective, under what conditions they present the best prospects for success, and what risks counterproductive consequences instead.

This project builds on early research on foreign policy effectiveness – and nuclear reversal policies specifically – by examining a more fine-grained estimation of both the policy inputs and the proliferation responses – thereby more closely matching the key policies with the changes in proliferation behavior. To do this, this project employs a mix of methods, testing the prospect for successful reversal as well as the risks of perverse proliferation first on cross-national annual data of foreign policies and the corresponding changes in nuclear behavior, followed by within-case comparisons in two current nuclear engagement cases. I develop a cross-national dataset capturing policy and proliferation activity from 1945-2012 built from 14 existing datasets. This data accounts for 10 unique foreign policy types, as well as the nuclear capabilities and changes in proliferating states, and several critical attributes of the different sending states that impose the deproliferation policies. This data allows for quantitative analysis of the effectiveness of common foreign policies at inducing deproliferation, as well as the conditions that promote or hinder deproliferation effectiveness. These cross-national comparisons are then complemented by within-case analysis of Iran and North Korea, two modern examples of proliferation which each highlight the conditions that lead nuclear reversal and those that encourage perverse proliferation. These detailed accounts of each states' responses

Deproliferation Dynamics: Why States Give Up Nuclear Weapons, San Diego, CA: University of California, San Diego

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to different foreign policy conditions provide a closer look at deproliferation engagement in action and helps to identify the causal mechanisms responsible for policy success or failure.

Contributions of the Project:

The contributions of this project are thus twofold. The first addresses remaining questions in the study of foreign policy and nuclear proliferation, explaining the foreign policy conditions that encourage nuclear reversal in weapons-seeking states. This issue has important policy implications, as policymakers question the success of the Iran Joint Comprehensive Plan of Action (JCPOA) and North Korea presses forward with its nuclear program. The second contribution is methodological, speaking to the persistent need for crafting and assessing effective security policy more broadly. I generate a testable definition of foreign policy effectiveness and develop a framework for testing policy effectiveness using both large-N quantitative analysis and critical case studies. The combination of a coherent definition and data-driven research design therefore injects objective clarity into the historically charged debate over foreign policy choices.

The first contribution is theoretical, helping to explain the effects of foreign engagement on a particularly relevant issue of international security, that of nuclear proliferation. While a large body of literature examines the motives behind initiating or abstaining from nuclear proliferation, this project examines proliferation behavior after a weapons program is already begun. In addition, existing foreign policy literature, in general, tends to either examine the effect of different foreign policies in isolation without controlling for the presence of simultaneous

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alternatives — particularly emphasizing the role of coercive policies.[16] This project instead mirrors the choices policymakers face by simultaneously comparing the effectiveness of many different foreign policies. It evaluates the role of both the explicit payout each policy offers — coercion imposes direct costs for proliferation, while positive inducements offer specific rewards for reversal — as well as the implicit signals they each carry about sender's intentions.[17] Using this analysis, I argue that cooperative inducements that offer enduring collaboration between proliferator and sender are more effective than coercive strategies at inducing nuclear reversal in proliferating states. In addition, cooperation from rival powers is the most effective, while coercion from these same senders is the least effective, most risky approach. Examining the theory and analysis from the following chapters, the implications from this work is that current deproliferation approaches in use today may be more risky with lower prospects for success than previously considered.

These theoretical contributions also present avenues for furthering research methods and empirical analysis in international security. The first empirical contribution is to develop a testable definition of policy effectiveness. Nuclear weapons development and its reversal takes many years and its progress is often nonlinear. A proliferator might make substantial progress in its enrichment capabilities short of breakout[18] for several years, but later scale down or dismantle its nuclear infrastructure before ever achieving a nuclear weapon (see for example, the scaling up

[16] See a general discussion of the foreign policy substitutability discussion in Palmer, G. And A. Bhandari (2000) "The Investigation of Substitutability in Foreign Policy, *Journal of Conflict Resolution,* 44:1-10. Also see discussion of cooperative alternatives in Cortright, D. (1997). *The Price of Peace: incentives and international conflict prevention*. Rowman and Littlefield Pub Inc; Nincic, M. (2011) *The Logic of Positive Engagement,* Ithica, NY: Cornell University Press

[17] Osgood, C. (1961) "An Analysis of the Cold War Mentality", *Journal of Social Issues*, 17(3) 12-19; Kydd, A. (2005) *Trust and Mistrust in International Relations*, Princeton, NJ: Princeton University Press; Nincic, M. (2005) *Renegade Regimes: Confronting Deviant Behaviors in World Politic,* New York: Columbia University Press

[18] Nuclear breakout means the acquisition of nuclear weapons, usually measured as the date the proliferator tests its first nuclear device.

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and down of South Korea's program from 1970-79[19]). Some proliferators scale down temporarily just to reinvigorate their program and achieve nuclear breakout at a later date as their circumstances change (India in 1986[20]). Traditional measures of policy success rely on binary outcomes of success or failure – meaning in this case only reversal or no reversal – which fail to account for perverse consequences or multiple changes throughout the bargaining process. Instead, this project argues that effective policy is both more likely to induce a shift away from acquiring a nuclear weapon, and less likely to inadvertently encourage perverse proliferation. Because foreign policies are costly—both in political and economic capital—understanding when and why these strategies effectively accomplish their policy objectives allows for more efficient use of foreign policy resources.

The second empirical contribution is to construct a fine-grained measure of proliferation behavior. The outcome of deproliferation efforts has historically eluded systematic analysis, stymying scholars with unclear causal identification of proliferators' behavior. This project instead measures proliferation changes over time as incremental shifts closer to or further from a nuclear warhead, thereby closely pairing proliferator responses with the policies responsible for these shifts. Achieving a nuclear arsenal takes many years, during which time the proliferator may accelerate or reverse its weapons capacity and opponents may vary their deproliferation tactics. Instead of aggregating many years of proliferation activity into a single final outcome, I measure changes in nuclear development over time, better reflecting the behavior of weapons-seeking states and helping to identify the causal mechanisms behind proliferators' responses to foreign engagement. This project, therefore, contributes to existing work in international security

[19] Kim, S. Y. (2001). Security, nationalism and the pursuit of nuclear weapons and missiles: The South Korean case, 1970–82. *Diplomacy and Statecraft*, *12*(4), 53-80.
[20] Frey, K. (2007). *India's nuclear bomb and national security*. Routledge.

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by providing a theoretical framework, an empirical method, and an improved measure for examining foreign policy effectiveness.

Thesis Roadmap:

The dissertation proceeds as follows: The introduction discusses the importance of analyzing policy effectiveness—particularly with regard to nuclear deproliferation—and provides a brief background on relevant existing literature. Chapter Two outlines the theory proposed here for comparing the relative effectiveness of different foreign policies, and applies this logic to the case of nuclear deproliferation. Chapters Three and Four then provide tests of the different aspects of policy effectiveness that the theory suggests: Chapter Three gives assessments of the likelihood of reversal and risks of perverse proliferation, while Chapter Four treats the sender conditions that mediate those effects. Chapters Five and Six then give within-case comparisons of historical examples: Chapter Five traces of deproliferation engagement efforts with the Islamic Republic of Iran, while Chapter Six traces those efforts with North Korea. Chapter Seven concludes by outlining the central findings of this project, the policy implications these findings suggest, and presenting opportunities for further research on policy effectiveness.

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Chapter 2: Theory

How Policies Impact State Behavior

Combatting ongoing proliferation has current policy and security implications but research has yet to systematically define or test the effects of international engagement on nuclear reversal. Foreign policies that fail to reverse the proliferation of weapons of mass destruction weaken nonproliferation efforts more broadly. Even worse, some deproliferation policies may perversely increase the very proliferation they seek to reverse, thereby potentially bringing more harm than good. These important security consequences of deproliferation policies therefore begs the question: when and under what conditions will foreign policies most effectively encourage deproliferation in weapons-seeking states, and when will they encourage perverse proliferation instead?

I argue that a proliferator's motivation for pursuing a nuclear weapon is determined in part by the foreign policies they face – but not necessarily in the way that the sending state intends – leading to important differences in the proliferator's response to engagement. Not only does a sender's choice of deproliferation engagement impose costs or offer rewards, but it also sends the proliferator an implicit message about the character or intent of the sender themselves, and therefore about the proliferator's security environment more broadly. A sender's choice to offer cooperation can serve to reassure the proliferator that its security environment is not threatening, thereby reducing its security motivated demand for a nuclear deterrent. Conversely, while coercion imposes costs for proliferating, the very choice to use coercion instead of a more cooperative alternative can inadvertently signal to the proliferator that the sender is actually a potentially threatening adversary, thereby increasing the proliferators security motivated demand for a nuclear deterrent. As a result, even though senders may choose coercion for the explicit costs they inflict for proliferating, the result may be to inadvertently increase the proliferator's security motivations for the very thing the

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sender sought to combat. Cooperation that reassures the proliferator about its security environment[1] can reduce the proliferator's demand for a nuclear weapon, making it more willing to accept nuclear reversal and proliferation safeguards as a viable policy. Based on this logic, I argue that cooperative inducements are more effective than coercive strategies for reversing nuclear proliferation, but within that, policy effectiveness is further mediated by the power and rivalry of the sending state. Powerful rivals will have the greatest effect on the proliferator's perception of its security environment, magnifying both the reassuring qualities of cooperative inducements as well as the threatening qualities of coercive policies. As a result, the most effective strategies will involve cooperative inducements from powerful rivals, but should these senders choose coercion instead, they also have the greatest risk of inadvertently induce perverse proliferation instead.

This theory and the logic behind it are informed by existing research in nuclear proliferation, international bargaining, and foreign policy substitutability, which taken together present new implications for deproliferation engagement. First, existing research on the determinants of nuclear proliferation finds that security fears are an important motivation for nuclear proliferation,[2] meaning that each proliferator's demand for a nuclear weapon is informed and updated in response to its changing security environment. Relatedly, research in bargaining and credibility suggests that states update their beliefs about adversaries based on their experiences engaging with those adversaries – using the adversary's choice of engagement as a reflection of its intent and character.[3] Taken together, a state's perceptions of its changing security environment – and thereby its need for a nuclear weapon – change in

[1] Not all positive inducements offer cooperation, however, so not all positive inducements will be so effective. This will be discussed in greater detail below, but in general strategies that necessitate more enduring cooperation such as technical cooperation and increased diplomatic recognition serve as better assurances than do quid pro quo payoffs like temporary foreign aid or financial assistance.

[2] Meyer, S.M. (1984) *The Dynamics of Nuclear Proliferation*. Cambridge, MA: MIT Press;

[3] Kydd, A. (2005) *Trust and Mistrust in International Relations*, Princeton, NJ: Princeton University Press; Nincic, M. (2011) *The Logic of Positive Engagement,* Ithica, NY: Cornell University Press; Jervis, R. (2017). *Perception and Misperception in International Politics: New Edition*. Princeton University Press.

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response to foreign states' actions. According to foreign policy substitutability literature, these foreign adversaries (or foreign policy senders) can select from a variety of engagement tools in pursuit of their goals, ranging from coercion to inducement.[4] Many different policies can be employed to the same end, and the choice of one policy type over another therefore gives insight into the character of the adversary and their intentions.

Based on this diverse body of literature, we can conclude that an adversary's selection of one policy type over available alternatives serves as a signal to the targeted proliferator about the threatening or benign intentions of the adversary and thereby the proliferator's own broader security environment. While coercion signals threat and conflict, making the international environment appear more threatening, inducements signal cooperation and make the environment appear more friendly. Coercive strategies can therefore inadvertently increase the proliferating state's demand for a nuclear weapon, while positive inducements can instead reduce its security fears and thereby its nuclear demand.

Not all sending states have the same degree of influence on the proliferator's security fears, however. Rival states, and particularly nuclear-armed rivals, disproportionately contribute to those fears, meaning cooperative signals from these senders can more effectively reduce the proliferator's demand for a nuclear weapon. Similar inducements from a non-nuclear armed ally will be less effective. These less powerful senders cannot provide the same nuclear carrots, and states expect allies to be cooperative, meaning that these signals do little to reduce a proliferator's demand for a nuclear weapon.

[4] Foreign policy substitutability more generally examines the ability of policymakers to choose from among a variety of available policy options in order to achieve their objective. This work has not been widely applied to nuclear proliferation, but provides insight more generally on when and why policymakers choose one foreign policy alternative over another. See for example: Palmer, G. And A. Bhandari (2000) "The Investigation of Substitutability in Foreign Policy, *Journal of Conflict Resolution,* 44:1-10; Clark, D. H., and Reed, W. (2005). The strategic sources of foreign policy substitution. *American Journal of Political Science*, *49*(3), 609-624; Palmer, G. And T.C. Morgan, (2011) *A Theory of Foreign Policy,* Princeton, NJ: Princeton University Press

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More broadly, this research seeks to explain how foreign policy choices interact with the international environment in sometimes unexpected and inadvertent ways. It argues that proliferating states use the foreign policies they receive as signals that inform their beliefs about their security environment and thus their policy responses. Assessing policies through both the immediate costs and benefits they promise, as well as their implicit signals they send can better explain the conditions that lead to the success and failure of foreign engagement. The framework and analytical process proposed here can be applied beyond the specific nuclear context, presenting new avenues for inquiry in international security more broadly.

Foreign Policy Literature:

An important goal of international relations scholarship is to understand the conditions under which different foreign policies bring about their desired outcomes. To that end, a substantial branch of foreign policy research has examined the success of specific engagement,[5] usually each policy in isolation.[6] The majority of this literature has focused on coercive tools, such as the threat and use of force.[7] Literature on the effectiveness of threats has examined what determines the credibility and coercive power of those threats. By and large, this literature finds that the military or economic power a state can bring to bear directly influences its ability to extract concessions – the more powerful the sender, the greater its coercive capacity to extract concessions from the proliferator.[8] In addition to

[5] See a very brief sample in: Schelling, T. C. (1980). The Strategy of Conflict, 1960. *Harvard Business School Press: Boston, MA*; Drezner, D. W. (2000). Bargaining, enforcement, and multilateral sanctions: when is cooperation counterproductive?. *International Organization*, *54*(1), 73-102.; Morgan, T.C. , Bapat, N. and Kobayashi Y. (2014) "The Threat and Imposition of Sanctions: Updating the TIES dataset." *Conflict Management and Peace Science* 31(5)

[6] For example, either economic sanctions, foreign aid, or defense agreements, but not accounting for the possibility of simultaneous policies imposed all together. More on this later.

[7] Nincic, M., and Ramos, J. M. (2010). Ideological structure and foreign policy preferences. *Journal of Political Ideologies*, *15*(2), 119-141; Reardon, R. (2010) *Nuclear Bargaining: Using Carrots and Sticks in Nuclear Counterproliferation* Boston: Massachusetts Institute of Technology Press

[8] George, A. L., and Smoke, R. (1974). *Deterrence in American foreign policy: Theory and practice*. Columbia University Press; Art, R. J. (1980). To what ends military power?. *International Security*, *4*(4), 3-35.; George,

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power, others have argued that reputation – like a states proven willingness to follow through on its threats – also directly impact the effectiveness of their threats.[9] Even a powerful opponent with credible resolve can encounter resistance—such as Iraqi resistance to Israeli threats prior to the latter's pre-emptive strike against the Osirak reactor. A sender facing such resistance must then decide if it is willing to take on the costs of war and whether those costs would bring about the desired outcome.[10] When the issue under dispute is nuclear proliferation, the use of force is especially risky; if the sender fails to entirely eliminate a burgeoning arsenal, it could incite a retaliatory response with the very weapons it sought to destroy.

Others have therefore proposed that economic sanctions provide an alternative coercive tool that pressures proliferating states without incurring the same costs to senders as military force. Unfortunately, research generally finds that sanctions do not actually work well, successfully changing the target state's behavior less than half the time—and some argue the success rate may be even lower.[11] While sanctions can impose economic costs on the targeted state, they are also costly for senders to impose, often causing sending states give up or inflict insufficient costs.[12] Some even argue that, because of this ineffectiveness, sanctions may simply be a way of pandering to domestic audiences—a costly sign of disapproval and public

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A. L. (1991). *Forceful persuasion: Coercive diplomacy as an alternative to war*. US Institute of Peace Press; Fearon, James. (1995) "Rationalist Explanations for War." International Organization 49(3):379–414

[9] Guisinger, A., and Smith, A. (2002). Honest threats: The interaction of reputation and political institutions in international crises. *Journal of Conflict Resolution*, *46*(2), 175-200; Mercer, J. (2010). *Reputation and international politics*. Cornell University Press.

[10] George, A. L. (1991). *Forceful persuasion: Coercive diplomacy as an alternative to war*. US Institute of Peace Press; Wagner, R. H. (2000). Bargaining and war. *American Journal of Political Science*, 469-484; Filson, D., and Werner, S. (2002). A bargaining model of war and peace: Anticipating the onset, duration, and outcome of war. *American Journal of Political Science*, 819-837; Slantchev, B. L. (2003). The power to hurt: Costly conflict with completely informed states. *American Political Science Review*, *97*(1), 123-133.

[11] Smith, A. (1995). The success and use of economic sanctions. *International Interactions*, *21*(3), 229-245; Morgan, T. C., and Schwebach, V. L. (1997). Fools suffer gladly: The use of economic sanctions in international crises. *International Studies Quarterly*, *41*(1), 27-50; Pape, R. A. (1997). Why economic sanctions do not work. *International security*, *22*(2), 90-136; Allen, S. H. (2005). The determinants of economic sanctions success and failure. *International Interactions*, *31*(2), 117-138.

[12] Marinov, N. (2005). Do economic sanctions destabilize country leaders?. *American Journal of Political Science*, *49*(3), 564-576; Lektzian, David and Mark Souva, (2007) "An Institutional Theory of Sanctions Onset and Success," *Journal of Conflict Resolution*, 51(6)

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demonstration of policymaker resolve—rather than a real attempt to change target state behavior.[13]

While coercive tactics tend to dominate the literature, states can instead choose to entice behavior through offers of positive inducements,[14] though systematic empirical analysis of the success of these policies has been hampered by a lack of data. Despite this hurdle, research has found that international cooperation and institutions can foster positive collaboration, suggesting that existing alliances and shared network membership can help support cooperation between states.[15] While cooperation is easier between already-friendly partners, traditional rivals can also find ways to overcome mistrust, for example by employing enforcement mechanisms that tie their hands against future defection, or costly signals that demonstrate their commitment to cooperation.[16] Such strategies allow states to overcome their mutual mistrust in order to cooperate for mutual gains. For example, the Non-Proliferation Treaty asks signatories to give up any pursuit of nuclear weapons but promises security alliances and civilian energy support in exchange.[17]

Such research on either cooperative or coercive policies provides insight into these tools exercised in isolation but does not reflect the policy decision of sending states who choose

[13] Galtung, J. (1967). On the effects of international economic sanctions, with examples from the case of Rhodesia. *World politics*, *19*(3), 378-41; Krustev, VL and T. Clifton Morgan, (2011) "Ending economic coercion: Domestic politics and international bargaining", *Conflict Management and Peace Science* 28 (4); McLean, E. V., and Whang, T. (2014). Designing foreign policy: Voters, special interest groups, and economic sanctions. *Journal of Peace Research*, *51*(5), 589-602.

[14] Baldwin, D. A. (1971). The power of positive sanctions. *World Politics*, *24*(1), 19-38; Bernauer, T., Ruloff, D., Kegley Jr, C. W., and Puchala, D. J. (Eds.). (1999). *The politics of positive incentives in arms control*. Univ of South Carolina Press; Nincic, M. (2010). Getting what you want: positive inducements in international relations. *International Security*, *35*(1), 138-183.

[15] This research helps inform the following sections proposing the theory of cooperative inducement effectiveness. See for example: Legro, J. W. (1996). Culture and preferences in the international cooperation two-step. *American Political Science Review*, *90*(1), 118-137.; Martin, Lisa L., and Beth A. Simmons (1998) "Theories and empirical studies of international institutions." International Organization 52(4) 729-757; Adler, E. (2004). *Communitarian international relations: The epistemic foundations of international relations*. Routledge.

[16] Fearon, James. (1997) "Signaling Foreign Policy Interests: Tying Hands versus Sinking Costs." Journal of Conflict Resolution 41(1):68–90

[17] Rublee, M.R. (2009) *Nonproliferation Norms: Why States Choose Nuclear Restraint*. Athens, GA: University of Georgia Press.

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from among available tools, weighing each tool's associated costs and benefits. Policymakers then strategically select the tool that maximizes their chances of success while minimizing the associated costs.[18] This decision is a difficult one, however, made in low-information conditions meaning even the most careful leaders may inadvertently choose less effective policies. For example, individual leaders often tend toward a particular policy tool, preferentially select this favorite and potentially at the expense of other tools that would have been better suited.[19] The relative paucity of positive inducements in literature and practice may, therefore, reflect sender predisposition rather than expected efficacy. Rigorous analysis of relative effectiveness can, therefore, contribute to our understanding of foreign policy by addressing which engagement tools will best succeed and under what conditions.

Examining Engagement Options:

Sending states that hope to induce nuclear reversal can choose from a number of engagement strategies ranging from offers of positive inducements to pressure from negative coercion, which respectively reward the proliferating state compliance or punishes their resistance.[20] Positive inducements, or 'carrots' have in the past included offers of nuclear energy cooperation, security agreements, or economic payments like foreign aid or preferential trade agreements.[21] They offer to reward the prospective proliferator for reversing its nuclear weapons program, thereby increasing the proliferator's value for

[18] Most, B. A., & Starr, H. (1984). International relations theory, foreign policy substitutability, and "nice" laws. *World Politics*, *36*(3), 383-406; Palmer, G. And A. Bhandari (2000) "The Investigation of Substitutability in Foreign Policy, Journal of Conflict Resolution, 44:1-10; Palmer, G. And T.C. Morgan, (2011) A Theory of Foreign Policy, Princeton, NJ: Princeton University Press

[19] Nincic, M., and Ramos, J. M. (2010). Ideological structure and foreign policy preferences. *Journal of Political Ideologies*, *15*(2), 119-141.

[20] Baldwin, D. A. (1971). The power of positive sanctions. *World Politics*, *24*(1), 19-38; Nincic, M. (2010). Getting what you want: positive inducements in international relations. *International Security*, *35*(1), 138-183; Reardon, R. (2010) *Nuclear Bargaining: Using Carrots and Sticks in Nuclear Counterproliferation* Boston: Massachusetts Institute of Technology Press

[21] Nincic, M. (2011) *The Logic of Positive Engagement,* Ithica, NY: Cornell University Press; Nincic, M. "Positive Incentives, Positive Results? Rethinking US Counterproliferation Policy," in Solingen, E. (eds.) (2012) *Sanctions, Statecraft, and Nuclear Proliferation* New York, NY: Cambridge University Press

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choosing non-proliferation. Negative coercion, or 'sticks' instead impose costs for proliferating, and have in the past included threats or — more rarely — use of military force, diplomatic isolation, or economic sanctions.[22]

I argue that cooperative inducement should be more effective than negative coercion at inducing nuclear reversal. This means that cooperative inducements are 1) more likely than coercive policies to result in nuclear reversal, and 2) less likely than coercive policies to risk inducing greater proliferation instead. The logic of cooperative inducement success is elaborated here, exploring both the explicit costs and benefits that different policies impose on the proliferator, as well as the implicit signals that the choice of one policy over another also sends to the proliferator. The interaction of the explicit costs and rewards, as well as the implicit signals associated with different policies help determine the response of the proliferator, sometimes in unintended ways.

Motives for Proliferation:

I suggest that the most effective strategy for inducing deproliferation in weapons-seeking states is to reduce their security-inspired demand for the bomb. I base this theory on two assumptions drawn from existing nuclear proliferation literature: 1) security is an important motive for modern proliferators, and 2) sending states can more effectively reduce a prospective proliferator's demand for the bomb than its capacity to nuclearize. First, existing research has suggested several possible motives for proliferation, generally broken into three broad categories of security, domestic, and normative incentives. While every proliferator may have multiple motives for pursuing nuclear weapons, I assume that national security concerns are an essential element of a proliferator's commitment to its indigenous nuclear

[22] Paul, T.V. (1996) "Strengthening the Non-Proliferation Regime: The Role of Coercive Sanctions," *International Journal* (51) (3), 440–65

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weapons program. I base this assumption on several factors. First, self-preservation and security from foreign aggression are basic needs of all states, irrespective of their other political or international concerns. Second, domestic incentives such as rally effects are heavily influenced by security and deterrence concerns, meaning even leaders seeking domestic political benefits from proliferation often do so by explicitly referencing security threats. Finally, while mastery of the nuclear fuel cycle can indeed provide international status benefits, these benefits can come from advanced civilian programs while unsanctioned weaponization can often bring international censure and exclusion instead.

As realist arguments have posited as early as Thucydides (circa 460-411 BC), all states must first and foremost preserve their continued existence.[23] States can ensure this survival by either reducing external threats, such as through non-aggression pacts or by increasing their defensive capabilities. Domestic military power represents the final defense for self-preservation, and nuclear weapons are the ultimate expression of that power. Despite their awesome deterrence value, however, many capable states choose to forego nuclear weapons because of the significant material, technological, and international hurdles they present.[24] Even for states that already possess an advanced industrial complex and technological expertise, enriching sufficient fissile material and marrying this to a warhead can take years. States that decide to pursue nuclear weapons do so because the benefits are great enough to justify the associated costs.

Significant security threats present just such a demand, one that can justify enormous expenses and enduring support. For states that believe their continued survival to be at risk, a

[23] Jervis, R. (1978). Cooperation under the security dilemma. *World politics*, *30*(2), 167-214; Mearsheimer, J. J. (1985). *Conventional deterrence*. Cornell University Press; Walt, S. M. (1985). Alliance formation and the balance of world power. *International security*, *9*(4), 3-43;

[24] Reiss, M. (1995). *Bridled ambition: Why countries constrain their nuclear capabilities*. Woodrow Wilson Center Press; Dai, X. (2007) International Institutions and National Policies. Cambridge: Cambridge University Press; Rublee, M.R. (2009) Nonproliferation Norms: Why States Choose Nuclear Restraint. Athens, GA: University of Georgia Press

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nuclear arsenal guarantees the maximum possible deterrence and therefore the greatest chance at self-preservation.[25] All of the levels of state can be called upon to shoulder the associated costs of security when this basic need is threatened, from political and military leadership to the domestic public.[26] Unlike economic gains or political power, whose benefits are often unequally distributed within a state, security is a common good that can benefit every citizen, and all other state functions depend on its provision. This quality of national security means it serves as an effective rally element for state leadership, one that can justify great sacrifices or costs in its pursuit.

Consistent with security motives, Singh and Way (2004) found that a state's security environment was the strongest correlate for proliferation, second only to the technical capacity to do so. Threats like enduring rivalries and ongoing militarized disputes were each over eight times more indicative than any other potential motivation in the study.[27] This research finds evidence that threats to a state's national security may provide the strongest motivation to pursue nuclear weapons, though other characteristics of the state like their integration with global markets, domestic political environment, and international prestige can also play a role. Particularly in modern proliferators, security threats can present the greatest motive, eclipsing domestic politic or international status seeking as the most important incentive.[28] Even when domestic political gains motivate states to proliferate,[29] these benefits tend to rely on a security component as the focal point of the rally narrative. Proliferating leaders may hope to use the power of nuclear weapons to demonstrate a

[25] Lambert, A. J., Scherer, L. D., Schott, J. P., Olson, K. R., Andrews, R. K., O'brien, T. C., & Zisser, A. R. (2010). Rally effects, threat, and attitude change: An integrative approach to understanding the role of emotion. *Journal of Personality and Social Psychology*, *98*(6), 886.
[26] Colaresi, M. (2007). The benefit of the doubt: Testing an informational theory of the rally effect. *International Organization*, *61*(1), 99-143
[27] Singh, S., and Way, C. (2004) "The Correlates of Proliferation: A Quantitative Test," Journal of Conflict Resolution 48(6), 859–85. (p. 876-8)
[28] Kaplow, J. (2017) "The Changing Face of Nuclear Proliferation" Working paper presented at APSA: San Francisco, CA
[29] Lavoy, P. R. (1993). Nuclear myths and the causes of nuclear proliferation. Security Studies, 2(3-4), 192-212.

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commitment to national defense or to distract from internal challenges, but the costs of proliferation present hurdles that can backfire without sufficient domestic support. If critical domestic audiences do not believe their own interests would sufficiently benefit from acquiring the bomb, they will be unwilling to shoulder the associated costs of proliferation, making proliferation politically costly for leaders that seek them.

As a result, leadership appeals in favor of such weapons programs often cite security as their primary motive — and succeed best in garnering domestic support if they reference a specific foreign threat[30] — suggesting that rally effects from nuclear proliferation are intrinsically tied to national security concerns. For example, Libyan leader Mahmoud Ghaddafi pointed to American military presence in neighboring countries to garner domestic support,[31] while Pakistani leaders pointed to the Indian nuclear program and their rivalry over the Kashmiri province to justify their pursuit.[32] As a result, even those leaders that may seek nuclear proliferation as a means to solidify their political power often point to or are themselves motivated by an international security threat that can spur a demand for the bomb. Once proliferation is well underway, reliable domestic support for the program continues to be critical for progress toward the bomb. Domestic audiences can be impatient,[33] so that a time-intensive pursuit like nuclear weapons may run out of steam early on without a persistent external threat. However, as the deterrent value of nuclear weapons is incorporated into the security lexicon, these audiences will also be unwilling to part with this umbrella as long as they perceive an ongoing threat waiting to take advantage of their vulnerability.

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[30] Homolar, A. (2010) 'The Political Economy of National Security', *Review of International Political Economy* 17(2): 410-23

[31] Litwak, Robert S., (2012) Outlier States: American Strategies to Change, Contain, or Engage Regimes. Washington, D.C.: Woodrow Wilson International Center for Scholars

[32] Bidwai, P., & Vanaik, A. (2000). *New nukes: India, Pakistan and global nuclear disarmament*. Signal books; Burr, W. Eds. (2004) "China, Pakistan, and the Bomb: The declassified file on U.S. Policy, 1977-1997" National Security Archive Electronic Briefing Book No.114, http://nsarchive.gwu.edu/NSAEBB/NSAEBB114/ (accessed February 1, 2017)

[33] Nincic, M., and Ramos, J. M. (2010). Ideological structure and foreign policy preferences. *Journal of Political Ideologies*, *15*(2), 119-141.

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The third explanation for proliferation are the status benefits that an advanced nuclear program can afford. This argument suggests that—due to their significant cost and technological hurdles, as well as their ultimate expression of military might—nuclear weapons afford states great power status and international prestige.[34] However, shifting international norms increasingly marginalize states that pursue nuclear weapons.[35] As a result, some states have indeed used indigenous nuclear programs to demonstrate technological achievement or augment international status, but such appeals often highlight their civilian programs and not a nuclear arsenal (Paul 2000; Dai 2007). In addition, status seekers can also receive recognition through advanced civilian programs—for example, modern Japan and Germany are leaders in nuclear technology despite being NNWS—while simultaneously garnering Non-Proliferation Treaty rewards (Rublee 2009). These rewards can be both explicit incentives like civilian nuclear aid or implicit international community membership. Abstinence is thus increasingly rewarded both materially and in normative terms, while proliferators are increasingly excluded from this community and denied the associated benefits.

Increasing international pressure to agree to NPT safeguards may not always prevent new proliferators from seeking the bomb, but it has encouraged those that decide to thwart the NPT to do so in secret, thus suggesting that these pursuits cannot be status driven.[36] The few states that have overtly pursued the bomb self-identify as "oppositional nationalists," naturally opposed by a hostile international system and therefore acting in defense of their national independence from a larger community aligned against them.[37] Such oppositional

[34] Sagan, S.D. (1996/7) "Why do States Build Nuclear Weapons? Three Models in Search of a Bomb," International Security (21) (3), 54–86
[35] Rublee, M.R. (2009) Nonproliferation Norms: Why States Choose Nuclear Restraint. Athens, GA: University of Georgia Press; Bell, M. S., & Miller, N. L. (2015). Questioning the effect of nuclear weapons on conflict. Journal of Conflict Resolution, 59(1), 74-92
[36] Cohen, A., and Frankel, B. (1991) "Opaque nuclear proliferation". In B. Frankel (ed.), *Opaque Nuclear Proliferation*. London: Frank Cass, pp. 14–44
[37] Hymans, J.E.C. (2006) *The Psychology of Nuclear Proliferation: Identity, Emotions, and Foreign Policy*. Cambridge: Cambridge University Press, (p.2)

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narratives, like those exhibited by Israeli, Libyan, and North Korean nuclear accounts, stem from ongoing international hostility, which justifies extraordinary measures to protect their identity from annihilation.[38]

Particularly for ongoing proliferation, status motives fade after mastery of the fuel cycle is achieved. This that continue toward a nuclear arsenal shift focus toward a persistent need for militarization of the technology, a demand for which civilian or scientific rewards are insufficient. For example, while India is occasionally cited as a status-seeking proliferator, but once it has mastered the fuel cycle, this pursuit halted for some time, reigniting only when an immediate security threat incentivized it. As such, India's shifting military strategy and ongoing rivalry with Pakistan have increasingly hinged on the presence of a nuclear deterrent.[39] Though status-seeking may promote nuclear hedging and mastery of the fuel cycle under NPT safeguards, the costs of weapons proliferation tend to outweigh the normative benefits without the requisite motivation of security.

While motivators such as domestic politics and normative considerations can bolster commitment to nuclear proliferation, they often hinge on the perception of threats to national security. Without the focal point of a persistent security threat, domestic politics and normative pursuits are insufficient and volatile. I therefore argue that a sender who successfully signals cooperative intent can reduce all three of the proliferator's possible motives for proliferation. First, cooperative signals reduce the proliferator's fears of foreign aggression by signaling that that world is, in fact, less threatening than it had previously believed, thus addressing security motives for proliferation. Second, cooperative engagement provides an alternate support narrative for the proliferating state's leadership while simultaneously undermining any rally arguments based on national defense. Finally, status

[38] Bar-Tal, D. (1976). Prosocial behavior: Theory and research; Bar-Tal, D. (2000). From intractable conflict through conflict resolution to reconciliation: Psychological analysis. *Political Psychology*, *21*(2), 351-365
[39] Ochmanek, D., & Schwartz, L. H. (2008). *The Challenge of Nuclear-Armed Regional Adversaries*. Rand Corporation.

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pursuits can be shifted to mastery of the fuel cycle unless security threats demand the jump to an increasingly taboo indigenous weapons program. Addressing a proliferator's security concerns can thereby undermine all three of these possible motives for continued commitment to a nuclear weapon and provide a reliable strategy for deproliferation efforts to roll back an ongoing nuclear program.

The Foreign Policy Interaction:

A foreign policy interaction begins when the sender chooses its preferred strategy for inducing nuclear reversal in the proliferating state. Though states interact in the context of a broader international environment, for the purposes of theoretical clarity I focus here on the dyadic interaction of the two relevant players[40]—the sending state (or sender) and the proliferator (or prospective proliferator[41]). The sender's primary goal in this interaction is to reverse the proliferator's nuclear enrichment activities by rolling back or curtailing the latter's enrichment and reprocessing capabilities. The capabilities are the backbone of an indigenous nuclear program – one for military or peaceful energy purposes – and the sender's preferred outcome would be a total dismantling of the proliferator's weapons program and no future pursuit, but at minimum, avoiding accelerating the proliferator's nuclear activities. The sender also prefers to achieve that outcome at the lowest possible cost, meaning it will choose the option that maximizes its chances of reversing proliferation while minimizing its own expected costs.

[40] I also make the simplifying assumption of the state as a unitary actor. It's policy preferences can be determined by many factors, including domestic institutional design, bureaucratic politics, and international security. The domestic dynamics are outside the scope of this project, though future research could examine the domestic institutions and characteristics that determine a state's response to nuclear reversal policies.

[41] I recognize here that not all states accused of nuclear proliferation claim to be pursuing nuclear weapons, making them potential or prospective proliferators. For simplicity, I refer to them as proliferators but include those states pursuing nuclear latency, even if they claim to only pursue peaceful energy. For example, Iran from 2003 until today (Amuzegar, J. (2006). Nuclear Iran: perils and prospects. *Middle East Policy*, *13*(2), 90)

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To achieve that end, the sender can choose a positive inducement that offers a reward to the proliferator in exchange for its nuclear reversal, or a coercive tool that threatens punishment if the proliferator refuses. Both strategies can impose costs on the sender, such as the price of rewarding with foreign aid, or the loss of trade by imposing sanctions. No strategy is guaranteed to successfully induce reversal – and some may even risk inciting greater proliferation instead – so the sender chooses its engagement with imperfect information about the outcomes.

Upon observing the sender's policy, the prospective proliferator must then decide how to respond. The proliferator's primary goal is to maintain or ideally even increase its own security, but at minimum not to degrade that security.[42] State security can come from either its own internal power to repel a threat or from the lack of an external threat in the first place. The proliferator also prefers to achieve this security while incurring minimum costs; if two paths achieve equal security guarantees, it will choose the alternative with the lowest possible costs.

The proliferator also faces imperfect information and does not know whether the sender plans to induce nuclear reversal in order to exploit the proliferator's now-weaker state after reversal, or if the sender will instead respect the proliferator's security even without a nuclear deterrent – though the proliferator will have preconceived notions about the sender's intent and capabilities built from past experiences. Given this uncertainty, the prospective proliferator will use the sender's selection of an engagement strategy as an imperfect signal of the latter's intent. As a result, the type of engagement a sender chooses not only demonstrates its interest in nuclear deproliferation but also signals its future intent. The

[42] This assumption is consistent with the rationalist framework that suggests states are primarily security-seeking and balance against threats (Walt, S. (1987) *The Origin of Alliances*, Ithaca, New York; Glaser, C. L. (2010). *Rational theory of international politics: the logic of competition and cooperation*. Princeton University Press; Jervis, R. (2017). *Perception and Misperception in International Politics: New Edition*. Princeton University Press.).

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prospective proliferator then chooses its response to the policies it faces. The prospective proliferator will do one of three things: 1) deproliferation in compliance with the sender's demands, 2) maintaining its progress unchanged, or 3) doubling down in its pursuit of a weapon – choosing the strategy that it believes offers the greatest expected security at the lowest cost.

Positive Inducements and Negative Coercion:

To understand how the sender's choice of policies impacts the prospective proliferator's response, consider the proliferator's decision-making calculus when faced with international pressure. States will select the outcome that presents the greatest net returns by comparing the benefits minus associated costs of all possible policy alternatives.[43] There are both costs and benefits to pursuing weapons, as well as costs and benefits to abstaining.[44] Costs for pursuing weapons include intrinsic technological and material costs of the program itself, as well as possible punitive measures from outside forces.[45] The benefits of proliferation come from increased national security through a powerful deterrent, domestic rally for leaders that achieve this security, or international prestige from conquering this complex technology.[46] Costs for relinquishing an ongoing program, on the other hand, come from increased susceptibility to external security threats or domestic backlash for submitting to an

[43] For example, see research on the effect of foreign policies on target calculus: Haass, R. N., and O'Sullivan, M. L. (Eds.). (2001). *Honey and Vinegar: Incentives, Sanctions, and Foreign Policy*. Washington, DC: Brookings Institution Press

[44] Meyer, S.M. (1984) *The Dynamics of Nuclear Proliferation*. Cambridge, MA: MIT Press; Reiss, M. (1988) *Without the Bomb: The Politics of Nuclear Nonproliferation*. New York: Columbia University Press; Levite, A.E. (2002/03) "Never Say Never Again: Revisited," *International Security* 27(3), 59–88

[45] Sagan, S.D., and Waltz, K.N. (1995) *The Spread of Nuclear Weapons: A Debate*. New York: W.W. Norton; Paul, T.V. (1996) "Strengthening the Non-Proliferation Regime: The Role of Coercive Sanctions," *International Journal* (51) (3), 440–65; Nincic, M. "Positive Incentives, Positive Results? Rethinking US Counterproliferation Policy," in Solingen, E. (eds.) (2012) *Sanctions, Statecraft, and Nuclear Proliferation* New York, NY: Cambridge University Press

[46] Frankel, B. (1993) "The Brooding Shadow: Systemic Incentives and Nuclear Weapons Proliferation," *Security Studies* 2(3); Solingen, E. (2007) *Logics: Contrasting Paths in East Asia and the Middle East*. Princeton: Princeton University Press

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adversary.[47] The benefits, on the other hand, come from inclusion in the international community and civilian technology sharing through the Non-Proliferation Treaty, as well as from possible positive inducements.

Given this calculation by proliferators, evaluation of foreign policy instruments requires consideration of not only the explicit costs or benefits the strategy imposes, but also the signals of sender intent—and their implications for the prospective proliferator's threat perception. While coercion aims to increase the direct costs for proliferating—such as through sanctions or threat of military action—it also risks inadvertently increasing the prospective proliferator's perceived security threat and thereby their demand for a powerful deterrent. Coercion threatens the proliferator with punitive measures unless it reverses its nuclear program, but this creates *competing incentives* for proliferators: 1) imposing additional explicit costs for proliferating, but 2) signaling that the sender is threatening and thereby increasing the proliferator's perceived benefits from a nuclear deterrent. Coercion thus reinforces the prospective proliferator's security concerns, by highlighting the self-preservation benefits provided by a powerful weapon.[48] As a result, the deproliferation effects intended by the explicit costs are offset by the security benefits they inadvertently generate for proliferating.

Positive inducements, on the other hand, explicitly promise policy benefits[49] in exchange for deproliferation, and also implicitly signal the sender's cooperative or peaceful intent. The explicit benefits to the proliferator from these inducements can include security benefits from

[47] Schelling, T. C. (1980). The Strategy of Conflict, 1960. *Harvard Business School Press: Boston, MA*; Schultz, K. A. (1998). "Domestic opposition and signaling in international crises" *American Political Science Review*, *92*(04), 829-844; Tomz, M. (2007). "Domestic audience costs in international relations: An experimental approach." *International Organization*, 61(04), 821-840; Schnurr, S., Homolar, A., MacDonald M., Rethel, L. (2015) 'Legitimizing Claims for 'Crisis' Leadership in Global Governance: The Discourse of Nuclear Non-Proliferation', *Critical Discourse Studies* 12(2): 187-205

[48] Coercion can also increase domestic rally effects in support of proliferation against a foreign threat, thereby increasing target leader dedication to national power instead of international cooperation and integration.

[49] Baldwin, D. A. (1971). The power of positive sanctions. *World Politics*, *24*(1), 19-38 ; Haass, R. N., & O'Sullivan, M. L. (Eds.). (2001). *Honey and Vinegar: Incentives, Sanctions, and Foreign Policy*. Washington, DC: Brookings Institution Press

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defense cooperation agreements, economic gains from preferential trade agreements, or food and monetary transfers from foreign aid. The implicit effects of cooperation also encourage nuclear reversal, but by reducing the proliferator's expected costs for reversing. A prospective proliferator's demand for the bomb is bolstered by feelings of insecurity or the presence of an international threat,[50] so policies that signal sender goodwill can diffuse interstate tensions and reduce the prospective proliferator's security fears.[51] By signaling the sender's cooperative intent, cooperative inducements can reduce the proliferator's security fears and thus its security motivated demand for a nuclear weapon. In this way, positive inducements have *convergent effects* by 1) explicitly increasing the proliferator's value for compliance by providing direct benefits in exchange for nuclear reversal, while simultaneously 2) implicitly reducing its security fears and thus its potential security costs from relinquishing a nuclear deterrent.

A sender's selection of engagement strategy sends a signal of their interests or intentions, providing information to the proliferator about the sender's character or type. The costs senders take on for imposing a foreign policy increase the credibility of that signal, which in turn influence the overall effect of the policy on proliferator's decision-making. While positive inducements can produce convergent effects, offering explicit payouts and implicit cooperation benefits for denuclearization, coercion is hampered by the competing effects of explicit proliferation costs but implicit proliferation benefits (see Figure 2.1). Positive

[50] Reiss, M. (1988) *Without the Bomb: The Politics of Nuclear Nonproliferation*. New York: Columbia University Press; Reiss, M. (1995). *Bridled ambition: Why countries constrain their nuclear capabilities*. Woodrow Wilson Center Press; Hymans, J.E.C. (2006) *The Psychology of Nuclear Proliferation: Identity, Emotions, and Foreign Policy*. Cambridge: Cambridge University Press;

[51] Such as by gradually reducing tensions, removing the proliferator's feeling of outsider status, or by diffusion of beliefs or norms, for example. (See: Osgood, C. (1961) "An Analysis of the Cold War Mentality", *Journal of Social Issues*, 17(3) 12-19; Bar-Tal, D. (2000). From intractable conflict through conflict resolution to reconciliation: Psychological analysis. *Political Psychology*, *21*(2), 351-365; Nincic, M. (2011) *The Logic of Positive Engagement,* Ithica, NY: Cornell University Press; Nincic, M. "Positive Incentives, Positive Results? Rethinking US Counterproliferation Policy," in Solingen, E. (eds.) (2012) *Sanctions, Statecraft, and Nuclear Proliferation* New York, NY: Cambridge University Press

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inducements should thus go further in reducing the proliferator's demand for nuclear weapons when they effectively signal a cooperative international environment, while coercion risks fueling the proliferator's security-motivated demand for the bomb.

Figure 2.1: Engagement Effects

	Payout	**Signal**
Positive Inducements	Increase benefit of compliance	Decrease cost of compliance
Negative Coercion	Increase cost of resistance	Increase benefit of resistance

Judging the Signal *and* the Sender:

The theory outlined here suggests that the signals that implicitly accompany any foreign policy selection make positive inducements more effective than negative coercion at encouraging nuclear reversal in proliferating states. While both cooperative inducements and coercive policies are intended to induce reversal – cooperation offers explicit rewards for reversal, while coercion imposes explicit costs for proliferating – the signals these policies implicitly send do not always complement this goal of reversal. Because states have imperfect information about their opponent's intentions, they must rely on signals like their opponent's policy choices to form their beliefs about the security environment they face.[52] Signals from senders thus provide the proliferator with information about its security environment, and relatedly the risks it would take by relinquishing a nuclear deterrent. The

[52] Walt, S. M. (1985). Alliance formation and the balance of world power. *International security*, *9*(4), 3-43; Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of management journal*, *38*(1), 85-112; Gilboa, Itzhak and David Schneidler (1993), "Updating Ambiguous Beliefs" *Journal of Economic Theory*, 59

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value of inducements over coercion, therefore, comes from the effect of the implicit signals on the target perceptions of their security environment and therefore their demand for the bomb. Cooperative inducements implicitly signal benign intent, thereby reassuring the prospective proliferator that its security environment is less threatening than it had previously believed and reducing its security motivated demand for a nuclear deterrent. Coercive policies, on the other hand, implicitly signal the sender's threatening intent, thereby increasing the proliferator's security fears and its security motivated demand for a powerful deterrent.

The proliferator's security fears do not come equally from all states in the system, though. Rather, the proliferator judges both the intention and capacity of the sender to inflict harm or provide rewards. The proliferator judges the sender's intentions based on prior interactions with the state, using imperfect signals like common belief systems, past alliances, or shared networks to estimate the affability or rivalry of the sender.[53] Traditional rivals with whom the proliferator has previously clashed disproportionately contribute to the latter's security fears, while traditionally friendly states with whom the proliferator shares common beliefs and security alliances pose a much smaller threat.[54] Correspondingly, the impact of a sender's signals are directly tied to the proliferator's prior assumptions about the security threat that individual sender posed. The threat posed by a rival is much greater than that posed by a friend, so cooperative signals from a rival will induce a correspondingly larger reduction in the proliferator's security fears than cooperation from a traditionally friendly sender. Likewise, the threatening signal associated with coercive policies will also be larger when the sender is a rival than when the sender is a friend. Rivals simply play a larger role in fueling

[53] Wendt, A. (1999) *Social Theory of Foreign Policy Change*, Princeton, NJ: Princeton University Press; Moran, P. (2005) Structural vs. relational embeddedness: Social capital and managerial performance, *Strategic Management Journal* 26(12): 1129-51; Rathburn, B. (2012) *Trust in International Cooperation: International Security Institutions, Domestic Politics, and American Multilateralism.* New York: Cambridge University Press

[54] Kydd, A. (2005) *Trust and Mistrust in International Relations*, Princeton, NJ: Princeton University Press

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proliferator's security fears than do friendly senders, so signals of cooperative intent from traditional rivals will have a greater impact on nuclear reversal than will similar signals from a friend.

The magnitude of a sender's contribution to the prospective proliferator's threat environment, therefore, depends in part on the prior relationship between the two states. However, the proliferator does not only respond to the perceived intent of the sender — be it rivalrous or friendly — but also to the sender's capacity to do harm or to cooperate. More powerful senders have a greater capacity to inflict harm or offer support, while weaker senders are less able to affect the proliferator's security environment.[55] Nuclear weapons are the ultimate expression of that military capacity, and previous research has demonstrated that nuclear-armed states can better deter a foreign attack, demonstrate greater conventional military adventurism, and generally enjoy enhanced international bargaining power over those states not so equipped.[56] Nuclear-armed states are also better able to protect their allies, providing extended deterrence through a nuclear umbrella, meaning these powers can offer greater protection to their friends by threatening greater destruction against potential aggressors.[57] For example, some nuclear-capable states entirely dismantled ongoing programs in exchange for US nuclear security guarantees, such as South Korea in 1951 and Germany in 1953.[58] Finally, nuclear-armed states are generally the most experienced and capable of

[55] Walt, S. M. (1988). Testing theories of alliance formation: the case of Southwest Asia. *International Organization*, *42*(2), 275-316.; Sweeney, K., & Fritz, P. (2004). Jumping on the bandwagon: An interest-based explanation for great power alliances. *The Journal of Politics*, *66*(2), 428-449.; Rosecrance, R. (2006). Power and international relations: The rise of China and its effects. *International Studies Perspectives*, *7*(1), 31-35

[56] Frankel, B. (1993). The brooding shadow: Systemic incentives and nuclear weapons proliferation. *Security Studies*, *2*(3-4), 37-78; Gartzke, E., & Kroenig, M. (2009). A strategic approach to nuclear proliferation. *Journal of Conflict Resolution*, *53*(2), 151-160; Bell, M. S., & Miller, N. L. (2015). Questioning the effect of nuclear weapons on conflict. *Journal of Conflict Resolution*, *59*(1), 74-92.

[57] Weede, E. (1983). Extended deterrence by superpower alliance. *Journal of Conflict Resolution*, *27*(2), 231-253; Smith, A. (1998). Extended deterrence and alliance formation. *International Interactions*, *24*(4), 315-343;

[58] Pedlow, G. (1999) *NATO Strategy Documents, 1949-1969*, Brussels: NATO Printing; Hughes, C.W. (2004) *Japan's Security Agenda: Military, Economic, and Environmental Dimensions*. Lynne Rienner Publishers

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harnessing nuclear enrichment technology, meaning they are also the most capable partners[59] for offering even civilian nuclear energy assistance to others.

As a result, a prospective proliferator more heavily weighs signals from a nuclear-armed sender than those from a non-nuclear armed one, meaning it will revise its beliefs about its security environment in line with the nuclear capacity of the sender it faces. Cooperative signals from a powerful sender, therefore, lead to a greater improvement in the proliferator's security environment than the same signal from a weaker sender. Conversely, conflictual signals from a powerful sender are more threatening and lead the proliferator to perceive a greater security risk than do similar signals from a weaker sender. As a result, the magnitude of a signal's effect on the proliferator's security environment depends on both the capacity (nuclear or non-nuclear armed) and character (rival or friend) of the sending state.

Taken together, these attributes mean that same signal can lead to different changes in the proliferator's perceptions of its threat environment, its resulting security-motivated demand for a nuclear weapon, and thus its willingness to reverse its nuclear program in response to inducements. First, cooperative signals from rivals are unexpected and more significantly reduce the proliferator's security-motivated demand for a nuclear weapon than can the same signals from a friend. Second, nuclear-armed senders more significantly impact the target's security environment, these senders also influence the proliferator's security-motivated demand than do non-nuclear senders. As a result, prospective proliferators account for both the intent and power of the sender in their response to the sender's policy signals. Cooperative signals from nuclear-armed rivals will most effectively induce reversal, while the same offers from non-nuclear armed friends will be the least effective (shown in Figure 2.2). Conversely, threatening signals from these same nuclear-armed rivals will be the least

[59] Nuclear-armed states are not the only states with nuclear technology, and states like Germany, Japan, and South Korea – all non-nuclear armed states – have some of the most advanced civilian nuclear energy programs. However, nuclear technology sharing is strictly controlled, so the NPT five nuclear-armed states (see Figure 1.1, *de jure* NWS) have unique access to certain sensitive technology and the ability to aid civilian energy programs.

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effective with the greatest risk of inducing perverse proliferation, while the same threats from non-nuclear friends will be less risky, though still less effective than cooperative signals.

Figure 2.2: Influence of Signal by Sender Identity

	Ally	**Rival**
Nuclear Armed State	Moderate effect	Large effect
Non-Nuclear Armed	Little effect	Moderate effect

Making Cooperation Possible: Credibility Mechanisms

The largest impediment in using positive inducements to signal cooperative intent is that the proliferator may not believe that the signal is sincere, believing instead that the sender intends to dupe the proliferator into a weakened state.[60] This is particularly true when the sender and proliferator are long-time rivals who have preconceived notions about one another's intentions. Even if the proliferator believes the sender is sincere today, they may doubt that these intentions will endure; the sender that means to cooperate today could change its mind tomorrow and exploit the weakness of the now non-nuclear proliferator. As a result, positive inducements will be most successful if they credibly signal cooperative intent.[61]

[60] A large body of literature in international relations and political psychology has examined how states generate trust. See for example: Gilboa, I. and D. Schneidler (1993), "Updating Ambiguous Beliefs" *Journal of Economic Theory*, 59; Gulati, R., & Sytch, M. (2008). Does familiarity breed trust? Revisiting the antecedents of trust. *Managerial and Decision Economics*, *29*(2-3), 165-190; Kydd, A. (2005) *Trust and Mistrust in International Relations*, Princeton, NJ: Princeton University Press

[61] For discussion of credibility in general, see for example Fearon (1997), or specifically for nuclear assurances see Fuhrmann and Secher (2014): Fearon, J. (1997) "Signaling Foreign Policy Interests: Tying Hands versus Sinking Costs." Journal of Conflict Resolution 41(1):68–90; Fuhrmann, M. and Sechser, T. (2014) "Signaling Alliance Commitments: Hand-Tying and Sunk Costs in Extended Nuclear Deterrence." *American Journal of Political Science* 58(4): 919-935

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Both senders and proliferators must believe that their cooperative commitments toward reversal will be reciprocated, and that their opponent will respect their own commitments even after the negotiations are concluded. First, senders must believe that their cooperation – particularly sensitive cooperation like civilian nuclear energy support that could risk increasing the prospective proliferator's nuclear capabilities – will garner the nuclear weapons reversal promised rather than being misappropriated as soon as the ink dries on the agreement. As such, cooperative inducements tend to offer support that is not easily converted to perverse proliferation purposes, and require international verification.[62] For example, in the North Korean Agreed Framework of 1994, the United States and South Korea cooperated with North Korea to establish a jointly managed independent agency that would replace the North's dual-capable heavy-water reactors with proliferation-resistant[63] light water reactors.[64] Other agreements require recipient states to send spent nuclear fuel back to specifically designated supplier states in exchange for continued energy assistance,[65] providing an ongoing tit-for-tat exchange of proliferation risks for safe production components.

While the sender needs credible commitments that the prospective proliferator will forgo military application of nuclear technology, the prospective proliferator also needs credible commitments that the sender will not capitalize on the proliferator's nuclear abstinence to extract future concessions from a weaker target. The proliferator must therefore believe that

[62] See for example: Moniz, E. (March 28, 2018) "On Iran and North Korea: Don't trust, and verify, verify, verify" *Boston Globe,* (https://www.bostonglobe.com/opinion/2018/03/26/iran-and-north-korea-don-trust-and-verify-verify-verify/Rf4yxsjKFxeT8sUhBzxC7I/story.html)

[63] Dual-use reactors can be employed for low levels of enrichment necessary for energy production, as well as for higher levels of uranium enrichment necessary for weapons production. Proliferation-resistant technologies – though not entirely impervious to misappropriation – are more suited to low-levels of enrichment and are harder to secretly repurpose for weapons uses.

[64] See With et al. (2004) for more details: Wit, J., D. Poneman, and R. Galucci, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press

[65] Spent nuclear fuel rods can be reprocessed into fuel for nuclear weapons if the proliferator possesses the necessary reprocessing technology. See US Government Accountability Office (1980) Nuclear Fuel Reprocessing and the Problems of Safeguarding Against the Spread of Nuclear Weapons, *Report to Congress: 111839*, EMD-80-38: https://www.gao.gov/assets/130/129066.pdf

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the sender is negotiating in good faith, that its cooperation is a sincere signal of enduring benign intent – not just a short quid pro quo that will give way to coercion as soon as the proliferator has relinquished access to a nuclear deterrent. In fact, even states without a functioning nuclear arsenal can use their nuclear latency – or partial progress to a nuclear weapon – for deterrent purposes, meaning a prospective proliferator need not be nuclear armed to relinquish security when it rolls back its nuclear program.[66] Senders can credibly commit to cooperative intent with the inducements they select: some inducements like nuclear cooperation agreements and increased diplomatic engagement inherently commit the sender to enduring cooperation, while other inducements like one-time foreign aid packages or monetary compensation[67] do not necessitate future cooperation.

This suggests that cooperative inducements – those strategies that employ some mechanism that ensures continued and verifiable cooperation – can more credibly signal benign intent. Positive inducements that do not employ enduring forms of cooperation will not signal conflictual intent – so will not be as counterproductively risky as more coercive strategies – but will also be less convincing of a sender's future credibility or its commitment to cooperation than those that do. As a result, the most effective inducements will employ cooperative strategies that credibly signal an ongoing commitment to threat reduction, rather than short term quid pro quo rewards for reversal.

Addressing Counterarguments: Appeasement, Power, and Trust

The effectiveness of cooperative inducements has been largely overlooked in both political science and policymaking, stemming in part from moral and in part from practical

[66] Volpe, T. A. (2017). Atomic leverage: Compellence with nuclear latency. *Security Studies*, *26*(3), 517-544.; Mehta, R. N., and Whitlark, R. E. (2017). The benefits and burdens of nuclear latency. *International Studies Quarterly*, *61*(3), 517-528.

[67]. For example, the US provided rice shipments to North Korea to alleviate famine in the 1990s, but these ceased shortly after the Agreed Framework negotiations concluded.

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considerations. The moral argument against offering inducements for nuclear reversal is that proliferation is a normatively repudiated behavior, and 'bad' behavior deserves punishment, not reward.[68] Policymakers may indeed occasionally choose policies to signal their abhorrence for certain behavior, but this does not mean these policies are the most effective for ending or even preventing such behavior going forward. As such, this project takes an agnostic approach to the normative value of rewards or punishments, focusing instead on the effectiveness for achieving the sender's goals, and the practical considerations of reversing proliferation in weapons-seeking states.

The effectiveness of positive inducements also faces practical arguments, however. These arguments suggest that, irrespective of moral concerns, rewarding reversal may inadvertently encourage concession-seeking behavior in the future. By offering inducements, the sender could label itself a sucker, or establish a precedent for rewarding the contravention of nonproliferation norms.[69] This logic is reasonable f the rewards offered are uniquely available to those that reverse their programs – making proliferation a necessary condition for receiving the goods – or if the value of the rewards offset the costs of proliferation.

The effectiveness of cooperative inducements, however, comes not from monetary rewards but from signal cooperative intent. The most effective inducements, like access to civilian nuclear energy, diplomatic engagement, and nuclear negative security assurances[70] do not provide these unique benefits. Inducements like these are instead available to any state who forgoes nuclear weapons. For example, the Nonproliferation Treaty explicitly

[68] Nincic, M., and Ramos, J. M. (2010). Ideological structure and foreign policy preferences. *Journal of Political Ideologies*, *15*(2), 119-141; Nincic, M. (2011) *The Logic of Positive Engagement,* Ithica, NY: Cornell University Press

[69] See the discussion of concession-seeking and inadvertent moral hazard from inducements in: Rock, S. R. (2015). *Appeasement in international politics*. University Press of Kentucky; Wagner, H. R. (2005). The hazards of thinking about moral hazard. *Ethnopolitics*, *4*(2), 237-246.

[70] Nuclear negative security assurances promise not to use nuclear weapons to initiate an attack on the recipient of the assurance. These are neither a positive guarantee that promises to come to recipient's aid, not a conventional assurance that promises not to go to war with the recipient at all. They are a limited agreement simply not to use nuclear weapons offensively against the recipient.

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acknowledges the right of all states – including non-nuclear armed states – to peaceful nuclear energy,[71] and that nuclear-armed states undertake not to use their weapons against non-nuclear states.[72]

Second, the payoff from positive inducements would be hard-pressed to eclipse the costs of proliferating (both financial and diplomatic). Nuclear proliferation is expensive, requiring significant financial, technical, and political capital, making proliferation for extortion an expensive trade for comparatively meager concessions. Nuclear proliferation – particularly the more involved activities necessary for nuclear weapons rather than civilian energy purposes – require significant upfront investment and impose recurring expenses for new centrifuges, continuous refueling, and technical expertise.[73] Beyond the enrichment of the necessary fissile material, nuclear weapons require miniaturization of warhead[74] requires separate up-front and ongoing costs.[75] Beyond the financial costs, nuclear proliferation can incur diplomatic costs – even without the direct costs brought on by coercive engagement. Because new nuclear weapons development is formally renounced by the large majority of states,[76] new proliferators face systemic challenges that extend beyond specific nuclear negotiation. These challenges often come in the form of reduced access to international

[71] Provided this does not violate Articles I and II that prevent the pursuit or transfer of nuclear weapons to non-nuclear states (defined as all those not already nuclear armed at the time of ratification in 1970). "UNODA - Non-Proliferation of Nuclear Weapons (NPT)". United Nations Office of Disarmament Affairs (*un.org*)

[72] Though not a formal aspect of the NPT, many nuclear-armed states have an explicit "no first use" policy, promising not to use nuclear weapons except in defense against nuclear use by an adversary. For example, China, India, and France (See: Panda, A. (2018) 'No First Use' and Nuclear Weapons, *Council on Foreign Relations*).

[73] Reiss, M. (1995). *Bridled ambition: Why countries constrain their nuclear capabilities*. Woodrow Wilson Center Press; Levite, A.E. (2002/03) "Never Say Never Again: Revisited," *International Security* 27(3), 59–88; Fuhrmann, M. (2009) "Taking a Walk on the Supply Side: The Determinants of Civilian Nuclear Cooperation," *Journal of Conflict Resolution* 53 (2), 181-208

[74] Making the explosive warhead small and light enough to be able to reliably carry into battle – such as on the nose of a ballistic missile or in a small warfighting plane. (See the discussion of the cost of a nuclear arsenal, for example: Blumberg, Y. (2017) Here's how much a nuclear weapon costs, *CNBC: Make It* (https://www.cnbc.com/2017/08/08/heres-how-much-a-nuclear-weapon-costs.html)

[75] Jo, D.-J., and Gartzke, E. (2007) "Determinants of Nuclear Weapons Proliferation," *Journal of Conflict Resolution* 51(1), 167–94

[76] Initially in the Nuclear Non-Proliferation Treaty in 1970, and more recently with the Ban Treaty in 2017. (For example, see nonproliferation norms discussion in: Rublee, M. R. (2009). *Nonproliferation norms: Why states choose nuclear restraint*. University of Georgia Press.)

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technical expertise, but destabilizing the proliferator's regional and international relations.[77] Even if proliferators could reliably expect inducements rather than coercion, sending states simply cannot afford to offer sufficiently great incentives to offset the total cost of proliferating. As a result, undertaking a weapons program simply for the reward of short-term payout would still garner net losses to the would-be manipulator.

Counterargument: Coercive Power and Trusting Cooperators

Coercion relies on imposing short-term prohibitive barriers,[78] meaning the greater the economic, military, or political tools of the sender, the greater its coercive leverage to coerce concessions from its adversaries. This is both logically reasonable and empirically demonstrated,[79] meaning most research on the success of coercive policies argues that more powerful senders will be more effective than their weaker counterparts. However, I argue that when the concession demanded inherently weakens the state, making it more susceptible to future coercion – as is the case with nuclear reversal – the coercion can backfire instead. More powerful senders present inherently a greater threat – a boon for coercing concessions according to much of the literature – but this also means that prospective proliferators facing that powerful coercion will also perceive a greater security need for acquiring a nuclear deterrent, thereby increasing their security motivated-demand for the very thing the powerful coercer sought to combat. For example, years of sanctions levied by the most powerful

[77] Levite, A.E. (2002/03) "Never Say Never Again: Revisited," *International Security* 27(3), 59–88; Dai, X. (2007) *International Institutions and National Policies*. Cambridge: Cambridge University Press

[78] George, A. L., and Smoke, R. (1974). *Deterrence in American foreign policy: Theory and practice*. Columbia University Press.; George, A. L. (1991). *Forceful persuasion: Coercive diplomacy as an alternative to war*. US Institute of Peace Press.

[79] Singer, J. David, Stuart Bremer, and John Stuckey. (1972). "Capability Distribution, Uncertainty, and Major Power War, 1820-1965." in Bruce Russett (ed) Peace, War, and Numbers, Beverly Hills: Sage, 19-48; Art, R. J. (1980). To what ends military power? *International Security*, *4*(4), 3-35; Smith, Alastair (1995) "The Success and Use of Economic Sanctions." *International Interactions* 21(3); Allen, S. H. (2005). The determinants of economic sanctions success and failure. *International Interactions*, *31*(2), 117-138; Slantchev, Branislav (2011) *Military Threats: The Costs of Coercion and the Price of Peace*. Cambridge: Cambridge University Press

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economies failed to stop proliferation in some of the weakest states – such as those imposed by the US, Germany, or India against North Korea, Iran, or Pakistan.

In addition, research on cooperation often suggests that – as a result of the complexities of partner coordination and the possible risks associated with entangling oneself on such a way – inter-state cooperation is facilitated by shared identities, common interests, and past alliances.[80] These findings imply that cooperative offers should, therefore, be more effective when they come from friendly rather than rival senders, particularly cooperation on issues related to national security. I argue, however, that the value of this cooperation for inducing nuclear reversal comes from reducing the prospective proliferator's security fears. States do not seek nuclear weapons to protect against their friends, so cooperative offers from friends do little to reduce the proliferator's security fears. Cooperation from rivals, on the other hand, can actually help change the proliferator's beliefs about its security environment, meaning cooperation from rivals can go further in reducing the proliferator's security motivated demand for a nuclear weapon. As a result, contrary to past research in other areas, cooperation from rivals should be more effective than similar offers from friendlier senders when the issue at hand is inducing nuclear reversal.

Identifying Effective Deproliferation:

The practical considerations raised above, therefore, suggest that effective engagement not only achieves the desired outcome – nuclear reversal in this case – more often than other engagement strategies, but it also imposes smaller risks of inadvertently accelerating

[80] Haftendorn, H. (1991) "The security puzzle: theory-building and discipline-building in international security." *International studies quarterly* 35(1) 3-17; Gilboa, Itzhak and David Schneidler (1993), "Updating Ambiguous Beliefs" *Journal of Economic Theory*, 59; Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of management journal*, *38*(1), 85-112; Das, T. K., & Teng, B. S. (1998). Between trust and control: Developing confidence in partner cooperation in alliances. *Academy of management review*, *23*(3), 491-512.

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proliferation instead. As a result, policy effectiveness cannot be linked solely to the likelihood of some success, as it has often been studied before. Rather, effective policy implies a multi-part definition recognizing the likelihood of success and the risks of perverse consequences.

Likelihood of Reversal:

The first, and arguably most widely recognized aspect of effective policy is that of probability: a simple comparison of the likelihood that the policy eventually ends in the desired outcome, or not. In the case of deproliferation, more effective policy will therefore end in nuclear reversal more often than less effective policy, irrespective of how long it takes to achieve this reversal or whether the former proliferator maintains their commitment for long. Not surprisingly, much of the existing literature on foreign policies in general or nuclear proliferation more specifically employ such criteria of success, examining, for example, the likelihood of sanction success or failure,[81] or the likelihood of nuclear disarmament or breakout.[82] While the likelihood of success is clearly a critically important element of effective policy, this alone is not enough.

Risk of Perverse Proliferation:

While deproliferation policies are imposed to reverse a nuclear program, failure does not necessarily mean simply not achieving reversal. Policies may also backfire with catastrophic consequences for reversal, instead inducing the proliferator to double down in their nuclear pursuit and thereby doing more harm than good. When policies risk perverse proliferation,

[81] Dajani, M. S., and Daoudi, M. (1983). *Economic sanctions, ideals and experience* (p. 164). London; Boston: Routledge and Kegan Paul; Hufbauer, G. C., Schott, J. J., and Elliott, K. A. (1990). *Economic sanctions reconsidered: History and current policy* (Vol. 1). Peterson Institute; Allen, S. H. (2005). The determinants of economic sanctions success and failure. *International Interactions*, *31*(2), 117-138

[82] Singh, S., and Way, C. (2004) "The Correlates of Proliferation: A Quantitative Test," *Journal of Conflict Resolution* 48(6), 859–85; Mattiacci, E. and B. Jones (2016) "(Nuclear) Change of Plans: What Explains Nuclear Reversals?" *International Interactions* 42(3); 530-558

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they not only work against the immediate outcome they sought, but also set back the goal for future senders and future policies down the road. In addition, because proliferation in one state can risk inciting a cascade of new nuclear pursuits in regional adversaries,[83] perverse proliferation effects can both set back the immediate goal of reversal and damage global nonproliferation goals. Deproliferation policies that inadvertently incite perverse proliferation can therefore be worse than doing nothing at all, and are not simply a failure to reverse.

From Theory to Tests: Research Methods

The theory outlined above suggests that cooperative inducements are more effective than coercive strategies at encouraging nuclear reversal in proliferating states, and proposes a more nuanced and practical definition of policy effectiveness. The next steps, therefore, require testing this theory against real-world data. The following chapters, therefore, assess the effectiveness of deproliferation engagement, both in general across all proliferators and in particular cases, exploring both when and why some policies succeeded and others did not. The following two chapters test respectively the effectiveness of common engagement strategies, and the impact of sender conditions on this effectiveness. These chapters quantitatively evaluate the observable hypotheses of policy effectiveness and sender conditions on cross-national panel data from 1945 to 2012, thereby identifying global trends in prospective proliferators' responses to the foreign policies they face.

The next two chapters then extend this cross-national analysis of global trends to test the hypotheses through in-depth examination at the process of deproliferation engagement in two particularly relevant cases. Chapters Five and Six thus compare the effectiveness of specific policies through within-case comparisons over time in Iran and North Korea, respectively.

[83] Cirincione, J. (2000). The Asian nuclear reaction chain. *Foreign Policy*, (118), 120.; Allison, G. (2010). Nuclear disorder: surveying atomic threats. *Foreign Affairs*, 74-85.

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These case studies have each engaged in multiple iterations of nuclear reversal negotiations, with varying degrees of effectiveness across many years, many different senders, and in different international political environments. Finally, both cases have both been high-profile political issues for many years and many senders, meaning these senders have been willing to invest considerable resources into inducing reversal. As a result, when these policies failed – or even backfired by inducing perverse proliferation – the failure resulted not from a lack of sender interest, but because even carefully crafted, costly strategies were ill-suited to the goal.

Finally, the theory developed here has considered cooperation and coercion broadly, but these general policy types can each manifest in many ways, some of which can be more effective (or more risky) than others. While some previous work examined policy types in general — examining the aggregated effects of dovish policy packages relying on positive carrots, versus hawkish policy packages relying on coercive sticks[84] — this loses traction on which policies in any package are actually doing the deproliferation work and which can hamper effectiveness instead. Foreign policies are in fact not always aggregated in the same way, and instead serve as levers that sending states can pull independently, or mix and match to craft different policy packages. As a result, with the right data, we can separately consider their unique effects.[85] The tests performed here therefore disaggregate individual policy types so as not to misattribute policy effects to other policies simultaneously imposed. In the quantitative analysis, panel data traces foreign policies and proliferator responses to allow a closer match of policy to effect, but is limited to the types of unique policies on which accurate cross-national data is available.[86] Case studies, on the other hand, allow a more

[84] A necessary simplification from data limitations. See for example Nincic, M. (2010). Getting what you want: positive inducements in international relations. *International Security*, *35*(1), 138-183; Reardon, R. (2010) *Nuclear Bargaining: Using Carrots and Sticks in Nuclear Counterproliferation* Boston: Massachusetts Institute of Technology Press; Mehta, R. (2014) *Deproliferation Dynamics: Why States Give Up Nuclear Weapons*, San Diego, CA: University of California, San Diego

[85] See pairwise correlation tests that demonstrate policy independence in the Chapter 3 Appendix.

[86] Policies can be personalized to specific cases, hampering our ability to capture this nuance in aggregated or generalized datasets used in quantitative analysis.

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flexible and inclusive examination of different policies,[87] but are necessarily limited in their variation of the policies employed.[88] As a result, each method helps fill gaps left by the other and provide a fuller picture of the policies and sender conditions that most effectively induce nuclear reversal in prospective proliferators.

[87] For example, former US President Jimmy Carter's unofficial negotiations with North Korea (technically as a private citizen though with approval from Washington) paved the way for the Agreed Framework in 1994.
[88] For example, militarized disputes are rare, while economic sanctions have used often by many different senders.

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Chapter 3: Effectively Inducing Reversal

Cross-National Proliferation Effects of Foreign Policies

The preceding chapters present a theory of foreign policy effectiveness for inducing nuclear reversal that incorporates the signals associated with policy decisions as well as the explicit payoffs these policies promise to proliferators. I argue that positive inducements, particularly those that promise ongoing interstate cooperation are more effective than negative coercion at encouraging nuclear reversal in proliferating states. Cooperation and coercion both offer explicit payouts aimed at reversing proliferation – cooperation offers rewards for reversal while coercion imposes costs for proliferation. But while coercion signals the sender's threatening posture thereby increasing the proliferator's security motivated demand for a nuclear deterrent, cooperation signal a sender's accommodating attitude and thus reduced the proliferator's demand for a nuclear weapon.

For a foreign policy to be an effective nuclear reversal engagement option, it must address address several important goals of the sending states. This chapter tests two aspects of counterproliferation policy effectiveness including (1) the likelihood of encouraging nuclear reversal in the proliferating state, and (2) the risk of inciting perverse proliferation instead. In doing so, it assesses not only the possibility of policy success, but also the often overlooked risks when counterproliferation policies backfire. The analysis here thus brings new empirical analysis to bear on ongoing debates about the costs and benefits of international engagement strategies, and provides relevant insight into current counterproliferation efforts.

Testable Hypotheses

The two-fold definition of counterproliferation policy effectiveness leads to several observable implications regarding the likelihood of a weapons-seeker's nuclear reversal or proliferation in response to foreign engagement. First if cooperative inducements help assuage proliferator fears while coercion risks increasing those fears, then on balance inducements should be more likely to

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lead to reversal, while coercion should be more likely to lead to proliferation. I therefore test the following hypotheses regarding inducements versus coercion:

> **Cooperative Policy Hypothesis:** Cooperative policies are more likely to lead to nuclear reversal than to increased proliferation.
>
> **Coercive Policy Hypothesis:** Coercive policies are more likely to lead to increased proliferation than to nuclear reversal.

Data and Methods

In order to evaluate the testable implications of this theory, this chapter uses an aggregated dataset built from 14 existing datasets that together include information on foreign policies, nuclear capabilities, and dyadic conditions between sending and target states. The final dataset is structures into country-year units of analysis including measures of individual dyadic interactions including the power and political institutions of states, and the nuclear activity of weapons seeking states.

Dependent Variable: Changes in Nuclear Latency

Though most research on nuclear proliferation and reversal examine the likelihood of either a successful nuclear test or complete dismantling of a weapons program, proliferators take many years to reach these critical end points during which time they receive many forms of international engagement and vary their dedication to an indigenous nuclear weapon. While the ultimate goal of deproliferation engagement is to entirely end the target's weapons program, focusing exclusively on the final outcome eclipses small successes along the way and makes it difficult to parse which of the many policy treatments ultimately caused successful reversal or perverse proliferation. For example, North Korea temporarily froze their nuclear program in 1994, halting enrichment and opening to IAEA inspectors at their facility at Yongbyon, only to revitalize the program in 2001 and successfully test a nuclear weapon in 2006 (Wit et al. 2004). North Korea received both cooperative and coercive deproliferation policies over the course of it's many-year nuclear weapons

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program, but which of these caused reversal – even temporary and incomplete reversal – which had no effect, and which even led to greater proliferation instead. I therefore account for variation in nuclear activity over the course of the proliferator's weapons program, examining changes in its nuclear infrastructure every year following a foreign engagement.

To account for variation throughout a weapons-seekers pursuit, I construct a measure of changes in nuclear enrichment and reprocessing (ENR) infrastructure for each proliferator using the Nuclear Latency Dataset v1.2.[1] This data covers 254 plants in over 30 countries from 1939-2012, recording each plants' construction and operation start and end dates, as well as an ordinal size measure of facility size: laboratory (1), pilot (2), or commercial/industrial (3) scale. From this I derive an annual summed size of all operational facilities within each country, providing a country-year sum of all target nuclear plants. From this annual summed size, I construct two dependent variable measures: 1) The first measures the magnitude of change as a continuous variable, using a first difference in ENR capabilities from year to year. 2) The second is a set of two dummy indicators, measuring either positive change (proliferation) in the summed size, or negative change (reversal) in that sum from the previous year. The reversal variable records a (1) for a net reduction in nuclear infrastructure from the previous year, and no change or increase in infrastructure as (0). The proliferation variable records (1) as a net increase in the state's nuclear infrastructure, and a (0) for no increase either as no change or a decrease.

A net reduction may result from the permanent or temporary closure of existing facilities, or downgrading existing facility size such as commercial scale to pilot scale. Likewise, proliferation may result from reopening a closed facility, building an entirely new operational facility, or increasing the size of an existing operational facility, such as from pilot to commercial scale. To test nuclear proliferator responses to foreign policy treatments, these latency changes are led by one year, thereby testing changes in nuclear developments the year after facing each foreign policy. In order to examine nuclear weapons proliferators specifically, rather than all latent nuclear states, I test treatment responses of only those target states that have an active weapons program, includ-

[1]Fuhrmann, M. and Tkach, B. (2015) Almost Nuclear: Introducing the Nuclear Latency Dataset. *Conflict Management and Peace Science*32(4)

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ing both those that have and those that have not (yet) achieved nuclear breakout or assembled a functioning arsenal (Singh and Way 2004, updated as of 2016 by Way).

Independent Variables: Foreign Engagement

This dataset captures both coercive and positive inducement policies, including threat and imposition of economic sanctions, militarized interstate disputes, militarized compellent threats, military alliances, diplomatic sanctions, foreign aid, and nuclear cooperation agreements. It also captures attributes of each sender the proliferator faces including the relative power and ideological proximity in each dyad in every year of their interaction.

I define the following policies as coercive: threat and imposition of economic sanctions, militarized interstate disputes, militarized compellent threats, and diplomatic sanctions – all of these policies impose some costs for proliferating. The threat or imposition of economic sanctions is taken from the Threat and Imposition of Economic Sanctions (TIES) v4.13 dataset[2]. From this I derive an indicator of whether the target proliferator faced economic sanctions in any year from 1945-2006 (existing sanctions updates to 2009), including a separate variable for both nuclear-specific and non-nuclear sanctions. Targets can face separate independent nuclear and non-nuclear sanctions, meaning these variables may be simultaneously positive, both zero when no sanctions were in effect, or one positive and the other zero. The threat and use of force is measured using the Correlates of War Dyadic Militarized Interstate Dispute (MID) dataset[3] generating an indicator that measures active military engagement against the proliferator. It is positive when the proliferator was the target of military engagement from 1945-2010 (but not when the proliferator initiated military engagement abroad). I separately account for compellent threats using the Militarized Compellent Threat (MCT) dataset[4] to account for instances of threats against the proliferator even

[2]Morgan, T.C. , Bapat, N. and Kobayashi Y. (2014) The Threat and Imposition of Sanctions: Updating the TIES dataset. *Conflict Management and Peace Science* 31(5)

[3]Palmer, G, V. D'Orazio, M. Kenwick, and M. Lane. (2015) The MID4 Data Set: Procedures, Coding Rules, and Description.*Conflict Management and Peace Science.* 32(2), 222-242.

[4]Sechser, T. S. (2011). Militarized compellent threats, 1918-2001. *Conflict Management and Peace Science,* 28(4), 377-401.

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when no military engagement occurred. Finally, diplomatic censure is measured using the Diplomatic Representation Data[5] to measure diplomatic reductions and withdrawals as well as embassy closures from 1960-2013.

I define the following engagement types as positive inducements: nuclear cooperation agreements, new or increased diplomatic exchanges, defense cooperation agreements, and foreign aid – all of these policies offer a benefit in exchange for target state compliance with the senders' demands. The Nuclear Cooperation Agreements Dataset (NCA) v2.0[6] measures the peaceful NCAs signed between 1945-2003[7]. I measure increases in diplomatic interactions (including assignment of new diplomats or consuls in previously unrepresented targets) using the Diplomatic Representation Dataset[8] covering diplomatic representation and embassy data from 1960-2013[9]. Using the Defense Cooperation Agreements dataset[10], I account for both the presence of limited or specific defense cooperation agreements, and broad-reaching or general agreements. These two indicators (limited DCAs and general DCAs) measure agreements from 1980-2010 that establish institutional frameworks for longstanding mutual defense cooperation between the states. Finally, the Net Aid Transfers Data[11] captures foreign aid from 1960-2015, indicating any year in which the target state was the recipient of foreign aid.

[5]Moyer, J., D, Bohl, and S. Turner, (2015) "Diplomatic Representation Data Codebook" Diplometrics, Denver, CO: Frederick S. Pardee Center for International Futures, Josef Korbel School of International Studies, University of Denver, https://pardee.du.edu/diplomatic-representation-data-set

[6]Fuhrmann, M. (2009). Spreading temptation: proliferation and peaceful nuclear cooperation agreements. *International security*, 34(1), 7-41.

[7]This dataset also accounts for weapons-related aimed at aiding the recipients indigenous weapons program. nuclear cooperation agreements. These are explicitly negotiated to aid the target in their proliferation activity and are therefore excluded from the primary analysis of deproliferation inducements. Their effects are compared in the appendix.

[8]Moyer, J., D, Bohl, and S. Turner, (2015) "Diplomatic Representation Data Codebook" Diplometrics, Denver, CO: Frederick S. Pardee Center for International Futures, Josef Korbel School of International Studies, University of Denver, https://pardee.du.edu/diplomatic-representation-data-set

[9]Note that this data can be positive or negative in nature, as countries can open send new consulate or diplomatic ties, or recall their diplomats or close their embassies. To capture each, I develop a measure that assesses change in relations, capturing both the decrease in formal relations, as well as an increase in levels of formal relations.

[10]Kinne, B. J. (2018) Defense Cooperation Agreements and the Emergence of a Global Security Network. *International Organization*, 72(4), 799-837

[11]Roodman, D. (2015) "Net Aid Trasnfers data set (1960-2015)," Working paper (accessed March 2018) https://davidroodman.com/data/

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Controls: Time-Periods and Auto-Regression

Nuclear proliferation trends have changed over time, partially as a result of the availability of nuclear materials and technology, and partially in response to changing international norms. I account for these changes using static, cross-national decade controls. These include controls for 1945-1969, 1970-89, and 1990-2012 (the final category excluded for collinearity with the other categories).

In addition, I include auto-regressive controls that account for the potential stickiness of proliferation behavior within states. States that increased their nuclear infrastructure in the previous year, may be more capable of continuing that trend in the following year. Likewise, states that reversed in the previous year may be more capable of continuing that trend. Including auto-regressive controls help account for this within-unit trend, and they can take several forms. They can use cubic polynomials or cubic splines, taking the count of the number of years since the state last proliferated or reversed their nuclear infrastructure, then squaring and cubing that value. While this is a very good way of accounting for many possible auto-regressive temporal trends, these values are – not surprisingly – highly correlated with one another, which can lead to falsely improving the Aikake (or Baysian) Index Criteria (AIC).[12] I therefore use the count of years since proliferation, but not the squared and cubed terms as well (though they are included in the appendix for reference). Another auto0regressive temporal control available is that of the lagged, and twice-lagged dependent variable. This alternative is also tested in the appendix, but does not fare as well on the goodness of fit measures so is not included in the body tests.

The Complete Dataset

The complete dataset therefore compares the led nuclear response of weapons seeking states to all the policies they face in every year in which they have an active weapons program. The total dataset is therefore structured as country-year units of observation, with separate variables

[12]Neuhaus, J. M., J. D. Kalbfleisch, and W. W. Hauck. (1991) "A comparison of cluster-specific and population-averaged approaches for analyzing correlated binary data."*International Statistical Review* 59: 25-35

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recording whether the country faced each policy in a given year, the status of their nuclear weapons program, and their total nuclear latency in terms of the number and size of nuclear facilities.

The following histograms show the total number of all coercive and inducement policies (Figure 1), and the total number of individual policy types (Figure 2) in country-years. The policy-years represented in Figure 1 come from the individual policies shown in Figure 2. On balance, Figure 1 shows there is a nearly even number of country-years across the dataset in which a state faced coercive or inducement policies, but some types of coercive policies occur over many more years than others. For example, Figure 2 shows there are over 3000 country-years in which the state faced a militarized dispute (MID), but only 104 years in which they faced a militarized compellent threat (MCT), and only 428 country-years in which a state faced nuclear-specific sanctions.

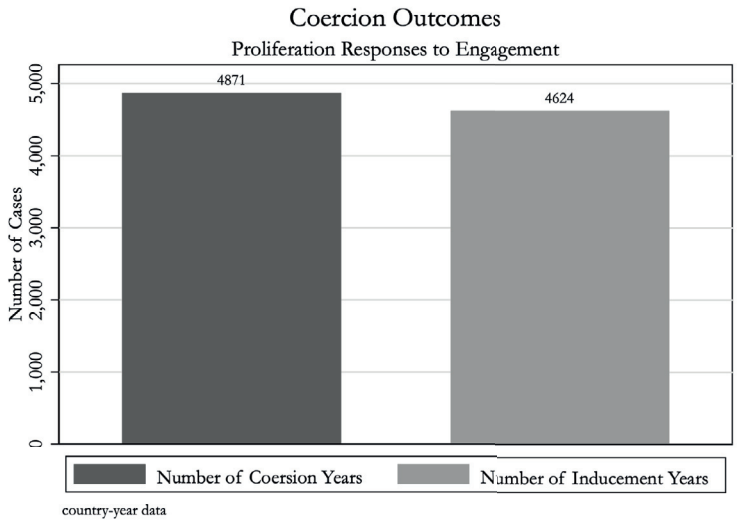

Figure 3.1: Number of Coercion and Inducement Years

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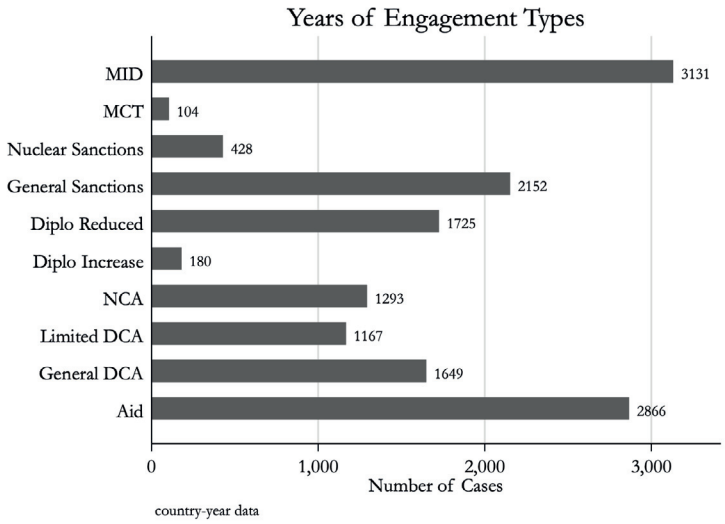

Figure 3.2: Number of Total Policy Years

Research Methods

To evaluate the relationship between the independent variable of interest (or foreign engagement) and the dependent variable of proliferation behavior (or changes in nuclear latency), I construct a series of models that examine the likelihood of proliferator responses after facing different forms of international engagement. Beginning with a simple pooled binomial logistic regression to test the likelihood of either proliferation or reversal, I serially complicate the model specifications to account for possible omitted variable biases.[13]

Pooled Models:

A series of pooled cross-national logistic regressions examine the likelihood of either proliferation or reversal. This design considers cross-national trends in weapons-seekers' proliferation behavior in the face of different foreign policies. It separately tests weapon-seeking states' likelihood of engaging in further proliferation (increasing nuclear latency) or nuclear reversal (reduction

[13]Further tests are included in the appendix, though these tests were not as well suited to either the research question or data structure and so are not included in the main body of the chapter.

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in latency) after the facing each foreign policy.[14]

Such pooled model provide an aggregated examination of the entire sample, and often serve as the standard first check on the outcomes of interest. The advantage of the pooled logit model is that by aggregating all weapons-seekers behavior, it detects cross-national trends in these states' nuclear proliferation responses to foreign engagement. The disadvantage is that it assumes no biases based on between-group heterogeneity.

Panel Models:

Unlike the pooled logistic regression, panel regression specifically accounts for the repeated observations within-unit, or time-series structure of the data. There are at least three general methods, including population averaged models (PA), fixed effects models (FE), and random effects models (RE), each assuming a different population parameter or population distribution. This chapter uses the population averaged specification, which estimates an average weapon-seeker's likelihood of either proliferating or reversing their nuclear program after facing a foreign engagement. Alternative specifications are included in the appendix.[15]

The primary models in this chapter employ a population averaged model. This approach does not fully specify the population distribution, instead specifying only a marginal distribution for the entire sample population,[16] which means that unlike the cluster-specific models (random and fixed effects), PA models estimate the effect of the regressors (the types of foreign engagement) on the average individual (or weapons-seeking state). This means that the estimates of the PA model report the odds of the average weapon-seeker reversing or proliferating after facing each specific foreign policy. This allows the PA models to estimate effects on the entire population while recognizing the panel structure of the data, giving it greater traction in small group-sample

[14] In this design, proliferation is compared to all other outcomes of reversal as well as more common no latency change, and reversal is compared to all other outcomes of proliferation and no latency change.

[15] While there are potential benefits to alternative specifications, both FE and RA models fail to capture proliferator's responses, also discussed in the appendix.

[16] Neuhaus, J. M., J. D. Kalbfleisch, and W. W. Hauck. (1991) "A comparison of cluster-specific and population-averaged approaches for analyzing correlated binary data."*International Statistical Review* 59: 25-35

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cases such years of nuclear proliferation.

Model Fit Assessments

Finally, to assess the fit of each model to the data, I employ Aikake information criteria. The AIC values are not suitable for estimating generalized estimation equations (GEE) like the population averaged models used in this chapter. These models instead use the quasi-likelihood under independence model criteria (qIC) to assess model fit to compare between GEE models.[17] Like AIC values, lower qIC values represent better model fit.

Results and Discussion

Pooled Binomial Logistic Regression

Model (1) presents a simple pooled binomial logistic regression, using static temporal controls for 1940-60s (before the ratification of the NPT), and 1970-80s(Cold War years but post-NPT ratification),[18] but no within-state auto-regression controls. Model (2) adds auto-regression controls to the pooled logit, using a mean-averaged count of the number of years since the target last proliferated (pt) or rolled-back (rt) its nuclear program. These controls account for the within-unit propensity for proliferation or reversal. These controls help account for the possibility of either momentum or stickiness in nuclear proliferation. Achieving substantive changes in nuclear ENR capabilities, both increasing and reversing, are costly steps meaning states that proliferate in *time t* may be more or less capable of again proliferating in *time t+1*.

The auto-regression controlled Model (2) provides a better model fit than the more basic Model (1), as demonstrated by lower AIC values, meaning that accounting for within-unit auto-regression of nuclear changes provides a closer approximation of the data. These statistical results make substantive sense: it is reasonable to believe the large increases or decrease to existing nuclear ENR

[17] Pan, W. (2001) Akaike's information criterion in generalized estimating equations. *Biometrics* 57: 120-125; Cui, J. (2007) QIC program and model selection in GEE analyses. *Stata Journal* 7: 209-220

[18] 1990-2010s static temporal control omitted in all models for perfect collinearity

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facilities are costly endeavors, meaning that a state that opens a new ENR facility for example, may be less capable of significantly expanding its capabilities again the following year.

Table 3.1: Proliferator Response to Engagement: Pooled Binomial Logit

	(1)		(2)	
	Proliferation	Reversal	Proliferation	Reversal
Nuke Sanc	0.99***	0.44	0.076	0.14
	(0.30)	(0.43)	(0.36)	(0.49)
Other Sanc	0.74***	0.65***	0.14	0.19
	(0.23)	(0.20)	(0.28)	(0.25)
MCT	0.16	-0.083	0.83*	0.24
	(0.43)	(1.05)	(0.48)	(1.03)
MID	0.96***	0.82***	0.97***	1.18***
	(0.24)	(0.27)	(0.32)	(0.36)
Reduce Diplo	-0.40**	0.089	-0.36*	0.31
	(0.16)	(0.19)	(0.20)	(0.24)
Increase Diplo	0.88***	1.14***	0.41*	0.38*
	(0.29)	(0.32)	(0.22)	(0.23)
NCA	1.40***	1.70***	0.46	0.78***
	(0.28)	(0.27)	(0.32)	(0.25)
Aid	-0.13	-0.65***	0.23	-0.27
	(0.26)	(0.25)	(0.20)	(0.26)
Limited DCA	1.44***	1.63***	1.11***	0.88*
	(0.45)	(0.51)	(0.40)	(0.46)
DCA General	-0.50	-0.94*	-0.49	-0.95**
	(0.44)	(0.53)	(0.37)	(0.40)
1940-1960s	1.73***	-0.23	1.25***	-0.83
	(0.33)	(0.49)	(0.40)	(0.74)
1970-80s	1.55***	0.23	1.02***	-0.19
	(0.27)	(0.32)	(0.33)	(0.31)
pt			-0.098**	
			(0.04)	
rt				-0.16***
				(0.04)
Constant	-6.44***	-5.80***	-4.16***	-3.65***
	(0.34)	(0.37)	(0.42)	(0.42)
Observations	7208	7208	1029	666
AIC	1331.2	876.9	734.3	480.7

Standard errors in parentheses
(1) no auto-regression temporal control (2) years since prolif/reversal
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Because the pooled model estimates behavior across the entire sample population from 1945-2012, controlling for temporal dependencies can help make the estimates more precise ? accounting for both global temporal trends using fixed period controls, as well auto-regressive controls for each state's proliferation trends. Though the pooled model averages estimates across the population, autoregressive temporal controls help account for within-unit dependency and the panel nature of the data.

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Based on the results from both Models 1 and 2, some policies, like MIDs, NCAs, increased diplomatic relations, and limited DCAs, are significantly correlated with changes in the target's nuclear program the following year. MIDs, increased diplomatic relations, and limited DCAs increasing the likelihood of both proliferation and reversal, while NCAs significantly increasing the likelihood of reversal but not necessarily the likelihood of proliferation (when controlling for auto-regressive conditionality as seen in Model 2). Similarly, reduced diplomatic relations and general DCAs are both significantly correlated with nuclear behavior, though they are correlated with reduced likelihood (rather than an increased likelihood) of change in response to engagement. Reducing diplomatic relations is significantly correlated with a reduced likelihood of proliferation the following year, while general DCAs are significantly correlated with a reduced likelihood of reversal the following year.

Panel Binomial Logistic Regression

The pooled binomial logit in Table 1 models proliferation behavior in all weapon-seeking states, testing their likelihood of proliferating and reversing their nuclear program in the year after they face each foreign engagement. While the pooled models used here control for global proliferation trends across different time periods (using static decade controls) and within-unit proliferation stickiness (using mean-averaged years), these models do not account for the panel structure of the data or the possibility that these states' proliferation behavior changes from year to year. As a result, the impact of nuclear sanction or NCAs on a weapons-seeker's proliferation behavior in 1950 is not differentiated from the impact of the same foreign policies in 1965 or in 1980 for example. Given that existing literature suggests both that nuclear capabilities have spread over time and that a taboo against proliferation has developed over time, the following test accounts for these nuclear shifts over time using a panel binomial logistic regression design.

Like the pooled model, the panel logistic regression find support at the 95% confidence level that MIDs increase the likelihood of both proliferation and reversal, while NCAs increase the likelihood of reversal only. In addition, reduced diplomatic engagement is correlated with a reduced

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Table 3.2: Panel Binomial Logit: Population Averaged Model

	Proliferation	Reversal
Nuke Sanc	0.070	0.25
	(0.36)	(0.43)
Other Sanc	0.15	0.072
	(0.26)	(0.26)
MCT	0.81	0.27
	(0.49)	(1.02)
MID	0.64**	1.03***
	(0.29)	(0.34)
Reduce Diplo	-0.33*	0.27
	(0.19)	(0.25)
Increase Diplo	0.21	0.14
	(0.20)	(0.23)
NCA	0.20	0.59**
	(0.28)	(0.23)
Aid	0.19	0.038
	(0.17)	(0.31)
Limited DCA	0.32	0.56
	(0.31)	(0.48)
DCA General	0.13	-0.73
	(0.34)	(0.48)
1940-1960s	0.95***	-1.10
	(0.36)	(0.83)
1970-80s	0.85**	-0.20
	(0.34)	(0.33)
pt	-0.12**	
	(0.05)	
rt		-0.18***
		(0.04)
Constant	-3.53***	-3.41***
	(0.39)	(0.44)
Observations	1029	666
qIC	777.68	514.83

Standard errors in parentheses
panel binomial logit with year count auto-regression
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

likelihood of proliferation, though this is only significant at the 90% confidence interval, and has no significant effect on reversal. These results can be seen in the following figure, which records the odds ratio proliferation or reversal: comparing the likelihood of observing each outcome in a proliferator facing each engagement compared to a similar proliferator *not* facing such engagement.

Note that while a population averaged model does not account for state fixed-effects (between-group heterogeneity), it instead estimates the average proliferator's response to engagement accounting for the panel structure of the data and changing temporal norms.[19] The results of this

[19]See the appendix for a discussion of the 'Dirty Pool' debate and estimates using a state fixed effects design.

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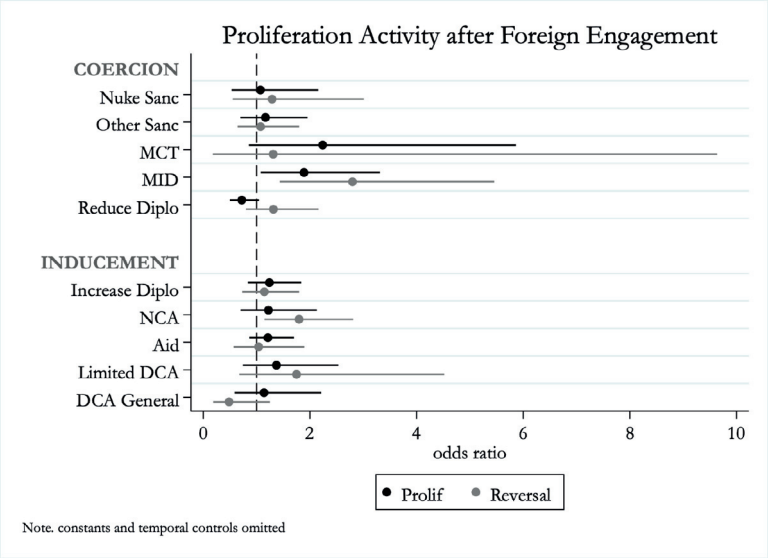

Figure 3.3: Odds Ratio of Regression Estimates

model are next analyzed as a lens for understanding historical cases of counterproliferation engagement. These post-estimation results highlight what the model implies in for real cases of counterproliferation, incorporating historical data to estimate the predicted risks of proliferation or reversal under different forms of foreign engagement.

Post-Estimation Interpretation

While the panel logit regression estimates demonstrate the correlation between individual policies and the potential proliferation outcomes, what do these results mean in terms of estimating the individual effects of key policies under real engagement conditions? The following section therefore demonstrates the estimated effects of specific policies, as well as the predicted proliferation outcomes of common policy packages against cases of prominent proliferators in the past. All post-estimation results rely on the panel population averaged logit model (Table 2 above).

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Marginal Effect on Proliferation and Reversal

The following figure shows the marginal effects in odds ratios of two key engagement strategies: the coercive mechanism of military force (MIDs) and the positive inducement of nuclear cooperation agreements (NCA). While MIDs are significantly associated with nuclear reversal, they are also similarly likely to lead to greater proliferation instead. In terms of odds ratios, the average proliferator facing military engagement from another state are about 8% more likely to reverse their nuclear program than another average proliferator *not* facing MIDs. However, that same average proliferator is also 6% more likely than another proliferator not facing military engagement to instead double down in their nuclear pursuit. This means that while MIDs are clearly potent movers for a proliferator's nuclear latency, their effects are volatile and potentially risky as counterproliferation strategies.

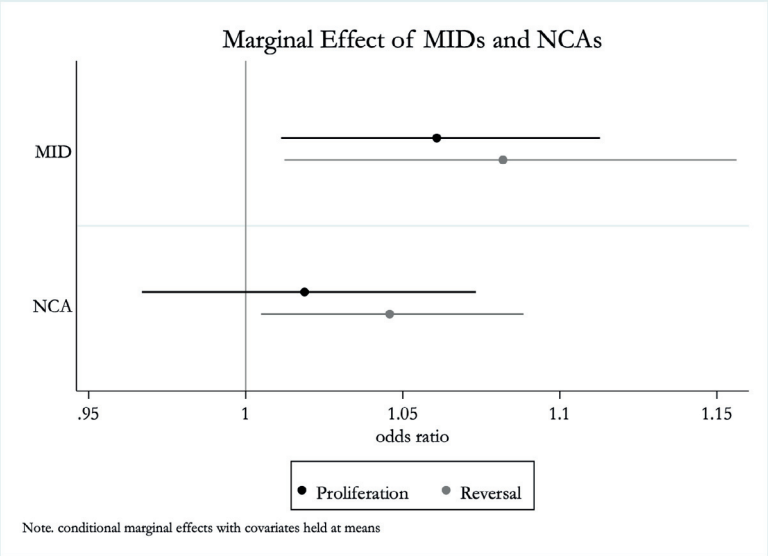

Figure 3.4: Comparing Marginal Effects of MID and NCA on Proliferation Outcome

On the other hand, nuclear cooperation agreements provide a positive inducement that is often offered to proliferators who agree to commit to purely peaceful uses of nuclear energy. These positive inducements are significantly associated with reversal, but not with proliferation. Specifically, average proliferator's that enjoy a nuclear cooperation agreement are 5% more likely to reverse than similar average proliferators that do not enjoy this inducement. While the marginal effect of

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these NCAs on nuclear reversal are slightly muted compared to those of MIDs, NCAs may still be a more reliable strategy for increasing nuclear reversal as they post a lesser risk of perversely accelerating proliferation instead.

While these conditional marginal effects demonstrate the predicted effect of individual policies on an average proliferator, they do not necessarily reflect what a common suite of engagement options used in conjunction with one another on any specific state would be expected to accomplish. What, therefore, would be the probability of both proliferation and reversal for real states if they faced a common set of counterproliferation policies?

Predicted Probabilities in Historical Examples

The following post-estimation results compare the predicted probabilities of proliferation and reversal in response to common policy suites in historical examples of states with active weapons programs. Let us begin by comparing two common suites of policies, a dovish package of positive inducements and a hawkish package of coercive strategies, each of which have often been suggested as alternative approaches to countering ongoing proliferation. The dovish set employs several inducements simultaneously to entice the proliferator into reversing, while the hawkish set combines several coercive policies to pressure the proliferator into reversing.

The following figure compares the predicted probabilities of proliferation and reversal under each policy suite had they been applied against Iraq in 1980. Iraq at this time provides a good test case because, while a number of states were concerned about potential ongoing nuclear activity, Iraq was not facing yet any concrete counterproliferation engagement explicitly targeting its nuclear program. Additionally, this case provides relevant insight as Iraq's possible enrichment activity would soon become the focus of much of the international community. In 1980, Iraq had just begun a full scale invasion of Iran – a war that would last eight years and lead to over 100,000 combatants killed in action though some sources claim up to 800,000 fatalities on both sides.[20] In addition, Iraq had recently begun a nuclear cooperation agreement with France in which the latter

[20]Hiro, Dilip (1991) *The Longest War: The Iran-Iraq Military Conflict*, New York: Routledge

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supplied highly enriched uranium fuel to be used in Iraq's new reactors. Under these conditions, what then would have been the predicted probability of either further proliferation or preferably reversal under two possible policy options?

The following figure therefore compares these predicted probabilities under a dovish and under a hawkish engagement strategy. Common dovish policy packages include defense cooperation agreements such as negative security assurances (non-attack clauses), as well as increased diplomatic engagement and civilian nuclear cooperation agreement (for peaceful energy purposes). Holding all else equal [21] this test estimates the predicted probability of reversal to be roughly proliferation to be about 45% greater than no engagement,

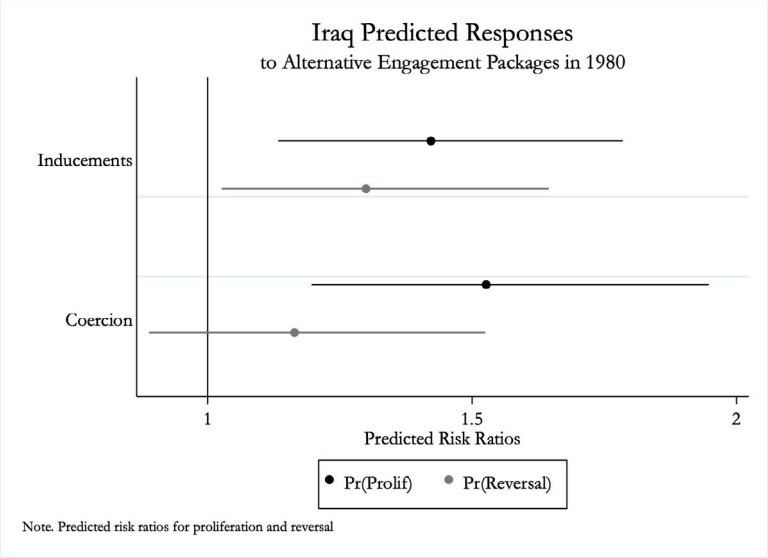

Figure 3.5: Predicted probabilities (in relative risk ratios) comparing dovish and hawkish engagement of in Iraq 1980.

What if we instead compared cases that were in fact successful using the cooperative packages estimated above for Iraq? The following graph compares the predicted probability of proliferation and reversal in two cases. In both cases the target states successfully reversed (entirely denuclearized) under cooperative engagement, but what would be the predicted probability of proliferation and reversal had they instead faced a full coercive suite of hawkish policies?[22].

[21] Meaning controlling for the ongoing war with Iran, the reduced diplomatic engagement this war produced, the static

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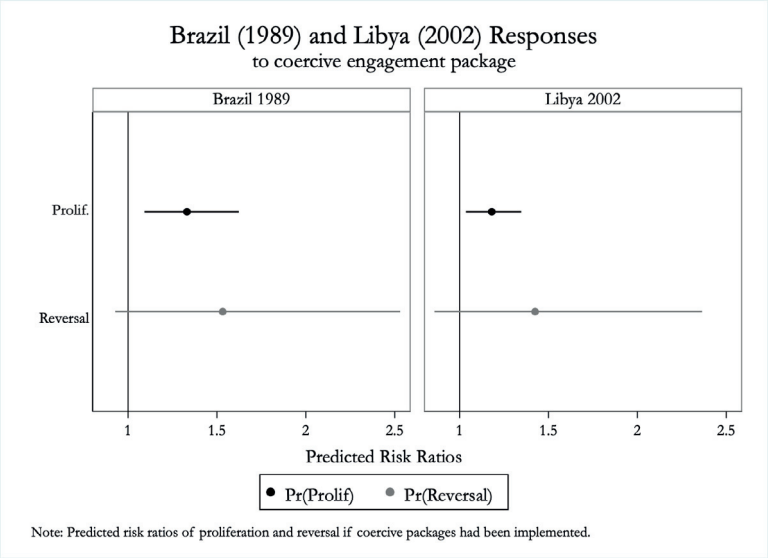

Figure 3.6: Predicted probabilities (in relative risk ratios) of nuclear responses to coercion instead of cooperation in Brazil (1989) and Libya (2002).

Finally, while the examples of Brazil in 1989 and Libya in 2002 suggest that coercion in those cases would have at best uncertain outcomes (in which only perverse proliferation offering statistically significant likelihood), how would dovish alternatives have fared in cases that actually faced coercion? Both Iran and North Korea attempted to conclude nuclear reversal agreements in 2005, but both of these cases failed to conclude their agreements. In both cases, the proliferators had requested some form of negative security guarantees, limited civilian nuclear cooperation agreements, and sanction easement. The following graph therefore compares the predicted probabilities (in odds ratios) of proliferation and reversal in each case, had these proliferators received the cooperative packages they requested.[23]

In both cases, there is a statistically significant and positive predicted probability of reversal, much greater than the predicted probability of perverse proliferation. In the case of Iran in 2005, the predicted risk ratio of reversal if their proposed Grand Bargain inducement package had been

time period of 1980, and Iraq's active proliferation with the auto-regressive proliferation control.

[22] A hawkish policy package means here the imposition of nuclear and general economic sanctions, militarized compellent threats, and reduced diplomatic relations

[23] This is the predicted probability of each proliferator facing a limited DCA (negative security assurance), nuclear cooperation agreement, and increased diplomatic engagement.

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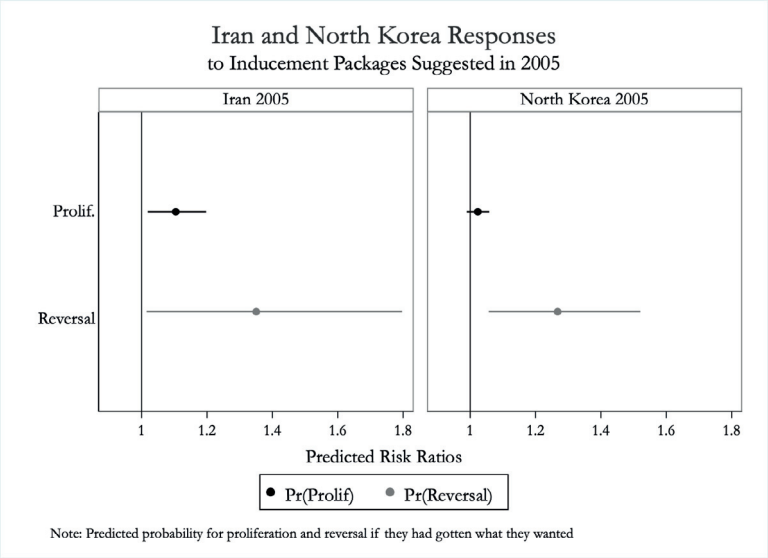

Figure 3.7: Predicted probabilities (in relative risk ratios) of Iran's and North Korea's nuclear responses to accepting their respective proposed cooperative agreements in 2005.

met was about 40% greater (1.4 times higher) than the alternative of not accommodating that Bargain. The risk of perverse proliferation under the bargain was about 10% higher than no Bargain (or 1.1 times greater). Likewise, North Korea in 2005 was in the midst of 6-Party Talks, similarly requesting sanction easement, negative security assurance, and civilian nuclear cooperation assistance. Had these demands been met, the model estimates that North Korea's predicted probability of reversal would have been nearly 25% greater than the status quo of not meeting those demands (a predicted risk ratio of 1.25 times greater of no agreement). The predicted risk of perverse proliferation for accommodating Pyongyang's requests is not statistically significant, meaning the risk of perverse reactions for the dovish policy package was not greater or lesser than the status quo of no agreement.

All of these results suggest that in a number of high-profile historical examples of counterproliferation engagement, the inducement package carried fewer risks and greater potential rewards than the hawkish alternatives. While dovish policy packages like nuclear cooperation and positive security guarantees sometimes risked perverse reactions, these predicted risks ratios were usually lower than expected rewards of reversal. Hawkish engagement, on the other hand, generated riskier

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outcomes with greater predicted risks of proliferation and lower predicted rewards of reversal.

Conclusions and Further Research

The analysis performed in this chapter suggests that some of the primary cooperative inducements – like nuclear cooperation agreements (NCAs) – are more effective at producing nuclear reversal than common coercive policies like threats or use of force (MCTs or MIDs, respectively), or economic sanctions. However, they also suggest that many of the engagement options that produce nuclear reversal also risk inciting greater proliferation instead, making them volatile and unpredictable counterproliferation policy tools.

For example, though militarized interstate disputes are significantly associated with reversal in both pooled and panel models, they also pose the greatest risk of inciting greater proliferation in the target state, a risk that could offset the benefits of this policy as a counterproliferation strategy. [24] Of all the engagement types, MIDs are the most potent movers for nuclear responses – both proliferation and reversal. They can therefore be highly effective for unilaterally destroying a proliferators nuclear infrastructure, as Israel proved against Syria's Osirak reactor in June 1981. When military engagement does not accomplish this singlehanded reversal, however – either because the intended target was not nuclear or because the attack failed – it often risks inciting greater proliferation in the bereaved proliferator, potentially creating greater risks of military retribution for similar attacks in the future.[25]

While these results examine the immediate effects of foreign policies on nuclear proliferation and reversal, they do not account for the engagement conditions – such as prior relations with the sending states, or the power of the sender – on the effectiveness of these policies. It is reasonable to assume that not all senders would be equally capable of incentivizing reversal, or equally likely to

[24] Likewise in the pooled regression models from Table 1, limited DCAs and increased diplomatic engagement are both significantly correlated with reversal as well as proliferation, though the significance, (but not direction) of these results falls away in the panel model in Table 2.

[25] Related findings and their implications are regularly referenced in existing literature (such as Jo and Gartzke 2007, or Fuhrmann 2009), usually concluding that states facing security threats are more likely to initiate nuclear weapons programs, and more likely to follow through a successful nuclear test than states facing no such existential threat.

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incite greater proliferation in response to their engagement. In addition, the tests presented here do not examine the long-term consequences of these policies for complete denuclearization or nuclear breakout. The subsequent chapters therefore examine these related aspects of counterproliferation policy effectiveness for a more complete picture the foreign engagement process.

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Appendix

The appendix provides tests of alternative specifications for examining the immediate responses of proliferators to foreign engagement. Like the body models these employ the Aikake Information Criteria where possible to assess model fit, except in the GEE equations which use the quasi-Information Criteria. [26]

The first tests alternative temporal controls for the Pooled Binomial Logit design, the second uses alternate parameter designs for the Panel Binomial Logit, the third tests several Linear OLS designs, and the final alternate specification tests a Multinomial Logistic Regression. Below these alternate specifications, the appendix includes pariwise correlation tests to check for

Pooled Binomial Logit: Alternative Temporal Controls

Model (1) below adds lagged outcome variables for 1-year (L.) and 2-year (L.2) to control for the states recent propensity for the outcome of interest (either proliferation or reversal). Model (2) drops the lagged dependent variable in favor of the mean-averaged count of the number of years since the state last proliferated (pt) or reversed (rt), and its a cubic polynomial (pt2/rt2 = the count squared, and pt3/rt3 = the count cubed). All model specifications in both Table 1 and the alternate controls here provide largely similar results in both direction and magnitude. The model fit (calculated using AIC values) suggest the mean-averaged count of years since proliferation or reversal (pt/rt) reported in Table 1, Model 2 provides a better model fit than a lag of the dependent variables (L.Proliferation/L.Reversal). While cubic polynomials in Model 2 here report lower AIC values (indicative of better model fit), they also generate larger standard errors. AIC values are biased in favor of variable collinearity (such as the highly collinear cubic polynomials), meaning the lower AIC values of Model 2 compared to those in Table 1 may actually result from model

[26]The AIC uses the following equation to estimate model fit:

$$AIC = Tlog\frac{SSE}{T} + 2(k+2) \quad (1)$$

in which T = the number of observations and k = the number of regressors. Lower AIC values represent a better model fit. The criteria penalizes overfitting by inflating k but biases in favor of models with collinear regressors.

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overfitting. The results for these alternate specifications are reported here in full for comparison.

Table 3.3: Pooled Binomial Logit: Alternate Control for Auto-Temporal Correlation

	(1)		(2)	
	Proliferation	Reversal	Proliferation	Reversal
Nuke Sanc	0.78***	0.47	-0.040	0.14
	(0.30)	(0.42)	(0.41)	(0.48)
Other Sanc	0.62***	0.48**	0.069	0.36
	(0.20)	(0.20)	(0.24)	(0.22)
MCT	0.21	-0.066	0.78	0.15
	(0.48)	(0.97)	(0.56)	(1.10)
MID	0.85***	0.74***	0.84**	0.82***
	(0.22)	(0.27)	(0.38)	(0.30)
Reduce Diplo	-0.44**	0.15	-0.43**	0.46*
	(0.17)	(0.20)	(0.20)	(0.26)
Increase Diplo	0.70**	1.01***	0.52**	0.48**
	(0.28)	(0.33)	(0.25)	(0.24)
NCA	1.27***	1.54***	0.36	0.75***
	(0.27)	(0.28)	(0.33)	(0.26)
Aid	-0.13	-0.65**	0.20	-0.69*
	(0.23)	(0.25)	(0.27)	(0.38)
Limited DCA	1.30***	1.40***	1.46***	1.09**
	(0.40)	(0.52)	(0.51)	(0.54)
DCA General	-0.51	-0.95*	-0.54	-1.01**
	(0.42)	(0.51)	(0.52)	(0.48)
1940-1960s	1.63***	-0.28	1.11***	0.23
	(0.26)	(0.46)	(0.34)	(0.71)
1970-80s	1.45***	0.10	0.35	-0.38
	(0.22)	(0.30)	(0.33)	(0.32)
L.Proliferation	1.10***			
	(0.22)			
L2.Proliferation	0.78**			
	(0.33)			
L.Reversal		0.46		
		(0.50)		
L2.Reversal		1.21***		
		(0.39)		
pt			-0.67**	
			(0.33)	
pt2			-0.048	
			(0.03)	
pt3			-0.00086	
			(0.00)	
rt				-0.78*
				(0.41)
rt2				-0.061
				(0.04)
rt3				-0.0013
				(0.00)
Constant	-6.19***	-5.52***	-4.66***	-4.47***
	(0.31)	(0.36)	(0.66)	(1.00)
Observations	6432	6432	1029	666
AIC	1264.1	838.3	647.7	433.8

Standard errors in parentheses
(1) 1 and 2 years lagged DV (2) cubic polynomial of years since prolif/reversal
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

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Panel Binomial Logit: Alternative Parameter Designs

This Model changes the pt/rt so they have a running count for each country of the number of years since they entered the dataset, including before they acquire their first ENR facility. While this increases the N to include pre-proliferation years, it may be inappropriate because these states have not decided to pursue nuclear capabilities. Their proliferation behavior – of no change – before initiating such an option may be different therefore from once this response is available to them.

Table 3.4: Panel Binomial Logit: Population Averaged Model

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.11 (0.33)	0.0090 (0.38)
Other Sanc	0.18 (0.25)	0.034 (0.21)
MCT	0.53 (0.48)	0.13 (1.00)
MID	0.57* (0.25)	0.97** (0.33)
Reduce Diplo	-0.39* (0.19)	0.15 (0.22)
Inrease Diplo	0.16 (0.21)	0.27 (0.20)
NCA	0.26 (0.28)	0.53* (0.24)
Aid	0.18 (0.19)	-0.26 (0.22)
Limited DCA	0.70 (0.38)	0.80 (0.44)
DCA General	-0.17 (0.37)	-0.94* (0.40)
1940-1960s	1.11*** (0.32)	-1.18* (0.57)
1970-80s	1.05** (0.33)	-0.14 (0.28)
pt	-0.11*** (0.03)	
rt		-0.16*** (0.03)
Constant	-3.78*** (0.41)	-3.12*** (0.42)
Observations	1645	1645
qIC	920.61	600.66

Standard errors in parentheses
(1) population averaging with count auto-temp nuclear proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Panel Binomial Logit: Alternative Parameter Designs

The following tests examine alternate panel logit specifications, Model (1) using state fixed effects, and model (2) using population random effects. Unlike the PA model included in the body, both models fully specify the population parameters: FE models by assuming the population is fixed by group (in this case by proliferating state), and RA models specify the population parameters as a distribution.

State fixed effects (in Model 1) account for heterogeneity between groups (in this case, states) by calculating regression estimates within each state, rather than across all states. This method accounts for the possibility that each weapons-seeking state is significantly different from other weapons-seeking states in its response to foreign engagement, and that sending states might predict this and thereby choose different foreign policies for different weapons-seekers *ex ante*. In order to perform such state-specific estimates, however, fixed effects models splits the sample by state, assuming homogeneity within state over time but accounting for heterogeneity between states. This method performs well in panel data in which groups can be assumed to be significantly different from one another, each group generally behaves consistently over time, and for which there are large numbers of observations for each group. Such regression techniques are hampered, however, when the numbers of observations per state are sufficiently small, or when there is significant temporal heterogeneity within states but homogeneity between them.[27] This leads to little significant correlation between any foreign engagement and any nuclear responses, or as Beck and Katz (2001) explain, throwing the proverbial baby out with the bath water.[28][29] Historical evidence (as well as all other test specifications) suggest that this complete lack of effect of foreign engagement on proliferation is implausible, and more likely the result of low count (few numbers of proliferation years) problems within each state.

Random effects specifies the population parameters as a distribution (unlike population-averaged

[27] See the Dirty Pool debate in *International Organizations*, 2001.

[28] Beck, Nathaniel, and Johnathan Katz (2001). Throwing Out the Baby with the Bath Water: A Comment on Green, Kim, and Yoon. *International Organization* 55 (2): 487-495.

[29] Green, Donald P., Soo Yeon Kim, and David H. Yoon (2001). Dirty Pool. *International Organization* 55 (2): 441-468.

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models that do not specify the population parameters, or fixed effects models that considers the population distribution as fixed.[30] This means that RE assume that the population parameters are randomly distributed, and each observation is likewise randomly distributed within those parameters. While random effects models control for unobserved heterogeneity, they assume that individual-specific heterogeneity are not correlated with the independent variables. As a result, random effects models neither estimate average effects across all weapons-seekers (like PA models), nor control for unobserved state idiosyncrasies (like FE models). They are therefore not commonly used for state-specific panel data but are provided here nonetheless for completeness.

Table 3.5: Panel Binomial Logit: FE and RE Models

	(1)		(2)	
	Proliferation	Reversal	Proliferation	Reversal
Nuke Sanc	0.26	-0.058	0.50	0.27
	(0.25)	(0.39)	(0.26)	(0.40)
Other Sanc	0.13	-0.48	0.31	-0.14
	(0.20)	(0.27)	(0.20)	(0.28)
MCT	0.15	-0.097	0.11	-0.072
	(0.48)	(0.78)	(0.49)	(0.79)
MID	0.098	0.098	0.34	0.38
	(0.23)	(0.30)	(0.23)	(0.29)
Reduce Diplo	-0.35	0.061	-0.41*	0.022
	(0.20)	(0.24)	(0.20)	(0.24)
Increase Diplo	-0.051	0.037	0.059	0.20
	(0.27)	(0.32)	(0.28)	(0.34)
NCA	0.16	0.42	0.48*	1.02***
	(0.21)	(0.28)	(0.22)	(0.31)
Aid	0.48	0.39	0.27	0.0059
	(0.31)	(0.45)	(0.29)	(0.37)
Limited DCA	0.46	0.77	0.66	1.14*
	(0.43)	(0.46)	(0.43)	(0.46)
DCA General	-0.28	-1.08*	-0.20	-0.89
	(0.42)	(0.49)	(0.43)	(0.47)
1940-1960s	0.99**	-1.49***	1.34***	-0.85*
	(0.37)	(0.45)	(0.37)	(0.43)
1970-80s	1.34***	-0.36	1.51***	-0.073
	(0.33)	(0.35)	(0.32)	(0.33)
Constant			-7.65***	-6.52***
			(0.59)	(0.56)
lnsig2u			1.56***	1.23**
			(0.35)	(0.43)
Observations	1821	1534	7208	7208
AIC	899.2	576.7	1213.8	828.7

Standard errors in parentheses
(1) state fixed effects (2) random effects
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[30] Scribney, W. "Comparing RE and PA Models", Stata Corps, https://www.stata.com/support/faqs/statistics/random-effects-versus-population-averaged/

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Panel Model: Count and FD IVs

The table shows counts of the number of each foreign policy a proliferator faces in any given year. Using a count model includes more total information available form the data, but has several important drawbacks. First, substantively there is no definitive reason why more of any one policy is necessarily better. More likely in fact, the marginal impact of any additional instances after the first would have significantly weaker effect on the prolfierator's sense of security or drive to nuclearize than did that initial instances. One militarized dispute, for example, would likely be enough to create a sense of insecurity as it suggests clear foreign threat, but the 3rd, 4th, or 10th instance of a MID may not have nearly the same impact. The same argument of diminishing returns can be made for NCAs, diplomatic sanctions, or any other form of engagement. Secondly, there are methodological reasons to use dummy variables (the presence of absence of a specific policy in that year), as this maintains comparability to previous work on proliferation. The presence or absence (0, 1) of MIDs, cooperation agreements, or alliances have been used regularly to test the causes of proliferation in the past.[31] While the main body tests therefore employ dummy variables for theoretical and methodological reasons, count variables are shown here for comparison.

All of the direction and significance of the results corroborate the primary results that test for the presence or absence of the treatments, with one exception. The significance of MIDs for inducing perverse proliferation disappears when using the count rather dummy indicators. The direction is still the same (a positive correlation) but the results are so small as to be insignificant. MIDs have the highest incidence of any foreign policy, (with some country-years experiencing as many as 30+ MID incidents). Possibly as a result of this high incidence of MIDs in some states (either as subsequent or concurrent disputes), the strength and significance of MIDs effect on proliferation drops away.

[31] Gartzke, E. and D.J. Joo, (2009) "Bargaining, Nuclear Proliferation, and Interstate Disputes" *Journal of Conflict Resolution*, 53: 209-233; Singh, S. and C. Way, (2004) "Correlates of Nuclear Proliferation: A Quantitative Test" *Journal of Conflict Resolution* 48: 859-885

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Table 3.6: Panel Binomial Logit: Changes in Number of Each Treatment

	(1) Proliferation	(2) Reversal
Total Sanc Nuke	0.026	-0.20
	(0.14)	(0.23)
Total Other Sanc	0.034	0.017
	(0.08)	(0.09)
Total MCT	0.26	-0.34
	(0.26)	(0.44)
Total MID	0.038	0.11*
	(0.04)	(0.05)
Total Reduced Diplo	-0.20*	0.042
	(0.09)	(0.05)
Total Increase Diplo	0.026	0.090
	(0.10)	(0.16)
Total NCA	-0.0037	0.066*
	(0.05)	(0.03)
Total Aid	-0.00049	-0.14*
	(0.07)	(0.07)
Total Limited DCA	0.21	-0.35
	(0.33)	(0.40)
Total Gen DCA	0.095	-0.16
	(0.26)	(0.34)
1940-1960s	0.82*	-1.26*
	(0.36)	(0.60)
1970-80s	0.71*	-0.25
	(0.34)	(0.25)
pt	-0.10*	
	(0.04)	
rt		-0.16***
		(0.04)
Constant	-2.59***	-2.36***
	(0.32)	(0.31)
Observations	1154	772
AIC	.	.

Standard errors in parentheses
(1) population averaging with count auto-temp controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Linear OLS Models: Simplified Models and Data

While most of the models used here test the likelihood of competing outcomes – proliferation or reversal – these results are estimated using original data that is continuous in nature (total state latency in each year). Likewise, many of the independent variables can also be recorded as the total number of each policy the proliferator faces in any given year by aggregating all of the unique engagements across all senders. While linear OLS models of proliferation behavior can accommodate such continuous variables, they are not properly suited to testing the research question: the likelihood of each type of engagement inducing proliferation or reversal. These estimations are

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therefore simpler checks on the relationship between regressors and outcome variables, they fail to account for some potential outcomes that would have great relevance for counterproliferation policymaking – for example the potential for competing but significant effects on both proliferation and reversal (linear models will estimate no significant effect, while series of logistic regression can capture the potential for success but the simultaneous risk for perverse effects). The linear models are therefore included for completeness, and as a check for potentially divergent results, but provide less traction on the questions posed in this chapter.

Models (1-3) use the total summed latency of the state (led by one year) as the dependent variable, [32] while Model (4) uses the first difference of this value. These specifications find poor fit with the data (very high AIC values), which is logical as they fail to account for the simultaneous and competing incentives to proliferate or reverse in response to the same foreign policies. For example, Table 1 and 2 suggest that MIDs are significantly correlated with both proliferation and reversal. Linear models fail to capture the potential for significant but competing effects, finding only the strongest correlation (either proliferation by increasing latency, or reversing by reducing total latency).

Model (1) reports a simple linear model with robust standard errors, finding that both nuclear and non-nuclear (other) sanctions, as well as MIDs, NCAs, and limited DCAs are all positively correlated with an increase in target total latency the following year. Total diplomatic relations, as well as foreign aid and general DCAs are negatively correlated with total latency, suggesting they lead to nuclear reversal. However, this model does not take into account the heterogeneity between states, so Model (2) reports a panel linear model with state fixed effects, finding that MCTs are now negatively correlated with latency (so positively correlated with reversal) but that nuclear sanctions, MIDs, diplomatic relations, and aid are no longer significant indicators. Model (3) reports a two-way fixed effect linear model, including both state and year (time) fixed effects. General sanctions, NCAs, and limited DCAs were all positively correlated with latency (meaning they were all correlated with proliferation int eh following year), while MCTs and foreign aid were

[32] This is the sum of the ordinal size calculator of every ENR facility in each country in each year. It leads to a nearly continuous indicator of the total state latency annually.

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negatively correlated with latency (meaning positively correlated with reversal). The individual year indicators are omitted for space, but years 1945-1969 were all positively correlated with latency (suggesting states tended to proliferate in that time period), while years 1970-2012 were not significantly correlated with changes in latency. Finally, Model (4) reports a first differenced panel linear regression, first differencing both the dependent and independent variables. This tests annual changes in each foreign policy against annual changes in nuclear latency in the following year. In this model, no policy differences (the start of new engagement or the end of an existing engagement) are significantly correlated with changes in target latency.

Table 3.7: OLS Tests: Total Latency Responses

	(1) Total Latency	(2) Total Latency	(3) Total Latency	(4) FD Total Latency
Nuke Sanc	3.21***	-0.057	-0.100	-0.06
	(0.48)	(0.14)	(0.14)	(0.16)
Other Sanc	2.11***	0.36***	0.37***	.04
	(0.20)	(0.07)	(0.07)	(0.03)
MCT	-0.50	-0.58*	-0.54*	0.07
	(0.71)	(0.24)	(0.23)	(0.06)
MID	1.99***	-0.024	-0.031	0.003
	(0.15)	(0.07)	(0.07)	(0.01)
Total Diplo Relations	-0.096*	-0.00025	-0.0026	-0.004
	(0.05)	(0.01)	(0.01)	(0.00)
NCA	4.06***	0.73***	0.51***	0.02
	(0.28)	(0.09)	(0.09)	(0.02)
Aid	-1.05***	-0.10	-0.44***	-0.04
	(0.12)	(0.09)	(0.10)	(0.03)
Limited DCA	2.88***	0.69***	0.62***	0.07
	(0.27)	(0.13)	(0.13)	(0.07)
DCA General	-0.53**	-0.11	-0.14	-0.03
	(0.18)	(0.12)	(0.12)	(0.07)
1940-1960s	0.50**	-0.80***	-9.22***	0.10**
	(0.16)	(0.10)	(1.66)	(0.03)
1970-80s	0.85***	0.31***	1.13	0.044*
	(0.16)	(0.08)	(1.53)	(0.02)
Observations	6554	6554	6554	6544
AIC/qIC	40783.3	28598.8	28314.4	2849.9

Standard errors in parentheses; (1-3) AIC (4) qIC
(1) simple OLS (2) state fixed effects (3) two-way fixed effects (4) first differenced IV/DV
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The outcome variables for Table 4 instead collapse the effects of foreign policies for both proliferation and reversal, thereby only recording whichever effect is stronger. Direction and magnitude of the estimates are largely similar across all averaged models (those that do not separate proliferation and reversal). Models (1) and (2) test the general latency change recoded as (-1) for reversal,

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(0) for no change, and (1) an increase in nuclear latency. Model (1) measures this using state fixed effects, while Model (2) measures this using a population averaged panel OLS with state clustered errors. Models (3) and (4) use instead a first-difference in the total state-wide latency measure. This measure is similar to the general latency change used in Models (1) and (2), but it records the actual magnitude of the change in target latency change in the year following each foreign policy. Model (3) uses population averaging with state clustered errors, while Model (4) uses state fixed effects. Comparing the different possible outcome variables (either generalized or magnitude of latency change), both the qIC values for the PA models as well as the AIC values for the FE models suggest that the generalized latency change measure provides a better model fit than using the magnitude of change. This is logically consistent, as magnitude of change is likely determined more by the resource and capabilities of the target state, meaning a resource-rich target will be able to make larger proliferation changes from year to year, while an equally motivated resource-poor target will make smaller changes, but in the same general direction (either proliferation or reversal).

Regardless of the magnitude, however, both dependent variable specifications inappropriately collapse policy effects on both proliferation and reversal. As discussed above, the determinants of whether a policy leads to proliferation or reversal may not be fully captured in the covariates available here. Collapsing these opposing outcomes into the average effect makes it likely that these linear models will miss potentially significant but opposing effects. In fact, comparing the results from Table 3 to those in Table 4, we can see that some precision and significance is lost int he collapsed models of Table 4.

Multinomial Logistic Regression

The following table presents a multinomial logistic regression, which account for the potential of simultaneous and competing effects of foreign policies on targets proliferation behavior. This model therefore uses a multinomial (rather than dichotomous) variable for proliferation changes, taking a (1) for increases in proliferator ENR capabilities, a (0) for no change, and a (-1) for a reduction in target ENR capabilities. This allows the multinomial logit design to separate the ef-

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fects of proliferation or reversal from no change, unlike the binomial design with collapses lack of proliferation to include both reversal and no change, and collapses lack of reversal to include both proliferation and no change. While this allows for greater nuance here, it is not an entirely appropriate reflection of the data. Multinomial logistic regression models are intended for dependent variables that reflect largely stationary conditions, rather than those tha change year to year. Proliferation behavior is inherently (and can be seen in the data) to be variable, so that a state that proliferates in one year could very well reverse their gains the following year.

Table 3.8: Pooled Multinomial Logit

	Reversal	Proliferation
Nuke Sanc	0.025	-0.72
	(0.54)	(0.67)
Other Sanc	0.31	0.28
	(0.29)	(0.38)
MCT	0.81	1.02
	(1.15)	(0.89)
MID	1.38***	1.25*
	(0.38)	(0.52)
Reduce Diplo	0.32	-0.72*
	(0.27)	(0.30)
Increase Diplo	0.62*	0.73*
	(0.26)	(0.36)
NCA	0.69*	-0.27
	(0.31)	(0.42)
Aid	-0.26	0.28
	(0.32)	(0.59)
Limited DCA	0.99	1.32*
	(0.51)	(0.56)
DCA General	-1.33**	-0.20
	(0.42)	(0.62)
1940-1960s	0.37	2.24***
	(0.94)	(0.53)
1970-80s	0.62	1.55***
	(0.49)	(0.41)
pt	0.17***	-0.30***
	(0.03)	(0.07)
rt	-0.29***	0.20***
	(0.06)	(0.05)
Constant	-4.45***	-4.65***
	(0.46)	(0.71)
Observations	666	
AIC	770.1	

Standard errors in parentheses
with mean offset auto-regression controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Pairwise Correlation Matrices

The following table examines the collinearity of independent variables used in these tests. These tests find that only General and Limited DCAs come close to the standard cutoff of high collinearity (correlation of 0.7 or higher), but even these two do not quite reach this threshold. In addition, these occasionally collinear DCA variables are often used in very different cases and have different proliferation outcomes, and thus I maintain the two separate variables in the analyses.

Table 3.9: Regressor Correlation Matrix: Basic Conditions

	Nuke Sanc	Other Sanc	MCT	MID	Reduce Diplo	Inrease Diplo	NCA	Aid	Limited DCA	General DCA
Nuke Sanc	1									
Other Sanc	0.034	1								
MCT	0.098	0.0050	1							
MID	0.19	0.046	0.12	1						
Reduce Diplo	0.062	0.077	0.053	0.20	1					
Increase Diplo	0.12	0.086	0.035	0.13	0.13	1				
NCA	0.039	0.073	0.0036	0.071	0.31	0.18	1			
Aid	-0.017	0.22	-0.012	-0.069	0.057	0.045	-0.094	1		
Limited DCA	-0.052	0.19	-0.041	0.070	0.00059	0.100	0.083	0.054	1	
General DCA	-0.067	0.20	-0.045	0.056	-0.0061	0.069	0.084	0.047***	0.69***	1

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Chapter 4: The Dyadic Component

Power and Rivalry of the Sender

In the previous chapter, cross national quantitative analysis suggested that cooperative inducements like nuclear cooperation agreements (NCA) are more effective at inducing nuclear reversal than are coercive policies like militarized interstate disputes. These cooperative inducements were significantly more likely to lead to nuclear reversal, while the coercive policies that led to reversal also significantly increased the risk of inciting greater proliferation instead. These results provide some preliminary support for the theory that cooperative inducements are more effective than coercive policies at inducing deproliferation,[1] but these tests do not account for the variation in the other side of the dyadic engagement coin – the sending state who selects the policies tested in Chapter 3. This chapter therefore adds to the previous analysis by accounting for the dyadic conditions of the foreign policy interaction, examining the impact of the sender's traits on the effectiveness of the deproliferation policies it chooses.

While the previous chapter finds initial support for the theory, that cooperative inducements are more effective than coercive strategies at inducing nuclear reversal in proliferating states, not all senders are equally capable of inducing reversal – or of inadvertently inciting perverse proliferation. Instead, proliferators will moderate their response to deproliferation policies depending on the sender they face. In particular, engagement from nuclear armed rivals will elicit the strongest responses – generating the most effective deproliferation from cooperation and the greatest risk of proliferation from coercion. As such, this chapter analyzes two important sender characteristics that influence the effectiveness of the deproliferation policies they chose – the power of the sender, and that sender's prior relationship with the proliferator.

[1] at least in the short term, examining the year after engagement.

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Sender Conditions: Facing the Mighty or the Meek

Not all sending states have the same degree of influence on the proliferator's security fears. Powerful states, and particularly nuclear armed powers, are disproportionately capable of igniting or alleviating those fears. More powerful senders have greater capacity to inflict harm or offer support, while weaker senders are less able to affect the proliferator's security environment.[2] Nuclear weapons are the ultimate expression of that military capacity, and previous research has demonstrated that nuclear armed states can better deter a foreign attack and thus more readily initiate even conventional conflict than can those states not so equipped.[3] Nuclear armed states are also better able to protect their allies, providing extended deterrence through a nuclear umbrella, meaning these powers can offer greater protection to their friends by threatening greater destruction against potential aggressors.[4] For example, some nuclear capable states entirely dismantled ongoing programs in exchange for US nuclear security guarantees, such as South Korea did in 1951 and Germany in 1953.[5]

As a result, proliferators more heavily weight signals from a nuclear armed sender than signals from a non-nuclear one, meaning they will revise their belief about their security environment in line with the nuclear capacity of the sender they face. Cooperative signals from a powerful sender therefore lead to a greater improvement in the proliferator's security environment than the same signal from a weaker sender.[6] Conversely, conflictual signals from a powerful sender are more threatening, and lead the target to perceive a greater security risk than do similar signals

[2]A large body of literature has examined this. Some canonical examples include: Walt,S. (1987) *The Origin ofAlliances*, Ithaca, New York; Jervis, R. (1982). "Deterrence and perception." *International Security* 7(3), 3-30; Glaser, C. L. (2010).*Rational theory of international politics: the logic of competition and cooperation*, Princeton University Press

[3]Davis, Z.S., and Frankel, B. (eds.) (1993) *The Proliferation Puzzle: Why Nuclear Weapons Spread and What Results*. London: Frank Cass; Frankel, B. (1993) The Brooding Shadow: Systemic Incentives and Nuclear Weapons Proliferation, *Security Studies* 2(3); Bell, M. S., and Miller, N. L. (2015). Questioning the effect of nuclear weapons on conflict, *Journal of Conflict Resolution*,59(1), 74-92

[4]Weede, E. (1983). Extended deterrence by superpower alliance.*Journal of Conflict Resolution,*27(2), 231-253

[5]Pedlow, G. (1999) *NATO Strategy Documents, 1949-1969*, Brussels: NATO Printing; Hughes, C.W. (2004) *Japan's Security Agenda: Military, Economic, and Environmental Dimensions*. Lynne Rienner Publishers

[6]Bleek, P. C., and Lorber, E. B. (2014). Security guarantees and allied nuclear proliferation.*Journal of Conflict Resolution*,58(3), 429-454; Monteiro, N. P., and Debs, A. (2014). The strategic logic of nuclear proliferation.*International Security*,39(2), 7-51

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from a weaker sender. This signaling literature therefore suggests that cooperative signals from powerful senders can more effectively reduce the proliferator's demand for a nuclear weapon, compared to similar inducements from a non-nuclear armed senders. Additionally, as security risks are greater when facing a nuclear-armed sender, the risk of perverse consequences may be greater for coercive policies from powerful senders than similar coercion from weaker senders.

Some existing research argues, however, that more powerful states will also be better positioned to coerce their targets into submission.[7] According to this logic, more powerful senders are actually better capable of overcoming the proliferator's resistance to successfully coerce nuclear reversal.[8] It is therefore unclear whether greater military power is a bane or boon for a state's ability to induce nuclear reversal. The push and pull of the direct policy effects – cooperative rewards and coercive costs – compared to the security signals makes for an uncertain deproliferation policy outcome. This projects therefore examines the policy outcomes of different senders and the different foreign policies they can choose to encourage nuclear reversal in proliferating states.

Dyadic Conditions: Facing Friends or Foes

While a sending state's power mediates its influence over others' behavior, power alone does fully explain why some senders are effective sometimes and not others. Nuclear weapons are in large part a defensive tool, used to deter outside aggression and preserve their possessors against destruction. For this kind of costly and tremendous deterrent to be necessary, the opponent must mean to do harm. A friendly opponent – even a powerful one – that has never demonstrated an intent to do the proliferator harm does not therefore generate significant security incentives for the proliferator to acquire such a powerful nuclear deterrent.

As a result, a proliferator's pursuit of a nuclear weapon is more responsive to the behavior of

[7]Gombert, D. and H. Binnendijk, (2016) "The Power to Coerce: Countering Adversaries without Going to War" *RAND Corporation*. Or for power in sanction success: Allen, S. H. (2005). The determinants of economic sanctions success and failure.*International Interactions*,31(2), 117-138.

[8]Art, R. J. (1980). *To what ends military power?*International Security,4(4), 3-35; Slantchev, B. (2011) *Military Threats: The Costs of Coercion and the Price of Peace*. Cambridge: Cambridge University Press

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its rivals than by its friends. This means that deproliferation engagement from rival senders, regardless of their power, will have a greater impact on the behavior of their targets than will the same engagement from more friendly senders. Cooperation from a rival will do more to reduce the security-motivated demand of the proliferator for a nuclear weapon than will cooperation from a friend – from whom the proliferator did not expect threats anyway – meaning cooperative inducement from a rival will more effectively lead to nuclear reversal in a proliferating state than will cooperative inducements from the proliferator's friends.

This does not mean, however, that rivals are always more effective than friends. Because proliferator's will find security threats from rivals to be more credible and more dangerous than threats from friends, coercive policies that signal such threat will increase the proliferator's security-motivated demand for a nuclear weapon when they come from a rival than from a friend. As a result, the perverse effects of coercive policies[9] will be greater when originating from a rival than from a friend. Together, this means that while cooperative engagement is still more effective than coercive policies at inducing nuclear reversal in proliferating states, cooperation is even more effective, and coercion even more risky, when they come from rival senders than from friendly ones.

Testable Hypotheses

I argue that these outcomes are moderated by the power of the sender that imposes them, so that nuclear armed powers will be more able to reduce the proliferator's security motivated demand for a weapon, but are also more capable of increasing the proliferator's security fears and therefore their demand for a nuclear bomb. I argue that cooperation from a powerful sender will more likely to lead to reversal, but coercion will carry greater risks of perverse proliferation when coming from a nuclear-armed sender than similar moves from a non-nuclear sender.

> **Power Cooperation Hypothesis:** Cooperative policies are more likely to lead to nuclear reversal when coming from a nuclear-armed sender than from a non-nuclear

[9] as discussed and demonstrated in Chapter 3

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sender.

Power Coercion Hypothesis: Coercive policies from a nuclear-armed sender are more likely to lead to increased proliferation than are similar policies from non-nuclear senders.

Likewise, I argue that the dyadic relationship between the sender and proliferator will also impact the latter's response to the foreign policies it faces from the former. Proliferators do not seek security from their friends, rather they balance against threats they perceive from their enemies. States may fear their enemies are contemplating an attack, but are not likely to fear their friends would do the same. Cooperative signals from a rival will therefore reduce the proliferator's security-motivated demand for a nuclear weapon by more than the same cooperation from a friend – the proliferator did not expect threats from a friend in the first place so cooperation from them brings only limited updating to the proliferator's beliefs about its security environment.

Rival Cooperation Hypothesis: Cooperative policies from rival senders are more likely to lead to nuclear reversal than are similar policies from friendly senders.

Rival Coercion Hypothesis: Coercive policies from rival senders are more likely to lead to increased proliferation than are similar policies from friendly senders.

Data and Methods

In order to evaluate the testable implications of this theory, this chapter uses the same dataset from Chapter 3 – aggregating information from 14 existing datasets that together account for ten foreign policy types, nuclear latency, and a suite of standard controls. In addition, these tests account for data on the sender – including the sender's nuclear status (nuclear armed or not) in the year of engagement and its ideological proximity to the proliferator (ideologically distant rivals, or proximate friends). The final dataset maintains a country-year unit of analysis, but preserves

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relevant dyad-year information as well. While the preceding chapter describes the dataset and common variables, the following section describes the data structure and the new sender condition variables included here.

Dependent Variable: Changes in Nuclear Latency

Like the preceding chapter, the analysis of sender conditions measures changes in the proliferator's nuclear latency as the dependent variable.[10] This variable measures changes in the proliferator's total country-wide nuclear latency across all enrichment and reprocessing centers (ENR) taken from the Nuclear Latency Dataset v1.2.[11] Like the preceding chapter, positive changes in latency – or a net increase in country-wide ENR capacity – are measured as proliferation. Negative changes in latency – or net reductions in country-wide ENR capacity – are measured as nuclear reversal. Maintenance of prior ENR levels is recorded as neither proliferation, nor reversal (both variables take a 0 when there is no increase or decrease in the net country-wide sum of ENR capabilities.

Independent Variables: Sender Conditions and Foreign Engagement

The data also captures the same coercive and positive inducement policies as the preceding chapter – including threat and imposition of economic sanctions, militarized interstate disputes, militarized compellent threats, military alliances, diplomatic sanctions, foreign aid, and nuclear cooperation agreements – but to this I add controls for the identity of the sending state. Rather than just the type of policy the proliferator faces, this conditional dataset measures wither the proliferator faced each foreign policy from either a nuclear-armed sender or a non-nuclear sender, and whether it faced each foreign policy from a rival sender or from a friendly one.

The theory suggests that powerful senders – and specifically nuclear armed senders – have

[10] see Chapter 3 for a complete discussion of the root dataset and how the changes in the nuclear latency variable were generated.

[11] Fuhrmann, M. and Tkach, B. (2015) Almost Nuclear: Introducing the Nuclear Latency Dataset. *Conflict Management and Peace Science*32(4)

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a greater impact on the proliferator's threat perceptions. Threats from nuclear-armed senders can heighten the proliferator's security fears more than similar threats from non-nuclear senders, whereas cooperation from nuclear-armed senders can reduce the proliferator's security fears more than similar promises from non-nuclear senders. To compare the proliferator's responses to engagement from nuclear and non-nuclear senders, I therefore generate dichotomous variables that capture whether the proliferator faced each policy type from a nuclear-armed sender in each year, and a separate dichotomous variable that measures whether the proliferator faced that policy from a non-nuclear sender in each year. The nuclear attributes of the sender are taken from the v-Clear dataset,[12] measuring whether the sender is believed to have possessed a nuclear arsenal in the year they imposed the foreign policy.[13]

The theory also suggests that the sender's existing relationship with the proliferator affects the latter's response to engagement. Rival states have a greater impact on the proliferator's security fears, and so cooperative inducements from rival senders will reduce the proliferator's security-motivated demand for a nuclear weapon more than similar inducements from friendly states – from whom cooperation is already expected. To test this, I generate a dichotomous variable for rivalry between sender and target, which measures the ideological proximity between the two. This measure employs the United Nations General Assembly voting patterns drawn from Bailey, Strezhnev, and Voeten (2017),[14], and compares the ideological proximity of any dyadic pair based on their voting patterns. This measure performs well as an instrument of friendly or rivalrous relations because it is both relatively consistent over time, and is independent from any foreign policies – such as formal alliances or defense cooperation agreements. I define the cut-point of rivalry as an ideological distance of greater than 2.0, which is as close a proximity as the US

[12]Smith, B. and W. Spaniel, (2018) Introducing v-CLEAR: A Latent Variable Approach to Measuring Nuclear Proficiency, *Conflict management and Peace Science*, 1-25

[13]Nuclear arsenal status of states are often classified information. There are a few cases where the nuclear status is unconfirmed (Israel post 1970s, North Korea 2006-2009, for example) but these present a relatively small sample of the data. The data used here is also widely employed in nuclear research, making the results replicable and comparable to existing research in the field.

[14]Bailey, M., A. Strezhnev, and E. Voeten (2017) "Estimating dynamic state preferences from united nations voting data." *Journal of Conflict Resolution* 61(2): 430-56.

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came to any USSR-affiliated state during the Cold War.[15] The disadvantage of a measure like this is that there is no clear cut-point for rivalry or friends. I therefore also test alternative cut-points of 1.5 and 2.5 – a stricter and more generous definition of friendly relations, respectively – the results for which are presented in the appendix.

Rather than a single policy variable, these sender conditional variables are broken into two independent variables, which can each take a 0 or 1 in any given year. For example, if a proliferator signed a nuclear cooperation agreement with a nuclear-armed sender in 1970, the NCA-Power variable takes a 1. If the same proliferator also signed an NCA with a non-nuclear sender in 1970, NCA-Weak would also take a 1 in that same year. As a result, while the previous chapter can only account for the types of policies the proliferator faced – for example, signing an NCA with any sender in 1970 – these tests disaggregate the policies from nuclear from non-nuclear armed senders, and the policies imposed by rivals from those imposed by friends.

Controls: Time-Periods and Auto-Regression

The models account for standard time period controls and the same auto-regressive nuclear proficiency controls discussed in the preceding chapter. Static, cross-national decade controls include variables for 1945-1969, 1970-89, and 1990-2012 (the excluded category for collinearity). Auto-regressive controls account for the potential stickiness of proliferation behavior within states, using the count of years since proliferation or reversal, beginning with the first year the potential proliferator either began an exploratory nuclear program or began construction of its first ENR facility.[16]

[15] for reference, the US and USSR were as far apart and 4.0 in the height of the Cold War, and the US and Iran had a distance fo greater than 4.5 after the 1979 Islamic Revolution. On the other hand, close allies like the US and Canada, as well as the US and UK have enjoyed ideological distances of less than 1.0.

[16] In this way, nuclear-capable non-nuclear states are included in the analysis, but their effect is vanishingly small as they continue to abstain from proliferation changes.

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The Complete Dataset

The complete dataset therefore compares the led nuclear response of weapons seeking and nuclear-capable states to the specific policies. The total dataset is therefore structured as country-year units of observation, with separate variables recording whether the country faced each policy from a nuclear-armed or non-nuclear armed sender, and from a rival or friendly sender in a given year.

The following histograms show the total number of individual policy types (Figure 4.1) in country-years. The policy-years represented in Figure 1 come from the individual policies shown in Figure 2. On balance, Figure 1 shows there is a nearly even number of country-years across the dataset in which a state faced coercive or inducement policies, but some types of coercive policies occur over many more years than others. For example, Figure 2 shows there are over 3000 country-years in which the state faced a militarized dispute (MID), but only 104 years in which they faced a militarized compellent threat (MCT), and only 428 country-years in which a state faced nuclear-specific sanctions.

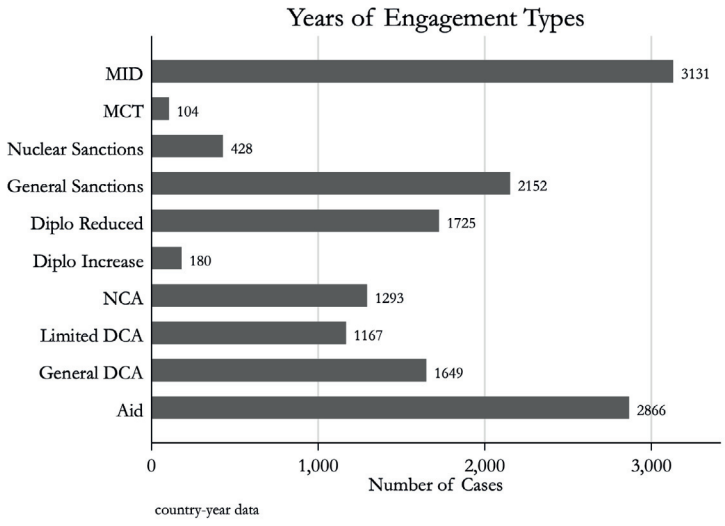

Figure 4.1: Number of Total Policy Years

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Research Methods

To test these hypothesis, I use a series of population averaged panel logistic regression like those used in the preceding chapter. This allows for consistency across chapters and appropriately captures the structure and limits of data. Unlike the previous chapter, however, the design here compares the effects of sender conditions on the outcome of the policies they impose. These tests therefore perform repeated replacement of the unconditional foreign policy variables with conditional policy variables that also capture important attributes of the sending state – comparing if the policy was imposed by a powerful or weak sender, or by a rival or friendly sender. For example, the first model replaces the generic Nuclear Sanction variable with two variables – nuclear sanctions from powerful (nuclear armed) senders, and nuclear sanctions from weak (non-nuclear armed) senders – but keeps all other variables in their basic or unconditional form. The conditional forms – Nuke Sanctions-Power, and Nuke Sanctions-Weak – together capture all the same sanctions included in the basic Nuke Sanctions variable, but allows the tests to differentiate between sanctions imposed by different senders. In some cases, a target may face nuclear sanctions from weaker senders as well as sanctions from more powerful senders, meaning that in that year both Nuke Sanctions-Power, and Nuke Sanctions-Weak will be recorded as 1.

The second model then reverts to the basic nuclear sanctions variable, and replaces the general sanctions with conditional variables – Other Sanc-Power and Other Sanc-Weak. This practice is replicated for each foreign policy, testing first the sender power conditions, and then similarly replicating these tests for rival or friendly senders. This iterative replacement has two advantages over a single model that accounts for all conditional tests.[17] First, it avoids overloading the model with double the number of independent variables, instead splitting only one foreign policy at a time. Second, it allows for more direct comparison to the unconditional tests performed in the previous chapter by maintaining a structure a variable specification close to that of the basic model.

[17] A fully conditionalized model, in which every foreign policy is split into power/weak or rival/friend finds similar results and is included in the appendix for reference.

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The disadvantage of this approach – iteratively replacing the unconditional with the split conditional variable – is that it hinders direct comparison between the conditional tests. In order to facilitate a more complete picture of the effects of sender conditions on proliferation and reversal, these results are therefore presented in figures representing the marginal effects of each conditional variable, the marginal effects of power on proliferation (Figure 4.2) and another on reversal (Figure 4.3), as well as the marginal effects of rivalry on proliferation (Figure 4.4) and another on reversal (Figure 4.5).[18]

Results and Discussion

Panel Binomial Logistic Regression

The following Table 1 estimates proliferation behavior in all weapon-seeking states facing any sender, testing the likelihood of proliferation or reversal in the year after they face each foreign engagement.

Sender Power Tests

The initial test – not conditioned on sender power – shows that MIDs risk both proliferation and reversal, while NCAs increase the likelihood of reversal only. While this suggests that some coercive deproliferation strategies may risk backfiring while some cooperative overtures can increase the chances of reversal without these risks, it does not control for the identity or power of the sending state. The following tests therefore repeat this binomial logistic regression design, but systematically replaces each unconditional policy type with conditional variables. These tests therefore examine the effects of each conditional policy – for example nuclear sanctions from powerful (nuclear armed) senders to nuclear sanctions from weak (non-nuclear armed senders) – while accounting for all other unconditional foreign policies. These tests are repeated for each

[18]The complete models are all listed in the appendix for reference.

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Table 4.1: All Senders: Panel Binomial Logit PA Model

	Proliferation	Reversal
Nuke Sanc	0.070	0.25
	(0.36)	(0.43)
Other Sanc	0.15	0.072
	(0.26)	(0.26)
MCT	0.81	0.27
	(0.49)	(1.02)
MID	0.64**	1.03***
	(0.29)	(0.34)
Reduce Diplo	-0.33*	0.27
	(0.19)	(0.25)
Increase Diplo	0.21	0.14
	(0.20)	(0.23)
NCA	0.20	0.59**
	(0.28)	(0.23)
Aid	0.19	0.038
	(0.17)	(0.31)
Limited DCA	0.32	0.56
	(0.31)	(0.48)
DCA General	0.13	-0.73
	(0.34)	(0.48)
1940-1960s	0.95***	-1.10
	(0.36)	(0.83)
1970-80s	0.85**	-0.20
	(0.34)	(0.33)
pt	-0.12**	
	(0.05)	
rt		-0.18***
		(0.04)
Constant	-3.53***	-3.41***
	(0.39)	(0.44)
Observations	1029	666
qIC	777.68	514.83

Standard errors in parentheses
panel binomial logit with year count auto-regression
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

policy.[19]

As the forest plots here demonstrate, more powerful senders are not more capable of compelling nuclear reversal than their less-powerful counterparts. In fact, only coercive strategy from *non*-nuclear senders were significantly associated with reversal (shown in Figure 4.3), including nuclear sanctions, MCTs, and MIDs. In addition, militarized compellent threats from powerful senders were entirely excluded from this figure for empty cell problems: there are zero instances in the data of MCT's from nuclear-armed powers resulting in reversal.[20]

[19]The complete tables are included in the appendix.
[20]of the 104 instances of MCTs, only 2 resulted in reversal, and both of these were issued by non-nuclear senders.

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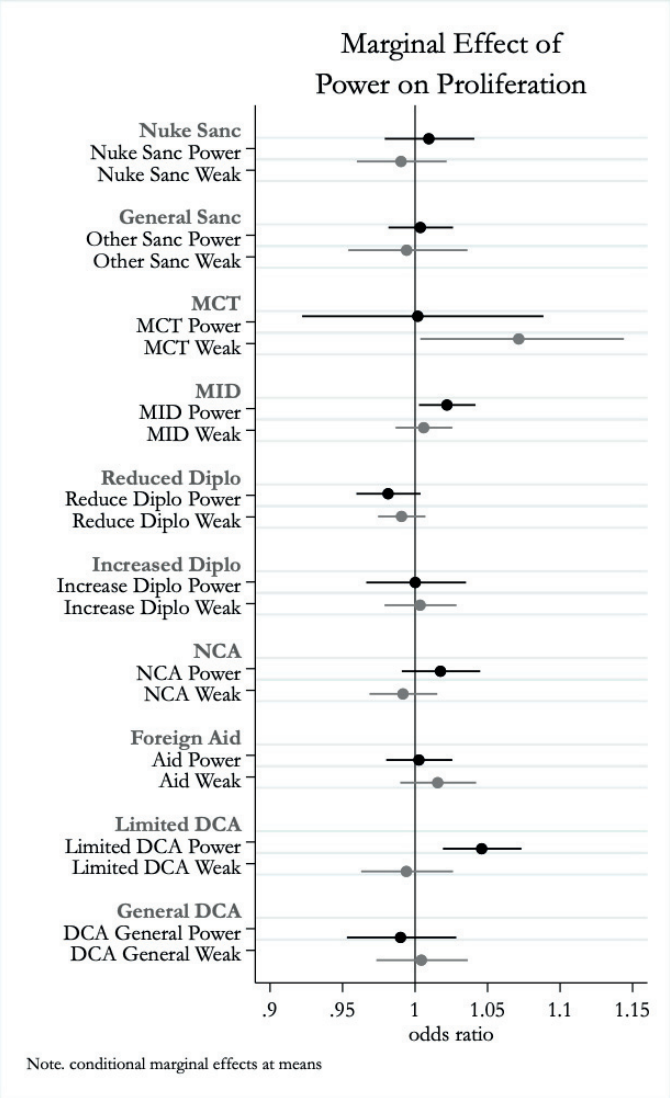

Figure 4.2: Marginal Effects on Proliferation

None of the cooperative strategies from either powerful or weak senders were significantly associated with reversal. Nuclear cooperation agreements from either powerful or weaker senders, as well as limited DCAs from powerful senders all came close, but none of these were significant to the 95% confidence level.[21] The results here are therefore suggestive that coercive power – at least the power of nuclear weapons to compel nuclear reversal – is limited at best, and suggests that a sender's effect on a proliferator's nuclear reversal may come more from the security signals associated with each policy than from the power to coerce or reward directly.

[21] Limited DCAs were only significant at the 90% confidence level.

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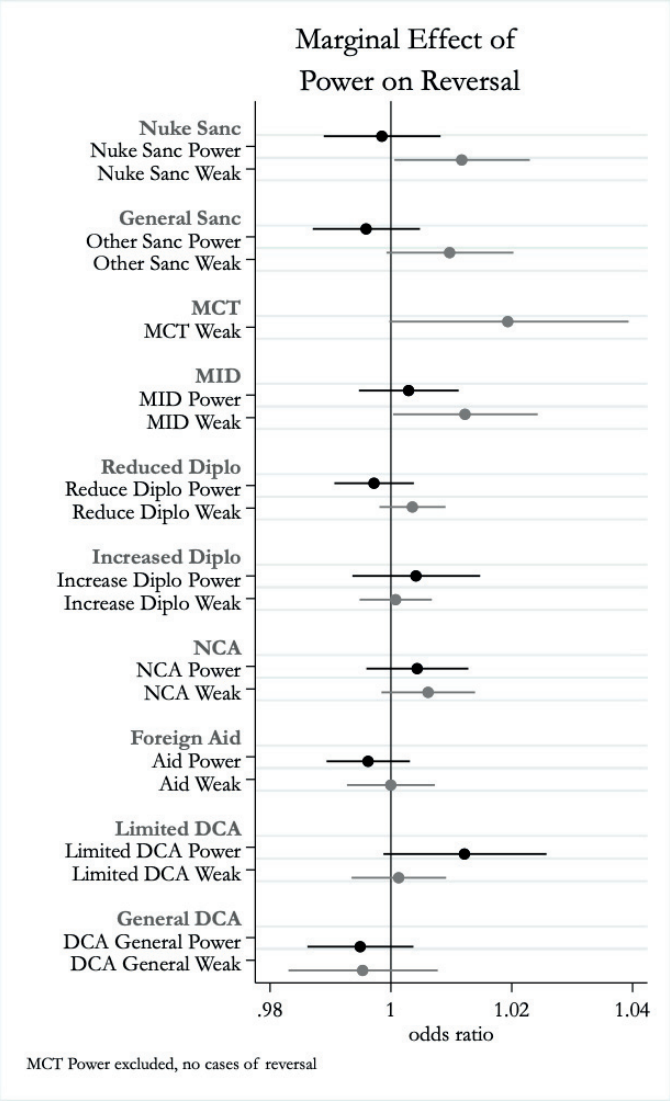

Figure 4.3: Marginal Effects on Reversal

Sender Rivalry Tests

Like the previous test, the following plots demonstrate the effect of rivalrous relationships between the sending state and the proliferator, thus accounting for the dyadic component of the sender-target relationship. The following forest plots therefore compare rival versus friendly senders' prospects for successfully inducing reversal, as well as the risks each pose for inadvertently spurring further proliferation instead. Figure 4.4 shows the relative risks each type of sender poses for increasing proliferation compared to the baseline of no engagement, while Fig-

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ure 4.5 shows the relative likelihood of successfully inducing reversal also compared to the baseline of no engagement.

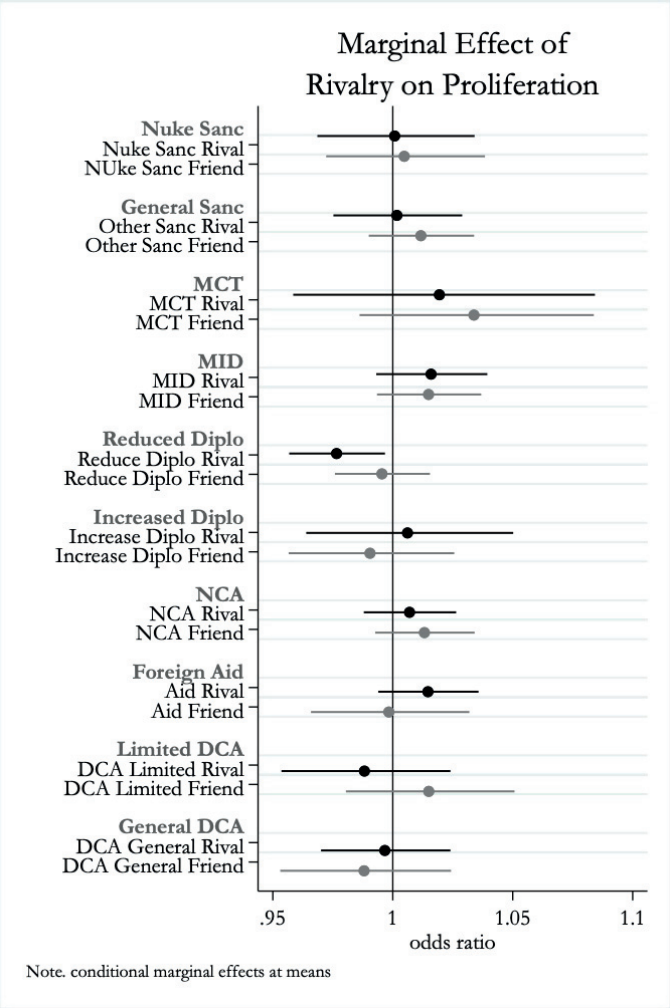

Figure 4.4: Marginal Effects on Proliferation

First, like in the power tests above, the results are less significant across the board than in the unconditional tests from the previous chapter. This is due in large part to the fact that the observations for each policy-type are split between rival and friendly senders, leading to far fewer observations in each sender category than in the unconditional tests that pool different sender types. Despite these more limited observation and reduced significance, the results are still suggestive, bearing further discussion and interpretation. For example, for some of the most promising cooperative inducements found in the preceding chapter – like increased diplomatic engagement and

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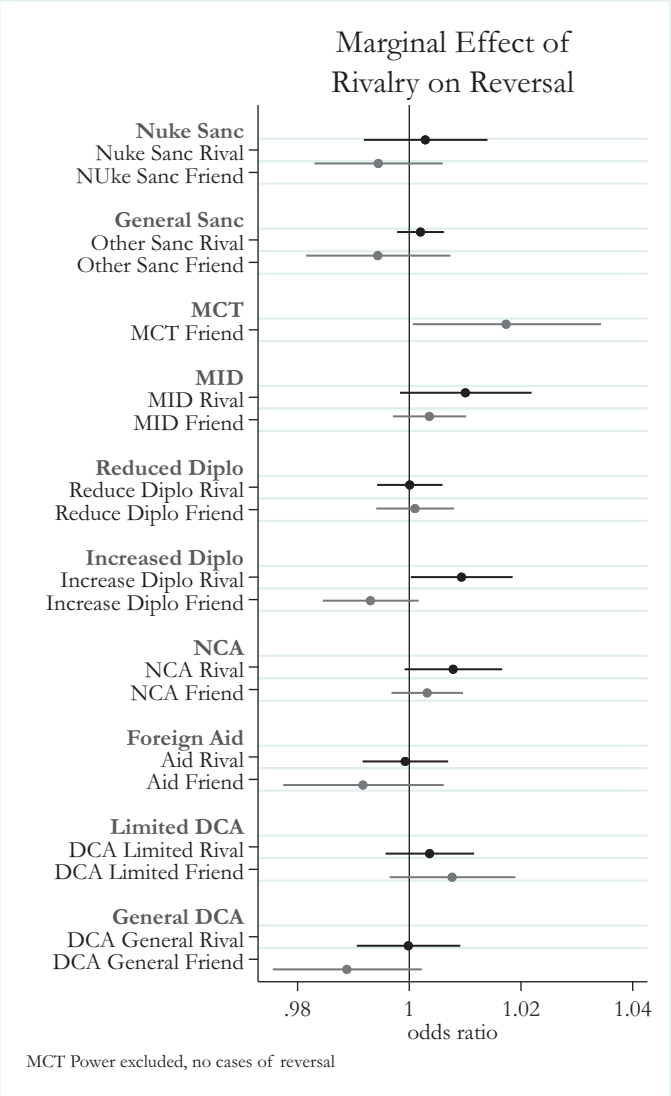

Figure 4.5: Marginal Effects on Reversal

NCAs – show particular promise when offered by rival states (Figure 4.5), and lower risks of inadvertently escalating proliferation (Figure 4.4), consistent with the Rival Cooperation hypotheses presented earlier. Coercive policies show a smaller difference between rivals and friendly senders,[22]

[22]though MCTs are again left out of the reversal estimation for rivals due to empty cell problems. There are no cases of MCTs leading to reversal when the threatening state is a rival. Rival MCTs only ever lead to proliferation, while friendly MCTs pose risks for either outcome.

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Post-Estimation Interpretation

Sender Power

Foreign engagement strategies rarely occur in isolation, so that often cooperative policies are offered together as a comprehensive bag of policy 'carrots', while coercive alternatives are grouped together in a larger bundle of policy 'sticks'. This section therefore examines the predicted probabilities of proliferation and reversal in some high profile proliferation cases. Beyond the effectiveness of specific policy types – as examined in the previous chapter – this section differentiates those predicted probabilities by the types of senders that could have offered these policies. It predicts not only how Libya would have responded in 2002 if it had faced coercion instead of the cooperation, but also how it would have responded to coercion from powerful versus weak senders, as well as friendly versus rival senders.

Some might claim that the ineffectiveness of coercion found in Chapter 3 could come from not conditioning on the power of the sender to coerce its target – power defined here as possessing a nuclear arsenal[23]. The findings in this chapter demonstrate however, that greater power does not translate into a greater coercive power against a nuclear proliferator. For example, applying the model to the case of Libya in 2002, I examine the predicted probability of proliferation and reversal had Libya faced either powerful or weak senders offering a coercive policy package rather than the cooperative inducements that actually led to its denuclearization. What if Libya had faced hawkish engagement from powerful senders, and what if it had instead faced the same policies from weak senders? If the proponents of power as a critical component of coercion are correct, we should see powerful senders extracting greater concessions and thus greater reversal than their weaker counterparts would.

While in both cases, hawkish policies might extract reversal, they were at least as likely to inadvertently spur greater proliferation instead – and maybe even more likely to do so in the case if they come from powerful senders (though this difference is not significant). In fact, powerful

[23] Or believed the possess a nuclear arsenal, since some like Israel believed by the scholarly and international communities to possess nuclear weapons have never explicitly claimed to have them.

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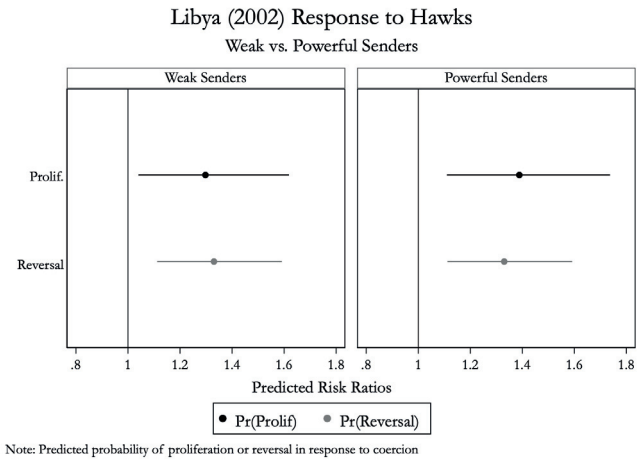

Figure 4.6: Predicted probabilities (in relative risk ratios) of Libyan proliferation and reversal had it faced coercion rather than inducements in 2002.

senders are no more likely to induce reversal than are their weaker counterparts, meaning that the possibly greater risk of proliferation comes with no greater reward for reversal. Sender power, thus does not translate into coercive power to force another to reverse its nuclear program. Even though the senders with nuclear weapons tend to be the most economically connected, conventionally well-armed, and internationally central,[24] even these superior resources do not translate into successful economic sanctions, military threats, or diplomatic censure to induce nuclear reversal.

Given the very mixed predicted response of proliferators to coercion – even coercion from the most powerful senders – let us turn to more cooperative alternatives. If the nuclear powered senders are impotent to coerce compliance, is a sender's power always useless for inducing nuclear reversal in weapons seeking states? I therefore test the predicted probability of proliferation and reversal in high-profile cases of deproliferation engagement. What if the Islamic Republic of Iran in 2005 had received the cooperative inducements its proposed as part of the Grand Bargain and Paris Agreement of 2003 and 2004.[25] While these inducements never manifested,[26] Iran

[24] most often the UN Security Council (UNSC) permanent 5 members (P5) like the US, France, and UK

[25] Both Iran and North Korea attempted to conclude nuclear reversal agreements in 2005, but both failed to conclude their agreements. In both cases, the proliferators had requested some form of negative security guarantees, limited civilian nuclear cooperation agreements, and sanction easement.

[26] Instead, the US followed by France and the United Kingdom in 2005 imposed sanctions for Iran's proliferation.

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requested negative security assurances from the US, as well as recognition and support with a civilian nuclear energy program in return for opening its ENR facilities to IAEA inspection. Iran specifically broached these offers to key nuclear-armed states and powerful members of the UN Security Council, demonstrating that the Islamic Republic at least believed sender's power was important in the inducements it requested.[27] However, when the US and EU3 declined, Iran instead accelerated its enrichment and missile programs in the face of escalating sanctions and international diplomatic censure. The following figure therefore compares the effectiveness of cooperative inducements from powerful, nuclear-armed senders to less powerful senders without an indigenous nuclear arsenal.

Regardless of the sender's power, the predicted risk of Iran perversely proliferating in response to its proposed cooperative policy package is very low – statistically insignificant and lower than that predicted for coercive alternatives. The promise of such cooperation is much greater, and this promise is particularly pronounced when the sender is itself a nuclear-armed state. While the predicted effectiveness of cooperative engagement with Iran in 2005 is thus much more promising than for coercive alternatives, cooperation from powerful senders is much more likely to induce reversal compared to similar assurances from non-nuclear armed senders. Iran facing a dovish policy packages from powerful senders in 2005 is predicted to be 1.4 times (over 40%) more likely to reverse it program than if it did not face such powerful assurances, and statistically much more likely to reverse than proliferate when facing such senders. If Iran faced weaker senders offering the same dovish policies, however, its predicted probability of reversal is less than 1.2 times (or 20%) more than if it did not face these weaker assurances – and this result is also statistically insignificant at the 95% confidence level. As a result, assurances from powerful senders are predicted to be much more effective than similar assurances from weaker senders, though assurances from any sender are more promising and less risky than coercive policy alternatives.

The promise of cooperation from powerful senders is likely due in large part to dispropor-

[27] As we will see in the following section, these states were also some of Iran's greatest rivals, an important attribute in the latter's selection of these senders.

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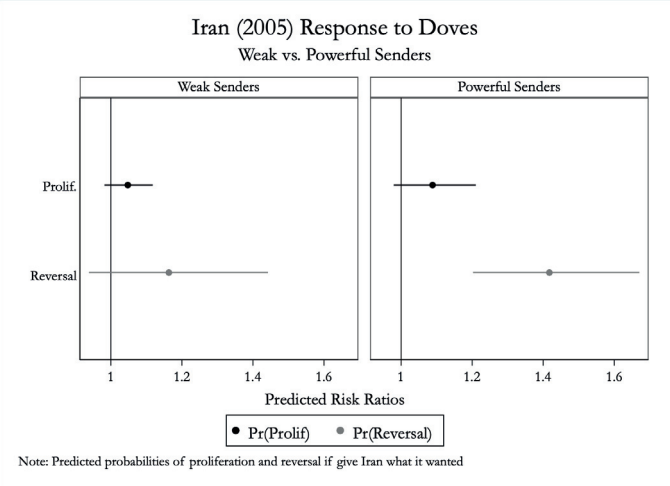

Figure 4.7: Predicted probabilities (in relative risk ratios) of Iranian proliferation and reversal had it received the inducement package it requested in 2005.

tionate ability of these senders to provide the highly coveted inducement of nuclear cooperation agreements – one of the most effective policies as demonstrated in Figure 4.3. Nuclear armed states – and especially the UNSC P5 as NPT-recognized nuclear weapons states – are usually critical to any civilian nuclear cooperation agreement, serving as exporters of nuclear fuel or recipient of spent fuel rods. Beyond their critical position as backers of most NCAs, these powerful senders are also better situated to provide other powerful assurances as well. Nuclear armed states can provide their proteges with the security of a nuclear umbrella.[28] However, nuclear weapons are also associated with greater military reach and adventurism, so even a negative security assurance (like a limited DCA) can reassure prospective proliferators more than negative assurances from non-nuclear armed senders.[29] Finally, nuclear-armed senders also tend to be more economically and politically central in the international system, making them better suitors when they offer trade deals, aid, or diplomatic inducements.

Powerful inducements, however, are not always enough. North Korea, for example, proved its willingness to turn down inducements from some powerful senders in its pursuit of nuclear

[28]The United States and Russia, for example, have both extended the security of their own nuclear arsenals to their key allies, umbrellas that serve as replacements for the allies developing indigenous arsenals of their own.

[29]See for example Bell and Miller (2015) (Bell, M. and N. Miller (2015) "Questioning the effect of nuclear weapons on conflict," *Journal fo Conflict Resolution* 51(1) p.74-92) and Gartzke and Jo (2009) (Gartzke, E. and D-J Jo (2009) "Bargaining, Nuclear Proliferation, and interstate disputes," *Journal fo Conflict Resolution* 53(2): 209-233).

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weapons.[30] The following test examines the predicted probability of proliferation and reversal in North Korea if it had received a similar bag of carrots[31] from either powerful or weak senders in 2005 – the year before it tested its first nuclear weapon despite ongoing Six-Party talks. Neither powerful nor weaker senders provide a better predicted response from North Korea, with neither proliferation nor reversal being statistically significant.[32] If sender power is not always enough to explain the different responses of proliferators to the engagement they face, what differentiates these outcomes?

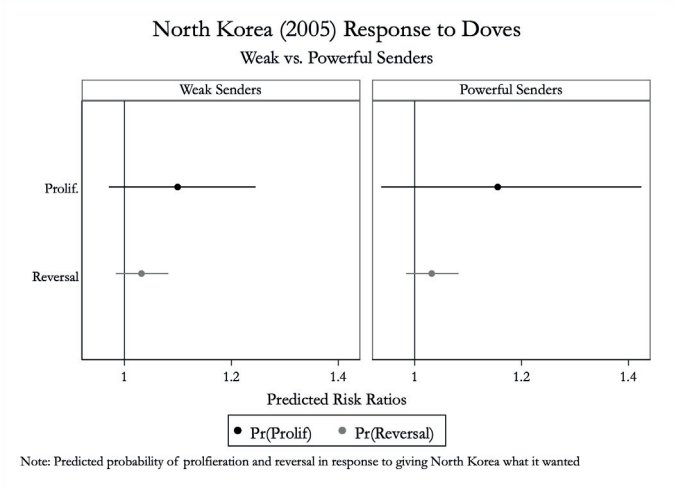

Figure 4.8: Predicted probabilities (in relative risk ratios) of North Korean proliferation and reversal had it received the inducement package it requested in 2005.

Dyadic Rivalry

While conditioning on the power of the sender does not explain the predicted effectiveness of a cooperative policy package for North Korea found in the previous chapter, conditioning on rivalry withe sender helps fill this gap. Testing the same cooperative packages examined above,

[30]For example, North Korea resisted agreement in December 2008 because the US pulled out, despite promises of continued fuel shipments from China and Russia (Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", Fact Sheets and Briefs: Arms Control Association, https://www.armscontrol.org/factsheets/dprkchron).

[31]These dovish policy packages include limited defense cooperation agreements like negative security guarantees, nuclear cooperation agreements, and increased diplomatic engagement.

[32]Though the predicted risk of proliferation is slightly greater than that of reversal in both cases.

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let us instead compare the predicted outcomes for rival versus friendly senders. While aid and assurances from North Korea's most powerful neighbors (China and Russia) were unsuccessful, even more limited overtures from the US in 94 and again in 2000 led to verified reductions in North Korea's ENR capabilities.[33] This preferetial cooperation with rivals at first appear surprising given the large body of literature suggesting that cooperation between allies is easier and more credible than similar engagement between rivals.[34] However, North Korea's primary security fears – and thus its security motivation for pursuing its 'nuclear deterrent'[35] came from its primary rival, the United States. China and Russia, on the other hand, had each been security benefactors for decades and therefore did not pose an existential security threat that would not justify the need for such a costly deterrent.

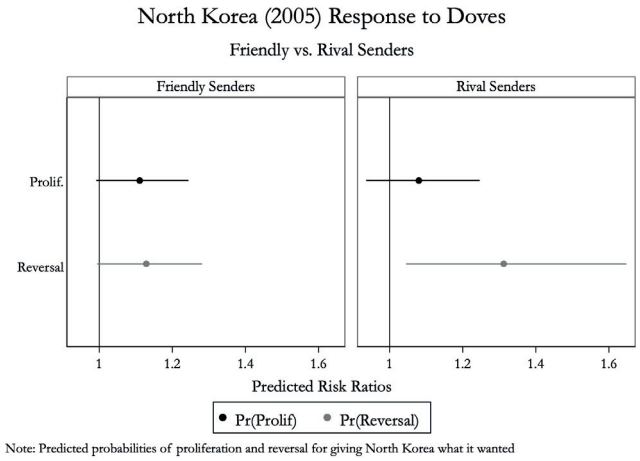

Figure 4.9: Predicted probabilities (in relative risk ratios) of North Korean proliferation and reversal had it received the inducement package it requested in 2005.

Instead, as demonstrated in Figure 4.9, the predicted probability of reversal in response to rival senders[36] is much greater than that of similar cooperation from traditionally friendly senders.

[33] See Chapter 6 for further discussion of this case in detail.

[34] Boehmer, C., E. Gartzke, and T. Nordstrom, "Do intergovernmental organizations promote peace?" *World Politics*, 57(1), p.1-38; Bearce, D. and S. Bondanella (2007) "Intergovernmental Organizations, socialization, and member-state interest convergence" *International Organizations* 61(4), p.703-733

[35] As members of the DPRK foreign ministry refered to the program after 2006 (See Hecker, S. (2006) "Report on North Korean nuclear program", *Center for International Security and Cooperation* for further discussion.

[36] Providing the same cooperative policy package North Korea requested as part of the Six Party talks, including normalized diplomatic relations, civilian nuclear assistance, and limited security assurances

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While this set of cooperative assurances from rivals generates increases the predicted probability of North Korean nuclear reversal by over 30% (or 1.3 times more than no cooperative assurances), its predicted probability in response to the same package from friendly senders is less than 20% more than no cooperation at all. Consistent with the unconditional tests from the previous chapter, neither sender significantly increases the predicted probability of proliferation, but these policies are more effective coming from rivals than when they are offered by friends.

The finding of preferential cooperation with rivals also holds up when tested against Iran in 2005. As noted earlier, Iran had requested cooperative assurances including recognition for its right to a civilian program and security assurances from the US and EU3 in 2003 and 2004, but negotiations broke down in 2005. While the previous section examined the importance of the senders' power – for example, the fact that Iran sought out assurances from three nuclear armed senders – this section examines the difference between such assurances from rivals versus friendlier senders. Figure 4.10 shows the predicted probability of Iran's proliferation or reversal in response to cooperation from friendly senders compared to the same overtures from rivals. A cooperative package from a rival sender is not only more likely to lead to reversal than to proliferation, the difference in the predicted probability of these competing outcomes is much greater when offered by rivals than when offered by traditionally friendly states.[37] In fact the greatest predicted probability of reversal – coupled with one of the lowest risks of perverse proliferation – can be seen here in response to cooperative assurance from rival senders. While cooperation from traditionally friendly senders does increase the predicted probability of reversal, the unique ability of rival senders (like Iran's nemesis, the US or "Great Satan", and its former imperial aggressor, the United Kingdom) to reassure provided the best possibility for successful reversal.

A cooperative package from a rivals sender is not only more likely to lead to reversal than to proliferation, the difference in the predicted probability of these competing outcomes is much greater when offered by rivals than when offered by traditionally friendly states.[38] In fact the

[37]Like North Korea, Iran specifically sought out cooperation from its nemesis, the so-called "Great Satan" the United States, and its former colonial imperialist the United Kingdom. It did not target cooperation from more proximate states like Russia.

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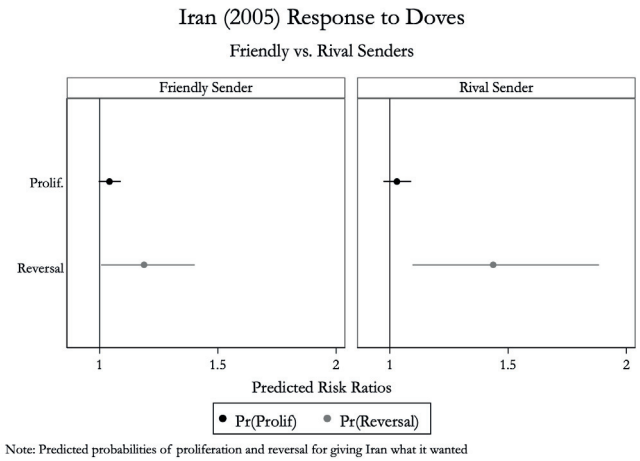

Figure 4.10: Predicted probabilities (in relative risk ratios) of Iranian proliferation and reversal had it received the inducement package it requested in 2005.

greatest predicted probability of reversal – coupled with one of the lowest risks of perverse proliferation – can be seen here in response to cooperative assurance from rival senders. While cooperation from traditionally friendly senders does increase the predicted probability of reversal, the unique ability of rival senders (like Iran's nemesis, the US or "Great Satan", and its former imperial aggressor, the United Kingdom) to reassure provided the best possibility for successful reversal.

The ability of rivals to reassure is not accompanied, however, with a greater ability to coerce. While literature has demonstrated that threats from rivals may appear more credible than threats from allies[39] – arguably making the former better suited to extracting concessions from their target – the credibility of their threats does not actually translate into the ability to effectively extract nuclear reversal concessions. For example, Figure 4.11 shows the predicted probability of proliferation and reversal in Libya if it had faced a coercive policy package from either friendly or rival senders in 2002.[40]

States, and its former colonial imperialist the United Kingdom. It did not target cooperation from more proximate states like Russia.

[39]Fearon, J. (1997) "Signaling foreign policy interests: Tying hands versus sinking costs", *Journal of Conflict Resolution*, 41(1), p.68-90; Kydd, A., (2005) *Trust and Mistrust in International Relations*, Princeton, NJ: Princeton University Press

[40]This answers the question: what if Libya had faced coercion instead of the cooperation that actually led to reversal in 2003? It mirrors the same tests performed in the previous section comparing weak and powerful senders.

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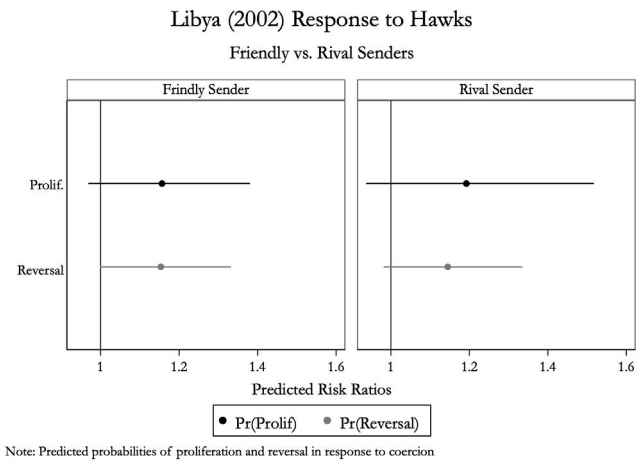

Figure 4.11: Predicted probabilities (in relative risk ratios) of Libyan proliferation and reversal had it faced coercion rather than inducements in 2002.

Neither traditionally friendly nor rival senders are predicted to be effective at coercing Libya into reversing its nuclear program in 2002. While both friends and rivals might have coerced reversal (though neither are significant at the 95% confidence interval) both friends and rivals posed similar probabilities of risking inadvertently escalating proliferation instead. If anything, rival senders actually pose a slightly higher predicted probability of proliferation than reversal,[41] while friendly senders pose generally equal risks of both. These results suggest that neither friends now rivals are effective at coercing reversal, though both are equipped to cooperatively induce this prefered response. These results are therefore consistent with the Rival Cooperation and Rival Coercion hypotheses – finding that rival senders are even more effective at cooperatively inducing reversal than are friendly ones, but that rival senders pose a greater risk of perversely increasing proliferation through coercion than do their friendlier counterparts.

[41] Though again these differences are not significant.

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Conclusions and Further Research

Combined, these results corroborate the both unconditional Cooperative and Coercive hypotheses tested in Chapter 3[42] as well as the hypotheses regarding how proliferators condition their responses to the senders they face. Consistent with the Power Cooperation and Coercion hypotheses, nuclear-armed senders are more effective in their cooperative assurances but also riskier in their coercive policies than are non-nuclear weaker senders. Likewise, consistent with the Rival Cooperation and Coercion hypotheses, rival senders are both more effective in their cooperative assurances and more risky in their coercive attempts than are senders with a traditionally friendly relationship with the proliferator. The most effective policy package is therefore one of cooperative assurances – like NCAs, security assurances, and diplomatic engagement – from rival powers, much like those Iran and North Korea each requested of their nuclear armed rivals in 2005. By contrast, the least effective and most risky policy package consists of coercive strategies – like threats or use of military force, as well as threats or imposition of various economic sanctions – likewise from powerful rivals, though coercion from friendlier or weaker senders also posed significant risks.

These findings contribute to both scholarly and applied policy research on foreign policies and nuclear deproliferation engagement specifically. Policymakers have often focused on the use of coercive 'sticks' like sanctions, diplomatic censure, or military threats the induce reversal in proliferating states,[43] but the cross-national analysis of policy outcomes from 1945-2012 suggests that coercion is less effective than cooperative assurances – presenting lower probabilities of reversal with greater risks of perverse proliferation instead. In addition, the identity of the sending state matters in nuclear deproliferation engagement, but not always in the ways previous research on international engagement and bargaining might lead us to believe. While some research has found that more powerful or rival states may be better able than weaker friendlier states to coerce concessions from their adversaries, this research actually finds evidence that these states actually

[42]Finding that in the high-profile historical examples of counterproliferation engagement, the inducement package carried fewer risks and greater potential rewards than the hawkish alternatives.

[43]See for example recent tactics toward North Korea and Iran, for example.

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run even greater risks of perverse consequences when it comes to deproliferation engagement specifically. Likewise, though research on international cooperation tends to find that shared institutional networks and a history cooperation facilitate the negotiation of agreements, this work suggests that rival states – and specifically powerful rivals – are actually more effective than long-time allies at inducing nuclear reversal in proliferating states.

These results support the hypotheses introduced in this study, but further scrutiny is required to understand when and why these findings hold up in real cases of deproliferation engagement. In addition, cross-national, observational data can fall prey to selection biases and endogenous selection.[44] Within case comparisons of proliferator responses to engagement help control for the heterogeneity between proliferators, by evaluating the response of a single proliferator to multiple different policies. In addition, cross-national analysis necessarily examines policies for which there is reliable, global data, meaning specially crafted proposals or uniquely negotiated policy packages are not fully represented in the data. Again, qualitative analysis can help provide insight here, allowing a closer analysis of the specific caveats or creative approaches that can make up the deproliferation engagement process.

Finally, the findings have important implications for ongoing issues in international security – most notably in the prospects for engagement with the now-nuclear-armed North Korea, as well as for preventing nuclear break-out in the Islamic Republic of Iran[45] so I now turn to close scrutiny of these two critical cases. How do the prospects for cooperative or coercive policies manifest in these two cases over the long periods of their international engagement over their respective nuclear programs? What conditioned these prolfierators' responses to different foreign policies, and why did each acquiesce in some cases, or double down in others?

[44] in which senders selectively choose the toughest sanctions or perhaps the cheapest policies to combat the hardest cases of reversal – making these policies appear even more ineffective for having been preferentially used against those least likely to reverse, for example.

[45] At the time of writing, both cases are top priorities for the United States and its allies.

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Appendix

The main marginal effects figures compare proliferator responses to different senders for only the significant effects across the repeated models. Below are the complete models that iteratively compare the effect of sender power in each of the foreign policies. These models employ the population averaged panel binomial logistic regression discussed in the body, and control for the presence of other foreign policies without overloading the model with many independent variables of interest at once.

Table 4.2: Sender Power: Nuclear Sanctions (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc Power	0.21	-0.14
	(0.34)	(0.45)
Nuke Sanc Weak	-0.22	1.07*
	(0.36)	(0.49)
Other Sanc	0.18	0.14
	(0.25)	(0.22)
MCT	0.50	0.085
	(0.50)	(0.98)
MID	0.60**	0.91**
	(0.23)	(0.33)
Reduce Diplo	-0.38*	0.14
	(0.18)	(0.22)
Increase Diplo	0.16	0.23
	(0.21)	(0.21)
NCA	0.28	0.39
	(0.28)	(0.28)
Aid	0.14	-0.23
	(0.19)	(0.18)
Limited DCA	0.72*	0.81
	(0.36)	(0.45)
DCA General	-0.18	-0.95*
	(0.36)	(0.42)
1940-1960s	1.11***	-1.11*
	(0.32)	(0.55)
1970-80s	1.05**	-0.065
	(0.33)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.17***
		(0.03)
Constant	-3.63***	-4.03***
	(0.48)	(0.61)
Observations	1645	1645
qIC	924.08	594.88

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.3: Sender Power: Other Sanctions (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.11	-0.044
	(0.33)	(0.37)
Other Sanc Power	0.081	-0.36
	(0.24)	(0.33)
Other Sanc Weak	-0.13	0.85
	(0.46)	(0.55)
MCT	0.53	0.061
	(0.48)	(1.03)
MID	0.60**	0.94**
	(0.22)	(0.33)
Reduce Diplo	-0.38*	0.14
	(0.19)	(0.21)
Increase Diplo	0.16	0.26
	(0.21)	(0.20)
NCA	0.27	0.52
	(0.28)	(0.27)
Aid	0.17	-0.19
	(0.20)	(0.19)
Limited DCA	0.71	0.88
	(0.38)	(0.47)
DCA General	-0.17	-0.97*
	(0.37)	(0.44)
1940-1960s	1.07***	-1.15*
	(0.32)	(0.53)
1970-80s	1.02**	-0.12
	(0.33)	(0.30)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.61***	-3.76***
	(0.56)	(0.66)
Observations	1645	1645
qIC	928.07	599.16

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.4: Sender Power: MCTs (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.15	0.047
	(0.35)	(0.38)
Other Sanc	0.18	0.016
	(0.25)	(0.19)
MCT Power	0.042	–
	(0.94)	
MCT Weak	1.53*	1.58*
	(0.67)	(0.69)
MID	0.56*	0.93**
	(0.25)	(0.33)
Reduce Diplo	-0.37*	0.18
	(0.19)	(0.23)
Increase Diplo	0.18	0.29
	(0.21)	(0.20)
NCA	0.24	0.50*
	(0.28)	(0.23)
Aid	0.18	-0.26
	(0.18)	(0.22)
Limited DCA	0.71	0.83
	(0.38)	(0.44)
DCA General	-0.16	-0.93*
	(0.38)	(0.41)
1940-1960s	1.13***	-1.21*
	(0.32)	(0.59)
1970-80s	1.04**	-0.15
	(0.33)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.78***	-3.11***
	(0.41)	(0.42)
Observations	1645	1645
qIC	921.33	596.17

Standard errors in parentheses
Reversal (2) fails to converge when including MCT Power
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.5: Sender Power: MIDs (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.12	-0.077
	(0.32)	(0.36)
Other Sanc	0.19	0.11
	(0.25)	(0.22)
MCT	0.48	0.0022
	(0.48)	(1.00)
MID Power	0.48*	0.24
	(0.22)	(0.34)
MID Weak	0.13	1.02***
	(0.23)	(0.25)
Reduce Diplo	-0.40*	0.097
	(0.20)	(0.24)
Increase Diplo	0.11	0.092
	(0.22)	(0.19)
NCA	0.25	0.52*
	(0.29)	(0.24)
Aid	0.16	-0.23
	(0.20)	(0.22)
Limited DCA	0.63	0.77
	(0.37)	(0.46)
DCA General	-0.15	-0.95*
	(0.36)	(0.43)
1940-1960s	1.05**	-1.22*
	(0.32)	(0.54)
1970-80s	1.03**	-0.016
	(0.33)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.65***	-3.13***
	(0.43)	(0.41)
Observations	1645	1645
qIC	922.20	595.2

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.6: Sender Power: Reduced Diplo (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.13	-0.0016
	(0.33)	(0.38)
Other Sanc	0.16	0.045
	(0.25)	(0.21)
MCT	0.54	0.12
	(0.49)	(0.98)
MID	0.58*	0.97**
	(0.25)	(0.32)
Reduce Diplo Power	-0.42	-0.23
	(0.24)	(0.24)
Reduce Diplo Weak	-0.22	0.32
	(0.18)	(0.24)
Increase Diplo	0.15	0.24
	(0.20)	(0.19)
NCA	0.28	0.56*
	(0.27)	(0.24)
Aid	0.18	-0.26
	(0.18)	(0.21)
Limited DCA	0.72	0.84
	(0.37)	(0.45)
DCA General	-0.17	-0.96*
	(0.37)	(0.41)
1940-1960s	1.15***	-1.12
	(0.32)	(0.59)
1970-80s	1.06***	-0.091
	(0.32)	(0.30)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.82***	-3.17***
	(0.40)	(0.43)
Observations	1645	1645
qIC	921.44	600.11

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.7: Sender Power: Increase Diplo (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.12	0.00014
	(0.32)	(0.37)
Other Sanc	0.18	0.041
	(0.25)	(0.22)
MCT	0.54	0.12
	(0.49)	(1.01)
MID	0.57*	0.97**
	(0.25)	(0.33)
Reduce Diplo	-0.38*	0.15
	(0.19)	(0.22)
Increase Diplo Power	0.0030	0.33
	(0.39)	(0.41)
Increase Diplo Weak	0.075	0.040
	(0.27)	(0.26)
NCA	0.26	0.54*
	(0.28)	(0.23)
Aid	0.19	-0.25
	(0.18)	(0.22)
Limited DCA	0.70	0.81
	(0.37)	(0.43)
DCA General	-0.15	-0.93*
	(0.37)	(0.40)
1940-1960s	1.12***	-1.18*
	(0.32)	(0.58)
1970-80s	1.06**	-0.14
	(0.33)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.79***	-3.13***
	(0.41)	(0.43)
Observations	1645	1645
qIC	924.06	603.10

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.8: Sender Power: NCA (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.096	0.033
	(0.32)	(0.38)
Other Sanc	0.18	0.027
	(0.25)	(0.21)
MCT	0.52	0.13
	(0.49)	(1.03)
MID	0.58*	0.93**
	(0.25)	(0.33)
Reduce Diplo	-0.38*	0.092
	(0.19)	(0.22)
Increase Diplo	0.18	0.24
	(0.20)	(0.20)
NCA Power	0.39	0.36
	(0.29)	(0.27)
NCA Weak	-0.18	0.49
	(0.26)	(0.33)
Aid	0.18	-0.23
	(0.19)	(0.21)
Limited DCA	0.68	0.80
	(0.36)	(0.45)
DCA General	-0.15	-1.01*
	(0.38)	(0.40)
1940-1960s	1.10***	-1.20*
	(0.31)	(0.56)
1970-80s	1.05**	-0.22
	(0.32)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.78***	-3.07***
	(0.39)	(0.40)
Observations	1645	1645
qIC	921.70	597.89

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.9: Sender Power: Foreign Aid (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.12	0.0056
	(0.33)	(0.37)
Other Sanc	0.19	0.041
	(0.25)	(0.21)
MCT	0.53	0.13
	(0.48)	(1.01)
MID	0.58*	0.98**
	(0.24)	(0.33)
Reduce Diplo	-0.40*	0.15
	(0.19)	(0.22)
Increase Diplo	0.16	0.26
	(0.20)	(0.20)
NCA	0.26	0.53*
	(0.29)	(0.23)
Aid Power	0.059	-0.31
	(0.26)	(0.27)
Aid Weak	0.34	0.088
	(0.29)	(0.30)
Limited DCA	0.69	0.78
	(0.39)	(0.44)
DCA General	-0.19	-0.93*
	(0.38)	(0.41)
1940-1960s	1.15***	-1.18*
	(0.33)	(0.57)
1970-80s	1.10**	-0.14
	(0.35)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.81***	-3.13***
	(0.44)	(0.43)
Observations	1645	1645
qIC	922.01	602.01

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.10: Sender Power: Limited DCA (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.12	0.031
	(0.32)	(0.39)
Other Sanc	0.18	0.014
	(0.25)	(0.20)
MCT	0.56	0.16
	(0.48)	(1.02)
MID	0.59*	0.96**
	(0.25)	(0.32)
Reduce Diplo	-0.40*	0.17
	(0.19)	(0.22)
Increase Diplo	0.20	0.28
	(0.21)	(0.19)
NCA	0.24	0.51*
	(0.28)	(0.24)
Aid	0.16	-0.22
	(0.18)	(0.21)
Limited DCA Power	1.04***	1.01*
	(0.26)	(0.47)
Limited DCA Weak	-0.14	0.031
	(0.36)	(0.30)
DCA General	-0.16	-0.96*
	(0.36)	(0.43)
1940-1960s	1.25***	-1.10
	(0.33)	(0.60)
1970-80s	1.19***	-0.037
	(0.30)	(0.32)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.91***	-3.20***
	(0.39)	(0.45)
Observations	1645	1645
qIC	917.61	599.79

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.11: Sender Power: General DCA (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.11	0.041
	(0.33)	(0.38)
Other Sanc	0.18	0.052
	(0.25)	(0.19)
MCT	0.52	0.14
	(0.48)	(1.00)
MID	0.56*	0.94**
	(0.24)	(0.33)
Reduce Diplo	-0.39*	0.17
	(0.19)	(0.23)
Increase Diplo	0.15	0.25
	(0.21)	(0.21)
NCA	0.25	0.50*
	(0.28)	(0.23)
Aid	0.19	-0.29
	(0.19)	(0.23)
Limited DCA	0.64	0.61
	(0.34)	(0.44)
DCA General Power	-0.22	-0.40
	(0.42)	(0.36)
DCA General Weak	0.076	-0.34
	(0.35)	(0.43)
1940-1960s	1.13**	-1.11
	(0.35)	(0.57)
1970-80s	1.06**	-0.10
	(0.35)	(0.32)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.78***	-3.17***
	(0.42)	(0.41)
Observations	1645	1645
qIC	924.05	607.42

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.12: Sender Rivalry: Nuclear Sanctions (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc Rival	0.018	0.24
	(0.37)	(0.47)
NUke Sanc Friend	0.11	-0.47
	(0.38)	(0.41)
Other Sanc	0.19	0.0066
	(0.24)	(0.22)
MCT	0.56	0.046
	(0.50)	(1.06)
MID	0.59*	0.99**
	(0.24)	(0.34)
Reduce Diplo	-0.40*	0.16
	(0.19)	(0.22)
Increase Diplo	0.16	0.31
	(0.21)	(0.21)
NCA	0.24	0.65*
	(0.28)	(0.29)
Aid	0.19	-0.36
	(0.18)	(0.21)
Limited DCA	0.67	0.89*
	(0.36)	(0.45)
DCA General	-0.18	-0.93*
	(0.37)	(0.41)
1940-1960s	1.12***	-1.18*
	(0.32)	(0.56)
1970-80s	1.06**	-0.12
	(0.33)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.85***	-2.85***
	(0.48)	(0.49)
Observations	1645	1645
qIC	925.84	601.22

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.13: Sender Rival: Other Sanctions (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.14	-0.025
	(0.34)	(0.39)
Other Sanc Rival	0.038	0.17
	(0.30)	(0.19)
Other Sanc Friend	0.26	-0.47
	(0.25)	(0.45)
MCT	0.53	0.14
	(0.48)	(1.00)
MID	0.58*	0.99**
	(0.24)	(0.33)
Reduce Diplo	-0.39*	0.15
	(0.19)	(0.22)
Increase Diplo	0.13	0.31
	(0.21)	(0.21)
NCA	0.23	0.60*
	(0.29)	(0.27)
Aid	0.19	-0.39*
	(0.19)	(0.19)
Limited DCA	0.69	0.83
	(0.40)	(0.44)
DCA General	-0.16	-0.91*
	(0.39)	(0.40)
1940-1960s	1.09***	-1.14*
	(0.33)	(0.54)
1970-80s	1.04**	-0.13
	(0.33)	(0.28)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.90***	-2.82***
	(0.41)	(0.49)
Observations	1645	1645
qIC	926.30	599.78

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.14: Sender Rival: MCTs (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.12	0.0084
	(0.33)	(0.37)
Other Sanc	0.18	0.0019
	(0.25)	(0.19)
MCT Rival	0.43	–
	(0.71)	
MCT Friend	0.74	1.42*
	(0.55)	(0.67)
MID	0.57*	0.95**
	(0.25)	(0.33)
Reduce Diplo	-0.39*	0.17
	(0.19)	(0.23)
Increase Diplo	0.17	0.29
	(0.21)	(0.20)
NCA	0.26	0.52*
	(0.28)	(0.24)
Aid	0.18	-0.26
	(0.18)	(0.22)
Limited DCA	0.70	0.83
	(0.38)	(0.44)
DCA General	-0.17	-0.94*
	(0.37)	(0.40)
1940-1960s	1.12***	-1.21*
	(0.32)	(0.58)
1970-80s	1.05**	-0.16
	(0.33)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.78***	-3.11***
	(0.41)	(0.42)
Observations	1645	1645
qIC	922.34	596.44

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.15: Sender Rival: MIDs (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.10	-0.031
	(0.32)	(0.41)
Other Sanc	0.16	0.011
	(0.26)	(0.22)
MCT	0.52	0.13
	(0.49)	(1.05)
MID Rival	0.34	0.77**
	(0.26)	(0.30)
MID Friend	0.32	0.28
	(0.23)	(0.25)
Reduce Diplo	-0.38*	0.19
	(0.19)	(0.22)
Increase Diplo	0.11	0.19
	(0.23)	(0.20)
NCA	0.23	0.51*
	(0.28)	(0.23)
Aid	0.17	-0.23
	(0.19)	(0.24)
Limited DCA	0.67	0.74
	(0.39)	(0.46)
DCA General	-0.11	-0.89*
	(0.39)	(0.43)
1940-1960s	1.11***	-1.24*
	(0.32)	(0.55)
1970-80s	1.07**	-0.14
	(0.33)	(0.28)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.66***	-2.94***
	(0.39)	(0.38)
Observations	1645	1645
qIC	926.51	603.78

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.16: Sender Rival: Reduced Diplo (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.14	0.0092
	(0.32)	(0.38)
Other Sanc	0.19	0.042
	(0.24)	(0.21)
MCT	0.53	0.11
	(0.47)	(0.99)
MID	0.58*	0.99**
	(0.25)	(0.31)
Reduce Diplo Rival	-0.54*	0.0059
	(0.22)	(0.24)
Reduce Diplo Friend	-0.10	0.12
	(0.23)	(0.28)
Increase Diplo	0.16	0.28
	(0.20)	(0.20)
NCA	0.25	0.55*
	(0.27)	(0.24)
Aid	0.17	-0.26
	(0.18)	(0.22)
Limited DCA	0.70	0.80
	(0.38)	(0.43)
DCA General	-0.18	-0.95*
	(0.39)	(0.39)
1940-1960s	1.12***	-1.19*
	(0.32)	(0.57)
1970-80s	1.05**	-0.13
	(0.33)	(0.28)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.81***	-3.12***
	(0.41)	(0.42)
Observations	1645	1645
qIC	922.71	603.09

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.17: Sender Rival: Increase Diplo (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.12	-0.012
	(0.33)	(0.41)
Other Sanc	0.17	-0.0011
	(0.25)	(0.21)
MCT	0.54	0.15
	(0.49)	(1.04)
MID	0.58*	0.97**
	(0.25)	(0.33)
Reduce Diplo	-0.38*	0.14
	(0.19)	(0.23)
Increase Diplo Rival	0.14	0.77**
	(0.48)	(0.29)
Increase Diplo Friend	-0.21	-0.50
	(0.39)	(0.35)
NCA	0.26	0.55*
	(0.28)	(0.23)
Aid	0.22	-0.18
	(0.20)	(0.23)
Limited DCA	0.71*	0.80
	(0.36)	(0.44)
DCA General	-0.15	-0.95*
	(0.36)	(0.39)
1940-1960s	1.13***	-1.19*
	(0.31)	(0.58)
1970-80s	1.07***	-0.17
	(0.32)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.79***	-3.12***
	(0.40)	(0.43)
Observations	1645	1645
qIC	926.41	596.32

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.18: Sender Rival: NCA (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.12	-0.016
	(0.32)	(0.40)
Other Sanc	0.19	0.044
	(0.25)	(0.22)
MCT	0.52	0.20
	(0.46)	(1.00)
MID	0.59*	0.99**
	(0.25)	(0.32)
Reduce Diplo	-0.42*	0.097
	(0.19)	(0.22)
Increase Diplo	0.15	0.24
	(0.20)	(0.20)
NCA Rival	0.16	0.65*
	(0.21)	(0.26)
NCA Friend	0.30	0.24
	(0.24)	(0.25)
Aid	0.20	-0.30
	(0.18)	(0.22)
Limited DCA	0.68	0.77
	(0.39)	(0.44)
DCA General	-0.18	-0.91*
	(0.38)	(0.38)
1940-1960s	1.12***	-1.22*
	(0.32)	(0.56)
1970-80s	1.03**	-0.20
	(0.34)	(0.27)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.81***	-3.07***
	(0.40)	(0.42)
Observations	1645	1645
qIC	917.62	595.97

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.19: Sender Rival: Foreign Aid (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc	0.10	0.010
	(0.33)	(0.37)
Other Sanc	0.17	0.019
	(0.25)	(0.21)
MCT	0.52	0.094
	(0.49)	(1.03)
MID	0.58*	0.94**
	(0.25)	(0.33)
Reduce Diplo	-0.40*	0.15
	(0.19)	(0.22)
Increase Diplo	0.17	0.28
	(0.22)	(0.20)
NCA	0.27	0.57*
	(0.28)	(0.24)
Aid Rival	0.33	-0.060
	(0.23)	(0.32)
Aid Friend	-0.042	-0.59
	(0.38)	(0.52)
Limited DCA	0.71*	0.86*
	(0.36)	(0.43)
DCA General	-0.18	-0.91*
	(0.37)	(0.40)
1940-1960s	1.16***	-1.13
	(0.33)	(0.58)
1970-80s	1.08**	-0.14
	(0.34)	(0.28)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.84***	-3.16***
	(0.42)	(0.42)
Observations	1645	1645
qIC	921.86	602.23

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.20: Sender Rival: Limited DCA (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc Power	0.17	-0.17
	(0.34)	(0.45)
Nuke Sanc Weak	-0.22	1.07*
	(0.36)	(0.49)
Other Sanc	0.19	0.15
	(0.24)	(0.21)
MCT	0.48	0.068
	(0.50)	(0.99)
MID	0.60**	0.90**
	(0.23)	(0.34)
Reduce Diplo	-0.37*	0.14
	(0.19)	(0.22)
Increase Diplo	0.16	0.21
	(0.21)	(0.21)
NCA	0.28	0.40
	(0.28)	(0.29)
Aid	0.13	-0.20
	(0.20)	(0.17)
DCA Limited Rival	-0.25	0.33
	(0.38)	(0.28)
DCA Limited Friend	0.33	0.53
	(0.36)	(0.40)
DCA General	0.18	-0.91*
	(0.31)	(0.42)
1940-1960s	0.98**	-1.17*
	(0.33)	(0.56)
1970-80s	0.94**	-0.11
	(0.31)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.17***
		(0.03)
Constant	-3.50***	-3.95***
	(0.47)	(0.62)
Observations	1645	1645
qIC	931.77	596.38

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.21: Sender Rival: General DCA (PA Model)

	(1) Proliferation	(2) Reversal
Nuke Sanc Power	0.21	-0.12
	(0.34)	(0.45)
Nuke Sanc Weak	-0.21	1.07*
	(0.35)	(0.48)
Other Sanc	0.18	0.14
	(0.25)	(0.22)
MCT	0.49	0.098
	(0.50)	(0.98)
MID	0.60**	0.91**
	(0.23)	(0.33)
Reduce Diplo	-0.39*	0.15
	(0.19)	(0.22)
Increase Diplo	0.17	0.23
	(0.21)	(0.21)
NCA	0.29	0.37
	(0.28)	(0.28)
Aid	0.13	-0.27
	(0.19)	(0.18)
Limited DCA	0.82*	0.71
	(0.38)	(0.41)
DCA General Rival	-0.084	0.00024
	(0.30)	(0.35)
DCA General Friend	-0.29	-0.79
	(0.40)	(0.45)
1940-1960s	1.08**	-1.08
	(0.33)	(0.56)
1970-80s	1.02**	-0.044
	(0.35)	(0.30)
pt	-0.11***	
	(0.03)	
rt		-0.17***
		(0.03)
Constant	-3.60***	-4.05***
	(0.49)	(0.62)
Observations	1645	1645
qIC	925.15	598.43

Standard errors in parentheses
population averaging with count auto-temp proficiency controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Fully Conditional Models

The following models estimate fully conditional binomial logit designs: The first examines powerful versus weak senders across all foreign policies, the second fully conditional model examines rival versus allied senders across all foreign policies. The direction and magnitude of the results are similar across all policies to the results of the iteratively replaced models (Table 4.2 - 4.21), though significance is generally lower in the fully conditional models. This is expected from the inclusion fo additional variables, and the qIC values also reflect this penalization for the large number of covariates necessary for a fully conditional model. These models are included here for completeness, but are not replicated in the body.

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Table 4.22: Sender Power: Fully Conditional Panel Binomial Logit(PA)

	(1) Proliferation	(2) Reversal
Nuke Sanc Power	0.17	0.029
	(0.33)	(0.46)
Nuke Sanc Weak	-0.35	0.58
	(0.56)	(0.64)
Other Sanc Power	0.10	-0.29
	(0.22)	(0.30)
Other Sanc Weak	0.24	-0.058
	(0.72)	(0.79)
MCT Weak	1.79***	1.55*
	(0.52)	(0.78)
MID Power	0.49*	0.19
	(0.25)	(0.36)
MID Weak	0.19	0.81**
	(0.30)	(0.25)
Reduce Diplo Power	-0.51*	-0.17
	(0.23)	(0.27)
Reduce Diplo Weak	-0.16	0.18
	(0.19)	(0.27)
Increase Diplo Power	-0.015	0.28
	(0.40)	(0.40)
Increase Diplo Weak	0.046	-0.014
	(0.29)	(0.22)
NCA Power	0.36	0.44
	(0.27)	(0.27)
NCA Weak	-0.17	0.43
	(0.27)	(0.42)
Aid Power	-0.000079	-0.18
	(0.27)	(0.30)
Aid Weak	0.40	-0.22
	(0.36)	(0.29)
Limited DCA Power	1.09**	0.92*
	(0.34)	(0.42)
Limited DCA Weak	-0.23	0.016
	(0.30)	(0.39)
DCA General Power	-0.48	-0.37
	(0.42)	(0.32)
DCA General Weak	0.042	-0.59
	(0.41)	(0.45)
1940-1960s	1.16**	-1.21*
	(0.39)	(0.51)
1970-80s	1.14***	-0.088
	(0.34)	(0.35)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.56***	-3.43***
	(0.53)	(0.63)
Observations	1843	1843
qIC	993.1	636.44

Standard errors in parentheses
(1) population averaging with count auto-temp controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 4.23: Sender Rivalry: Fully Conditional Panel Binomial Logit(PA)

	(1) Proliferation	(2) Reversal
Nuke Sanc Rival	-0.0060	0.26
	(0.36)	(0.49)
NUke Sanc Friend	-0.46	-0.22
	(0.80)	(0.65)
Other Sanc Rival	-0.013	0.11
	(0.28)	(0.23)
Other Sanc Friend	0.52	-0.16
	(0.61)	(0.74)
MCT Rival	0.42	
	(0.72)	
MCT Friend	0.76	1.62**
	(0.54)	(0.57)
MID Rival	0.44	0.70**
	(0.33)	(0.22)
MID Friend	0.21	0.35
	(0.28)	(0.22)
Reduce Diplo Rival	-0.57*	-0.17
	(0.26)	(0.28)
Reduce Diplo Friend	-0.13	0.20
	(0.28)	(0.28)
Increase Diplo Rival	0.088	0.73**
	(0.49)	(0.28)
Increase Diplo Friend	-0.32	-0.47
	(0.42)	(0.29)
NCA Rival	0.18	0.67*
	(0.21)	(0.32)
NCA Friend	0.28	0.42
	(0.23)	(0.30)
Aid Rival	0.34	-0.40
	(0.28)	(0.28)
Aid Friend	0.15	-0.42
	(0.27)	(0.48)
DCA Limited Rival	-0.33	0.23
	(0.37)	(0.22)
DCA Limited Friend	0.37	0.35
	(0.45)	(0.37)
DCA General Rival	0.11	-0.038
	(0.39)	(0.40)
DCA General Friend	-0.10	-0.60
	(0.45)	(0.44)
1940-1960s	0.87*	-1.43**
	(0.39)	(0.51)
1970-80s	0.86*	-0.35
	(0.38)	(0.29)
pt	-0.11***	
	(0.03)	
rt		-0.16***
		(0.03)
Constant	-3.39***	-2.55***
	(0.56)	(0.49)
Observations	1843	1843
qIC	1020.21	632.55

Standard errors in parentheses
(1) population averaging with count auto-temp controls
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Pairwise Correlation Matrices

The following table examines the collinearity of independent variables used in these tests. These tests find that only General and Limited DCAs come close to the standard cutoff of high collinearity (correlation of 0.7 or higher), but even these two do not quite reach this threshold. In addition, these occasionally collinear DCA variables are often used in very different cases and have different proliferation outcomes, and thus I maintain the two separate variables in the analyses.

Table 4.24: Regressor Correlation Matrix: Basic Conditions

	Nuke Sanc	Other Sanc	MCT	MID	Reduce Diplo	Increase Diplo	NCA	Aid	Limited DCA	General DCA
Nuke Sanc	1									
Other Sanc	0.034	1								
MCT	0.098	0.0050	1							
MID	0.19	0.046	0.12	1						
Reduce Diplo	0.062	0.077	0.053	0.20	1					
Increase Diplo	0.12	0.086	0.035	0.13	0.13	1				
NCA	0.039	0.073	0.0036	0.071	0.31	0.18	1			
Aid	-0.017	0.22	-0.012	-0.069	0.057	0.045	-0.094	1		
Limited DCA	-0.052	0.19	-0.041	0.070	0.00059	0.100	0.083	0.054	1	
General DCA	-0.067	0.20	-0.045	0.056	-0.0061	0.069	0.084	0.047***	0.69***	1

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Chapter 5: Tackling Tehran

Deproliferation Engagement with the Islamic Republic of Iran

The preceding chapters have all presented findings on the statistical relationships between foreign engagement with potential proliferators, providing cross-national and generalizable conclusions about the effectiveness of specific strategies. Such large-N analysis does not, however, provide good traction on the causal mechanisms that motivate the associations. The subsequent chapters therefore dive deeper into the engagement processes with two proliferators over the course of their nuclear programs, drawing from original interviews of key policymakers as well as archival, primary, and secondary source research to examine why some engagement strategies led to reversal agreements and verifiable rollback, while others led to increased proliferation or invigorated nuclear pursuits instead. These chapters test the effectiveness of nuclear deproliferation policies in engagement with Iran and North Korea, using within-case comparison across the years that each of these potential proliferators pursued a nuclear (weapons) program.[1]

This chapter uses within-case[2] comparison of nuclear deproliferation negotiations with the Islamic Republic of Iran to examine the conditions that facilitated successful reversal, as well as those that led to perverse proliferation. This method — comparing different engagement instances within one proliferator — in this case, in particular, provides key insights to the mechanisms that facilitate or hinder nuclear reversal negotiations. First, case

[1] I use existing research in each case to determine the time period when Iran and North Korea each pursued a nuclear program. While each state has alleged at one point or another that they were not seeking nuclear weapons, only nuclear energy, both scientific research and international policymakers have found evidence of nuclear-related activities outside the purview of purely civilian behavior. Whether Iran or North Korea actually intended their activities at every point in their supposed weapons pursuit to be dedicated to military purposes is not essential for this analysis, as the outcome of interest here is compliance with international requests for nuclear reversal, not a cessation of an explicit weapons program. Rolling back previously noncompliant dual-use programs reduces international concern about nuclear proliferation even if the deproliferating state had not intended those technologies to be used for weapons-building purposes.

[2] While I employ two separate country cases, these are not for between-case comparison purposes. Some common lessons may arise from multiple within-case comparisons, but the primary analysis is performed by comparing different negotiation attempts with one country at different times.

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studies in general provide critical insight into the mechanisms behind observed outcomes.[3] Such studies allow close examination of when and why deproliferation negotiations succeed, rather than whether or not they do succeed, adding dimension and insight to the generalizable analysis of the preceding chapters. In addition, the method of within-case analysis allows for comparability between engagement instances, controlling for any possible country-specific idiosyncrasies.[4] This is especially important when studying issues like nuclear rollback agreements as the states that have pursued nuclear weapons are arguably not a random or representative selection of all states that could do so — meaning comparing between cases is subject to confounding variables between comparison cases like state size, political institutions, alliance arrangements, and much more. In addition, senders do not impose policies at random, but rather craft the deproliferation engagement strategy they deem to be the most likely to succeed in the particular case at hand, for example using the cheapest tools against the easiest reversal cases and pulling out the big guns only against the most resistant cases.[5] As a result, examining the effects of a single proliferator to different policies helps control for cross-national heterogeneity, meaning differences in negotiation outcomes within a single proliferator are a good reflection of the conditions surrounding the negotiations and are not driven by than differences between the proliferators themselves.[6]

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[3] Goertz, G. (2017) *Multimethod Research, Causal Mechanisms, and Case Studies: An Integrated Approach*, Princeton, NJ: Princeton University Press

[4] Beach, D. (2017, January 25). Process-Tracing Methods in Social Science. *Oxford Research Encyclopedia of Politics.* Ed. http://oxfordre.com/politics/view/10.1093/acrefore/9780190228637.001.0001/acrefore-9780190228637-e-176

[5] This non-random assignment of policy to proliferator also suggests there is endogenous selection of policy to the likelihood of proliferation. For example, arguably senders could choose the easiest policies for those most likely to reverse and the strongest inducements for the toughest cases, leading to potential selection biases in observational data.

[6] "When using process tracing, many scholars claim that we do not need to utilize evidence of difference-making across cases (or subunits of cases) in order to make inferences (George & Bennett, 2005; Collier, Brady, & Seawright, 2010; Mahoney, 2012). Instead, we can use observational within-case empirical material left by the workings of a causal mechanism within an actual case to make inferences about the existence of a mechanism in a case, a form of evidence that is termed "mechanistic evidence" in recent work in the philosophy of science (Russo & Williamson, 2007; Illari, 2011). The term "mechanistic evidence" is a more precise formulation of the type of evidence used in process tracing than the widely used term "causal process observation," which is a broader term that refers to information about *both* context and mechanisms, defined as "… an insight or piece of data that provides information about the context or mechanism and contributes a

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These cases provide additional insight into proliferator responses to engagement, but also into the choice of senders to use one type of policy over another. For example, in the following chapter, we will see many instances if international sanctions against Iran intending to coerce reversal. However, there are not many instances of reductions in diplomatic relations or any militarized disputes.[7] The lack of variation in coercion reflects the senders' preferential use of sanctions against this particular case and limits the analysis on the effectiveness of other coercive tools. However, though senders have largely focused on different forms of sanctions in their coercive efforts, they have employed creative and varied forms of cooperative strategies. Many positive inducements in both Iran and North Korea were uniquely developed by the senders to reflect the proliferator's unique demands, and then further tailored in negotiations. As a result, these cases provide greater depth of insight into the type and effects of positive inducements in a way that cannot be captured in the cross-national data. Together, the mix of methods – the preceding quantitative tests and the following case studies – provide a fuller picture of deproliferation policy effectiveness.

In addition, I select the particular case of the Islamic Republic of Iran as a subject for within-case analysis for several reasons. First, Iran has had an active and contested nuclear weapons programs for many years, and has engaged in a number of attempted nuclear reversal negotiations over the course of its program.[8] These multiple negotiation attempts therefore provide several instances to compare across time while still controlling for a relatively stable institutional type, leadership, demographic characteristics, and regional security environments. In addition, Iran's behavior has changed in response to different

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different kind of leverage in causal inference. It does not necessarily do so as part of a larger, systematized array of observations …" (Collier, Brady, & Seawright, 2010, pp. 184–185)." in Beach, D. (2017, January 25). Process-Tracing Methods in Social Science. *Oxford Research Encyclopedia of Politics.* Ed. http://oxfordre.com/politics/view/10.1093/acrefore/9780190228637.001.0001/acrefore-9780190228637-e-176

[7] In part because the key senders like the United States had already closed their embassy in Iran after the 1979 Islamic Revolution.

[8] Rezaei, F. (2017) *Iran's Nuclear Program: A Study in Proliferations and Rollback*, Gewerbestrasse, Switzerland: Springer, Palgrave MacMillan

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inducement attempts, providing variation in the dependent variable of proliferation behavior. Finally, Iran's nuclear program remains of significant concern to many states, though its proliferation behavior in the past few years has paused.[9] As a result, the analysis performed here can provide insight into a particularly policy-relevant case, and demonstrates how the findings of both the cross-national and case study research may be applied to ongoing foreign policy issues.

This chapter proceeds as follows. It begins with a short background explaining when and why Iran initiated a nuclear program, and what led to this program becoming of concern to the international community. It then describes the major negotiations that different concerned states have conducted with the Islamic Republic over the course of that program, including the Grand Bargain and ensuing Paris Agreement, the 2007 Work Plan, and the most recent Joint Comprehensive Plan of Action (JCPOA). It follows with a discussion of the conclusions drawn from this history, as well as the possible counterarguments and their weaknesses for understanding the successes and failures in engaging with the Islamic Republic of Iran. Finally, it concludes with the policy implications that this case provides, as well as a discussion of further research that would help shed further light on the effectiveness of deproliferation engagement tactics more broadly.

History of the Iranian Nuclear Program:

Iran first began pursuing nuclear technology for energy purposes in the 1950s as part of the Atoms for Peace program with support from the United States, Great Britain, and France. However, support with these benefactors as well as the flow of available resources to the

[9] According to IAEA inspection reports, which find no proliferation noncompliance with JCPOA safeguards since the signing of the deal in 2015 (GOV/2019/10 (Feb 22 2019) "Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)" *IAEA Board OF Governors,* https://www.iaea.org/sites/default/files/19/03/gov2019-10.pdf)

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program ran dry after the 1979 Islamic Revolution. The revolution ousted the American-backed Shah and brought to power an Islamic theocracy that directly opposed the history of "imperialist meddling" of the United States and the Western world order more generally in the internal affairs of Iran. The revolution and the ensuing Hostage Crisis ended all formal diplomatic ties with the United States, leading to a period of internal upheaval marked by both political and military foreign conflict. Having cut ties with all its previous benefactors[10], Iran was suddenly vulnerable to reinvigorated conflict with its neighboring rivals,[11] and shortly after the fledgling Islamic Republic took power, Iraq invaded Iran. This initiated an eight-year-long war between the two neighboring rivals that eventually cost Iran between 500,000 and 1 million lives and ended in a stalemate.[12] The protracted and costly war with Iraq diverted Iran's resources toward short term conventional capabilities, but Iran returned to its nuclear program in the 1980s, initially on an exploratory scale but accelerated to an organized pursuit of both nuclear energy and a clandestine weapons program by the late 1990s.[13]

International concern about possible nuclear proliferation in Iran began in the 1990s following the discovery of evidence by the United States of collusion between the Iranian government and the nuclear supplier network of AQ Khan, including the transfer of

[10] The United States had backed and protected the regime from both domestic upheaval and regional rivals since the 1950s, before which the United Kingdom had played much the same role. This support ended abruptly in 1979 when Mohammed Reza Shah and his government was ousted and replaced by the Islamic Republic of Iran. (See Ansari, A. (2007) *Confronting Iran: The Failure of American Foreign Policy and the Next Great Conflict in the Middle East*, Philadelphia, PA: Basic Books)

[11] As the only Shia majority country in a predominantly Sunni region, Iran has strained relations with several of powers in its region including Saudi Arabia and Iraq, all which have vied for regional leadership and dominance. (See for example: Salimal-Rawashdeh, M. (2016) "The Regional competition for the leadership fo the Middle East region", *Scholars Journal of Arts, Humanities, and Social Sciences* 4(3A) 176-192) In addition, the Islamic Republic has very divisive relations with Israel, who is believed to have acquired nuclear weapons in the 1970s (Israel has neither confirmed nor denied this widespread assumption).

[12] Hiro, D. (1991) *The Longest War: The Iran-Iraq Military Conflict*. New York: Routledge; Bercovitch, J. and R. Jackson, (1997) *International Conflict: A Chronological Encyclopedia of Conflicts and Their management 1945-1995;* Black, I. "Iran and Iraq remember war that cost more than a million lives", *The Gaurdian,* (Sept 23, 2010)

[13] Sinha, Shreeya and Susan Campbell Beachy, April 2, 2015, "Timeline of Iran's Nuclear Program", *New York Times,* (https://www.nytimes.com/interactive/2014/11/20/world/middleeast/Iran-nuclear-timeline.html)

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schematics for weapons designs in 1987.[14] This prompted greater international interest in the Iranian nuclear program and sparked a contentious deproliferation battle that continued for over a decade.[15]

Over the course of this battle, Iran faced multiple forms of coercive pressure and positive inducements from different states at different times. Coercive tactics relied primarily on economic and political sanctions – though some sender's have also threatened military attack[16] – while positive inducements have ranged from technical cooperation to sanction relief. These tactics have been imposed unilaterally by different senders, multilaterally by groups of states, and even formally by international organizations. As a result, the changing engagement tactics from international powers and the corresponding responses from Tehran provide ample within-case variation to assess the conditions that facilitated or hindered nuclear rollback.[17]

The international deproliferation efforts against Iran began when evidence surfaced of collusion between the Islamic Republic and the black market nuclear supplier network of AQ Khan.[18] The US responded to this evidence by imposing new sanctions against the Islamic Republic as part of the Iraq-Iran Nonproliferation act of 1992, and when these did not change Iran's pursuit, followed with further sanctions in 1996 as part of the Iran-Iraq Sanctions Act. While both the 1992 and 1996 sanctions specifically targeted nuclear supply networks[19] —

[14] Sinha, Shreeya and Susan Campbell Beachy, April 2, 2015, "Timeline of Iran's Nuclear Program", *New York Times,* (https://www.nytimes.com/interactive/2014/11/20/world/middleeast/Iran-nuclear-timeline.html)
[15] This effort arguably continues through the writing of this article, as the United States has withdrawn from the most recent agreement, the Joint Comprehensive Plan of Action and the future of Iran's nuclear program remains unclear.
[16] Black, I. (Nov. 28, 2009) "Israel primed to attack a nuclear Iran", *The Guardian*, https://www.theguardian.com/world/2010/nov/28/israel-primed-attack-nuclear-iran
[17] Note that variation in Iran's nuclear proliferation responses does not imply complete nuclear dismantling or conversely nuclear breakout. Rather, proliferation behavior in the context of nuclear negotiations refers to Iran's incremental steps toward limiting or conversely increasing its nuclear capabilities and nonproliferation oversight compliance.
[18] Collins, C. and D. Frantz, (January 31, 2018) "The Long Shadow of A.Q. Khan: How One Scientist Helped the World Go Nuclear", *Foreign Affairs*, https://www.foreignaffairs.com/articles/north-korea/2018-01-31/long-shadow-aq-khan)
[19] Nuclear-specific economic sanctions are levied at both the proliferating state and against any third party that supplies nuclear material or technology to the would-be proliferator.

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aimed at limiting the flow of nuclear material and technology to Iran and Iraq — these coercive efforts were not accompanied by negotiations or an enduring international engagement process. By 2003, further evidence demonstrated that these sanctions had done little to dampen Iran's nuclear pursuit. Instead, Iran had persisted and even accelerated their clandestine nuclear program despite these sanctions, with active enrichment ongoing at the ENR facilities in Arak and Natanz. These discoveries made it clear that Iran had found ways to circumvent supply-side barriers and overcome sanction costs in its pursuit.

Grand Bargain 2003-2005

This evidence prompted greater international concern about the proliferation risks posed by Iran's nuclear pursuit. The IAEA responded by passing a resolution calling on Iran to comply with its NPT commitments, including full disclosure and IAEA inspections of any ENR facility.[20] Iran responded by broaching the possibility of multilateral negotiations with the US and its European allies to find a diplomatic resolution. Because the US still had no formal diplomatic ties with the Islamic Republic,[21] Iran presented a possible "Grand Bargain" using back channels through the Swiss embassy.[22] It offered greater transparency in its nuclear program including full IAEA inspections of both its Arak and Natanz plants, as well as withdrawal of its military support for Hamas and Hezbollah,[23] which the US had demanded as part of its 1992 and 1996 sanctions. In exchange, Tehran requested a security assurance from the United States as its primary adversary, recognition of its right to civilian nuclear enrichment, as well as easement from the sanctions it already faced. While American

[20] GOV/2003/40 - "Implementation of the NPT safeguards agreement in the Islamic Republic of Iran" (PDF). Accessed June 21, 2018

[21] The US cut all ties during the Islamic Revolution and ensuing hostage crisis on 1979 and had still not recognized the Islamic Republic as the official government of Iran.

[22] The Swiss embassy served as a neutral conduit between the two estranged states as neither had an ambassadorial or consular presence in the other.

[23] Flynt Leverrett, in (2007) "The "Grand Bargain" Fax: A Missed Opportunity?" *Frontline: PBS* https://www.pbs.org/wgbh/pages/frontline/showdown/themes/grandbargain.html

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and multilateral sanctions imposed significant strain on the Iranian economy,[24] the Islamic Republic's primary demands — and those that proved the greatest sticking points in these and subsequent negotiations — were security assurances from its primary adversary[25] and recognition of rights to civilian enrichment, not sanction easement.

Security assurances were important to a regime surrounded by regional adversaries and facing a recent history of conflict with both the global superpower and the larger Western international community it supported. While a negative security assurance[26] was not a substitute for diplomatic recognition, it would help alleviate immediate national security concerns of the besieged regime. On the other hand, recognition of rights to a civilian energy program provided the twin benefits of 1) freeing up more of Iran's oil reserves for lucrative foreign export — the rents from which paid for public goods to buy regime domestic legitimacy,[27] as well as Iran's military and national defense structure — and 2) could provide significant prestige as a regional leader in science and technology.

Though the US did not respond to Tehran's offers, the United Kingdom, France, and Germany (EU3) did. While these were not Iran's primary security threat or first choice for negotiation partners, they were close allies and frequent security partners of the US, and had

[24] These sanctions are cumulatively estimated to have hampered the government's ability to provide public goods, and generated unemployment and inflation rates usually in the double digits. See for example Beehner, L. (May 5 2006) "What Sanctions Mean for Iran's Economy" *Council on Foreign Relations*, https://www.cfr.org/backgrounder/what-sanctions-mean-irans-economy Habibi, N., (Oct 2008) "The Iranian Economy in the Shadow of Economic Sanctions"*, Middle East Brief (Brandeis University, Crown Center for Middle East Studies)*, No. 31, https://www.brandeis.edu/crown/publications/meb/MEB31.pdf

[25] The Islamic Republic has regularly described the United States as the "Great Satan" (Seib, G. (March 1, 2019) "A Regime Still Fighting the 'Great Satan'" *The Wall Street Journal*, https://www.wsj.com/articles/a-regime-still-fighting-the-great-satan-11551454517)

[26] Negative security assurances are a promise not to attack offensively in some way. For example, the NOT calls for nuclear negative assurances from nuclear-armed states to the non-nuclear states, promising not to use nuclear weapons against a non-nuclear armed state (See Kimball, D. (March 2018) "U.S. Negative Security Assurances at a Glance" *Arms Control Association*, https://www.armscontrol.org/factsheets/negsec; UNODA (Oct 12, 2018) Negative Security Assurances as a Practical Step toward Global Zero" https://www.un.org/disarmament/update/negative-security-assurances-as-a-practical-step-towards-global-zero/)

[27] Iran heavily subsidizes domestic oil consumption as a way to maintain public support, but it also heavily relies on foreign export of oil as its primary source of regime income. Sustainable energies (nuclear energy for civilian purposes) therefore help preserve Iran's oil and natural gas reserves for lucrative export (see Crane, K., R. Lal, J. Martini, (2008) "Iran's Political, Demographic, and Economic Vulnerabilities" *RAND Middle East Perspectives* https://www.rand.org/content/dam/rand/pubs/monographs/2008/RAND_MG693.sum.pdf)

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themselves been regularly critical of Iran's nuclear program. As a result, cooperation from the EU3 was sufficient to meet Iran's need for rival power assurances.[28] The EU3 in a joint statement in October 2003 known as the Tehran Declaration, therefore promised to work toward future nuclear cooperation under IAEA safeguards, to recognize Iran's right to civilian enrichment, and to cooperate toward a Middle East Nuclear Weapons Free Zone.[29] In return, Iran agreed to sign the NPT Additional Protocol[30] and implement IAEA safeguard inspections. Together, these cooperative promises were intended to "create confidence and set up working groups on nuclear, security and economic cooperation, and to reach to an agreement within the next three months on exactly how Iran's nuclear programme [would] be monitored."[31] They, therefore, set the stage for phased implementation and negotiation over several months.

In accordance with these negotiations, Iran soon signed the Additional Protocol and agreed to begin IAEA safeguard inspections. The initial months of implementing the tentative agreement were rocky, made especially difficult by the US continued outspoken resistance to any indigenous enrichment or reprocessing in Iran — even civilian facilities under IAEA safeguard inspections — and refusal to provide Iran with the security assurances it sought. During these early months, Iran turned away several special IAEA inspections which it claimed were beyond the bounds of the signed agreement[32], and the IAEA issued rebukes for

[28] In addition, Iran held out hope that collaboration with the EU3 would eventually lead the US to sign on to the negotiated agreement. (Ansari, A. (2007) *Confronting Iran: The Failure of American Foreign Policy and the Next Great Conflict in the Middle East*, Philadelphia, PA: Basic Books)

[29] According to Sinha (Sinha, S. (2005) Paris Agreement and the Iranian Nuclear Case, Institute for Peace and Conflict Studies, http://www.ipcs.org/comm_select.php?articleNo=1606 (accessed May 12, 2018)). However, no specific deadlines or steps were set, meaning verification and stepwise agreements proved impossibly difficult (Kubbrig (2006) www.europarl.europa.edu/hearings/20060914/sede/kubbrig_en.pdf Accessed June 15, 2018).

[30] The Additional Protocol (AP) is an addendum to the NPT that provides for supplementary safeguard inspections by the IAEA in the signatory states, beyond those required by the NPT alone. Of the 189 signatories to the NOT, 134 have also accepted AP safeguards, which are more thorough and intrusive than the basic NPT requirements. (For further details on the AP and its obligations, see: "Additional Protocol" *IAEA: International Atomic Energy Agency*, https://www.iaea.org/topics/additional-protocol)

[31] Sinha, S. (2005) Paris Agreement and the Iranian Nuclear Case, Institute for Peace and Conflict Studies, http://www.ipcs.org/comm_select.php?articleNo=1606 (accessed May 12, 2018)

[32] Iran regularly complained that it was being subject to more stringent inspection protocols than other states,

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Tehran's lack of full cooperation.[33] Despite these hurdles, Iran maintained its commitment to freeze its enrichment and reprocessing (ENR) infrastructure and halted enrichment at its Natanz and Arak facilities until they could be brought under international inspection.[34] As a result, in November 2004 Iran and the EU3 successfully concluded their negotiations and signed the Paris Agreement[35] in which Iran agreed to continue to implement the NPT Additional Protocol,[36] suspend its enrichment activities, and publicly support the development of a constitutionally elected government in Iraq — another nod to US demands despite the latter's continued absence from these negotiations.[37] In exchange, the EU3 agreed to support Iran's accession to the World Trade Organization, its inclusion in the IAEA Nuclear Fuel Cycle Expert Group,[38] and to continue working toward future energy and security cooperation with Iran. These promises were aimed at bringing Iran into the international integrated economy, to support its desire to be a technology leader in the region and to build an efficient alternative energy sector.[39]

After the Paris Agreement, however, implementation and deepened collaboration proved elusive. The Agreement had not set any specific benchmarks or deadlines for either side, and

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foreign inspections it claimed jeopardized its national security capabilities.

[33] See IAEA June 2004 report for full list Iran's "pattern of concealment" ("GOV/2004/83 – Implementation of the NPT Safeguards Agreement in Iran" (PDF). Accessed June 20, 2018.)

[34] This behavior — ceasing operation of existing ENR facilities — provides evidence of temporary nuclear restraint, in line with the quantitative analysis of the previous chapters. However, it is not as observable or permanent a change as nuclear reversal and thus demonstrates interim restraint while further negotiation could be carried out.

[35] "INFCIRC/637 - Statement to IAEA on Paris Agreement" (November 26, 2004) https://www.iaea.org/sites/default/files/publications/documents/infcircs/2004/infcirc637.pdf accessed June 20, 2018

[36] The AP implements the strictest inspection protocol, and as the nee suggests is a voluntary addition to the standard requirement to NPT safeguards. A number of NPT-compliant states — including the US — have elected not to ratify the AP claiming it sets a precedent for unduly invasive inspections and the potential for security leaks of sensitive information or technology.

[37] This agreement came shortly after the War in Iraq, in which Iran had supported insurgent groups against the new Iraqi government. In this stipulation, Iran would end support for rebel groups against the Iraqi government.

[38] https://www.iaea.org/INPRO/2nd_Dialogue_Forum/mna-2005_web.pdf, accessed June 20, 2018.

[39] Iran has been investing alternative energies beyond nuclear, including solar and wind power for many years (see Bahrami, M. and P. Abbaszadeh (2013)"An overview of renewable energies in Iran", *Renewable and Sustainable Energy Reviews* 24, p. 198-208, https://www.researchgate.net/profile/Payam_Abbaszadeh/publication/261364068_Bahrami_Abbaszadeh/links/00b7d5340f71d137f6000000/Bahrami-Abbaszadeh.pdf)

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the US continued to push back against Iran's civilian program — including its entry to the IAEA Nuclear Fuel Expert Group — or to provide the security assurances for which Iran continued to hold out hope.[40] Iran insisted that it would maintain its right to civilian enrichment as agreed under the 2004 stipulations, but the EU3 eventually caved to US pressure to reject these assurances.[41]

Without this recognition of its prized nuclear energy program or the protection of US security assurances, even the threat of multilateral sanctions could not maintain Iran's commitment to the agreement.[42] It responded to European reneging by refusing to carry out its own agreements, including unilateral nuclear reversal or opening its existing facilities for foreign inspectors.[43] According to testimony before the US Congress, "extensive US unilateral sanctions have not achieved their difficult goals…Overall, sanctions have not prompted Iran to renounce the use of terrorism or the acquisition of nuclear weapons."[44] The agreement broke down in 2006 when the IAEA Board of Directors voted to report Iran to the UN Security Council for noncompliance. Rather than caving to this multilateral pressure, Iran's parliament passed a measure committing itself to promptly restart enrichment if the

[40] Kubbrig (2006) www.europarl.europa.edu/hearings/20060914/sede/kubbrig_en.pdf Accessed June 15, 2018
[41] "EU rejects Iran call to speed up nuclear talks". Web.archive.org. Reuters. 1 February 2005. Archived from the original on 7 February 2005; Morrison, David (21 January 2006). "The EU misleads on Iran's nuclear activities" (PDF). *Labour & Trade Union Review*
[42] See Iranian Ambassador Ali Soltanieh elaboration of Iranian commitment to continued enrichment rights (limited to energy and research under safeguards). "If your proposal excludes Iran's rightful nuclear fuel cycle including enrichment, you can assume that it will be rejected right away." (in Meier, O. (2006) Interview with Ambassador Ali Asghar Soltanieh, Iran's Permanent Representative to the International Atomic Energy Agency" *Arms Control Association*)
[43] Ansari, A. (2007) *Confronting Iran: The Failure of American Foreign Policy and the Next Great Conflict in the Middle East*, Philadelphia, PA: Basic Books
[44] Schott, J. (July 25, 2006) "Economic Sanctions, Oil, and Iran" *Testimony before the Joint Economic Committee, United States Congress Hearing on "Energy and the Iranian Economy",* Peterson Institute for International Economics

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UNSC took direct action,[45] suspending its special inspections,[46] and choosing instead to face the resulting comprehensive trade and financial sanctions[47] – which the UN quickly imposed.

This initial attempt at nuclear deproliferation negotiations with Iran highlighted the critical sticking points for all sides, and also demonstrated the Islamic Republic's resilience in the face of international pressure. The cooperative inducements the Islamic Republic most valued in these negotiations proved to be recognition of its right to civilian enrichment, particularly recognition from powerful rivals. While it was willing to safeguard this program against future weapons purposes in exchange for cooperative assurances, the energy program was important for both its alternative energy pursuits and a right it claimed under the NPT.[48] Continued push-back from the US (even as an outsider to the negotiations) to provide this recognition caused Iran to step away, even under threat of comprehensive UN sanctions. Without assurances from its primary adversaries, Iran chose to take on sanction costs rather than relinquish its nuclear program and even demonstrated surprising resilience by enhancing its nuclear enrichment capabilities while under significant unilateral and multilateral sanctions. Rather than coercing nuclear concessions as intended, the sanctions hardened Iran's nuclear resolve,[49] strengthened hardline factions within the Iranian government who claimed the West — including the EU3 as primary allies of the United States — would

[45] See Soltanieh in Meier, O. (2006) Interview with Ambassador Ali Asghar Soltanieh, Iran's Permanent Representative to the International Atomic Energy Agency" *Arms Control Association*
[46] "Resolution GOV/2006/14 of the Board of Governors: Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran"(PDF) (Press release). International Atomic Energy Agency. 2 April 2006.
[47] UNSCR 1737 Security Council Imposes Sanctions on Iran for failure to Halt Uranium Enrichment, Unanimously Adopted, December 23, 2006
[48] Article IV of the NPT recognizes an "inalienable right of all the Parties to the Treaty to develop research, production, and use of nuclear energy for peaceful purposes with discrimination" (test of the treaty, see *The Treaty on the Non-Proliferation of Nuclear Weapons (NPT)*, 2005 Review Conference of the pits to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), https://www.un.org/en/conf/npt/2005/npttreaty.html)
[49] William Toby in an original telephone interview (July 25, 2018). Tobey is a senior fellow at Harvard University's Belfer Center for Science and International Affairs and former Deputy Administrator for Defense Nuclear Nonproliferation at the National Nuclear Security Administration

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capitalize on Iran's unilateral reversal to weaken the Islamic Republic and threaten regime security.

Work Plan and Fuel Swap 2007-2010

While the comprehensive UNSC sanctions and the persisting unilateral American sanctions imposed significant hurdles, Iran continued to make progress on its nuclear program. Fearing Iran was nearing nuclear breakout,[50] the IAEA attempted in 2007 to revitalize the Paris Agreement conditions. In these negotiations, Iran and the IAEA concluding an initial work plan to gradually bring Iran back into compliance with full inspections and the Additional Protocol of the NPT, still without direct involvement from the US or even from the EU3. As a result, while plan specified inspection protocols and promised UN economic sanction easement pending Iran's compliance, it lacked some critical components. Unlike the Paris Agreement, it made no specific promises of diplomatic recognition of Iran's right to civilian enrichment, and offered no diplomatic assurances from Iran's primary rivals. Instead, the loose Work Plan focused on economic incentives to Iran in the form of sanction easement.[51] Not surprisingly, therefore, Iran proved resistant to this basic economic *quid pro quo* even while suffering difficult economic conditions these sanctions had generated.[52] Instead, Iranian representatives reiterated that its partners should not "conclude that Iran will accept that enrichment will not be made in Iran [or that] Iran will be deprived of this right."[53]

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[50] Nuclear breakout is the point at which a state can assemble a nuclear warhead. This is often measured at the first successful nuclear test, but a state need not test a weapon to reach breakout.

[51] Note that sanction easement does not transfer money or aid from the sender to the recipient. Instead, it removes existing barriers to trade and banking so that Iran might re-engage with global markets.

[52] Beehner, L. (May 5 2006) "What Sanctions Mean for Iran's Economy" *Council on Foreign Relations*, https://www.cfr.org/backgrounder/what-sanctions-mean-irans-economy; Habibi, N., (Oct 2008) "The Iranian Economy in the Shadow of Economic Sanctions", *Middle East Brief (Brandeis University, Crown Center for Middle East Studies)*, No. 31, https://www.brandeis.edu/crown/publications/meb/MEB31.pdf

[53] in Meier, O. (2006) Interview with Ambassador Ali Asghar Soltanieh, Iran's Permanent Representative to the International Atomic Energy Agency" *Arms Control Association*

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Lacking the crucial elements of cooperative assurances from major rivals (namely the US), the plan did not progress far. Instead, the US continued to press for greater multilateral sanctions and Iran resisted special inspections. The United States claimed Iran could not be trusted with nuclear technology, while Iran claimed it needed assurances in exchange for allowing the intrusive inspections which would generate unacceptable security risks by granting foreign "access to sensitive information related to its conventional military [capabilities]."[54] Failing to provide Iran with these assurances it needed, the tentative Work Plan quickly broke down, and Iran continued to progress in its indigenous ENR capabilities, foiling the economic and trade barriers in place from widespread sanctions.

After several years of unsuccessful sanctions and continued unsafeguarded enrichment, Iran and the UN Security Council Permanent Five[55] plus Germany (P5+1) again attempted to negotiate a nuclear agreement in 2009, agreeing in principle to a fuel swap[56] as a way to meet Iran's demands for civilian energy and international concern over the potential for misuse of indigenous enrichment and reprocessing. However, the specifics of such a deal proved elusive — with the United States continuing to resist the continuation of any sensitive nuclear technology in Iran, and Tehran refusing to accept any swap with French suppliers,[57] claiming that France's past failure to honor bilateral nuclear deals with Iran generated an "unfortunate confidence deficit".[58] Eventually, Iran signed a multilateral fuel swap in 2010 without the UN P5+1, working instead with Brazil and Turkey backed by Russia as the primary fuel supplier. Iran agreed to suspend high-level uranium enrichment, but it reiterated its commitment to low-level enrichment as part of a civilian energy program. In exchange for Iran's restraint, the

[54] Kerr, P. (2018) "Iran's Nuclear Program: Tehran's Compliance with International Obligations" Congressional Research Service, p.2
[55] UN Security Council five permanent members (P5) are China, France, Great Britain, Russia, and the United States.
[56] Official Proposals of the Iranian Nuclear Issue 2003-2013, Arms Control Association July 2015, https://www.armscontrol.org/factsheets/Iran_Nuclear_Proposals (Accessed November 2, 2018)
[57] The primary Western supplier for the reactors Iran operated.
[58] Crail, P., "Iranian Response to LEU Fuel Deal Unclear," *Arms Control Association*, https://www.armscontrol.org/act/2009_11/Iran (Accessed July 10, 2018)

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agreement stipulated Russia would supply Tehran's Research Reactor (TRR) with nuclear fuel so long as Tehran exported the spent fuel back to Russia for reprocessing.

While exporting spent fuel to an NPT nuclear supplier state would purportedly reduce Iran's proliferation risks,[59] the US, United Kingdom, and France feared that without IAEA or UN oversight Iran would misappropriate the fuel resources towards a future weapons program. Once again, the agreement broke down under this opposition before it was even implemented. With no cooperative alternatives to replace this deal, deproliferation efforts with Iran deteriorated further, relying exclusively on the mounting coercive pressure of further international sanctions — sanctions that continued to produce nothing but greater proliferation from the Islamic Republic in the hopes that the economic pain and roadblocks to nuclear supply networks would force Iran to capitulate. During the next five years, the US unilaterally and UN Security Council jointly increased sanctions against both Iran and any third parties attempting to trade with the Islamic Republic.[60] Instead, the Islamic Republic continued to improve its ENR capabilities, overcoming international trade and financial barriers to initiate new power plant operations in Bushehr and uranium enrichment in Fordu.[61]

Joint Comprehensive Plan of Action (JCPOA) 2012-2015

The break to this unsuccessful cycle finally can after the election of Iranian President Hassan Rouhani, a relative moderate who ran on a platform of re-engagement with the West. Responding to then US President Obama's offer to "extend a hand if you are willing to

[59] Spent fuel can be reprocessed to extract weapons-grade material over time. Exporting spent fuel rods, therefore, reduces this risk and also allows inspectors to monitor the nuclear activity in the exporting state.
[60] Reuters (2011) "Timeline: Iran's Nuclear program since October 2009", https://www.reuters.com/article/us-iran-nuclear-events/timeline-irans-nuclear-program-since-october-2009-idUSTRE70K02P20110121 (Accessed July 10, 2018)
[61] Official Proposals of the Iranian Nuclear Issue 2003-2013, Arms Control Association July 2015, https://www.armscontrol.org/factsheets/Iran_Nuclear_Proposals (Accessed November 2, 2018)

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unclench your fist."[62] Rouhani's new cabinet reached out privately to its primary rival on the sidelines of the UN General Assembly meeting in New York.[63] The United States and Iran began a series of backroom negotiations in what would prove the longest negotiations and most lasting agreement to date, crafting an agreement that would bring Iran's nuclear enrichment activities under IAEA safeguards and reduce tensions between the two countries. Early in these negotiations, the two rivals initiated a freeze-for-freeze as a first confidence-building step, in which Iran agreed to temporarily freeze[64] its enrichment activities and the United States agreed to freeze its economic sanctions against Iran's nuclear program.[65] Facing the prospect of normalizing relations with its primary rival, Iran responded favorably, and within a few months, Iran and the IAEA concluded a follow on Joint Statement on Framework for Cooperation, which set out specific steps for third-party verification of the bilateral freezes and committed to working towards a more permanent multilateral resolution.[66] While previous negotiations had stagnated or failed after similar initial stages, this first attempt brought Iran's primary rival to the table and paved the way for greater multilateral negotiations.

Over the course of a series of high-level diplomatic meeting and technical exchanges, Iran and the P5+1 negotiated the Joint Comprehensive Plan of Action (JCPOA) — also known as the Iran Deal — which specified the timeline and scope of Iran's reversal steps and

[62] President Barack Obama in 2009 Inaugural Address in Taranto, J. (Jan 20, 2009) "Unclench Your Fist" *Wall Street Journal* https://www.wsj.com/articles/SB123246859069298241 (Accessed March 2, 2019)
[63] Davenport, K. (2019) "Timeline of Nuclear Diplomacy With Iran" *Arms Control Association* https://www.armscontrol.org/factsheet/Timeline-of-Nuclear-Diplomacy-With-Iran
[64] Iran reiterated that it would not accept any agreement that permanently weakened its nuclear energy program: "We will not accept that our uranium enrichment program becomes something like a toy" (Deputy Minister Majid Takht-Ravanchi in *Agence France Press*, "Iran says won't accept 'toy' enrichment programme" (August 10, 2014) https://web.archive.org/web/20140819083850/http://www.afp.com/en/node/2713895 (accessed April 8, 2019))
[65] Timeline on Iran's Nuclear Program, New York Times, https://www.nytimes.com/interactive/2014/11/20/world/middleeast/Iran-nuclear-timeline.html#/#time243_8733 (Accessed November 8, 2018)
[66] "The Iran Nuclear Deal: A definitive guide" (2017) Belfer Center, https://www.belfercenter.org/sites/default/files/files/publication/IranDealGuide2017.pdf (accessed July 10, 2018)

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the P5+1 inducements. The JCPOA stipulated strict inspection protocols for all of Iran's ENR facilities but permitted Iran to maintain a functioning civilian program under strict IAEA safeguards — one of Iran's primary recurring demands since 2003. In exchange, the P5+1 promised sanction easement as well as gradual relaxation fo the strict limited on Iran's nuclear energy program over time, provided Iran demonstrate adherence with IAEA safeguards. As a result, the barriers to a robust indigenous Iranian nuclear energy program would gradually disappear over time as well, providing Iran its a robust civilian energy program recognized by its primary adversaries.[67] In exchange, Iran agreed to ratify the NPT Additional Protocol, blend down its existing stockpiles to natural or low-enrichment levels, and dismantle or safeguard its existing centrifuges and facilities against weapons-grade enrichment or reprocessing.[68] Finally, the P5+1 lifted the economic sanctions limiting Iran's nuclear trade and released an estimated $100 billion in frozen Iranian assets from foreign banks.[69]

The JCPOA thus reversed Iran's existing ENR capabilities and reduced the risk of further proliferation through robust IAEA oversight,[70] while still providing Iran with a path to normalized economic relations and recognizing a future for its nuclear energy program[71] — effectively meeting Iran's core demands from the 2004 Paris Agreement and 2007 Work Plan in exchange for deproliferation. While all the previous attempts had threatened sanctions for

[67] The JCPOA is a very detailed agreement, specifying in an over-100p document the responsibilities and repercussions for each signatory. "The Iran Nuclear Deal: A definitive guide" (2017) Belfer Center, https://www.belfercenter.org/sites/default/files/files/publication/IranDealGuide2017.pdf

[68] These restrictions are temporary, with a series of sunset clauses gradually relaxing the stipulations down to the standard NPT agreement.

[69] "The Iran Nuclear Deal: A definitive guide" (2017) Belfer Center, https://www.belfercenter.org/sites/default/files/files/publication/IranDealGuide2017.pdf (accessed July 10, 2018)

[70] This oversight includes surprise inspections at all facilities, blending down enriched fissile material to reduce Iran's stockpiles, and installing tamper-proof seals and cameras to monitor activity between inspections. ("The Iran Nuclear Deal: A definitive guide" (2017) Belfer Center, https://www.belfercenter.org/sites/default/files/files/publication/IranDealGuide2017.pdf, accessed July 10, 2018)

[71] According to Iran's foreign minister and primary negotiator, Mohammad Javad Zarif, "today the Iranian nuclear program is internationally recognized and no one speaks about our enrichment right, and these are successes achieved [in the JCOA]." (Zarif in *Islamic Republic News Agency*, "Zarif: Objective, reaching agreement in shortest possible time" (Nov 25, 2014), http://www.irna.ir/en/News/81400139 (accessed 4/8/2019))

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proliferation and offered easement for compliance, none provided the cooperative assurances and recognition from the US that the JCPOA did. As a result, previous attempts were imprecise and short-lived, but the JCPOA was signed and implemented, with the IAEA finding Iran in compliance of its deproliferation provisions for several years.[72]

Counterarguments to Cooperation

While the evidence presented here suggests that cooperative assurances were critical to the limited successes of nuclear reversal, some scholars and policymakers have argued against the centrality of cooperative inducements in nuclear negotiations with Iran. Most of these counterarguments fall into one of two groups: either 1) sanctions were necessary to bring Iran to the table, while positive inducements were superfluous sweeteners that acted at the margins at best, or 2) positive inducements actually pose a moral hazard — counterproductively enticing future proliferation by offering concessions for reversal. Here I examine each of these counterarguments through the context of the Iranian case study.

First, the argument that sanctions were necessary is often heard in policymaking circles, whose proponents argue that sanctions provided the leverage necessary for bringing Iran to the negotiating table.[73] However, each time sanctions were threatened or imposed, Tehran stepped away from negotiations and reinvigorated their nuclear programs, despite the costs these moves created.[74] Even if, as the argument goes, sanctions take time to work their magic,[75] during this lag, Iran continued to make progress on its program despite the costs and

[72] This has persisted even in the face of US leadership turnover and without the expected improvement to Iran's economy after sanction easement. (See Habibi, N., (Oct 2008) "The Iranian Economy in the Shadow of Economic Sanctions", *Middle East Brief (Brandeis University, Crown Center for Middle East Studies)*, No. 31, p.6 for further discussion (https://www.brandeis.edu/crown/publications/meb/MEB31.pdf))

[73] Gary Samore, former White House Coordinator for Arms Control and Weapons of Mass Destruction, in an original telephone interview, June 2018; Richard Nephew, former Principal Deputy Coordinator for Sanctions Policy, US Department of State, original telephone interview, June 13, 2018

[74] As seen with Iran in 1996, 2005, and 2009, or North Korea when the Agreed Framework broke down in 2001 or Six-Party Talks failed (again) in 2006.

[75] For example, the George W. Bush administration made this argument vis-a-vis North Korea Six-Party talks, as did members of the Obama administration for bringing about the JCPOA negotiations. See Cha, V. (2003)

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hurdles imposed by economic sanctions. As a result, negotiations had greater reversal ground to cover once reinstated and eventually produced a similar agreement to the one Iran had requested in 2003 and again in 2007 before widespread sanctions were imposed. For example, while sanction easement was the immediate concession offered to Iran as part of the JCPOA, the agreement itself also granted Iran the resolution it had proposed several times before — international (especially US) acceptance of an Iranian civilian nuclear program under IAEA safeguards.

The necessity of sanctions is also undermined by Iran's Green Revolution in 2009, before the imposition of the 2012 sanctions often credited with bringing the proliferator to the JCPOA negotiations. According to sanction supporters, the pain of economic sanctions was responsible for turning the Iranian public against the nuclear program, thus forcing the Iranian government to change its stance on deproliferation negotiation with the West.[76] If this was true, Rouhani was caving to foreign pressure in his 2013 diplomatic outreach that led to the JCPOA negotiations. This claim, however, overlooks the fact that the Iranian public, in fact, supported a very similar reformist candidate with similar promises of reengagement with the West in Iran's 2009 presidential elections.[77] Presidential candidate Mir Hossein Mousavi promised renewed negotiations and normalized relations with the West,[78] but widespread election tampering prevented these elections from bringing about the rapprochement he

"Weak but still Threatening." *Nuclear North Korea: A Debate on Engagement Strategies*, Eds. V. Cha and D. Kang, New York: Columbia University Press; Chinoy, M. (2008) *Meltdown: The Inside Story of the North Korean Nuclear Crisis*, New York: St. Martin's Press; Sherman, W. (2018) "How we got the Iran deal: And why we'll miss it", *Foreign Affairs*, September/October; Nephew, R. (2018) "The Mirage of Renegotiating the Iran Deal", Columbia SIPA, Center on Global Energy Policy (https://energypolicy.columbia.edu/sites)

[76] Iran is a partial democracy, with an educated public and regular elections for its parliament and president. The state's nuclear policy preferences are therefore in part determined by the preferences of the public. While I do not address the details of domestic or bureaucratic politics here, the change in the public's preferences provides insight into the state negotiating stance.

[77] Leaked interior ministry figures suggested that Mousavi had, in fact, won the election, despite ballot tampering and voter intimidation campaigns, while the named victor incumbent Ahmadinejad revived only 12% of the vote (Reals, T. (June 18, 2009) "Watch" *CBS News*).

[78] Iran's Twitter revolution. (2009, June 16). The Washington Times. http://www.washingtontimes.com/news/2009/jun/16/irans-twitter-revolution/

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promised. Fearing that Mousavi would institute political and economic freedoms that would weaken the regime's grip on power, the government – backed by the military and the Guardian Council[79] – opposed his candidacy and violently repressed the resulting public protests. This clash became known as the Green Revolution,[80] recognized as "the worst crisis [in Iran] since the 1979 Islamic Revolution"[81] and far too costly to repeat in the subsequent elections. As a result, when the 2013 election brought a similar candidate — Hassan Rouhani — to power running on a similar platform of re-engagement, the Guardian Council had to accept these results rather than risk a repeat of the 2009 crisis.[82] As a result, the Iranian shift to reengagement with the West and resulting JCPOA agreement can be attributed to its public's demand for normalized relations – a demand articulated before the pressure of 2012 sanctions took effect.[83]

Another counterargument to positive inducements is the risk of moral hazard, or the possibility that offering rewards for compliance, or 'good' behavior could risk enticing future proliferation, or 'bad' behavior from opportunistic states seeking those rewards.[84] Proponents of this argument suggest that even if coercive strategies do not work well, they at least do not risk this outcome.[85] There are two problems with this argument as it applies to nuclear reversal, however. The first is that the inducements that were most successful at incentivizing

[79] The clerical body "empowered to vet legislation and oversee elections" (Council of Guardians, Iranian Government, *Encyclopedia Britannica,* https://www.britannica.com/topic/Council-of-Guardians)
[80] Black, I., V. Dodd, and M. Weaver, (2009) "Iranians March in protest of reelection", *The Guardian*
[81] "Guardian Council praises 'cleanest' vote," *France24 Newswire (June 26, 2009)*
[82] Colin Kahl in an original interview at Stanford University, (February 20, 2019). Kahl is the co-director of the Center for International Security and Cooperation at Stanford University and was formerly the Deputy Assistant to the President and National Security Advisor to the Vice President.
[83] The conservative Guardian Council of Iran — tasked with protecting the Islamic Revolution actually feared rapprochement with the US and lifting of sanctions that would weaken is economic control (in what they termed a 'velvet revolution'). (Sahimi, M. (April 28, 2009) "Iran's power struggle" *New York Times*.) (Honari, A. (2018). "We Will Either Find a Way, or Make One": How Iranian Green Movement Online Activists Perceive and Respond to Repression. *Social Media + Society*.)
[84] See Nincic (2010) and Pattison (2018) for further discussion. Nincic, M. (2010). "Getting What You Want: Positive Inducements in International Relations." *International Security, 35*(1), 138-183; Pattison, J. (2018). "Positive Incentives". In (Ed.), The Alternatives to War: From Sanctions to Nonviolence Oxford, UK: Oxford University Press
[85] For example, some sanction proponents argue that these coercive elements allowed for sanction easement as a reward, effectively getting something for nothing (nuclear reversal for the lifting of sanction).

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reversal were not petty rewards such as one-time aid transfers or *quid pro quo* payoffs that might encourage such concession seeking. Instead, Iran sought cooperative offers like recognition of rights to a safeguarded civilian energy program[86] or negative security assurances that are available to all states who ratify the Nonproliferation Treaty — regardless of whether they possessed a nuclear program in the past.[87] For example, in the 2004 Paris Agreement, the 2007 Work Plan, and the 2015 JCPOA, Iran reaffirmed its commitment to its access to civilian nuclear technology, stating (and demonstrating) that any agreement refusing "Iran's rightful nuclear fuel cycle" would be "rejected right away."[88] Because the assurances offered to Iran are protected rights under the NPT and are therefore accessible to all nuclear abstainers,[89] concession seekers need not embark on a costly enrichment program to access them. While some inducements may indeed risk inciting perverse reward-seeking behavior, the costly[90] the pursuit of nuclear weapons would be an impractical way to access such rewards and thus do not logically fall under the domain of moral hazard.

The second problem the argument — that coercive sanctions are better suited to avoiding perverse outcomes than are positive inducements — is the track record of sanctions. The Islamic Republic repeatedly demonstrated from 1992 until 2015, that it would invariably double down on unsafe guarded (and likely dual use) nuclear enrichment every time sanctions were imposed. By contrast, every time the critical element of rival assurances were offered, Iran froze or reversed its enrichment and opened its facilities to IAEA inspections.

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[86] While Iran likely sought a clandestine dual-use program, they were willing to reverse much of their weapons proliferation capabilities in exchange for these non-nuclear state rights under the NPT.
[87] "The Global Nuclear Nonproliferation Regime" (2012), *International Institutions and Global Governance,* Washington, D.C.: Council on Foreign Relations; UNSC Res. 255 (1968); US ACDA, (1969) Documents on Disarmament, 1968, pp. 444, 439-440
[88] in Meier, O. (2006) Interview with Ambassador Ali Asghar Soltanieh, Iran's Permanent Representative to the International Atomic Energy Agency" *Arms Control Association*
[89] "The Global Nuclear Nonproliferation Regime" (2012), *International Institutions and Global Governance,* Washington, D.C.: Council on Foreign Relations; UNSC Res. 255 (1968); US ACDA, (1969) Documents on Disarmament, 1968, pp. 444, 439-440
[90] Nuclear weapons programs are expensive, even without sanction costs, requiring specialized technical expertise and materials. Petty rewards would generally be insufficient to cover these costs.

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This suggests that the coercive instruments of economic sanctions actually led to perverse proliferation, while cooperation like increased diplomatic engagement and support for Iran's right to peaceful nuclear enrichment instead induced nuclear reversal – providing evidence in support of the theory that cooperative inducements are more effective than coercive deproliferation strategies.

Finally, both of these arguments highlight the costs of offering positive inducements — the political or economic capital for handing over a valuable reward — but assume that economic sanctions are only costly for the targeted state, not the senders. However, past research has demonstrated that sanctions that are costly for the target are usually quite costly for the sender as well, as trade losses and restricted financial flows cut both ways.[91] As a result, for sanction to be more effective — meaning leading to success more often and with a lower risk of perversely increasing proliferation — they would need to do so while inflicting no greater costs on the sender than would alternative inducement policies. In contrast, the 2012 sanctions that proponents credit with JCPOA successes were very costly for many senders — Iran is an important source of oil and natural gas for Europe and Asian P+1 states — and limited senders' trade with any third party states that did business with Iran. In comparison, the cost of recognizing Iran's right to a civilian nuclear energy program are comparatively small, with fewer bargaining costs than the difficult sanction negotiations from 2012[92] and inflicting little economic retraction from reduced trade flows. As a result, the sanctions proponents credit with finally making the Islamic Republic more pliant had to be so

[91] Morgan, T.C. and L. Schwebach, (1997) "Fools Suffer Gladly: The Use of Economic Sanctions in International Crises" *International Studies*, 41(1)

[92] The United States engaged in many rounds of difficult negotiations with the other senders to corral support for multilateral sanctions. These previous partner senders have since resisted reimposing sanctions in part because such comprehensive trade barriers were costly for the senders as well as for Iran, the target. (DiColo, J. (Juli 1, 2012) "EU Embargo on Iran Oil Takes Effect" *Wall Street Journal*, https://www.wsj.com/articles/SB10001424052702303649504577496463851879 25; Paraskova, T. (March 18, 2018) "EU Could Switch to Euros in Oil Trade with Iran" https://oilprice.com/Geopolitics/Europe/EU-Could-Switch-To-Euros-In-Oil-Trade-With-Iran.html)

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costly that many senders have since been unwilling to revisit them, even when pressured to do so by most powerful allies.[93]

Conclusions and Further Research

This chapter tests the theory that cooperative incentives are more effective than negative coercion at inducing nuclear reversal in a single proliferator, the Islamic Republic of Iran. By comparing Iran's responses to different engagement options over time, I find support for the theory that cooperative assurances were more effective than the common coercive strategies of economic sanctions. In the case of Iran, the cooperation they most valued was recognition by its most powerful adversaries for its right to civilian nuclear enrichment program as well as improved diplomatic relations with its primary adversary, the United States. During repeated negotiations from 2003 to 2015, Iran regularly requested — and eventually received — international recognition of a long-term indigenous nuclear energy program. While the Islamic Republic regularly faced economic sanctions, both unilateral sanctions and multilateral ones from many powerful senders, these resulted in Iran resisting sender's demands and even doubling down in its enrichment activities. While these sanctions did, in fact, impose significant costs on Iran's economy,[94] Iranian leaders used these costs as proof of foreign enmity and a call to rally behind the nuclear program. According to Iran's Supreme Leader, Ayatollah Khamenei:

> What the United States…expects from our nation and government is submission and surrender to its hegemony, and this is the real motive for the U.S…[But if we] make concessions to those powers, these concessions will never come to an end!... They will never stop obtaining concessions from you through pressure and

[93] Katzman, K. (2019) CRS Report R20871, "Iran Sanctions" Congressional Research Service, https://fas.org/sgp/crs/mideast/RS20871.pdf (Accessed April 3, 2019); Kerr, P. and Katzman (2019) CRS Report R43333, "Iran Nuclear Agreement and U.S. Exit" Congressional Research Service; Rennack, D. CRS Report R43311, "Iran: U.S. Economic Sanctions and the Authority to Lift Restrictions," Congressional Research Service

[94] Salehi-Isfahan, D. (June 22, 2009) "Iran's Economy: Trouble in Tehran" *Brookings*, https://www.brookings.edu/articles/irans-economy-trouble-in-tehran/; Farhi, F. (27 July 2012).Sanctions and the shaping of Iran's"Resistance Economy" *LobeLog.com-Foreign Policy*

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> intimidation…[but] the Iranian people have not invested us with the right to surrender our country to the enemy!
>
> —Address to students at Shahid Beheshti University, May 2003[95]

Rather than caving to coercion, therefore, Iran remained committed to a civilian energy program, refusing any agreements that prevented this goal and even increasing their nuclear capabilities in the face of international isolation, economic costs, and trade barriers. However, when powerful senders — especially powerful rivals like the United States and EU3[96] — agreed to cooperate with Iran on a future nuclear energy program, the Islamic Republic reversed its ENR capabilities at several sites and allowed comprehensive IAEA inspections. These provide historical support for the theory that cooperative inducements are more likely to lead to more rapid and sustainable reversal, while coercive policies pose a greater risk of perversely accelerating proliferation instead. In addition, Iran's repeated insistence that they negotiate with and receive assurances from their primary powerful rival, the United States, demonstrates that these cooperative assurances are even more effective when they come from a powerful rival than when they come from a weaker friend.

While this chapter has examined the nuclear negotiation processes in one case, the success of one case may be insufficient to demonstrate a pattern of cooperative successes. For example, Iran has access to a vast wealth of natural resource reserves, which may make them particularly resistant to coercion from sanctions.[97] In addition, the institutional design is a partially consolidated semi-presidential system in a country with a highly educated and politically informed populace, which may make it more prone to public demands for

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[95] Khamenei, (May 28, 2003) "Leader's Address to Students at Shahid Beheshti University" http://english.khamenei.ir/news/125/Leader-s-Address-to-Students-at-Shahid-Beheshti-University

[96] According to Richard Nephew, former Director for Iran on the National Security Staff and Principal Deputy Coordinator for Sanctions Policy at the Department of State, the biggest fear factor needs to be present in negotiations for the proliferator to trust the enemy will abide by agreements (in original telephone interview, (July 13, 2018).

[97] Resource rents can insulate the possessors from the whims of international trade, and therefore potentially from the pressure of international trade partners (see Krustev, V. and T.C. Morgan, (2011) "Ending Economic Coercion: Domestic Politics and International Bargaining" *Conflict Management and Peace Science*, 28(4); Naghavi, A. and G. Pignataro, (n.d.) "Theocracy and Resiliency Against Economic Sanctions", Working Paper DSE No.977, http://amsacta.unibo.it/4108/1/WP977.pdf)

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reintegration with the international community.[98] The subsequent chapter, therefore, examines similar patterns of negotiation and proliferation responses in a second case study, that of North Korea. In addition to adding depth to the theory tested here, this second case also examines how nuclear deproliferation engagement can play out in a state that does not have either the pressures of an informed, active populace or the crutch of resource rents to fall back on. The following chapter, therefore, performs similar within-case comparisons as carried out in this chapter — in single proliferator over the multiple instances of deproliferation engagement it faced — but this time in a weaker and simultaneously more insulated state. If the effectiveness of cooperative assurances are still born out in this case, the findings from the Iranian case and the cross-national comparisons are unlikely to be artifacts of political rarities, but a rather a trend that manifests across countries and over time, all the way up to ongoing nuclear negotiations with North Korea.

[98] While not a full democracy, Iran is also not a complete or monolithic autocracy, as seen in the 2009 Green Revolution and the 2013 election of Rouhani.

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Chapter 6: Approaching Pyongyang
Deproliferation Engagement with North Korea

The theory presented in this work argues that cooperative incentives are more effective than coercive strategies for inducing nuclear reversal in proliferating states. The preceding chapters have thus far tested this theory using cross-national historical data and a single case of the Islamic Republic of Iran. The contemporary relevance of this issue, however, is exemplified most prominently in the ongoing nuclear reversal negotiations with North Korea. This chapter, therefore, engages with the current policy discussion by further testing the theory developed here in a within-case comparison of North Korea's responses to deproliferation engagement over the course of its nuclear program.

The previous chapter examined the policy conditions that most effectively encouraged nuclear reversal in the Islamic Republic of Iran, as well as those that posed the greatest risk of inciting further proliferation instead. This analysis lends support for the theory that cooperative inducements are more effective than coercive strategies, but testing on only a single country is insufficient to demonstrate that these findings hold across different countries under different conditions. How resilient are resource-poor states at resisting the coercive power of economic sanctions, or regionally weaker states at withstanding militarized threats? Alternatively, how receptive are more isolated regimes to diplomatic cooperation, or more autocratic regimes to the promises of international integration?

North Korea provides a hard test of the risks of coercion as it is economically limited,[1] technologically underdeveloped,[2] and militarily weak,[3] meaning it should be especially incapable of circumventing economic sanctions or resisting military threats. If coercive

[1] Economic sanctions cut off trade flows and reduce state access to financial resources.
[2] Sanctions also limit access to the materials and technology necessary for developing a nuclear program, so states without indigenous scientific and technological resources should be especially hindered by these limits.
[3] Military compellent threats or use of force rely on the ability of the aggressor to overrun the target state's defensive capabilities to impose their preferred outcome.

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strategies can prove successful against any target, they should be especially successful here. First, the Democratic People's Republic of Korea (DPRK) has a very weak economy with limited indigenous industry, with little in the way of food or resource reserves.[4] In fact, at several points over the course of its nuclear program — and the sanctions it faced as a result — North Korea suffered acute food shortages and widespread famine. It's lack of resources also means that, unlike Iran, sanctioning North Korea does not significantly hurt the economies of the sending states, and so these senders have been able to impose comprehensive sanctions against the DPRK for many years without suffering any burdensome reflected costs.

In addition to its resource restrictions, North Korea's government is a staunchly personalist and insular autocracy that has demonstrated persistent ability to control its public through propaganda and information control. The regime, therefore, faces little pressure from its population to engage with the international community and has faced little domestic pressure to cooperate towards better international relations like those the Islamic Republic faced in 2009. As a result of its limited financial and military resources, and its lack of politically engaged public, the DPRK should pose a prime target for successful coercive pressure and a hard test of the theory that cooperative inducements are more effective than coercion. If coercion is to work better than cooperation, in any case, it should be in a militarily vulnerable, economically weak, and technologically underdeveloped state like North Korea. This chapter, therefore, tests the effectiveness of cooperative overtures and coercive strategies at inducing nuclear reversal in North Korea by comparing its proliferation responses to different engagement tactics over the course of its decades-long nuclear pursuit.

[4] According to the CIA World Factbook, North Korea has suffered stagnant or even negative growth rates most years in the past decade, and has one father worst GDP per capita in its region of less than $2,000 per person. It has suffered regular famine and basic goods shortages and is heavily reliant on aid to meet its needs. ("East Asia, North Korea" *CIA World Factbook* (April 2019) https://www.cia.gov/librarY/publications/the-world-factbook/geos/kn.html)

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The chapter begins by providing a brief history of the North Korean nuclear program and its recent history to help explain its motivations for proliferating. It follows with a brief description of each of the several periods of negotiations conducted with North Korea, beginning with the first major diplomatic push of the Agreed Framework and its breakdown. It then explores the multilateral negotiations known as the Six-Party Talks, then North Korea's nuclear breakout, and finally briefly describing the bilateral summits that constitute the ongoing attempts at negotiations. The analysis here also provides clear implications for deproliferation engagement strategies in the future, as North Korea's nuclear pursuit and international attempts to reverse this program are still ongoing at the time of this research. In this way, the lessons drawn throughout this body of work will be tested and applied through within-case comparison of engagement with a single critical case.

History of the North Korean Nuclear Program:

Like the Islamic Republic of Iran, North Korea began a native nuclear enrichment program in the early 1980s. Initially, North Korea[5] relied on support from the Soviet Union — its primary benefactor throughout the Cold War. As its faith in its benefactor's commitment and capabilities waned, however, North Korea signed the Nuclear Non-Proliferation Treaty in a bid to ease tensions with its most powerful rival, the United States. Shortly after this, however, new satellite images demonstrated that the DPRK had continued a nuclear enrichment program in secret. By 1987 a new 8-megawatt reactor became operational at the main Yongbyon facility near Pyongyang.[6] The first official negotiations between the

[5] I refer to the state as North Korea and the Democratic People's Republic of Korea (DPRK) interchangeably throughout this paper, meaning the political body led by the Kim dynasty's regime.
[6] Yongbyon Nuclear Scientific Research Center is the primary facility in North Korea and is located in Nyongbyon County.

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United States and North Korea began in Beijing in December 1988 under the shadow of a burgeoning nuclear threat.[7]

These negotiations were slow at first but began to show promise in 1991 when the two Koreas agreed to a nonaggression pact and signed the North-South Denuclearization Declaration.[8] This agreement came on the heels of the United States — and Russian — repatriation of all forward-deployed nuclear weapons, a number of which had previously been station in South Korea. As part of the cooperative agreement between the two long-time rivals, North Korea agreed to join the United Nations and in February 1992, the two Koreas both agreed not to "test, manufacture, produce, receive, possess, store, deploy or use nuclear weapons" and to only seek nuclear enrichment for peaceful purposes.[9] They followed this agreement with the establishment of a Joint Nuclear Control Commission, an independent body in charge of monitoring and carrying out inspections in both rivals.[10] These cooperative mutual assurances and the promise of independent compliance monitoring helped pave the way for multilateral negotiations bringing in the United States, North Korea's most powerful rival and South Korea's primary security benefactor. Through a series of discussions, South Korea and the United States agreed to suspend their regular Team Spirit military exercises — joint military training exercises that Pyongyang had often protested as an act of aggression.[11] Following this joint cooperative overture, North Korea signed on to the full scope of the International Atomic Energy Agency's (IAEA) safeguards agreements, allowing inspectors into nuclear enrichment and waste sites in order to verify its compliance with Non-Proliferation Treaty protocols.

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[7] Wit, J., D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press

[8] Han, Y.S. (2000) "North Korean Behavior in Nuclear Negotiations" *Nonproliferation Review*, 7(1) p.41-54

[9] US DoS archives, 2004 online release

[10] The exact inspection procedures were never agreed upon, however, which led to complications with fulfilling their agreements later. (Wit, J., D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press; US DoS archives, 2004 online release)

[11] Reardon, R. (2012) "Containing Iran: Strategies for Addressing The Iranian Nuclear Challenge," *RAND Corporation*

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After several rounds of ad hoc inspections, however, Pyongyang refused further access of special inspectors to two suspected nuclear waste sites[12] — claiming it had already cooperated beyond the standard safeguards and required reciprocal assurances to continue cooperation.[13] Like Iran, North Korea claimed that providing such access could undermine its national sovereignty, risking its conventional military operations by allowing foreign inspectors to sensitive information — inspectors the DPRK claimed were not in fact impartial.[14] Unable to inspect these sites, the IAEA reported North Korea to its Board of Governors, which demanded Pyongyang accept special inspection within a month or risk being reported to the UN Security Council for failure to prove NPT compliance. The United States and South Korea responded to the IAEA's report by threatened to restart Team Spirit exercises, which North Korea condemned as an explicit military threat.[15]

The combined pressure from IAEA resolutions and US/ROK threats of military exercises did not have the intended effect of cowing Pyongyang into submission, however. Instead, it responded in March 1993 by announcing its intention to withdraw from the NPT altogether — a move that automatically initiated a 90-day countdown after which the DPRK would no longer be a Treaty member or beholden to its signatory obligations. This short window prompted the United States to reinvigorate negotiations in an effort to bring the DPRK back under safeguards compliance. While the military threats and diplomatic isolation led to renewed resistance on the part of North Korea, these overtures from its key rival proved more

[12] Sites the IAEA claimed were necessary for determining the extent of the DPRK's proliferation activity to date.

[13] Such special inspections are a common procedure when discrepancies are found, but are not strictly required as part of the standard safeguards agreements. This was, in fact, the first time that the IAEA was attempting to strengthen its inspection protocol in response to the discovery of Iraq's noncompliance with the NPT, and "North Korea objected to being [the IAEA's] first test case." Han, Y.S. (2000) "North Korean Behavior in Nuclear Negotiations" *Nonproliferation Review*, 7(1) p.41-54

[14] IAEA ad hoc and special inspections limit the host state sovereignty by granting outsiders access to sensitive areas, often with limited advanced notice. (Rauf T. (2016) The General Framework of IAEA Safeguards. In: Black-Branch J., Fleck D. (eds) *Nuclear Non-Proliferation in International Law*. T.M.C. Asser Press, The Hague; Wilner, M. (June 15, 2015) "Access and Sovereignty" *The Jerusalem Post* https://www.jpost.com/Middle-East/A-balance-between-access-and-sovereignty-407435)

[15] Han, Y.S. (2000) "North Korean Behavior in Nuclear Negotiations" *Nonproliferation Review*, 7(1) p.41-54

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successful. Through these negotiations[16] the rival states crafted an unofficial joint statement in which they promised mutual non-aggression. In response to this cooperative outreach, North Korea agreed to temporarily suspend its NPT withdrawal and agreed under the mutual nonaggression agreement to permit IAEA inspectors access to the contested Yongbyon nuclear facility.[17] Cooperation between rivals through this joint statement paved the way for further negotiations aimed at crafting a more robust and verifiable agreement.

The Agreed Framework:

Under the reinvigorated cooperative atmosphere between the rival states, North Korea broached an offer of unilateral nuclear reversal in exchange for support with building a Light Water Reactor (LWR) — a more proliferation-resistant technology and one that had been used in civilian nuclear cooperation agreements with other non-nuclear armed states in the past.[18] Pyongyang "made the strategic decision that if they could secure better relations with the United States, they were willing to pay the price [of] their nuclear program."[19] Pyongyang offered to dismantle its riskier dual-use facilities in exchange for American LWR technology operated under IAEA safeguards and to ship the spent fuel back to the United States for reprocessing.[20] If implemented, this offer promised to reverse the DPRK's nuclear capabilities in exchange for a long-term cooperative inducement, and would be carried out under the independent monitoring of both sides by the IAEA going forward.

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[16] Mainly conducted between Robert Gallucci representing the United States and Kang Sok-Ju representing North Korea.
[17] Wit, Joel, Daniel Poneman, and Robert Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press
[18] Abushady, Y. (2008) "Can Light Water Reactors be Proliferation Resistant" IAEA-SM-367/15/08; Penner, S. S., Seiser, R., & Schultz, K. R. (2008). Steps toward passively safe, proliferation-resistant nuclear power. *Progress in Energy and Combustion Science*, *34*(3), 275-287.
[19] Joel Wit in Boghani, N. (February 28, 2019) "The U.S. and North Korea on the Brink: A Timeline" *Frontline: PBS*. Wit is a senior fellow at John's Hopkins University and was one of the lead negotiators in the Agreed Framework.
[20] Mazzar, M. (1995) *North Korea and the Bomb: A Case Study in Nonproliferation*, New York: St Martin's Press

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The United States agreed to support such an exchange in theory,[21] but simultaneously continued its threats of economic sanctions pending North Korean reintegration into IAEA safeguards and inspections.[22] In addition, the concurrent North-South negotiations on Joint Nuclear Control Commission (JNCC) bilateral inspections were unsuccessful and the DPRK-IAEA negotiations failed to agree on the scope of inspections necessary for reintegration into the NPT. The US responded to the failure of the North-South negotiations by canceling the third round of talks, restarting preparations for the 1994 Team Spirit exercises, and announcing plans to send the Patriot Missile Battalion to South Korea. North Korea protested to all of these actions, claiming they posed direct threats of military escalation. Rather than being cowed by the threat of military pressure — even pressure from its most powerful rival — the DPRK responded by threatening to resume its nuclear program.[23]

As a last resort effort to salvage negotiations, the United States and North Korea agreed reset discussion in one day of comprehensive agreements, held on March 1, 1994.[24] During this "Super Tuesday", the rivals agreed that four key events would occur simultaneously: North Korea would permit IAEA inspections of its Yongbyon facilities, North and South Korea would exchange envoys, South Korea would announce the suspension of the 1994 Team Spirit exercises, and North Korea and the USA would announce the resumption of their third rounds of talks.[25] While the promise of ongoing cooperation through envoys and repeated negotiations paved the way for successful resumption of IAEA inspections on March 1, the success was short-lived. Within a few weeks of Super Tuesday, North Korea walked out of negotiations claiming the South was negotiating in bad faith by delaying the economic

[21] though only if third parties served as LWR suppliers, given the lack of a 123 Agreement between Washington and Pyongyang.
[22] Mazzar, M. (1995) *North Korea and the Bomb: A Case Study in Nonproliferation*, New York: St Martin's Press
[23] Han, Y.S. (2000) "North Korean Behavior in Nuclear Negotiations" *Nonproliferation Review*, 7(1) p.41-54
[24] Poneman, D. (2006) "The History of the Agreed Framework" *The Forum for International Policy*
[25] Poneman, D. (2006) "The History of the Agreed Framework" *The Forum for International Policy*

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and diplomatic integration between the two rivals, and that the IAEA was overstepping its agreed inspection rights.[26]

In response to these perceived abuses, North Korea once again prevented IAEA some of the special inspections, causing the IAEA to once again find the DPRK in noncompliance with its safeguard agreements. In an effort to pressure the DPRK to accept special inspections, the US again threatened to resume its Team Spirit exercises and soon after the US Patriot Missile defense system arrived in South Korea (April 1994).[27] The North responded by pulling out of the IAEA[28] and removing 8,000 spent fuel rods from its 5MW reactor without the necessary nonproliferation inspections. In response, the IAEA announced it could no longer confirm the continuity of safeguards in North Korea, finding the latter out of NPT compliance,[29] spurring Washington to take a series of decisive actions. It ended the ongoing dialogue with Pyongyang and began pursuing UNSC sanctions against North Korea.[30]

These threats did not cow the North into submission as hoped, however, and the US began military planning for escalating troop deployment to South Korea in case the issue turned violent.[31] However, simultaneously former President Jimmy Carter — ostensibly acting as a private citizen but with the acquiescence of the White House — traveled to Pyongyang as a last-ditch attempt to defuse the crisis.[32] He offered to resume negotiations

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[26] Sigal, L. (1997) "The North Korean Nuclear Crisis: Understanding the Failure of the 'Crime-and-Punishment' Strategy" *Arms Control Association* https://www.armscontrol.org/act/1997_05/sigal

[27] An event Pyongyang had specifically rejected earlier that year and which it claimed was a clear violation of the Armistice Agreement and military escalation on the part of the US (Wit, J, D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press)

[28] Though not the NPT, which would lead to some contention later as to its treaty obligations (Reardon, R. (2010) *Nuclear Bargaining: Using Carrots and Sticks in Nuclear Counterproliferation* Boston: Massachusetts Institute of Technology Press)

[29] Poneman, D. (2006) "The History of the Agreed Framework" *The Forum for International Policy*

[30] Wit, J, D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press

[31] Wit, J, D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press

[32] Wit, J., D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press

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under the previous terms if the DPRK would freeze its program and commit to continued inspections at Yongbyon. Pyongyang accepted, including suspending all of its activities at the 5MW reactor, in return for reinstatement of the previous cooperative promises. Negotiations resumed between the US, North Korea, and South Korea in July 1994, but after only one day, the death of DPRK leader Kim Il Sung's death suspended talks indefinitely.[33]

In August 1994 negotiations restarted, this time with the new DPRK government under Kim Jung-Il, which reiterated the previous leadership's offers of nuclear safeguards in exchange for US security assurances, normalizing diplomatic relations, economic aid, and American technological support for a LWR.[34] The US and DPRK soon concluded and signed an "agreed statement" which established a three-stage process for eliminating DPRK's nuclear weapon program, which was formalized on October 21, 1994 with the "Agreed Framework." In this most comprehensive and detailed agreement to date, North Korea agreed to freeze and begin dismantling all its nuclear facilities — including two still under construction — would permit IAEA special inspections, and would allow the 8,000 spent fuel rods from its Yongbyon facility to be removed for reprocessing. In return, the United States would lead a multilateral assistance program for the construction of two 1000MW LWR in North Korea and would supply the latter with 500,000 tons of liquid fuel oil until the reactors came operational.[35]

The successful negotiations of the Agreed Framework paved the way for some limited collaboration on the Korean peninsula and increased breakout time for a nuclear North Korea. In 1995, the USA, South Korea, and Japan established the Korean Peninsula Energy Development Organizations (KEDO) to oversee the Framework's implementation, and

[33] The change in leadership for the first time in the DPRK history caused doubt in the US on whether the new leadership would choose to pick up where Kim Il Sung had left off. (Wit, J., D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press; Poneman, D. (2006) "The History of the Agreed Framework" *The Forum for International Policy)*

[34] Kim Il Sung's son and successor.

[35] Poneman, D. (2006) "The History of the Agreed Framework" *The Forum for International Policy*

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several states including Australia, the European Union, and New Zealand also committed financial support for the KEDO. The United States eased sanctions against the DPRK, and refrained from resuming the Team Spirit exercises.[36] Later that year, IAEA inspectors verified that the Yongbyon facility had, in fact, remained frozen as agreed. In line with the theory that cooperative inducements – particularly from powerful rivals – are most effective, the Agreed Framework and North Korea's nuclear reversal was maintained for several years through cooperative inducements.

Breakdown of the Agreed Framework:

Over the subsequent years, however, several events began to derail the Framework,[37] largely initiated by continued disputes over the North Korean ballistic missile program — a program that the DPRK contended was not related to the Agreed Framework but which the US claimed contravened the intent of that agreement.[38] Pyongyang insisted that persisting sanctions[39] would need to end and construction on the long-delayed LWR[40] completed before any agreement on the missile program could be reached.[41] From 1996 to 1998, the US and North Korea held several rounds of talks on the issue, but these repeatedly broke down over

[36] Wit, J, D. Poneman, and R. Galuccia, (2004) *Going Critical: The First North Korean Nuclear Crisis*, Washington, DC: Brookings Institution Press

[37] Some have claimed the breakdown of the AF indicates North Korea did not act in good faith and the negotiations were simply a stall tactics (see for example Condoleezza Rice's interview on PBS's *NewsHour with Jim Lehrer* July 30, 2003). However, since all of North Korea's weapons were — at the time — entirely reliant on fuel from the Pyongyang reactor, the DPRK's verifiable freeze of that reactor and failure to reprocess rods it already had clearly hampered its weapons pursuit, demonstrating a verifiable commitment to the agreement stipulations (see Reardon 2009, p203-4 for further discussion).

[38] Note that the missile program was mainly used as a form of income for the Kim regime, rather than for use with the then-frozen nuclear program (Abramowitz and Laney 1998; Cha in Cha and Kang, 2003)

[39] While the Agreed Framework agreed to an easing of some sanctions, it did not provide for a full cease to all sanctions. Some of these were imposed for DPRK human rights violations, support for terrorism, or drug trade, which Washington claimed was unrelated to the nuclear negotiations.

[40] US regulation prohibits the transfer of nuclear technology without a 123 Agreement (a Section 123 agreement under the US Atomic Energy Act), an agreement that generally requires the recipient state meet strict nonproliferation requirements, including refraining from transferring or pursuing nuclear weapons-related technology and the delivery systems for the same (Kerr, P. and M. Nikitin (April 2019) "Nuclear Cooperation with Other Countries", *Congressional Research Service*, https://fas.org/sgp/crs/nuke/RS22937.pdf)

[41] North Korea contended it had complied with the letter of the Agreed Framework, despite the fact that its counterparts had not cooperated as promised. It therefore claimed it would not unilaterally concede new ground until its counterparts' previous obligations were fulfilled.

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disagreements on the appropriate compensation for an end to the missile program — with the DPRK insisting on the provision of its promised LWR and the US offering sanction easement. Despite the poor state of North Koreas economy, US offers of *quid pro quo* rewards like sanction easement and foreign aid proved a much less powerful bargaining chip than the technological cooperation and diplomatic normalization North Korea demanded. Instead, the latter claimed that sanction easement was implicit in the Agreed Framework and as such overdue and not sufficient to elicit deproliferation.[42] Repeated negotiation failures and continued progress in the disputed program led to incrementally stricter[43] US sanctions as the relationship deteriorated further, all to no avail against the ever-resilient target. Instead, North Korea warned that coercion and "bullying" on the part of the United States would force the former to "strongly react"[44] against its powerful adversary.

In April 1999, amidst growing concern that the DPRK was on the brink of developing an intercontinental ballistic missile capable of reaching the United States, the US collaborated with South Korea and Japan to establish the Trilateral Coordination and Oversight Committee aimed at integrating the three allies' policies toward North Korea. Soon after, Secretary of Defense William Perry traveled to Pyongyang, offering not only the now-standard sanction easement, but also humanitarian aid, a path for normalizing relations, and a limited security guarantee.[45] In response to this cooperative overture, the DPRK ceased its repeated undersea incursions into South Korean waters and its ballistic missile tests, to which the United States reciprocated by agreeing to partially lift sanctions.[46] Following these promising events, the

[42] The LWR were likewise promised in the AF, and yet the DPRK claimed these would be sufficient though sanction easement was not.
[43] These included new sanctions in May 1996 for missile transfers, August 1997 for unspecified missile activities, and April 1998 for sale of missile components to Pakistan's Khan Research Laboratory.
[44] Minju Joson news Agency in "North Korean media slams US 'warmongers'", BBC Monitoring, March 15, 2001, http://news.bbc.co.uk/2/hi/asia-pacific/1222444.stm (Accessed February 15, 2019)
[45] Cha, Victor and David Kang (2003) *Nuclear North Korea: A Debate on Engagement Strategies*, New York: Columbia University Press
[46] Though these promises were made in September 1999, sanctions were not actually lifted until June of the following year. (Cha, V. (2003) "Weak but still Threatening." *Nuclear North Korea: A Debate on Engagement Strategies*, Eds. V. Cha and D. Kang, New York: Columbia University Press; Davenport, K. (2019)

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two sides agreed to continue high-level talks and KEDO officials finally signed a contract to begin construction on the long-delayed Kuhmo LWR promised in the Agreed Framework.[47] Throughout the proceedings, American inspectors continued to verify the compliance of the DPRK with the Agreed Framework freeze on the Pyongyang facility.[48] Negotiations continued, with North Korea holding out for normalized relations and the LWR over sanction easement, demonstrating its need for to enduring cooperation rather short term economic rewards.[49]

Despite this progress, the negotiations began to falter as the new George W. Bush administration took over in January 2001 before an agreement could be reached. The latter's relations began with new sanctions against North Korea for missile sales to Iran, followed shortly by messages of suspicion that North Korea had not upheld its nuclear reversal commitments. Balking at the new tone from the US, the DPRK took a harder line itself, claiming it would "take thousand-fold revenge" on the United States "and its black-hearted intention to torpedo the dialogue between north and south"[50] if it scuttled ongoing peace dialogues between the two neighboring rivals. Despite these messages, the DPRK claimed remained "fully committed to both diplomacy and war" and promising to extend its self-imposed missile moratorium for another three years if positive negotiations could be concluded with the new Bush administration.[51] In response, Washington issued a press release agreeing to new broad negotiations but reiterated the need for verifiable constraints on

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"Chronology of the US-North Korea Nuclear and Missile Diplomacy" *Arms Control Association,* (https://www.armscontrol.org/factsheets/dprkchron)

[47] Davenport, K. (2019) "Chronology of the US-North Korea Nuclear and Missile Diplomacy" *Arms Control Association,* (https://www.armscontrol.org/factsheets/dprkchron)

[48] Harrison, S. (2005) "Did North Korea Cheat?", *Foreign Affairs*, January/February; Davenport, K. (2019) "Chronology of the US-North Korea Nuclear and Missile Diplomacy" *Arms Control Association,* (https://www.armscontrol.org/factsheets/dprkchron)

[49] Harrison, S. (2005) "Did North Korea Cheat?", *Foreign Affairs*, January/February

[50] in Wood, D. (2012) *Presidential Saber Rattling: Causes and Consequences*, Cambridge, UK: Cambridge University Press, p. 125

[51] Davenport, K. (2019) "Chronology of the US-North Korea Nuclear and Missile Diplomacy" *Arms Control Association,* (https://www.armscontrol.org/factsheets/dprkchron)

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both the nuclear and missile program issues.[52] However, Washington soon after imposed a second round of sanctions under the Iran Nonproliferation Act of 2000 — the same used to impose sanctions in January of that year. Despite this, Kim Jung Il reiterated his commitment to a testing moratorium should the US suspend sanctions and resume negotiations,[53] saying "if the US has a will to drop its hostile policy toward the DPRK, it will have dialogue."[54]

Diplomacy further broke down beginning in 2002, as Washington labeled North Korea one of the Axis of Evil — though shortly after Secretary of State Colin Powell reaffirmed the administrations' commitment to resume negotiations and its belief that Pyongyang has complied with its self-imposed missile moratorium.[55] North Korean media responded to the change of US rhetoric saying that "the US warmongers have…further strengthened their hostile policy toward the Republic"[56] and that "as the US takes a hard-line approach to the DPRK, it is left with no option but to strongly react."[57] In the months following, prospects for resumed negotiations further deteriorated: Pyongyang balked at the US Nuclear Posture Review's discussion of nuclear contingencies against the DPRK, President Bush claimed he would not certify Pyongyang's continued compliance with the Agreed Framework, and Washington withdrew from scheduled talks in response to naval skirmished between North and South Korea. Finally, in August 2002 the US imposed another round of sanctions for the

[52] Pollack, J. D. (2003). The United States, North Korea, and the End of the Agreed Framework. *Naval War College Review*, *56*(3), 10-50.; Davenport, K. (2019) "Chronology of the US-North Korea Nuclear and Missile Diplomacy" *Arms Control Association,* (https://www.armscontrol.org/factsheets/dprkchron)
[53] Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, (https://www.armscontrol.org/factsheets/dprkchron); "North Korean Nuclear Negotiations 1985-2019" *Council on Foreign Relations*, (https://www.cfr.org/timeline/north-korean-nuclear-negotiations)
[54] DPRK Foreign Ministry, August 31, 2002, in Sigal, L. (2003) *DPRK Briefing Book: U.S. Interests And Goals On The Korean Peninsula,* Nautilus Institute https://nautilus.org/publications/books/dprkbb/uspolicy/dprk-briefing-book-u-s-interests-and-goals-on-the-korean-peninsula/
[55] "North Korean Nuclear Negotiations 1985-2019" *Council on Foreign Relations*, (https://www.cfr.org/timeline/north-korean-nuclear-negotiations)
[56] Minju Joson news Agency in "North Korean media slams US 'warmongers'", BBC Monitoring, March 15, 2001, http://news.bbc.co.uk/2/hi/asia-pacific/1222444.stm (Accessed February 15, 2019)
[57] Minju Joson news Agency in "North Korean media slams US 'warmongers'", BBC Monitoring, March 15, 2001, http://news.bbc.co.uk/2/hi/asia-pacific/1222444.stm (Accessed February 15, 2019)

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DPRK's missile technology transfer to Yemen. In a final attempt to preserve the Agreed Framework — which remained nominally in effect — Japan and North Korea negotiated the Pyongyang declaration, reiterating North Korea's commitment to a testing moratorium and in which "both sides affirmed the pledge to observe all the international agreements for a comprehensive solution to the nuclear issue on the Korean Peninsula".[58]

Less than one month later, however, the United States announced that North Korea had admitted to a secret underground uranium enrichment facility — an admission that North Korea denied — and that this program was in clear violation of the Agreed Framework.[59] This disclosure prompted the KEDO to suspend future shipments of heavy fuel provided in the Framework. North Korea took this as evidence of the end of the Agreed Framework, expelling IAEA inspectors, unsealing the frozen Yongbyon facility, turning off surveillance cameras, restarting enrichment at the 5MW reactor, and finally withdrawing from the Nuclear Non-Proliferation Treaty in January 2003.[60] According to Joel Wit, a chief negotiator of the Framework, the Bush administration "thought they could bully the North Koreans into stopping cheating."[61] However, the DPRK proved remarkably resilient in the face of threats and economic coercion, restarting their reactors and within a few months had completed reprocessing the 8000 spent fuel rods from its Yongbyon reactor.[62] In April 2003, North Korean representatives told the U.S. delegation at trilateral talks in Beijing that the DPRK possessed nuclear weapons, and by August of that year claimed it also had "the means to deliver them.[63]"

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[58] Japan-North Korea Pyongyang Declaration on BBC September 17, 2002
[59] "North Korean Nuclear Negotiations 1985-2019" *Council on Foreign Relations*, (https://www.cfr.org/timeline/north-korean-nuclear-negotiations)
[60] Poneman, Daniel (2006) "The History fo the Agreed Framework" *The Forum for International Policy*
[61] Wit in Boghani, P. "The U.S. and North Korea On The Brink: A Timeline", *PBS Frontline* (Feb 28, 2019) https://www.pbs.org/wgbh/frontline/article/the-u-s-and-north-korea-on-the-brink-a-timeline/
[62] Reprocessing spent fuel is a critical step in developing a plutonium nuclear warhead, and is therefore strictly safeguarded under the NPT. (Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, (https://www.armscontrol.org/factsheets/dprkchron))
[63] State Department official quoted in Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and

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Six-Party Talks

The breakdown of the Agreed Framework and subsequent North Korean claim of possessing nuclear warheads prompted renewed international collaboration to counter this proliferation. While economic sanctions continued after the breakdown of the Framework — during which time North Korea had continued to increase its indigenous ENR capabilities despite these hurdles — the DPRK's primary concerns remained centered on diplomatic and military assurances from its primary adversary.[64] In what became known as the Six-Party Talks, China, Japan, Russia, South Korea, and the United States held multilateral negotiations with North Korea to work out a replacement to the Agreed Framework. Throughout the many rounds of Six-Party negotiation, the DPRK continued its habit of doubling down in the face of coercion[65] while reiterating its need for security assurances and energy cooperation from the United States, demands it had made since 1992 as part of the Agreed Framework.

The first of these talks was held in Beijing in August 2003, at which North Korea proposed a step-by-step solution, requesting that the US provide a nonaggression treaty, normalized bilateral relations, and the LWR reactors discussed in the Agreed Framework.[66] In exchange, North Korea offered to relinquish a weapons program, rejoin the NPT, and resume IAEA inspections — though like Iran it maintained its right to a civilian energy program. Under this proposal, North Korea offered to gradually bring its nuclear program back under nonproliferation safeguards, contingent on security assurances and nuclear cooperation from

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Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron; "North Korea 'admits' having nukes" *CNN WORLD (April 25. 2003)* https://www.cnn.com/2003/WORLD/asiapcf/east/04/24/nkorea.us

[64] Exemplified by their claims to have successfully made a nuclear warhead (though no nuclear test had yet occurred). ("North Korea 'admits' having nukes" *CNN WORLD (April 25. 2003)* https://www.cnn.com/2003/WORLD/asiapcf/east/04/24/nkorea.us)

[65] Including threats and imposition of economic sanctions (unilaterally from the US and multilaterally from the UNSC), diplomatic isolation, and large Team Spirit military exercises on its borders.

[66] Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron

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the United States. Like the previous negotiation with the proliferator, Pyongyang again demonstrated its interest in negotiating, though in line with the theory argued here, this willingness of was dependent on cooperative assurances from its powerful rivals like the United States.

While these offers if implemented promised to reverse critical military or dual-use elements of its nuclear program, the DPRK made it clear they were entirely contingent on key assurances from the United States. The five negotiating partners — China, Japan, Russia, South Korea, and the USA — agreed to energy assistance, and the US and Japan agreed to move toward normalized relations[67], agreed not to deploy nuclear weapons to South Korea, and would consider providing LWR support "at an appropriate time."[68] However, the United States also explained that a security guarantee was "off the table" and ended support for KEDO, claiming there was "no future for the project."[69] The North Korean Foreign Ministry expressed concern over the vague nature the promises of US statements, claiming that without which North Korea could not relinquish its "nuclear deterrent," a plutonium path to the bomb that it displayed to visiting US scientists.[70]

Over the next two years, the parties continued to negotiate but a resolution was stymied by differences on verification, implementation timing, and assurances persisted between North Korea and the United States.[71] While the DPRK repeatedly reiterated its interest in

[67] No concrete timeline or steps were formalized, however.
[68] "Full text of 6-party talks joint statement" *China Daily* (Sept 19, 2005) http://www.chinadaily.com.cn/english/doc/2005-09/19/content_479150_2.htm
[69] Department of State spokesperson Adam Ereli in an official statement (Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron)The joint KEDO project had been funded by US and South Korean money since 1994. KEDO had been responsible for transferring fuel aid to North Korea and for the construction of the long-stalled LWR offered in the Agreed Framework.
[70] (Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron)
[71] There were a total of five talks before 2006, with several bilateral and interim negotiations between these talks. (Jang, W. Y., Hong, J., & Frederick, E. (2015). "The Framing of the North Korean Six-Party Talks by Chinese and North Korean News Agencies: Communist Propaganda and National Interests." *Media International Australia*, *154*(1), 42–52. https://doi.org/10.1177/1329878X1515400107)

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finding a negotiated resolution, it maintained its right to civilian enrichment and the need to assurances before it would commit to any "unilateral" concessions.[72] Throughout this time, the US imposed more unilateral sanctions against third parties trading or banking[73] with North Korea and suspended the KEDO light water reactor project. North Korea countered by claiming it was no longer bound its self-imposed missile test moratorium and began reprocessing its spent plutonium fuel rods — moves that combined brought the proliferator closer to both a missile delivery system and a weapon with which to arm these systems.[74]

When negotiations continued to stall in 2006 — with the US officially terminating the KEDO program and increasing third-party financial sanctions — North Korea conducted its first missile test since 1999. The US unilaterally and the UN Security Council multilaterally both condemned the test as a "provocative act", demanding that the DPRK suspend all ballistic-missile related activity and banning international trade or support for the North Korean nuclear program.[75] Rather than buckling under the mounting international pressure, North Korea claimed it would "not be bound" by any such resolution, and would only return to talks if the US returned assets frozen DPRK assets.[76] As further sanctions accumulated, North Korea further proved its resistance to coercion by announcing and then conducting its first nuclear test. The DPRK claimed that the need for the test was "a result of U.S. political pressure…an active self-defense measure…entirely attributable to the US nuclear threat,

[72] Jang, W. Y., Hong, J., & Frederick, E. (2015). "The Framing of the North Korean Six-Party Talks by Chinese and North Korean News Agencies: Communist Propaganda and National Interests." *Media International Australia*, *154*(1), 42–52.(https://doi.org/10.1177/1329878X1515400107)

[73] The most painful of these was the freeze of approximately $25 million of assets in Banco Delta Asia (Soloman, J. and N. King, (Aril 12, 2007) "How the US Used a Bank to Punish North Korea," *Wall Street Journal* https://www.wsj.com/articles/SB117627790709466173)

[74] Kerr, P. (April 1, 2005) "North Korea Disavows Missile Moratorium: Talks Remain Stalled" *Arms Control Today*, https://www.armscontrol.org/print/1785; Brooks, (May 15, 2005) "North Koreans Claim to Extract Fuel for Nuclear Weapons," *New York Times* https://www.nytimes.com/2005/05/12/world/asia/north-koreans-claim-to-extract-fuel-for-nuclear-weapons.html

[75] UNSC8778, (July 15, 2006) "Security Council Unanimously Condemns People's Republic of Korea's Missile Test" *United Nations Press Release* https://www.un.org/press/en/2006/sc8778.doc.htm

[76] Assets totaling approximately $25 million on Banco Delta Asia (Lague, D. and D. Greenlees,(Jan 18, 2007) "The Squeeze on Banco Delta Asia hit North Korea where it hurt," *New York Times*, https://www.nytimes.com/2007/01/18/world/asia/18iht-north.4255039.html)

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sanctions, and pressure." Rather than forcing compliance, the increasing multinational sanctions instead "compelled [the DPRK] to substantially prove its possession of nukes to protect its sovereignty."[77] The UNSC responded to the test with further sanctions and demanded that North Korea refrain from further tests.[78]

After North Korea demonstrated it possessed nuclear breakout capacity,[79] it claimed to still be interested in finding a diplomatic resolution. In a series of negotiations, the US and the DPRK reached a potential compromise, in which the US offered to remove North Korea from its state sponsors of terrorism list, rescind its application of Trading with the Enemy Act — both necessary conditions for normalizing relations between the two rivals. In addition, the US agreed to return the $25 million in frozen assets from Banco Delta Asia, provided those funds were used for humanitarian and educational purposes.[80] In response, the DPRK readmitted IAEA inspectors who then verified that the state had, in fact, halted its ENR activities at Yongbyon as agreed.[81] While the comprehensive multilateral sanctions had produced only increased nuclear activity in North Korea, bilateral negotiations with its primary adversary as well as multilateral negotiations that included regional rivals (South Korea and Japan) produced a period of nuclear reversal and detente. Over the following year, the agreement continued to be successfully implemented, with the IAEA continuing to affirm North Korea's compliance, relations between North and South Korea thawing, and the US initiating the removal of North Korea from the state sponsor of terrorism list.

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[77] in Hecker, S. (Nov 15, 2006) "Report on North Korean Nuclear Program", *Center for International Security and Cooperation Stanford University* (https://fas.org/nuke/guide/dprk/nuke/hecker1106.pdf); Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron

[78] S/Res/1718 (2006), *United Nations Security Council* https://www.treasury.gov/resource-center/sanctions/Documents/1718.pdf

[79] Though the actual yield of the 2006 nuclear test and the state's ability to deliver a warhead were still unproven at this time.

[80] These assets were confiscated for money laundering and likely originally belonged to DPRK elites. Returning the assets for solely humanitarian purposes, therefore, prevented the elites from receiving a quid pro quo in return for their nuclear concessions.

[81] Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron

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Throughout these negotiations, North Korea repeatedly allowed supplementary IAEA inspections and proposed denuclearization verification protocols when the US provided diplomatic assurances — such as the removal of the DPRK from the state sponsor of terrorism list. However, progress began to break down at the end of 2008 when the DPRK slowed its removal of spent fuel rods in response to delays in US energy support, and then broke down entirely when the US ceased its fuel aid, citing delays in the DPRK's deproliferation. Failing to find an agreement on joint verification of mutual Korean denuclearization,[82] the DPRK told US officials it had already weaponized its plutonium stockpiles and in 2009 conducted its first rocket launch, followed soon after by its second nuclear test. While the nuclear test again resulted in the now foreseeable multilateral UNSC sanctions, North Korea continued to double down on its proliferation actives, claiming it would weaponize all its newly separated plutonium and would respond militarily to any blockade.[83] The talks did not resume for a number of years, and failed to again make verifiable progress on reversing the DPRK's nuclear weapons program.

As it had done in the past, North Korea repeatedly walked away from the Six-Party Talks each time the US ended cooperation or imposed new sanctions — even when other world powers continued cooperating and aid continued — again demonstrating the DPRK's surprising resilience in the face of coordinated multilateral coercion. Over the following years, relations continued to deteriorate, with the US and South Korea increasing military collaboration,[84] and South Korea taking a harder line against its northern neighbor including

[82] North Korea had regularly demanded concurrent joint access to South Koreas facilities to confirm the latter did not host any US nuclear weapons or a nascent indigenous program. South Korea, in fact, had not had nuclear weapons for several decades at that point, but the demands suggest North Korea still feared duplicity and balked at demands for unilateral opening of military facilities.

[83] The DPRK claimed the Proliferation Security Initiative begun by the US in 2003 and which South Korea joined in 2009 — a nuclear interdiction effort to intercept the transfer of sensitive materials to proliferation risks like the DPRK — was an act of aggression.

[84] Including larger Team Spirit exercises, the same annual military exercise that North Korea had objected to as direct provocation during the Agreed Framework negotiations.

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ceasing all aid and supporting the interdiction of North Korean shipping vessels.[85] However, rather than successfully pressuring the economically unstable and isolated proliferator into compliance, North Korea responded by initiating direct military action against South Korea,[86] increasing its ENR capabilities with new plants operating around the country, increasing the yield of its subsequent nuclear tests, and developing a more robust ballistic missile program.

While the Six-Party Talks had provided a forum for greater cooperation with other powers beyond the three-way negotiations of the Agreed Framework — power like China and Russia who often showed more interest in cooperating than had the United States — the potential for more global cooperation did not lead to greater success. In fact, when the more proximate powers offered to cooperate despite US reluctance,[87] North Korea held out for Washington's involvement. However, when the US agreed to bilateral negotiations with the DPRK outside the Six-Party framework, these negotiations made promising headway even absent the bonuses the other powers might have provided.[88] Beyond the importance of assurances from rival powers, the Six-Party talks demonstrated the surprising resilience of North Korea in the face of mounting multilateral sanctions. Unlike Iran, whose vast oil and natural gas reserves, as well as its central location for Middle East trade flows, made it difficult to isolate through sanctions, North Korea's economy has proven far less integrated or resilient.[89] Despite its relatively weak economy and limited industrial infrastructure,[90] however, the DPRK

[85] As part of the Proliferation Security Initiative.
[86] Including sinking the South Korean submarine *Cheonan* and shelling the island of Yeonpyeong.
[87] For example, in December 2008 when China and Russia continued fuel shipments despite US resistance until the IAEA verified DPRK compliance (Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron)
[88] For example, negotiations between Assistant Secretary Christopher Hill and North Korean Vice-Foreign Minister Kim Gye Gwan in spring 2008 (Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron).
[89] The precise economic effects are difficult to measure since much of the impact of financial sanctions and asset freezes actually impact North Korea's black market activity such as money laundering and arms sales.
[90] "East Asia, North Korea" *CIA World Factbook* (April 2019) https://www.cia.gov/librarY/publications/the-world-factbook/geos/kn.html

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accelerated its nuclear weapons capabilities in the face of global interdiction efforts, trade barriers, and even targeted financial restrictions. In fact, the isolated regime even accelerated these economically costly and technologically demanding capabilities every time coercive pressure intensified.

Evaluating the Counterarguments

While the evidence described here suggests that cooperative agreements — particularly those from North Korea's most powerful rivals — were more effective than coercive tactics at inducing nuclear reversal, several importance counterarguments exist in both the scholarly and policymaking communities. Here I explore these counterarguments, assessing their abilities to explain the evidence compared to the theory tested here that positive inducement from powerful rivals were more effective than negative coercion for inducing nuclear reversal in North Korea. The counterarguments I address can fall into two general categories. The first is that cooperative inducements are not more effective than coercive strategies, either because cooperation does not produce reversal, or because coercion does it better. The second category of arguments contends that the most effective engagement comes not from powerful rivals, but from more trusted allies. I begin with the counterarguments to cooperation with North Korea and follow with the sender conditions counterarguments that doubt the effectiveness of cooperation from powerful rivals.

Counterarguments to Cooperation

Counterarguments to the use of positive incentives[91] for inducing nuclear reversal rest on two basic assertions: that North Korea was always negotiating in bad faith, or relatedly that

[91] For sake of brevity, this chapter addresses counterarguments unique to the North Korean case, rather than reiterating the general counterarguments already evaluated in the preceding cross-national and Iran chapters. The same inducements and thus the same logic applies here. For further discussion, reference the discussion of

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the DPRK's misdemeanors should be met with punishment from moral grounds. In applied policy communities, skeptics of cooperative approaches suggest those in favor of cooperating with North Korea and other renegade regimes were blind to the transgressions of these proliferators and naive for pursuing altruistic principles of forgiveness.[92] These claims reflect a well-earned skepticism of the sincerity of North Korean promises, as well as a belief in the principles of reciprocity: reward 'good' behavior and punish 'bad'.[93] The first concern — skepticism over the sincerity of North Korean promises — reflects an oft-repeated belief that North Korea was always committed to achieving nuclear breakout regardless of its claims to the contrary, but this is difficult to square with the evidence. While North Korea did in fact regularly hold out for cooperative inducements, its persistent negotiation in pursuit of diplomatic normalization and security assurances at the expense of proffered sanction easement and aid packages is inconsistent with concession-seeking behavior. While the gains from aid and sanction easement are preservable even when reneging later cuts off future gains, security agreements and diplomatic normalization are immediately removable should the recipient violate the terms of the agreement. Diplomatic and security cooperation with its primary rival — the adversary most likely to present a security threat and the least likely to grant *quid pro quo* concessions — is an inferior inducement for insincere concession-seekers compared to the rapid rewards of economic payouts.[94]

The second concern underpinning the hard-line policy approach to North Korea is the moral argument that contravening international norms and standards of behavior should be met punishment, not reward. This argument reflects twin concerns: one utilitarian and the

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cooperation counterarguments in chapters 3 and 5.

[92] See Cha, V. (2003) "Weak but still Threatening." *Nuclear North Korea: A Debate on Engagement Strategies*, Eds. V. Cha and D. Kang, New York: Columbia University Press; Chinoy, M. (2008) *Meltdown: The Inside Story of the North Korean Nuclear Crisis*, New York: St. Martin's Press

[93] Nincic, M. (2010)*"Getting What You Want: Positive Inducements in International Relations." Quarterly Journal: International Security*, 35(1). p.138-183

[94] Sigal, L. (1997) "The North Korean Nuclear Crisis: Understanding the Failure of the 'Crime-and-Punishment' Strategy" *Arms Control Association* https://www.armscontrol.org/act/1997_05/sigal

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other ethical. The utilitarian argument that reprehensible behavior should be met with punishment generally references the risks of moral hazard — that rewarding bad behavior will incite concession seeking in the future.[95] As discussed in the previous chapters, this risk is a reasonable concern since policies that induce reversal today only to entice further proliferation tomorrow are not effective in the long term. However, the most effective policies for inducing reversal in North Korea — like those most effective in the cross-national analysis and Iranian case study — are less prone to moral hazard risks as they are protected rights for all non-proliferation compliant signatories to the NPT.[96] The primary demands of the DPRK were for negative security assurances from the United States and support for a civilian nuclear energy program. For these provisions, it repeatedly accepted some of the most comprehensive and intrusive IAEA inspections ever forced on a past proliferator. In addition, the prospective proliferator held out against offers of greater economic concessions — aid and sanction easement that better fit the risk of moral hazard — in order to secure assurances granted to even those nonproliferation abiders who never used an existing enrichment program as a bargaining chip.

Finally, the ethical concerns of these counterarguments — that contravening accepted international norms deserves punishment not reward — falls outside the scope of the analysis of effectiveness performed here, but I will briefly address these concerns here. While the research performed here assesses the Machiavellian effectiveness of foreign policy strategies, asking not which policies are ethically superior, but which most effectively to lead to nuclear reversal, the findings have implications for the protection global norms as well. According to the literature on norm consolidation, these standards of acceptable behavior are constituted

[95] De Mesquita, E. B. (2005). "The terrorist endgame: A model with moral hazard and learning." *Journal of Conflict Resolution*, *49*(2), 237-258.
[96] "The Global Nuclear Nonproliferation Regime" (2012), *International Institutions and Global Governance,* Washington, D.C.: Council on Foreign Relations; UNSC Res. 255 (1968); US ACDA, (1969) Documents on Disarmament, 1968, pp. 444, 439-440

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and protected through widespread adherence.[97] This suggests that the longer North Korea and other renegades can defy their adoption weakens the norm.[98] As a result, even if the goals of policymaking was to uphold the ethics of good international citizenship, they may be better served by assessing foreign policies as a means for achieving the ends of nonproliferation rather than by taking the hard line of punishments for deviance.

Counterarguments to Rival Powers

Like the importance of cooperative inducements in nuclear negotiation, the importance of negotiating with rival powers rather than long-time allies is contested in both research and policy circles. These counterarguments occasionally concede that cooperation can be useful but that it is better concluded between allied states where a history of trust can facilitate cooperative negotiations. Scholarly literature on international bargaining suggests that trust can grease the wheels of negotiations, making bargaining easier and opening the way to more fruitful interactions.[99] Allies can draw from shared economic ties to offer more lucrative deals, can draw from shared security interests to coordinate mutually defense pacts, and can lean on a history of successful cooperation to back their credibility as partners. By contrast, rivalries make negotiations more complicated by reducing the overlap of negotiator's preference, and mistrust can hinder bargaining and make resolution harder to achieve.[100] Policy circles have also articulated a variation of this argument, suggesting that cooperation from China — as North Korea's primary financial supporter and an important security backer

[97] Freedman, L. (2013). "Disarmament and other nuclear norms" *The Washington Quarterly*, *36*(2), 93-108; Wunderlich, C. (2014). "A 'rogue' gone norm entrepreneurial? Iran within the nuclear nonproliferation regime" In *Deviance in international relations* (pp. 83-104). Palgrave Macmillan, London.
[98] Nincic, M. "Positive Incentives, Positive Results? Rethinking US Counterproliferation Policy," in Solingen, E. (eds.) (2012) *Sanctions, Statecraft, and Nuclear Proliferation* New York, NY: Cambridge University Press
[99] Fearon, J.D. (1995). Rationalist explanations for war. *International Organization, 49*(3), 379-414; Kydd, A. (2005) *Trust and Mistrust in International Relations,* Princeton, NJ: Princeton University Press;
[100] Budge, I., & Klingemann, H. D. (2001). *Mapping policy preferences: estimates for parties, electors, and governments, 1945-1998* (Vol. 1). Oxford University Press on Demand.; Jennings, N. R., Faratin, P., Lomuscio, A. R., Parsons, S., Wooldridge, M. J., & Sierra, C. (2001). Automated negotiation: prospects, methods, and challenges. *Group Decision and Negotiation*, *10*(2), 199-215.

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— would be necessary to secure nuclear reversal from the DPRK. These critics suggest that successful resolution could be achieved if only China would use its leverage to coerce compliance from the DPRK.

While the finding in scientific research that cooperation between allies is certainly easier than the same between adversaries, the evidence here suggests that easier does not necessarily mean more effective. As North Korea repeatedly claimed, its nuclear program constituted an important deterrent against foreign aggression or an existential threat. This threat justified the *juche* and *songun* ideologies — roughly translated to self-reliance and military first, respectively — that have served as the regimes motivating principles, which defend the preferential flow of the regimes limited resources to military means at the expense of economic prosperity or even basic public goods.[101] That threat was primarily posed by the United States, a powerful leader of the international community that had refused to recognize the DPRK as the official government of the northern part of the Korean peninsula, that had stationed nuclear weapons aimed at North Korea along on the contested Demilitarized Zone (DMZ), and which regularly conducted military drills in preparation for possible military conflict with North Korea. As a result, the primary and arguably existential threat faced by the DPRK has long been that of the United States, and so as suggested by the theory, the most valuable cooperative overtures proved to be cooperative assurances from this rival. Similar assurances from China — though a more proximate major power and a reliable aid and trade partner — did little to assuage North Koreas fears of a persistent existential threat and proved insufficient to induce reversal.

Finally, while some critics concede that the US may have been critical to any temporary negotiation successes, this was due to its role as the primary superpower and not its rivalrous

[101] Suh, D. S. (2002). Military-First Politics of Kim Jong Il. *Asian Perspective*, 145-167; Habib, B. (2011). North Korea's nuclear weapons programme and the maintenance of the Songun system. *The Pacific Review*, *24*(1), 43-64; Park, Y. S. (2014). Policies and ideologies of the Kim Jong-un regime in North Korea: Theoretical implications. *Asian Studies Review*, *38*(1), 1-14

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relationship with North Korea. However, this argument fails to explain why concessions from less powerful rivals — cooperative assurances from South Korea and Japan, for example — were more effective than inducements from major powers like China and Russia. Whereas fuel aid flows from the latter two major powers were insufficient to bring North Korea to the table,[102] bilateral agreements with its smaller regional rivals produced verifiable concessions from North Korea like permitting IAEA inspections to disputed facilities.[103] This evidence, therefore, suggests that while the power of the United States may indeed have been beneficial in negotiating the successful periods of reversal in North Korea, power alone is not a sufficient explanation. Rather it was the cooperative assurances in the form of more normalized diplomatic relations,[104] as well as civilian nuclear cooperation agreements with the DPRK's powerful rival that most effectively encouraged nuclear reversal.

Conclusion:

As proven by this discussion of deproliferation engagement with North Korea, even the weakest and most isolated proliferators can prove highly resistant to coercive strategies. Repeatedly citing its need for security assurances — most especially assurances from its most powerful rival — North Korea demonstrated the effectiveness of cooperative inducements by repeatedly and measurably reversing its treasured nuclear program when it received cooperative inducements from the US. Also in line with the theory, however, North Korea demonstrated the ineffectiveness of coercive policies by doubling down on its nuclear program. Even this economically isolated, industrially weak state – arguably an especially

[102] For example, in December 2008 when China and Russia continued fuel shipments despite US resistance until the IAEA verified DPRK compliance (Davenport, K. (2019) "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy", *Fact Sheets and Briefs: Arms Control Association*, https://www.armscontrol.org/factsheets/dprkchron)

[103] Han, Y.S. (2000) "North Korean Behavior in Nuclear Negotiations" *Nonproliferation Review*, 7(1) p.41-54; Japan-North Korea Pyongyang Declaration in *BBC (*September 2002)

[104] such as removing North Korea from the State sponsor of terrorism list, and the negotiation of LWR technology under IAEA safeguards.

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susceptible target for coercion – managed to overcome significant sanctions costs and thwart widespread international barriers to achieve nuclear breakout.

North Korea's resilience in the face of sanctions cannot be attributed to economic resilience. The DPRK has few trade partners, relies heavily on foreign aid to provide basic goods to its people, and has remain industrially underdeveloped despite rapid industrialization in most of its regional neighbors. In fact, according to the CIA World Factbook, "industrial capital stocks is nearly beyond repair."[105] Unlike Iran, whose vast oil and natural gas reserves as well as its central location for Middle East trade flow made it difficult to isolate through sanctions, North Korea's economy is far less integrated or resilient.[106] While these weaknesses should make North Korea a prime candidate for coercion — particularly the comprehensive trade barriers that should hinder the prospective proliferator's access to necessary technologies — these measures not only failed to induce reversal but often resulted in perverse proliferation instead.

The perverse proliferation in North Korean demonstrates that in the face of some of the most comprehensive nuclear sanctions ever attempted, highly motivated proliferators can overcome these barriers, even when the proliferator is impossibly weaker and smaller than the combined weight of the sanction senders. This evidence therefore suggests that economic sanctions — even comprehensive sanctions that target not only the proliferator but their supply networks as well — cannot ultimately prevent even an isolated and impoverished proliferator from achieving its goals. Cooperative assurances, on the other hand, provide a reasonable alternative with past evidence of successfully inducing verifiable reversal — both in weak and isolated proliferators like North Korea, and in more economically central cases like Iran. Not all positive inducements lead to reversal — for example, *quid pro quo* rewards

[105] "East Asia, North Korea" *CIA World Factbook* (April 2019) https://www.cia.gov/librarY/publications/the-world-factbook/geos/kn.html

[106] The precise economic effects are difficult to measure, since much of the impact of financial sanctions and asset freezes actually impact North Korea's black market activity such as money laundering and arms sales.

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of economic sanction easement or foreign aid packages were less successful than more enduring cooperative assurances like security assurances and technical cooperation agreements. In addition, not all senders were equally successful in their overtures, with cooperative offers from powerful rivals like the United States making greater headway than similar offers from weaker states or traditional allies. However, in all cases, the cooperative assurances presented a lower risk of perversely increasing proliferation than did more coercive strategies. Even when cooperation did not successfully induce reversal, it at least did not systematically lead to greater proliferation. Threats of force or economic sanctions on the other hand — even those from the most powerful multilateral bodies capable of truly 'turning the screws' against proliferators — repeatedly led to greater proliferation instead, making these strategies arguably a worse choice than no engagement at all.

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Chapter 7: Bringing it All Together to Effectively Induce Nuclear Reversal

In 2015, the Islamic Republic of Iran signed a 109-page comprehensive agreement in which it agreed to reverse its long-contested nuclear enrichment program, open its facilities to foreign inspectors, and forgo further expansion of its nuclear program for at least 25 years. The agreement, known as the Joint Comprehensive Plan of Action (JCPOA) or colloquially as the Iran Deal, marked the end of almost three years of negotiations and over three decades international deproliferation engagement with Iran. The JCPOA is by no means the only example of such enduring efforts to end or even reverse the spread of nuclear weapons, materials, and technology. Over thirty states have pursued nuclear weapons in the seventy years since such weapons were first used in 1945, though only nine states are believed to maintain a nuclear arsenal today. Instead, the international community has made a concerted effort to prevent their spread, energetically trying to reverse any enrichment programs that popup with varying degrees of success.

As North Korea's nuclear posturing threatens to imitate a cascade of proliferation in East Asia, and the hard-won JCPOA threatens to crumble, this project seeks to understand when and why some cases of deproliferation engagement effectively lead to nuclear reversal, while others have perverse consequences of greater proliferation instead. Choosing the most effective policy in each instance thus has important consequences for international security beyond addressing the immediate threat of a single proliferator. What conditions the response of the proliferator to the policies it faces? When will it choose to acquiesce, rolling back its enrichment and reprocessing, and when will it choose to thwart its opponent and perversely double-down in its pursuit? In general terms, are positive inducements or negative coercion more effective, when we consider the double-edged sword of engagement rather than just the prospects for success? More specifically, which particular forms of cooperation or coercion

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are more or less effective, and which sending states can most effectively employ these tools to induce nuclear reversal?

Review of Findings

This research finds that many engagement policies present the possibility of successfully inducing nuclear reversal in prospective proliferators, but that many of these potentially successful tactics also carry significant risks of inadvertently spurring further proliferation instead. Some of the most powerful tools of reversal are also the most risky. And sometimes the sending states with the greatest policy arsenals are also the most impotent. As a result, selecting the most effective tool — the one most likely to induce reversal and least likely to risk perverse consequences — means considering more than just whether a given tool has succeeded in the past. Canny policymakers must consider not only if their preferred policy is likely to achieve their goals of deproliferation, but also whether that policy poses greater risks than rewards, and even whether their state is the right man for the job.

Some of the most popular deproliferation policies like nuclear sanctions or military threats are surprisingly ineffective against ongoing proliferators. Some, like sanctions, are largely impotent — even when imposed by the most powerful states in the system — and rarely induce reversal. While research on economic sanctions and military threats outside the specific application of deproliferation engagement suggest that the most powerful states should have the greatest prospects for coercing concessions from their adversaries, this power to coerce does not hold up when the desired concession is nuclear reversal. In fact, powerful states — like those that already possess nuclear weapons — may actually suffer greater risks of inciting perverse proliferation. Other policies, like threats or use of military force, actually present equal if not greater chances of inducing greater proliferation instead, meaning employing such tactics can actually be worse than doing nothing at all. While research on

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foreign policies more generally argues that more powerful senders should be better able to coerce policy concessions, we see here that sender power does not translate into coercive power when the concession demanded in nuclear reversal. In fact, the most powerful senders may even be less effective at coercing deproliferation than are their weaker counterparts, facing potentially greater risks of perversely accelerating proliferation with no greater prospects for success.

The ineffectiveness of coercion for combating nuclear proliferation does not imply, however, that no effective strategy exists for inducing reversal. Other more cooperative policies — like civilian nuclear cooperation agreements or increased diplomatic engagement — show promise for successfully inducing reversal, coupled with no significant risks of inadvertently escalating proliferation. While past research suggests that cooperation is facilitated by existing alliances and ideological cohesion between partner states, we see here that the most effective deproliferation cooperation are actually those overtures offered by rival senders. While cooperation between rivals may indeed be tricky to implement, these positive inducements present the best chances of inducing nuclear reversal while minimizing risks of perverse proliferation.

Not all positive inducements are effective deproliferation strategies, however. For example, quid pro quo payments like foreign aid are not associated with reversal — regardless of the power of dyadic relationship of the sender — but may occasionally risk escalating proliferation. Again, this suggests that senders determined to reverse ongoing nuclear proliferation should use caution when selecting positive inducements as well, eschewing one-off side payments in favor of more prolonged cooperative gestures. Signaling cooperative intent requires more sustained interaction but is also more effective than providing the proliferator with some short term financial incentives.

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Contributions to Research and Policy

Comparing foreign policy outcomes along both their prospects for success as well as their risks of perverse reactions provides insight into the effectiveness of each policy as a tool of statecraft. In particular, the promise and risks of deproliferation policies aimed at reversing ongoing sensitive nuclear enrichment have implications for current policy dilemmas — dilemmas that threaten to fracture alliances, increase the risk of conflict, and cause a cascade of new nuclear pursuits. If the JCPOA collapses and Iran reinvigorates a nuclear weapons program, its regional adversaries[1] have suggested they may likewise initiate programs of their own to safeguard against an Iranian nuclear threat. Similarly, some of North Korea's most nuclear-capable neighbors may consider balancing against their bellicose rival's conspicuous proliferation with build-up of their own.[2]

This work, therefore, provides a framework for assessing the effectiveness of policy alternatives for inducing reversal in proliferating states, considering both the prospects for success as well as the risks for each policy individually. Many individual deproliferation policies are often presented as part of a larger cooperative package — packages that can include more effective policies or more risky ones simultaneously. As a result, testing

[1] Saudi Arabia, for example, has begun accelerating its nuclear energy infrastructure and has claimed in the past that it would pursue equal capabilities as Iran if the latter were to accelerate its indigenous program (for example, see Prince Turk al-Faisal in Vick, K. (May 1, 2014) "Saudis Show Off a Missile as Tensions with Iran Rise," *Time*; Cigar, N. (2016) *Saudi Arabia and Nuclear Weapons: How Do Countries Think About the Bomb?* Abingdon: Routledge.

[2] Japan and South Korea each have very robust nuclear energy programs, and most analysts believe either state could accelerate those programs to weapons-grade enrichment and reprocessing on a very accelerated timeline if they made the decision to do so. While both are NT signatories and have thus-far professed enduring commitment to nonproliferation norms, there have been some high-level discussions of requesting US redeployment of nuclear weapons, even while the US has discussed reminding its nuclear umbrella to allow these two proteges to fend for themselves (see for example Lu, Z. Sept 16, 2017) "China rejects letting South Korea, Japan have nuclear arms" *South China Morning Post*).

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policies as part of a larger package[3] or relying on a limited number of critical case studies[4] facing these packages risks misattributing the success of more effective policies or overlooking the risks of concurrent ineffective alternatives. This study, therefore, disaggregates the expected effects of each foreign policy on nuclear reversal, conditioning those effects by the environment in which each policy was used, and applying these lessons to recent cases.

Implications for Crafting Effective Nuclear Reversal Strategies

Engagement Approaches: Cooperation versus Coercion

The first step in crafting effective strategies for inducing nuclear reversal in proliferating states is selecting the type of policy, or suite of policies. States that hope to induce reversal can choose either to impose costs for proliferating through coercive strategies like economic sanctions or military force, or they can offer rewards in exchange for reversal through positive inducements like nuclear cooperation agreements or foreign aid. All of these policies are intended to incentivize reversal, either by making proliferation more costly or reversal more beneficial. Some policies are more effective than others, however, and each comes with associated costs to the sender, so sending states have an incentive to select the most effective policy for accomplishing their goals. Not only can any policy fail to achieve nuclear reversal, but it could even backfire instead, increasing the very proliferation it seeks to undo.

While coercive strategies can impose costs for proliferating — and some even increase the technical or material hurdles — selecting these strategies can also inadvertently increase the proliferator's security benefits for acquiring a powerful deterrent. By choosing to coerce the proliferator, the sending state may signal threatening intent, leading the proliferator to

[3] Early cross-national quantitative work on nuclear reversal strategies has tended to aggregate policy types (See Mehta, R. (2014) *Deproliferation Dynamics: Why States Give Up Nuclear Weapons*, UC San Diego Press: San Diego, California;

[4] Interesting work by Reardon (2010) *Nuclear Bargaining: Using Carrots and Sticks in Nuclear Counter-Proliferation,* MIT Press: Cambridge, MA

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believe it needs the security afforded by nuclear weapons to protect itself. As a result, though coercive policies can increase the financial costs and technical hurdles for proliferation, they can inadvertently increase the security benefits of acquisition as well. These perverse consequences are born out the empirical evidence in Chapter 3, which demonstrates that some of the most common coercive policies actually present the greatest risks of perverse proliferation — risks that often override their prospects for success. For example, threats of military force are more likely to lead to proliferation than reversal, irrespective of which sending state chooses them. Even the use of military force against a proliferator does not reliably lead to reversal, for while it may be occasionally associated with reversal, it is also significantly correlated with proliferation making even this costly coercive tool an ineffective deproliferation strategy. Some of the most common coercive strategies — like economic sanction often used by important entities like the UN Security Council and its most powerful members — have no significant effects whatsoever on the proliferation of their targets.

Cooperative inducements provide an alternative strategy to these common coercive policies, offering rewards in exchange for reversal. Engagement strategies that entail ongoing cooperation between the sender and proliferator can signal to the latter that the former does not pose an existential threat and rather means to continue working with the proliferator over time to meet its needs. For example, civilian nuclear cooperation agreements can provide resources like proliferation-resistant reactors or fuel provision and reprocessing to help the recipient harness the technology required (and earn the associated prestige) for mastering a sustainable nuclear energy program.[5] Likewise, increasing diplomatic engagement through the exchange of ambassadors, or committing to limited defense agreements like negative security assurances can also encourage reversal under specific engagement conditions.[6] Such

[5] They also provide the added benefit of ensuring the agreed civil program is safeguarded against future misuse by ensuring inspector access and monitoring to deter and detect ENR activity outside the scope of the agreed civilian program.

[6] The reversal effects of these engagement strategies are only significant for certain senders as seen in Chapter 4,

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engagement not only provides the proliferator with rewards — such as support for its domestic energy demand or greater access and reduced threat from the sender — these strategies generate fora for ongoing positive engagement and reassure the proliferator its adversaries will not capitalize on its future weakened state even after it cedes the contested elements of its program.

These results provide useful insight into past instances of deproliferation engagement. For example, what if Brazil's adversaries like Argentina had chosen coercive policies in the 1980s to attempt to force the former into relinquishing its nuclear weapons program? Similarly, what if the United States had employed coercion rather than diplomatic engagement with Libya in 2002? In both of these cases, the proliferators in fact fully reversed their respective nuclear weapons pursuits under cooperative engagement, but these successful outcomes should not be taken for granted. Rather, testing Brazil and Libya's predicted responses to coercive policy packages,[7] we find both proliferators have a significant predicted risk of proliferation, but neither shows a significant predicted probability of reversal.[8] These results suggest that the senders' choices of cooperative engagement in both cases were fortuitous since in both cases we could reasonably have expected proliferation, not reversal had their respective senders chosen coercive strategies instead.

We can see these cross-national trends played out in historical examples as well, both in the resistance of proliferators like Iran and North Korea to coercion as well as their verified reversal in response to cooperation. For example, even the weak and economically fragile North Korea has managed to resist very costly economic sanctions for decades — sanctions that targeted basic goods as well as cut nuclear supply lines, making proliferation not only

not in the aggregated tests of Chapter 3. Further discussion can be found below.
[7] Using the unconditional model, population averaged binomial logistic regression from Chapter 3 (Table 2).
[8] See Chapter 3, Figure 6. Predicted risk ratios for reversal are positive but not significant, with wide confidence intervals, meaning the mode cannot reliably predict reversal under the conditions in each proliferator during those years.

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more financially costly but more technically difficult as well — to achieve nuclear breakout in 2006, testing increasingly powerful weapons and delivery systems ever since. By contrast, sustained cooperative attempts — like the promise of light water reactors for a civilian nuclear energy program, and high-level diplomatic exchanges with adversaries like the United States, South Korea, and Japan — provided the only instances of nuclear reversal, reversal that verifiably reduced North Korea's ENR capabilities.[9]

Neither positive inducements nor negative coercion provide reliable engagement strategies, however. Not all coercion is equally risky, and the conditions under which a policy is imposed can alter the response of the proliferator. For example, reducing diplomatic engagement does not effectively lead to reversal, but does decrease the risk of further proliferation — meaning that political censure is not an effective reversal strategy, but may support non-proliferation (preventative) efforts, at least in the short term. Similarly, some tempting positive inducements actually increase the risks of proliferation. For example, foreign aid — a seemingly simple and easy way to provide positive inducements for reversal — may actually increase the risks of proliferation.[10] These aggregated tests, therefore, suggest that blanket claims that either focus only on punishments or rewards more generally — like all coercion is risky or all positive inducements are more effective — can oversimplify the choice of deproliferation strategy selection. Finally, the theory specifically hinges on the importance of reducing the proliferator's security motivated demand for the bomb. As a result, any analysis that fails to account for the variation between different senders' impact on that proliferator's security environment risks overlooking critical determinants of each sender's effectiveness.

[9] Monitored and confirmed by the IAEA for a number of ears, including under the Agreed Framework or later in early stages fo the Six-Party talks.
[10] These results are inconclusive but provide cause for concern and motivation for further research.

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Sender Power: Facing the Mighty or the Meek

The unconditional tests find the most effective strategies involve enduring cooperation between sender and proliferator, while coercive strategies pose the greatest risks of perverse consequences. However, some may argue that this results from a failure to account for the unequal power of senders. Because coercion relies on the ability of the sender to impose costs that force their target into compliance, research has traditionally found that more powerful senders are better able to extract concessions, meaning the ineffectiveness of the unconditional tests of coercion may be the result of diluting the sample with weaker senders who should be less capable of extracting reversal. Yet, the threat posed by powerful senders can also backfire when the issue at hand is the present and future security of the prospective proliferator. While more powerful senders can threaten greater physical destruction or economic costs than their weaker counterparts if the proliferator resists, powerful senders also contribute a greater share to the proliferator's security fears and thus threats from these senders increase the proliferator's security motivated demand for a powerful (nuclear) deterrent more than threats from weaker senders.

As a result, if we condition the proliferator's response by the power of the sender it faces, we find that more powerful senders are even less capable of inducing reversal than are their weaker counterparts. For example, Chapter 4 demonstrates that militarized disputes with powerful senders — who poses the potential to destroy the proliferator's nuclear facilities and thus induce reversal even without the latter choosing to do so — are *only* significantly associated with proliferation, not reversal. Only MIDs with weaker senders are associated with reversal, questioning old assumptions about the power of coercion, at least when the issue at stake is nuclear proliferation. Likewise, militarized compellent threats — which supposedly rely on sender's power to threaten unacceptable harm to its adversary unless it

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concedes to the sender's demands — are only associated with reversal when those threats come from a weak sender. In fact, out of all the compellent threats from 1945-2012, there is not a single recorded case in which MCTs from powerful senders led to reversal.[11]

These results generate some concerning predictions for the effectiveness of commonly employed coercive policy packages. For example, using these models we find in Chapter 4 that if Libya had faced coercion from either powerful or weak senders in 2002 — rather than the cooperation that actually led to its complete reversal — neither powerful nor weak senders would effectively coerce reversal. Coercion, in either case, increases the predicted risk of proliferation about as much as it increases the predicted probability of reversal, and if anything coercion from more powerful senders increases the risk of proliferation over reversal even more than coercion from weaker senders. As a result, even a robust coercive package from senders traditionally considered the most able to extract concessions — including common strategies like imposition of economic sanctions, and the threats or use of military force — comes with greater risks of accelerating the very proliferation it seeks to reverse than if these senders had done nothing at all.

The ineffectiveness of powerful coercion does not mean that powerful senders are actually impotent. In fact, powerful senders are indeed more effective at inducing reversal than are their weaker counterparts when the inducements are made up of cooperative overtures to the proliferator. For the very reason that powerful senders present greater risks of perverse proliferation in their threats, these senders also are better suited to cooperative reassurances than are weaker senders. Just as threats from powerful senders can go further at increasing the proliferator's security fears and thus their demand for a nuclear deterrent, cooperation from these senders can do more to reassure the proliferator of its security and

[11] Sechser, T. (2011) "Militarized Compellent Threats, 1918-2001" *Conflict Management and Peace Science* 28(4), 377-401

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thereby reduce its demand for a nuclear deterrent. For example, preliminary evidence suggests that powerful senders are more effective than weaker ones when they offer increased diplomatic engagement or limited defense cooperate agreements.[12]

The cross-national results hold up in case study evidence as well. For example, North Korea is one of the weakest states — both militarily and economically — to ever attempt a nuclear weapons program. This should have made it a good candidate for military compellance and economic coercion, being less capable of defending against or absorbing these hits — particularly those imposed by powers like the United States[13] or important neighbors like China and South Korea.[14] Despite its vulnerability, North Korea managed to thwart sanctions and resist threats to develop not only an indigenous nuclear program, but also test increasingly large nuclear yields, develop increasingly robust delivery systems, and even make a business of exporting these controlled technologies overseas.[15] Each time the United States imposed sanctions or diplomatic censure against North Korea's nuclear program — even when accompanied by the combined might of the powerful UN Security Council — the supposedly vulnerable proliferator responded by throwing out IAEA inspectors, restarting frozen reactors, or initiating nuclear and ballistic missile tests. On the other hand, when the United States made sustained cooperative overtures — particularly civilian energy cooperation and increased diplomatic engagement — North Korea agreed to suspend proliferation, readmit IAEA inspectors, and verifiably reverse its ENR activities. As

[12] These results are not quite significant at the 95% confidence level, though, meaning further research is necessary to determine if these preliminary results hold up.
[13] While North Korea and the US share little bilateral trade (making direct sanctions arguably ineffective), most sanctions the US imposed were third-party sanctions that targeted any country doing business or banking with North Korea, forcing the latter's trade partners to choose between the tiny proliferator and their lucrative trade flows with the United States.
[14] China and South Korea have been North Korea's primary sources of trade and food aid for decades, meaning sanctions by these states should be able to inflict the most damage on North Korea's economy if it resists demands.
[15] Reports indicate that North Korea exported nuclear technology to Syria and Iraq, as well as ballistic missile components to Iran and Myanmar (see for example, "North Korea supplied arms to Syria and Myanmar, UN sanctions report finds" *The Guardian* (February 2, 2018);)

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a result, the United States — the largest economy and most powerful military force — was incapable of coercing nuclear reversal from even the weakest proliferator, but it was also the most effective when it offered cooperative inducements instead.

Dyadic Rivalry: Friends and Enemies

Beyond the monadic power of the sending state, the dyadic conditions of the sender-proliferator relationship help inform the latter's response to engagement. Existing literature on international bargaining and cooperation has suggested that cooperation is easier between ideologically similar or allied states. Friendly relations can facilitate trust, increase network allegiances, and lead to greater political and economic entanglement from which to build deeper cooperation in the future. On the other hand, rival senders are more likely to pose a threat to the proliferator's security than are friendly states, meaning these rivals will also have a larger part to play in affecting the proliferator's security motivated demand for a nuclear deterrent. As a result, while bargaining may, in fact, be facilitated by ideological proximity, rival states can do more to reduce a proliferator's security motivated demand for the bomb. States — including prospective proliferators — balance against expected foreign threats, not just the power of other states. The proliferator most likely pursued its nuclear program in part to protect against these very rivals. Though cooperation can be easier with friends, the proliferator did not anticipate an existential threat from these friends anyway, and so cooperative overtures will not go far in alleviating its security fears.

As a result, cooperative overtures from rival senders are more effective than similar overtures from friendly senders. For example, inducements that necessitate enduring cooperation between the adversaries like increased diplomatic engagement and nuclear cooperation agreements were both more effective when coming from a rival rather than a friendly sender. Both of these cooperative inducements provide a forum for further positive

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interaction between sender and proliferator long after the ink has dried on deproliferation agreements, and provide the proliferator with assurances of its rivals commitment to cooperation even after the former has reversed its nuclear program.

These cross-national results generate some promising predictions for cooperative assurances from rival states. For example, had Iran received the cooperative package it requested from its greatest rivals in 2003 to 2005 instead of the sanctions it actually faced, its predicted probability of reversal would be much greater than if it had received that same cooperation from friendly senders. Regardless of the sender, Iran would have been unlikely to have proliferated in response to such cooperation. But had the cooperation come from a traditional rival like the United States or Great Britain, Iran predicted probability of reversal would have significantly increased by 50%, whereas had it received the same package from a friend its predicted probability of reversal could only be expected to increase by about 20% compared to no engagement at all. Either way, cooperation would have been a more effective strategy than turning up the coercive screws — the strategy actually employed and which led instead to the Islamic Republic doubling down on its nuclear enrichment and turning away IAEA inspectors — but cooperation from rivals is even more promising than cooperation from friends. Likewise, long-time rivals and neighbors Brazil and Argentina managed to cooperate towards mutual deproliferation in the 1980s. Despite the fact that neither was nuclear armed themselves and neither was capable of providing lucrative quid pro quo rewards, the assurance of mutual reciprocal reversal and security guarantees was sufficient to induce successful reversal on both.

While rivals are more effective in their cooperative assurances than are friendly senders, coercion from rivals is not also more effective at inducing nuclear reversal. While we might expect threats from rivals to be more credible — and therefore better able to coerce concessions from the adversary — when these threats are aimed at the adversaries nuclear

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program, they tend to backfire. For example, militarized compellent threats from both rivals and friends risk increasing the proliferator's nuclear pursuit, but — like in the conditional power tests above — only MCTs from friends, not rivals ever led to reversal.[16] Likewise, though militarized disputes with rivals might induce reversal, they also risk perverse proliferation (when coming from both rival and friends).[17]

Testing these findings against historical examples, we can again see the risks associated with coercion, particularly coercion from rival senders. For example, while we know that Libya in fact deproliferated in 2002 in response to cooperation from its rival (and greatest security threat) the United States, could the US have also used its rival position to coerce that same outcome? Instead, we see in Chapter 4 that a coercive approach is predicted to be an ineffective, risky strategy in this case — in fact, coercion from a rival like the US is actually predicted to be even riskier than if a friendly sender had chosen that approach.[18]

These results are upheld in the case studies of both Iran in Chapter 5 and North Korea in Chapter 6. Iran specifically approached its greatest rivals both in its offer of a"Grand Bargain" in 2003, as well as in its 2013 outreach that culminated in the JCPOA. Though other powerful states had previously proven to be more willing negotiators — such as Russia's 2009 agreement to provide fuel for the Tehran Research reactor — the Islamic Republic targeted the United States, and later the EU3. Likewise, North Korea specifically approached the most staunch rivals to its nuclear program in both the 1994 Agreed Framework and later in 2003 at the start of the Six-Party Talks. Though cooperative assurances and aid packages were more forthcoming from powerful benefactors like China and Russia than from the United States or South Korea, North Korea only agreed to reversal when its rivals agreed to cooperate. As a result, though the bargaining process between rivals

[16] Again, none of the cases of reversal correspond with observed MCT imposition by a rival (seen in Secher, 2011).
[17] Though these results are insignificant at the 95% confidence level.
[18] Though neither is significant.

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did prove difficult — with distrust and opposing goals presenting regular hurdles — rival cooperation still presented an even more effective strategy than any offers from friendlier partners.

Bringing it All Together

Taken all together, these findings indicate that the most effective nuclear reversal policies are cooperative assurances offered by powerful rivals. There are several components to constructing an effective nuclear reversal policy package. First, a package of policy carrots rather than once of coercive sticks has greater prospects for success. Though punishments may be ethically satisfying — responding to norm violators with rebukes rather than rewards[19] — they can pose dangerous risks of accelerating nuclear proliferation instead of reversing it, increasing the hurdle future policies need to overcome and bringing the violator that much closer to nuclear breakout.

Second, the cooperative strategies are most effective when they come from a nuclear-armed sender with a history of rivalry with the prospective proliferator. These senders can reassure best because they pose the greatest security threat and therefore contribute most to the proliferator's security motivated demand for the bomb. However, if these senders stray from reassurances by interjecting threats or sanctions, they risk diminishing the credibility of these assurances and inciting greater proliferation instead. Powerful states have greater coercive tools at their disposal,[20] so could be tempted to throw their proverbial weight behind tough punishments, but they may find their power in other domains is impotent in nuclear reversal attempts. Powerful states do have some uniquely effective tools in their policy

[19] Nincic, M. (2011) *Logic of Positive Engagement*, Cornell University Press: Ithica, NY
[20] A finding corroborated in many studies that examine policy outcomes more generally.

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arsenal, though, so if strategic about their engagement strategy can offer the best hope for inducing reversal with the least risk of inadvertently inciting further proliferation instead.

Lastly, the effectiveness of cooperation from powerful rivals is not simply a process of offering the easiest one-off reward for reversal. In fact, if warnings of moral hazard are correct, petty quid pro quo or side payments could even risk concession seeking behavior in the future. For example, foreign aid from powerful senders may be the easiest to negotiate — such as food or fuel aid offered to North Korea — but could actually reduce the likelihood of reversal. Instead, states hoping to reverse ongoing proliferation should use care in selecting policies as well as the senders who offer them, choosing cooperative assurances from the proliferator's powerful rivals.

Applying Findings to Policymaking

Taking these findings into account suggests that current deproliferation concerns could be best served by reassuring prospective proliferators that a nuclear deterrent is not necessary for safeguarding their security. North Korea, for example, has reinvigorated its ballistic missile tests in recent years but has also made offers of reinvigorating negotiations. For these negotiations to lead to verifiable reversal, however, these results indicate that simple sanction easement or aid packages will be insufficient. In addition, relying on coordination from North Koreas powerful benefactors like China also presents little prospects for successful reversal. Rather, negotiations with powerful rivals like the United States — and arguably South Korea and Japan as nuclear-capable (though unarmed) regional rivals — that focus on securing means for enduring cooperation with Pyongyang provide the best prospects for deproliferation.[21] This strategy could include limited DCAs — such as negative security

[21] Note here that while this argues toward nuclear reversal policies, this does not suggest that North Korea will agree to complete 'denuclearization', a demand occasionally held as a criterion for negotiations in Washington. North Korea may never agree to entirely relinquish all nuclear warheads and its means for producing them, but the focus on deproliferation could at least reduce its weapons-grade infrastructure and safeguard existing

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assurances from the United States and South Korea against a 'shot from the blue' or unprovoked nuclear first use — which could assuage Pyongyang's concerns that its militarily superior rivals intend to forcibly overthrow the regime at any moment.[22] In addition, exchange of US and North Korean envoys could facilitate more rapid and open communication between the rivals. This increase in diplomatic engagement does not entail formal recognition[23] of the Kim dynasty, but rather allows the United States to speak directly and rapidly respond to developments.[24]

Looking forward, if these efforts do not secure true *denuclearization* — including North Korea relinquishing all stockpiled weapons and weapons-grade materials — it may be necessary to bolster deproliferation engagement in the region as other capable states could consider weaponizing their programs in response. Even in these cases, enduring cooperation can effectively induce reversal, such as bolstering US nuclear umbrella or increasing diplomatic engagement between North Korea and its rivals.

East Asia is not the only region on which applying these findings can be applied to emerging proliferation threats. Should the JCPOA crumble and Iran renew an unsafeguarded enrichment program, rivals of this potential proliferator could reengage in negotiations, particular negotiations that offer enduring diplomatic representation and recognition of a safeguarded, NPT compliance civilian energy program — much like those offered in the JCPOA negotiations but foregoing the years of multilateral sanctions that preceded these. Rapid renewal of safeguards not only effectively meets deproliferation goals vis-a-vis Iran, but reduces the risks that Iran's regional adversaries would pursue enrichment programs of

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stockpiles against inadvertent or unauthorized use.

[22] This negative assurance is minimalist. It does not mean the US or its allies relinquish the right to defend against future North Korean aggression, or that these senders need turn a blind eye toward violations by the regime. It only promises that they will not use nuclear weapons to initiate a military attack in North Korea.

[23] a loaded move with far-reaching and potentially undesirable consequences for military stability and treaty arrangements in the region.

[24] While Chapter 4 finds that reduced diplomatic engagement might reduce the likelihood of further proliferation, increased diplomatic engagement from a rival can actually increase the likelihood of reversal — a far greater deproliferation accomplishment than just prevention.

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their own. For example, Saudi Arabia is financially and technically capable of initiating its own program, and has clear security and prestige motives to do so should its regional rival acquire a nuclear military advantage.[25] Other rival neighbors like Iraq and Syria have already pursued clandestine programs in response to rival proliferation in the region, and each successfully resisted coercive deproliferation tactics like military strikes[26] and multilateral UN Security Council denunciation.[27] An effective reversal strategy in Iran — as well as against other prospective proliferators more generally — is not just useful for maximizing near-term deproliferation goals, but also for reducing the risks of future risks and upholding nonproliferation norms globally.[28]

Further Research

Multilateral and IO Negotiations:

While this project compares the effectiveness of cooperative and coercive strategies and the conditions that impact that effectiveness, there are a number of factors not tested here that could prove important in the outcome of these policies. For example, a number of negotiations seen in the case studies of Iran and North Korea involved multiple senders, some even under the auspices of international organizations like the UN Security Council. However, in other nuclear negotiations, the opponents came to a deproliferation agreement bilaterally — such as when South Korea reversed its program in exchange for civilian energy

[25] And some experts suggest that Riyhad's civilian nuclear pursuit is a hedge towards nuclear parity with Iran for that very reason (Ahmad, A., & Ramana, M. V. (2014). Too costly to matter: Economics of nuclear power for Saudi Arabia. *Energy*, *69*, 682-694.)

[26] Such as Israel's successful demolition of Iraq's Osirak reactor in 1981 or Syria's Al-Kibar reactor in 2007 (See Braut-Hegghammer, M. (2011). Revisiting Osirak: Preventive Attacks and Nuclear Proliferation Risks. *International Security*, *36*(1), 101-132; Chachko, E. (April 2, 2018) "The Al-Kibar Strike: Why a Difference 26 Years Make" *Lawfare* https://www.lawfareblog.com/al-kibar-strike-what-difference-26-years-make)

[27] Such as the UN Security Council S/RES/2209 March 6, 2015, or S/RES/2314 February 26, 2016

[28] Some research suggests that coercive strategies like nuclear sanctions deter potential proliferators even when they do not reverse ongoing proliferation (see Miller, N. L. (2014). The secret success of nonproliferation sanctions. International Organization, 68(4), 913-944.). The most effective strategy, though, is likely reversing proliferation as rapidly as possible to reduce the security incentives of unarmed states to secure themselves through programs of their own.

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support and security assurances from the United States, or when Brazil and Argentina agreed to mutually eliminate their respective weapons programs. When, therefore, is multilateral coordination a more effective strategy, and when is it more effective to minimize the number of proverbial cooks in the kitchen? Future research could, therefore, help explain why, for example, the 2015 Joint Comprehensive Plan of Action in Iran succeeded with the coordination of the six senders of the P5+1, when similar earlier bilateral agreements between the US and Iran failed. Likewise, why did South Korea commit to NPT safeguards in bilateral nuclear cooperation agreements with the US, while North Korea resisted similar agreements with the US?

Beyond Nuclear Weapons:

Additionally, while the results of this study support the theoretical claim that cooperation is more effective than coercion at inducing nuclear reversal, the effectiveness of cooperative signaling as a means of reducing security-seeking behavior could apply to nonnuclear military activities as well. Because security motivations may likewise drive other forms of military build-up, the effectiveness of reducing security motives through cooperative inducements may reduce conventional weapons demands in much the same way they can reduce nuclear pursuits. Further research could, therefore, examine the relative effectiveness of positive inducements versus negative coercion at inducing de-escalation in non-nuclear military proliferation. other factors may also contribute to the strength of different policy treatments.

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