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Leaders in Search of the Bomb: Institutional Incentives for Nuclear Decisions

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LEADERS IN SEARCH OF THE BOMB: INSTITUTIONAL INCENTIVES FOR NUCLEAR DECISIONS

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DEDICATION

To my family, and those friends that are like family, *thank you.* I would especially like to thank the three most important people in my life by dedicating this project to them. Namely, to my father, who has encouraged my inquisitive spirit from the very beginning and without whom I would never have had the courage to begin this journey; to my mother, whose unwavering faith in me means more than I can express; and to my husband, whose love and support have been the breath of fresh air needed to finish this project.

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ABSTRACT

Nuclear weapons hold a strong allure for many leaders. These weapons are more than tools of national security; rather, they represent international normative symbols of modernity and national identity. This symbolic power presents a strong incentive to proliferate. However, beginning a nuclear weapons program ("proliferating") is a costly endeavor, one that requires a significant amount of resources and time. A leader who chooses to proliferate must balance the preferences of his or her domestic audience with the significant resources required to proliferate in an international system that opposes nuclear proliferation to new states. In order to understand the paradox of nuclear proliferation, it is necessary to explain why leaders seek nuclear weapons in the first place. I seek to answer this paradox through several related questions. Why do leaders begin nuclear weapons programs? How do domestic audiences affect the decision to proliferate? What are the consequences when a leader is unable to acquire nuclear weapons? I seek to answer these questions with a multi-method research design, beginning with large *N* analyses to determine broader patterns of proliferation and following these with a small *n* most-similar systems case study to hone in on causal processes. I create an original dataset that spans the timeframe 1939-2013 that both extends existing nuclear data and adds new variables for nuclear sabotage to answer the above questions. I find that there are noticeable differences among leaders of different regime types for both beginning a nuclear weapons program as well as how successful they are at acquiring nuclear weapons. I find that, on average, leaders are less likely to

have an active nuclear weapons program and acquire nuclear weapons when they face a divided domestic audience. However, leaders are more likely to begin a nuclear weapons program and acquire nuclear weapons when they face internal conflict. This finding indicates that the diversionary war theory may extend to nuclear decisions and is a novel explanation for nuclear proliferation. There are also noticeable differences in the strategies employed by the international community to influence the reversal of nuclear programs. I find that, on average, positive inducements have a stronger effect on prompting nuclear reversal than negative inducements. This finding is particularly true for personalistic, and to a lesser extent, civilian dictators. These findings indicate that carrots may carry more weight than sticks in inducing nuclear reversal. Overall, the findings of this dissertation are valuable to both academics and policy-makers who are concerned with understanding the causes and consequences of nuclear proliferation and those strategies that may be viable for halting or reversing the nuclear development process.

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CHAPTER ONE

INTRODUCTION

Nuclear weapons hold a strong allure for many leaders. These weapons are more than tools of national security; rather, they represent international normative symbols of modernity and national identity (Sagan, 1996). This symbolic power presents a strong incentive to proliferate. The behavior of several leaders illustrates this point. For instance, Pakistani Prime Minister Bhutto declared shortly after the 1971 Indo-Pakistani War, "If India builds the bomb, we will eat grass or leaves, even go hungry, but we will get one of our own," (Corera, 2006; Feorz, 2012; Markey, 2013). Further, Iranian leaders remain determined to acquire nuclear weapons capabilities after thirty-one years of maintaining an active program, even though they are weaker and poorer than ever (Pollack, 2013). Libyan dictator Qaddafi sought nuclear weapons for three decades before being forced to give them up. These are just a few stories of the ardent desire for nuclear weapons. However, beginning a nuclear weapons program ("proliferating") is a costly endeavor, one that requires a significant amount of resources and time. A leader who chooses to proliferate must balance the preferences of his or her domestic audience with the significant resources required to proliferate in an international system that opposes nuclear proliferation to new states.

To illustrate this paradox, one needs look no further than North Korea. Since the early 1990s, North Koreans have been quite literally in the dark.

> With the collapse of the Soviet Union, which had propped up its old Communist ally with cheap fuel oil, North Korea's creakily inefficient economy collapsed. Power stations rusted into ruin. The lights went out. Hungry people scaled utility poles to pilfer bits of copper wire to swap for food. When the sun drops low in the sky, the landscape fades to gray and the squat little houses are swallowed up by the night. Entire villages vanish into the dusk. ...When outsiders stare into the void that is today's North Korea, they think of remote villages of Africa or Southeast Asia where the civilizing hand of electricity has not yet reached. But North Korea is not an undeveloped country; it is a country that has fallen out of the developed world. ...North Koreans complain bitterly about the darkness, which they still blame on the U.S. sanctions. They can't read at night. They can't watch television. 'We have no culture without electricity,' a burly North Korean security guard once told [Demick] accusingly. (Demick, 2009, p. 4).

Amidst all the darkness, North Korea's dear leaders have steadily sought nuclear weapons since 1980 and succeeded in acquiring a nuclear weapon in 2006 (Way, 2012).

In order to understand the paradox of nuclear proliferation, it is necessary to explain why leaders seek nuclear weapons in the first place. I seek to answer this paradox through several related questions. Why do leaders begin nuclear weapons programs? How do domestic audiences affect the decision to proliferate? What are the consequences when a leader is unable to acquire nuclear weapons? Do the consequences differ when

the leader voluntarily reverses a decision to nuclearize versus being forced to do so by the international community?

Approaching this puzzle from a strategic choice framework affords me the most leverage, where understanding the preferences of a leader's domestic audience and the constraints of the international system will shed light on the choice to proliferate. Early studies of nuclear proliferation (e.g. Waltz, 1959) focused on nuclear weapons from a systems level and how the proliferation of new states affected order in the international system. More recent quantitative studies of nuclear proliferation (e.g. Singh and Way, 2004; Jo and Gartzke, 2007) honed in on the domestic determinants of nuclear proliferation. While these studies represent definite advances in our knowledge of nuclear proliferation, they found that regime type was an insignificant indicator of nuclear proliferation due to operationalizing regime type as a dichotomous variable. It is not enough to approach the study of nonproliferation through a system level approach, focused on constraints or other variables, nor to lump states into crude, broad categories of regime type, democracies and autocracies, to understand differences in proliferation incentives. Rather, utilizing a strategic choice framework that places leaders' decisions at the center of the analysis provides the most leverage for answering questions of *why* leaders choose to proliferate.

One of the inherent limitations to studying and drawing generalizable conclusions from research on nuclear weapons proliferation is the rareness of the event. The small number of nuclear and aspiring nuclear states makes it difficult to test scientific hypotheses relevant to scholars and policymakers. This has created several divides in the

over 88,000[1] studies comprising the massive nonproliferation literature: empirical divides between quantitative and qualitative scholars; large-scale theoretical divides between scholars of realist, liberal, and constructivist traditions; divides between the supply and demand side of proliferation; and normative divides over whether or not proliferation will lead to the destruction of or the stabilization of the international system. With just under 100,000 studies on nuclear proliferation, we should be asking ourselves, "What have we learned from decades of research?" "What more is there to learn?" While there has been progress, there are many unanswered questions that are critical to policy-makers. We need to reframe our approach to the study of nuclear weapons proliferation and also expand the questions we ask.

I put forth a formal theory of strategic decision-making that better captures leaders' attempts at nuclear proliferation, using game theory. In doing so, I reveal the artificial divides that exist in the literature. There is much we can learn from integrating divergent approaches and perspectives. Further, I test this formal theory directly through the use of mixed methods, including event history, ordered logistic regression, and selection models. I then follow up this quantitative analysis with a most-similar systems case study, where case selection is determined based on the formal theory. The resulting project is a study in which the formal theory and the empirical testing of this theory are directly connected, yielding a clear understanding of causal pathways to proliferation.

By examining nuclear proliferation through the lens of strategic choice, I can assess how domestic audiences and institutional structures affect leaders' choices to proliferate. This is paramount, if we want to understand the strategic environment in

[1] As of August 26, 2014 a Google Scholar search for "nuclear weapons proliferation"

which leaders operate. From this, we can better understand leaders' preferences regarding proliferation; and if we can understand this, we may be able to formulate strategies that prevent or reverse proliferation.

The remainder of the project includes six distinctive chapters. Chapter One provides historical background to the changing norms of nuclear proliferation and nonproliferation. Chapter Two traces the evolving norms and technology of nuclear proliferation and Chapter Three examines the existing literature in nonproliferation studies, focusing on diverging approaches and gaps that remain to be filled. In this chapter, I trace advances in our knowledge from the nonproliferation literature and then show how tying the nonproliferation literature to comparative literature on political survival, audience costs, regime type, and domestic institutions gives a fuller picture of why leaders choose to proliferate, what constrains them, and what happens to them if they fail in their attempts. Chapter Four introduces my formal game-theoretic model of nuclear weapons proliferation and Chapter Five outlines the overall research design for the project. Chapter Six lays out the large *N* analysis that draws directly from the formal model to explain why leaders begin nuclear weapons programs in the first place and Chapter Seven lays out a large *N* study of nuclear reversal, focusing on what strategies may trigger reversal and what this means for nonproliferation. Chapter Eight utilizes a most-similar systems case design to trace the nuclear development paths of Pakistan and Iraq to show what factors lead to success and failure in acquiring nuclear weapons. Finally, in Chapter Nine, I conclude with a brief summary of the findings and their relevance to academia and policy-makers alike.

CHAPTER TWO

EVOLVING NORMS AND TECHNOLOGY, A BREIF HISTORY OF THE NONPROLIFERATION REGIME

2.1 Technological Advancements and Requirements for Nuclear Weapons

The original technology for nuclear weapons can be traced back to Italy in 1934 with the "bombard[ment] of uranium with neutrons," by Enrico Fermi, Edoardo Amaldi, Franco Rasetti, and Emilio Segre, which "produced the first, though then misunderstood, indications of fission," (Mozley, 1998. p. 3). The research on nuclear fission soon expanded to France, and later Germany, which quickly became the center of physics research until World War II, where the reign of Nazi Germany staunched the flow of research. "By 1941 about one hundred physicists had migrated from Germany to the United States, and a lesser number to Great Britain. With this influx of the most talented of the German physicists, Great Britain and the United States took the lead for nuclear research," (Mozley, 1998. p. 3).

After Albert Einstein wrote a letter to FDR in 1939 outlining both the magnitude of the benefits of atomic energy and especially the potential hazards of this energy, the United States began considering the possibility of building an atomic bomb (Mozley, 1998). Einstein and his colleague, Leo Szilard, both of whom had fled Europe to escape Nazism, feared that Hitler was working on building a bomb, and thus urged the United States to begin its own research on the atomic bomb with the initial intention of deterring

Hitler from becoming a world leader (nobelprize.org). Roosevelt agreed and the Manhattan Project was born. The project was massive, employing over 200,000 workers and thousands of scientists and engineers. When the first atomic bomb was tested on July 16, 1945 in the Alamogordo desert in New Mexico, "[i]t's power astonished even the men and women who had constructed it," (nobelprize.org). Robert Oppenheimer, oft referred to as the "father of the atomic bomb" for his role as the physicist in charge of the Manhattan Project, remembers that July day:

> We knew the world would not be the same. A few people laughed, a few people cried. Most people were silent. I remembered the line from the Hindu scripture, the Bhagavad-Gita; Vishnu is trying to persuade the Prince that he should do his duty, and to impress him, takes on his multi-armed form and says, 'Now I am become Death, the destroyer of worlds.' I suppose we all thought that, one way or another. (*J. Robert Oppenheimer, in television interview, 1965)*.

Also in the letter to FDR, Einstein highlights the inherent duality of nuclear energy that has plagued the international community since, "In the course of the last four months it has been made probable...that it may become possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium like elements would be generated. ... This new phenomenon would also lead to the construction of bombs, and it is conceivable – though much less certain – that extremely powerful bombs of a new type may thus be constructed," (Einstein, 1939.

Letter obtained from pbs.org). This dual power to both become an extremely valuable source of efficient energy and at the same time an extremely dangerous source of weaponry led to the original race to proliferate. A chain reaction was set off, and by the early 1940s research was conducted in Russia, Japan, France, Great Britain, and the United States on nuclear fission (Mozley, 1998). Note that with the subtraction of Japan and the addition of China, these states become the "original five" or the great powers to proliferate before the introduction of the Non-Proliferation Treaty in 1968.

But what is actually required to create a nuclear weapon? How likely is it that a state will have the capability to create and maintain a nuclear weapons system? There is wide consensus throughout the scientific community on the materials necessary for producing fissionable weapons: uranium 235 (U-235) and plutonium 239 (Pu-239) (Mozley, 1998; Cochran & Paine, 1995; Albright, Berkhout, & Walker, 1997; Bunn & Wier, 2006). Pu-239 is produced from the U-238 compound used in "nuclear-reactor fuel when it absorbs a neutron to become U-239 and then experiences two decays" the second of which produces Pu-239, (Mozley, 1998). It is, in general, simpler to obtain this compound than it is U-235, but is also inherently more difficult to construct a weapon from (Mozley, 1998. p. 22 – 23).

To produce a nuclear weapon from plutonium or uranium, the first steps are the same, "to mine, process, and refine uranium," (Mozley, 1998. p. 24 – 25). To create a weapon from plutonium, a state must then be able to produce plutonium from the refined uranium, which is accomplished through the use of a heavy water reactor—which is both very expensive and very rarely used. In fact, the only known heavy water reactor known is located in Canada (Mozley, 1998). For a weapon produced from uranium, a state must

enrich the refined uranium (Mozley, 1998). Uranium in its natural form is actually readily available in varying quantities throughout most of the world (Mozley, 1998). In order to produce a nuclear weapon, the uranium must be "extracted from ore...the radioactive ore is [then] crushed into fine grains...After the uranium has been separated from other material in this way it must be precipitated out of the solution...What results is generally a complex solid of varying composition, called yellowcake... This marketable commodity is then brought to another plant for further purification," (Mozley, 1998. p. 40 – 41). This is why the ability of a state to be able to enrich uranium is the single best indicator of nuclear weapons capability to date.

2.2 Evolving norms in the International Community

The "great" powers, which include the United States, United Kingdom, France, China, and Russia (formerly the Soviet Union), all proliferated before the inception of the NPT. These states have a unique role in matters of nuclear proliferation. Essentially "grandfathered in", their nuclear status is considered both secure and legitimate in the international system. What is more interesting is what these states do with their status – when do they assist other states in proliferating, when do they simply look the other way, and when do they directly challenge the proliferation of new states? The differences in these instances are telling of the evolving strategy and norms behind both proliferation and alliance structures.

For instance, the United States directly assisted both Great Britain and France in building their nuclear arsenals, while looking the other way towards Israel's nuclear pursuits (Waltz, 1995). While each country is a strong ally of the United States, one of the main differences in the United States' nuclear relationship with Great Britain, France,

and Israel can be found in the changes in norms regarding proliferation. The inception of the NPT represented a codified norm in the international system against nuclear proliferation, so the United States faced a more direct constraint with Israel than with the proliferation of its previous allies. The United States has directly opposed the proliferation of several states, in which the US was "constrained by interests beyond our concern for slowing the spread of nuclear weapons (mostly the Cold War framework)," (Waltz, 1995. p. 38 parenthetical added).

Other great powers either assist or attempt to prevent proliferation for similar strategic reasons. What makes this interesting is *their ability to do so*. Further, the spread of nuclear weapons by one ally to another is also met with hostility from other states. While there is much debate about the spread of nuclear weapons, one of the most undisputed indicators of proliferation is having an enduring rivalry with a state with nuclear weapons (Jo and Gartzke, 2007; Singh and Way, 2004; Way and Weeks, 2014). Waltz refers to this phenomenon as "hostile pairs," citing that the development of nuclear weapons by the United States as the main cause of the Soviet Union's nuclear weapons program, which led to China's, and China's then prompted India's, which was followed by Pakistan's, and Israel's pursuits drove Iraq's (Waltz, 1995).

Though nuclear weapons states (NWS) have the capability to use nuclear weapons, they do not actually do so (except for the bombings of Hiroshima and Nagasaki by the United States in August of 1945). The atomic bomb dropped on Hiroshima on August 6th killed roughly 70,000 people instantaneously and another 70,000 by the end of 1945 (Sekimori, 1989) and the bomb dropped on Nagasaki on August 9th caused fewer instantaneous deaths, though by the end of 1945, 70,000 had died and by 1950, 340,000

something people had lost their lives from the two atomic explosions (Sekimori, 1989). The devastation caused prompted the United Nations to issue its first ever resolution calling for total elimination of nuclear weapons, (Duarte, 2011).

Several attempts at creating a nonproliferation regime took place after the tragedies of Hiroshima and Nagasaki. The first was when the United States, United Kingdom, and Canada proposed what is formally referred to as the Agreed Declaration of 1945. This led to the United Nations Atomic Energy Commission (UNAEC) though it only lasted through 1946 and was met with constant pushback from the Soviet Union (Fischer, 1997). In 1953, Eisenhower proposed the Atoms for Peace program, which eventually led to the creation of the International Atomic Energy Agency (IAEA) in 1956 (though it did not come into force until 1957). In the 1960s and 1970s a number of regional treaties limiting the spread of nuclear weapons emerged, as well as a universal statement of nonproliferation in the form of the Nonproliferation Treaty (NPT) of 1968 (Fischer, 1997). Though these treaties and attempts appear throughout the Cold War timeline, the international order was in fact characterized by an arms race between the United States and the Soviet Union. With the end of WWII and the leftover tension between the United States and the Soviet Union, both states began to build up their nuclear arsenals, believing that nuclear deterrence was necessary for their security. During the Cold War, this shaped the prevailing international order and made deterrence, and thus an arms race, a norm in security culture.

When the Cold War ended and the Soviet Union fell, it created a change in the order of the international system, and with this change came a reshaping of the dominant security culture. This change is characterized by Western states attempting to construct a

non-proliferation arms control and disarmament (NACD) regime beginning in 1989 that was based on a change in the threat environment of the system away from the expansion of Soviet Communism to "a more diffuse and generalized risk of 'proliferation', understood as the 'destabilizing' spread of various types of military technology (especially weapons of mass destruction [and] their delivery systems...)," (Krause and Latham, 1998. p. 23). This shift in the norms in the international system placed the proliferation of nuclear weapons to non-nuclear weapons states as the principle threat to global security (Krause and Latham, 1998). It is important to note that this new world order and the attention to nonproliferation was heavily Western in influence and norms, though this is understandable as the United States emerged from the Cold War as the world's predominate superpower.

While deterrence explains the nonuse against other NWS's, the nonuse against states without the capability to retaliate is more puzzling (Paul, 2009). Paul (2009) argues that this nonuse can be attributed to an informal norm in the international system that has emerged as a tradition of nonuse from 1945 on, where the nonuse of nuclear weapons became iterated so that later decisions to refrain from using nuclear weapons is partly a product of previous decisions to refrain from using them (p. 1- 3). This norm fits within the general framework against any kind of coercive force that emerged after WWI, outlined in article 2(4) of the United Nation's Charter. For example, the power of the norm against the aggressive use of force to take territory has been used to help understand the lack of support in the General Assembly for Argentina after its attack on the Falklands/Malvinas (e.g. see Franck, 1985). It is perhaps even better illustrated by the First Gulf War to prevent the Iraqi absorption of Kuwait. Mueller's argument for the

"obsolescence of war," or Zacher's (2001) idea of the "territorial integrity norm," thus also meant that the newly independent and weak post-colonial states would be spared the possibility of being taken over by neighbors, or become part of multinational empires.

The norm for the non-use of nuclear weapons goes hand-in-hand with the purpose behind the nonproliferation treaty, and though it is not codified, it is perhaps more powerful as there have been several instances of states defying the NPT's mandates and zero instances of states using nuclear weapons. There are two factors that account for this according to Paul: (1) an appreciation for the massive amount of damage that would be produced – both short and long term, and perhaps more pertinent for the purposes of this analysis, (2) the reputational costs it would generate, "projecting poor images, signaling wrong intentions, and setting bad precedents," (p. 2).

Leaders who wish to proliferate today do so under an international order that largely opposes proliferation. This opposition is not always applied equally, but as a norm, it holds in the international system. Thus, proliferating today requires a strategic calculus that takes into consideration both the international audience as well as a leader's domestic audience preferences, with the understanding that the undertaking will be costly in terms of time and money spent, as well as reputational costs in the international system. Now that the evolution of international norms toward nuclear proliferation have been laid out, I will now trace the extant literature on the subject.

CHAPTER THREE

THE STUDY OF NUCLEAR PROLIFERATION AND NONPROLIFERATION

I build my theoretical framework for this study from three main bodies of literature: (1) a leader's desire for political survival and how audience costs affects this survival (Bueno de Mesquita (BdM), Smith, Siverson, & Morrow, 2003; Weeks, 2008); (2) literature emerging in comparative politics and among some international relations scholars on differences among the behavior of leaders by regime type (Levitsky and Way, 2002; Geddes, 2003, 2004; Weeks, 2012; Gandhi & Prezworski, 2007; Gates et al., 2006); and (3) nonproliferation. While there has been much progress in studies of nonproliferation, I am able to fill a gap in this literature by tying the four bodies of work together directly through the lens of strategic choice. It is a mistake to assume that all leaders will approach proliferation uniformly, which is a fault of much of the previous literature on proliferation, especially those early attempts at quantifying proliferation studies (e.g. Jo and Gartzke, 2007; Singh and Way, 2004). By utilizing the preference orderings of leaders structured by audience costs, regime type, institutions, personality, etc. I can get a clearer grasp on the decision to proliferate (or not).

One of the inherent issues with the vast body of nonproliferation literature is the lack of consensus on how best to study proliferation. Divides in past research most commonly arise from whether a researcher is focusing on the supply or demand side of

proliferation; on the timeframe of proliferation (essentially from before or after the Cold War); whether a researcher is focused on deterrence or positive proliferation; and based on whether a researcher is focusing on a state's opportunity or capability to proliferate versus a leader's willingness or choice to proliferate. These divides are not without reason. Research in proliferation is inherently tricky due to both the secrecy in which it is shrouded and the rareness of the event. What is problematic about these categorical divides is that even though they provide an ordering scheme; in many ways, they are false divisions.

Take for instance the division between opportunity and willingness (Most and Starr, 1989): most studies of nuclear proliferation focus almost exclusively on a state's potential for proliferation, without considering the leader's desire for proliferation. As the opportunity and willingness literature (Most and Starr, 1989; Starr, 1978) suggests, the willingness to proliferate is essential to any actual attempts at proliferation. Thus, I propose a new framework for studying proliferation that is based on strategic choice. Since a leader who chooses to proliferate must consider the preferences of both his or her domestic audience as well as the preferences of the international community, this strategic choice is inherently a two-level game (Putnam, 1988). Building on the role of leader personality, the desire for political survival, and authoritarian institutional structures, I contribute to the nonproliferation literature by modeling causal pathways to nuclearization or denuclearization with the hope of adding to our understanding of why leaders choose to proliferate in the first place.

In order to understand the strategic environments under which leaders operate, especially as they pertain to nuclear decisions, it is necessary to delineate the advances in

technology and how technology affects nuclear capability. This review of the literature first outlines advances in our understanding of the requirements to build a nuclear weapon and then traces the scholarly research on motivations for nuclear weapons.

3.1 Technological Advancements in both Proliferation and Scholarly Responses

Early studies of nuclear proliferation assumed that the answer to why states choose to proliferate is painfully obvious: if they face a threat to their national security that they cannot solve through conventional means, they will seek nuclear weapons programs; otherwise, they have no real incentive to nuclearize and will thus remain willingly as non-nuclear states (Sagan, 1996; e.g. Deutsch, 1992; and May, 1994). Sagan (1996) argues that this is an inadequate assumption, "because nuclear weapons programs also serve other, more parochial and less obvious objectives [than just national security]. Nuclear weapons, like other weapons, are more than tools of national security; they are political objects of considerable importance in domestic debates and internal bureaucratic struggles and can often serve as international normative symbols of modernity and identity," (Sagan, 1996). I use this assumption about nuclear weapons as normative symbols to inform my theory about leader incentives to proliferate based on regime-type.

3.1A Nuclear Materials and Capability

What is actually required to create a nuclear weapon? How likely is it that a state will have the capability to create and maintain a nuclear weapons system? The proliferation literature has made vast strides in understanding the capabilities necessary to begin a nuclear weapons program. This literature is important for my theory, as a leader must concurrently have the capability and the desire to begin a weapons program, (Starr, 1978; Most and Starr, 1989; O'Reilly, 2009).

Recent quantitative empirical work on understanding proliferation incentives has been influential in determining the necessary capabilities for developing nuclear weapons (e.g. Singh and Way, 2004; Jo and Gartzke, 2007; Fuhrmann, 2009a & 2009b; Kroenig, 2010) where high levels of economic development, physical resources, and technological knowhow are imperative. These measures range from scientific knowledge to the ability to enrich uranium and have been captured in various ways by scholars. Some measures focus more specifically on the economic capacity of a state (Singh and Way, 2004) while others focus on the natural resources and production of electricity. Most of these studies build on Meyer's 1984 study that developed ten indicators for nuclear weapons capability. The measures vary widely, from 69 states having latent nuclear capability (Barnaby, 2004), to somewhere in the high 40s (Hymans, 2006; Stoll, 1996), to 34 states having capability (Meyer, 1984). The variance is in large part due to the conceptualization and operationalization used to measure nuclear capability.

However, the majority of these measures lead to illogical conclusions about state capacity for nuclear proliferation. Specifically, Jo and Gartzke (2006) create a "sum of scores" measurement for nuclear capability that includes seven indicators of capability that measure a state's economic capacity, scientific knowhow, whether or not a state has nuclear power plants, and technological capacity to enrich uranium. These seven indicators are binary in nature and are then summed together to create a measure of nuclear capability ranging from 0 to 7 so that states with a higher score are considered more nuclear capable. The issue with this measurement is that each of the indicators are weighted equally, where the ability to enrich uranium is given the same weight as a

state's economic capacity and its level of scientific knowledge in determining a state's capability to produce nuclear weapons.

The result is that a state such as North Korea has an average summed score of 3 while a state such as Trinidad and Tobago has an average summed score of 5. Trinidad and Tobago's score of 5 includes having crude steel or aluminum to process uranium ore, having the engineering capacity to produce nuclear weapons, the necessary chemical capacity to do so, and being able to produce enough electricity to run nuclear weapon programs (Jo and Gartzke, 2006). What it lacks is the key ingredient to nuclear weapons production: enriched uranium. North Korea, with only an averaged summed score of 3, has as one of its indicators the ability to enrich uranium. As of 2003, North Korea is a known state with nuclear weapons. The summed score created by Jo and Gartzke (2006) is an unsatisfactory measure of nuclear capability. Each of the indicators discussed by Jo and Gartzke (2006) are important, but they are not *equally* so. Further, the focus on scientific knowledge is outdated. As Mozley (1998) notes, "A great deal of literature on U.S. nuclear-weapons development is declassified and available," (p. 22). A better measure of nuclear capability can be found specifically in a state's ability to enrich uranium. A brief review of the science behind nuclear technology will shed light on why this is a superior measure for nuclear capability.

3.1B The Supply-Side, International Assistance

There is also research that looks at the "supply side" of nuclear proliferation, focusing on whether it is possible for states to proliferate based on assistance received from a nuclear power. This research posits that it is not necessary for a state to be nuclear

capable in technological determinants, but rather, to be capable of purchasing nuclear materials or assistance.

While many small powers may not have the resources to build a nuclear weapon alone, assistance may come in the form of transferring key materials and/or technologies from a larger state. Kroenig (2010) argues that much work has been done to explain why states seek nuclear weapons programs, yet most ignores that "nuclear weapons programs spread from state to state," and in order to fully understand nuclear proliferation we must look at both the supply and demand sides of nuclear weapons, (Kroenig, 2010, p. 172). He asks, "Does sensitive nuclear assistance contribute to the international spread of nuclear weapons?" (Kroenig, 2010, p.172). Kroenig provides us with a fuller picture of proliferation, particularly for smaller powers. Sensitive assistance is defined as, "the state-sponsored transfer of the key materials and technologies necessary for the construction of a nuclear weapons arsenal to a nonnuclear weapons state," (Kroenig, 2010, p. 10-11) and Kroenig argues that states will provide assistance under certain conditions: (1) if the providing state has power significantly greater than the receiving state; (2) if the providing state and the receiving state share a common enemy; and (3) a state will be less likely to provide sensitive nuclear assistance if they are dependent on a superpower (Kroenig, 2010, p. 37-39). These conditions for providing assistance are important for understanding the strategic environment for smaller powers, which can utilize their size relative to larger states with nuclear weapons in order to seek assistance with proliferation.

Kroenig (2010) divides nuclear assistance into sensitive and non-sensitive assistance to test for previous arguments by academics and nuclear nonproliferation

professionals that has suggested that the spread of non-sensitive nuclear assistance (i.e. for peaceful energy purposes) leads to the spread of nuclear weapons (Fuhrmann, 2009; Lavoy, 2003; Weiss, 2003; Ferguson, 2007). He finds that nuclear assistance only significantly affects proliferation when it is specifically of the sensitive variety; non-sensitive nuclear assistance has no significant effect on proliferation (Kroenig, 2010, p. 151-172).

Kroenig's (2010) argument that the "supply side" is an important element to understanding nuclear proliferation is apt, however, he glosses over a problem of endogeneity. He follows Jo and Gartzke's framework of nuclear opportunity and nuclear willingness, arguing that sensitive nuclear assistance fits in the opportunity camp. Kroenig notes that there may be an issue with endogeneity due to the potential for sender states to channel sensitive nuclear assistance to those states they believe are most likely to begin nuclear weapons programs (161-163), though he argues that this problem is rendered moot by focusing on the strategic reasons a state would provide nuclear assistance. However, he misses another potential issue: the strategic environment of the receiving state. It is plausible that sensitive nuclear assistance will affect a leader's choice to begin a nuclear weapons program as much as it will affect the capability of a state. While filling in one gap in the proliferation literature, he has left another. In order to understand the proliferation of small state powers more fully, we need to not only combine the supply and demand literatures, but also the opportunity and willingness.

3.2 Motivations for Seeking Nuclear Weapons: Scholarly Debate

"Nuclear technology has long been recognized as capable of both tremendous benefits and tremendous destruction," (Lettow, 2010. p. vii). The power of nuclear fission

to produce both a new and efficient source of energy as well as the capacity to become a deadly weapon of mass destruction created a race among states to understand and develop the necessary technology required for this powerful new resource. This race created a new type of interaction in the international system, and with it, scholars began researching this new phenomenon of nuclear proliferation.

3.2A Realist versus Liberal Theories

Divisions in nuclear proliferation studies fit broadly within the longstanding debate between realist and liberal scholars in international relations. Much of the nonproliferation literature that arose from the Cold War era characterizes strategies of deterrence, where one actor tries to prevent the actions of another, and if successful, the first actor credibly convinces the second that its threats are more costly than any gains received from pursuing the desired action and that if it does not comply, it will be punished (Schelling, 1966). However, some realists provocatively claim that "more may be better" when it comes to the proliferation of nuclear weapons (e.g. Waltz, 1981; Mearsheimer, 1990).

The divide can be traced to a scholarly starting point: (1) whether nuclear weapons are seen to decrease or to increase the probability of interstate conflict and (2) whether nascent nuclear states are considered to be more prone to interstate conflict than the original nuclear states. The first divide includes those realist scholars who argue that nuclear weapons actually contribute to stability in the international system by making war unfeasible due to the cost of nuclear warfare (e.g. Ganguly and Hagerty, 2005; Mearsheimer, 1984 & 1985; and Waltz, 2003) versus those liberal scholars who argue that nuclear proliferation increases the probability of conflict by decreasing stability in

the international system (e.g. Geller, 1990; Saideman, 2005; Bajpai, 2009). The second divide is similar in form, where some realist scholars argue that new nuclear states should be no more prone to interstate conflict than old nuclear states due to the logic of nuclear deterrence holding regardless of the state (e.g. Waltz, 2003) and other liberal scholars argue that they will be more prone to interstate conflict because the logic of deterrence cannot be uniformly applied across the board (e.g. Sagan, 2003).

The debate has been simplified in some studies to characterize those scholars who study the effects nuclear weapons have on interstate conflict as nuclear optimists versus nuclear pessimists (e.g. Asal and Beardsley, 2007; Ganguly and Kapur, 2009; Rauchhaus, 2009). These studies focus primarily on a dyadic or a systemic level of analysis for understanding nuclear proliferation. Though nuclear proliferation is systemic in terms of the number of states in the international system that begin nuclear weapons programs, looking at nuclear proliferation from a systemic level of analysis does nothing to further our understanding of *why* states are proliferating. To understand why, we need to look at the strategic environment leaders operate in.

3.2B Strategic environment and nuclear development: Why states may reverse course

A leader's incentive to proliferate is not based solely on the preferences of her domestic audience; instead, she must balance these preferences with those of the international community. The inception of the nonproliferation treaty (NPT) in 1968 ushered in a "second nuclear age" (Solingen, 2007). States seeking to obtain nuclear weapons after this point did so under different conditions than the original five proliferators (the United States, United Kingdom, France, USSR/Russia, and China). The NPT represents a codified norm in the international system and states that ignore the

treaty risk being shunned or labeled a "rogue nation" by the international community (Solingen, 2007). This means that the "game" played by the leader is two-level in nature and it must be considered when thinking about his or her strategic decision-making.

Scholarly strategies for understanding proliferation run the gamut from deterrence to positive proliferation. Variants between these include "nuclear hedging," a middle ground between nuclear pursuit and reversal, (e.g. Levite, 2003) and understanding paths of nuclear reversal as products of various combinations of economic sanctions and military intervention (e.g. Solingen, 2012).

I rely on Levite's (2003) definition of nuclear reversal, "the phenomenon in which states embark on a path leading to nuclear weapons acquisition but subsequently reverse course, though not necessarily abandoning altogether their nuclear ambitions," (p. 61). This definition distinguishes states that have reversed their nuclear weapons programs from states that never began a program (Levite, 2003). This distinction is critical for my theory in fleshing out the repercussions for leaders who are unsuccessful at acquiring nuclear weapons after beginning programs. Instances of nuclear reversal can also be put into the opportunity and willingness framework (Starr, 1976; Most and Starr, 1989). A leader may denuclearize because she no longer has the necessary resources (opportunity) to maintain the program and/or because the costs of maintaining a nuclear weapons program become so great that the benefits are no longer worth the expense (willingness).

Using the major IR theories as a classification schema to focus on motives-based hypotheses, previous literature has three general explanations for why states reverse nuclear weapons programs, (1) security explanations, (2) norms-based explanations, and (3) domestic politics explanations. The first is predominately realist in nature, the second

deals with ideational factors in the international community that influence state behavior, and the third with cost/benefit analysis and institutional factors that take place at the sub-state level. This is not a completely clear-cut categorization; there is overlap between each of the three general explanations, though classifying the literature in this way is advantageous in utilizing the IR theoretical framework. Sagan (1997) utilized this framework to distinguish motivations for nuclear proliferation from explanations that focused on the capabilities to proliferate.

Security explanations of nuclear proliferation and reversal contend that states develop nuclear weapons programs when there is an existential threat to their security. The lifting of this threat is one explanation for reversing course (Levite, 2002; Paul, 2000). A general premise for these explanations, then, is that a leader should be more likely to abandon their nuclear weapons program when an external threat is no longer perceived. In security explanations, studies of nuclear proliferation focus on system level factors for the causes of proliferation, considering the state a unitary rational actor (Betts, 1993; Davis, 1993).

These studies, epitomized by Waltz (1981) "More May Be Better", fail to account for the strategic decision *not* to begin a nuclear weapons program, a decision that is far more common than to begin a program. The sole focus on system-level factors misses the sub-state level interactions that affect the nuclear decision-making process.

Norms-based explanations of nuclear proliferation are grounded in the security communities discussed by Deutsch (1957) where the international community has grown to view nuclear weapons proliferation as negative, devaluing the "prestige factor" that is associated with nuclear weapons (Adler, 1992). Also, central to this line of argument is

the shared values of Western democracies, the "core" of the international community; where these values have led to cooperation in nonproliferation (Chafetz, 1993). A general proposition derived from norms-based explanations would be that a non-signatory of the Non Proliferation Treaty (NPT) should be less likely to reverse their nuclear weapons program than a signatory.

Though these explanations account for those states who chose not to begin nuclear weapons programs, they miss states who operate outside the norm of nonproliferation; further, they make a blanket statement that nonproliferation is a universal norm where there have clearly been instances of both states proliferating in flagrant disregard for the NPT (such as North Korea) as well as states looking the other way to proliferation attempts (such as the United States and Israel). Norms-based explanations also fail to account for instances of nuclear reversal that occurred for reasons other than reputational costs in the international community.

Finally, domestic politics explanations seek to look under the hood of the state at the decision-making process occurring for nuclear proliferation. For instance, Solingen (2004) uses a case study approach to look at proliferation from the lens of different regime types and whether or not the regimes are inward-looking (isolated) or outward-looking (seek to be a part of the international community). Other studies have mapped the likely domestic determinants of proliferation such as technological factors, whether or not the state is a party to the NPT, whether the state has the ability to enrich uranium, levels of GDP, etc. (Singh and Way, 2004; Jo and Gartzke, 2007). Though these studies represent some of the first quantitative approaches to nuclear proliferation, they bypass nuclear reversal and do not consider it to be part of the process of proliferation.

Much of the literature on the occurrence of nuclear reversal has been fragmentary, where studies focus on individual cases of reversal and seek to explain the *unique* characteristics that led to a state's reversal of their nuclear programs (e.g. Hughes, 2007; Rublee, 2010). This individual approach means that studies are focused in on disparate reasons for nuclear reversal, without taking into account that the reasons in one instance may be similar to those of another. This approach is in many ways understandable, as there have been so few cases of nuclear reversal to characterize the process as a rare event. However, the phenomenon of nuclear proliferation is itself classified as a rare event. Of the twenty-four states that have begun nuclear weapons programs, fourteen of them have reversed course.

To highlight the fragmentary approach of nuclear reversals, take for instance Levite (2002): his study finds that Argentina reversed its nuclear program due to both domestic regime change internally and the removal of an existential threat externally, while Switzerland reversed course due to fear over how "hostile nuclear powers" may react (p. 63). While there may have been different factors affecting these countries, it is still important to consider them together, thus allowing us to find common trends among the cases of reversal. Looking at the unique factors in each case can only tell us so much; rather, in both proliferation and reversal, it is advantageous to study the *process* of decision-making that guides leaders to each stage of the nuclear process. It is especially important to do so for studies of nuclear reversal, as reversal should be studied as one of the outcomes of nuclear proliferation rather than disparate from it. In looking at the decision-making process, we can gain a better grasp on current cases of proliferation and what strategies may work to trigger nuclear reversal, such as Iran.

A strain of research that has made strides in advancing our understanding of viable strategies to reverse nuclear proliferation fits within previous research on positive and negative inducements in economic sanctions literature. Here, the focus is on whether positive or negative incentives are more successful at getting a state to reverse course. Positive inducements come in two forms for nuclear reversal: (1) transferring resources such as technology, money, or knowledge to influence a leader to give up their weapons program (economic incentives) or (2) through offering security assurances to remove a perceived threat, such as placing a state under the nuclear umbrella of a nuclear power, building confidence by creating or strengthening alliances, or offering diplomatic recognition (security incentives) (Haas and O'Sullivan, 2001; Solingen, 2007, 2012; and Nincic, 2010, 2011, 2012. Negative inducements come in both economic and security forms as well. Strategies for negative inducements include imposing economic sanctions (either unilaterally or multilaterally) on a state, threatening to withhold promised aid, or through threatening or using military intervention (Baldwin, 1971; Cortright & Lopez, 1995; Bernauer & Ruloff, 1999; Drezner, 1999, 2012; Davis, 2000; Haas and O'Sullivan, 2001; Solingen, 2007, 2012;).

3.2C Domestic Institutions and Political Survival

The theoretical argument for this study rests on two core assumptions. First, leaders want to maintain their grasp on power for as long as they can (BdM et al.., 2003). Second, the institutional settings leaders operate in differ not only between democracies and non-democracies, but also *among* non-democracies (Levitsky and Way, 2002; Geddes, 2003, 2004; Weeks, 2012; Gandhi & Prezworski, 2007). These institutional settings create the decision-making space under which leaders operate.

I address incentives of political survival through examining the multi-level pressures a leader faces—externally from the international community and internally from the leader's domestic audience. Bueno de Mesquita and associates' (2003) selectorate theory is one of the leading theories in both international relations and comparative politics for explaining political survival. Policy preferences are based on the size of a leader's "winning coalition", the portion of the total population that keeps a leader in power; where those elites in the winning coalition are pulled from the "selectorate", the portion of the population eligible to gain access to the winning coalition (BdM et al., 2003). Selectorate theory offers a novel way to conceptualize behavioral differences in the leaders of democracies and non-democracies. While elegant in its parsimony, the utility of selectorate theory is limited in its capacity for explaining variation among non-democracies, as all are typified by a small winning coalition. Therefore, I do not assume that it is only the size of a leader's winning coalition, but also the level of contestation within the coalition, that matters for determining a leader's nuclear policy choices.

There is great variation in the political institutional structures of autocracies, anocracies, and democracies. This variation influences the respective leaders' incentive structures for policy choices. Institutional stability decreases as regimes become less fully autocratic or democratic, so that the least stable political systems are mixed regimes: dictatorships with high levels of political participation (Gates et al., 2006; Gandhi & Przeworski, 2007). Leaders who face a civilian audience, typified by anocracies and democracies, are more apt to provide policy concessions to gain public cooperation while

monarchical and military leaders of autocratic regimes are more likely to distribute private spoils to their cronies (BdM et al.., 2003).

The model builds on Gandhi & Przeworski's (2007) assumptions of threats facing authoritarian leaders. They first assume that there are two threats that face an authoritarian leader, the first from inside the ruling elite and the second from outside citizens in the leader's society (Gandhi & Przeworski, 2007, p. 1280). While I assume an additional threat to leaders who choose to nuclearize will come from other states in the international system, their larger point is a crucial one: that these two types of threats create the need for different types of institutions. Threats from within the ruling elite are generally handled through including the elite in the distribution of private spoils; however, if the leader needs the cooperation of the citizens outside his ruling elite, he may make policy concessions, which are public and codified as legal norms (Gandhi & Przeworski, 2007, p. 1282). Thus, "although spoils can be distributed directly out of the autocrat's pocket, working out policy concessions requires an institutional setting," (Gandhi & Przeworski, 2007, p. 1282). It is concerns of audience costs that provide the greatest leverage for making distinctions among non-democracies, not simply the size of their leader's winning coalition.

One of the most influential ideas in the audience costs literature is that leaders who back down from international public threats will lose popular support domestically (Tarar and Leventoglu, 2013; Snyder and Borghard, 2011; Trachtenberg, 2011). This idea has also been supported when the threat is economic in nature (Martin, 1993; Dorussen and Mo, 2001, Chaudoin, 2014). Both military intervention and economic coercion are directly relevant when considering a leader attempting to nuclearize. Since the

international community has a generally stated preference for nonproliferation, a leader must weigh their ability to withstand heavy economic sanctions and military intervention from the outside world with the likelihood that their domestic audience will punish them if they are not able to withstand the international threat and are forced to reverse their nuclear programs. This ability to withstand international threats against proliferation, coupled with the resources a leader has at hand, leads to differentiation in strategic environments for proliferation among smaller and larger state powers.

3.2D Regime Type and Proliferation

In each of the empirical studies discussed, the scholars found that regime type was an insignificant predictor of nuclear proliferation. Sagan (2011) has gone so far as to note this finding to be an area of "specific agreement" in both case-oriented and quantitative approaches, that "regime type has only minimal effects on proliferation," (Sagan, 2011, p. 236). This is a source of consensus among nonproliferation scholars that I find tenuous. If there is no difference between the leaders of authoritarian regimes and democratic regimes in both their incentive for and their capability to seek nuclear weapons, then this runs counter to an entire body of research on the efficacy of domestic institutions. I posit that this finding in previous research is due to the dichotomization of democracies versus autocracies in the respective works.

Solingen (2007) represents one of the first works in nonproliferation studies to address this conundrum. Arguing that the democratic peace literature is not adequate for explaining proliferation differences in Asia and the Middle East, Solingen (2007) notes that the regimes in these states have mixed results with proliferation. Instead, she claims that domestic concerns of survival are the most apt for explaining proliferation. I tend to

agree with her basic premise, though there is still much to be explained. Similar to Way and Weeks (2014), Solingen theorizes that regimes which are more inward-looking will be the most likely to proliferate, while those that are more outward-looking and interested in the international environment (for trading etc.) will be less likely to proliferate. This is a solid assumption and I use it to inform my theory below. However, what is missing in her argument (as well as Way and Weeks) has to do with a clearer discussion of audience costs and domestic institutions. Authoritarian regimes are not the same; the audiences that leaders of these regimes are beholden to differ in significant ways and these differences affect the strategic environment in which leaders operate. Leaders of military dictatorships are significantly more likely to face coup attempts on their regime and thus must focus their resources on conventional weaponry as a means to "coup-proof" their regime (Weeks, 2012; Geddes, 2004).

Further, Solingen's (2007) discussion of those outward-looking regimes is useful but incomplete. The international community's preference for non-proliferation affects all states, not just those "outward-looking regimes". Any leader choosing to proliferate must weigh the preferences of her domestic audience against the costs of the international community's preferences. Perhaps a small distinction, it is still vital to understanding why and when leaders choose to proliferate.

Way and Weeks (2014) examine the relationship between personalism and proliferation. Their work represents a positive step towards understanding how institutional differences affect a leader's incentives to proliferate, arguing that the type of non-democracy that provides more incentives to proliferate is that of a "personalistic" dictator, otherwise known as a "boss". While this study represents a crucial step in

understanding how regime type affects proliferation, there is still work to be done. Namely, though noting important distinctions between types of authoritarian regimes, the forthcoming article simply creates a new dichotomous variable of regime type in order to test the effects on proliferation, lumping military regimes and competitive non-democracies in the same category as democracies, which may result in different measurement issues.[2] Even more than issues of empirics, are the theoretical concerns this leaves wanting. Authoritarian regimes are not all equal, and while Way and Weeks (forthcoming 2014) note that there are distinctions between these regimes, they do so with the goal of separating out those regimes that are "personalistic" in nature.

While Solingen (2007) and Way and Weeks (2014) represent solid improvements to our understanding of proliferation, there are inconsistencies in findings and gaps in the literature that can best be filled through a formal theory. This approach clearly outlines causal pathways based on the strategic environment in which leaders operate. I propose that what would be most useful is to look at personalistic, military, and competitive authoritarian regimes distinctly by focusing on the incentives produced by their domestic audiences and institutional structures; put differently, the strategic choice to proliferate is different for leaders of different authoritarian regimes. This is important not only to why leaders begin nuclear weapons programs, but also for what happens to leaders who fail to acquire nuclear weapons once they have started down the path towards proliferation and if and how these effects are different among leaders of different regime types. Perhaps

[2] Way and Weeks (2014) create a dichotomous variable for personalistic dictatorships versus all other non-personalitstic regime types in order to study the effects of personalism on proliferation.

most interestingly, it may also help us understand the instances in which the path towards nuclearization may lead to regime failure.

The dichotomization of regime types in previous work is indicative of the difficulty in studying nuclear proliferation from a quantitative angle, as there are so few cases of proliferation that including dummy variables for each of the different authoritarian regime types would result in lack of confidence in results, given the significant degrees of freedom required. Quantitative studies are not alone in facing hurdles for studying proliferation—qualitative studies have their own shortcomings. Nuclear weapons are a topic shrouded in secrecy, which has a practical concern for scholars of the topic; namely, it makes it much easier for reasonable scholars to come to wildly different interpretations of proliferation decisions (Sagan, 2011).

The rareness of proliferation presents a very real challenge to understanding why leaders decide to proliferate and under what conditions they choose to do so. My proposed study seeks to alleviate some of the shortcomings still inherent to the nonproliferation literature by utilizing a mixed methods approach well suited to a strategic choice framework for studying proliferation decisions.

CHAPTER FOUR

TO NUCLEARIZE OR NOT TO NUCLEARIZE? LEADERS AND THEIR AUDIENCES

4.1 The Interplay of Institutions and Political Survival:

The theoretical argument for this study rests on two core assumptions. First, leaders want to maintain their grasp on power for as long as they can (Bueno de Mesquita (BdM) et al., 2003). Second, the institutional settings leaders operate in differ not only between democracies and non-democracies, but also *among* non-democracies (Levitsky and Way, 2002; Geddes, 2003, 2004; Weeks, 2012; Gandhi & Prezworski, 2007). These institutional settings create the decision-making space under which leaders operate.

I address incentives of political survival through examining the multi-level pressures a leader faces—externally from the international community and internally from the leader's domestic audience. Bueno de Mesquita and associates' (2003) selectorate theory is one of the leading theories in both international relations and comparative politics for explaining political survival. Policy preferences are based on the size of a leader's "winning coalition", the portion of the total population that keeps a leader in power; where those elites in the winning coalition are pulled from the "selectorate", the portion of the population eligible to gain access to the winning coalition (BdM et al., 2003). Selectorate theory offers a novel way to conceptualize behavioral differences in the leaders of democracies and non-democracies. While elegant in its

parsimony, the utility of selectorate theory is limited in its capacity for explaining variation among non-democracies, as all are typified by a small winning coalition. Therefore, I do not assume that it is only the size of a leader's winning coalition, but also the level of contestation within the coalition, that matters for determining a leader's nuclear policy choices.

There is great variation in the political institutional structures of autocracies, anocracies, and democracies. This variation influences the respective leaders' incentive structures for policy choices. Institutional stability decreases as regimes become less fully autocratic or democratic, so that the least stable political systems are mixed regimes: dictatorships with high levels of political participation (Gates et al., 2006; Gandhi & Przeworski, 2007). Leaders who face a civilian audience, typified by anocracies and democracies, are more apt to provide policy concessions to gain public cooperation while monarchical and military leaders of autocratic regimes are more likely to distribute private spoils to their cronies (BdM et al., 2003).

The model builds on Gandhi & Przeworski's (2007) assumptions of threats facing authoritarian leaders. They first assume that there are two threats that face an authoritarian leader, the first from inside the ruling elite and the second from outside citizens in the leader's society (Gandhi & Przeworski, 2007, p. 1280). While I assume an additional threat to leaders who choose to nuclearize will come from other states in the international system, their larger point is a crucial one: that these two types of threats create the need for different types of institutions. Threats from within the ruling elite are generally handled through including the elite in the distribution of private spoils; however, if the leader needs the cooperation of the citizens outside his ruling elite, he

may make policy concessions, which are public and codified as legal norms (Gandhi & Przeworski, 2007, p. 1282). Thus, "although spoils can be distributed directly out of the autocrat's pocket, working out policy concessions requires an institutional setting," (Gandhi & Przeworski, 2007, p. 1282). It is concerns of audience costs that provide the greatest leverage for making distinctions among non-democracies, not simply the size of their leader's winning coalition.

The proposed model hinges on these theories of political survival and leader preferences by assuming that leaders of non-democracies will be beholden to a small subset of their population. Thus, their decisions about nuclear weapons programs will be determined by interests which keep them in power, internally from their winning coalition and externally from relations with other states in the international system.[3]

4.3 The Model:

The game operates under the umbrella of a set of international norms that prefers no new state to proliferate. This inherently means that a leader that wishes to begin a nuclear weapons program must enter into a two-level game, balancing the interests of her domestic audience against the restraint of the international system. In this game tree, I treat the umbrella of the non-proliferation regime as nature. The game begins with a determination of whether a state has nuclear capability (C) or does not have capability ($\sim C$). This serves as the necessary condition of opportunity, whereby a leader cannot

[3] This study focuses on domestic and international institutions as constraints to a leader's decision-making space. It is beyond the scope of this analysis to focus on leader-specific variables such as personality type, though these factors certainly matter for the decision-making process. In the concluding section, I discuss future work that will delve specifically into leader-level factors that affect decision-making.

begin a nuclear weapons program if she does not have the capability (opportunity) to do so (Most and Starr, 1989).

I utilize a formal theoretical argument from judicial literature to inform my model of decision-making. Though the assumptions and constraints in the judicial game are quite different in my international framework, the model is apt for capturing the nuclear decisions of leaders who must consider the preferences of their audience. The game is a simplified version of Staton's (2006) model of case promotion in the Supreme Court, where the decisions made by the Court in his model are comparable to the decisions made by state leaders in this game, see Figure 1 below. For Staton, case promotion is linked to judicial choice, or policy preferences, in the Supreme Court. An executive whose preferences come from potential public backlash based on media coverage influences Court preferences. When the Court is unlikely to exercise control over media coverage, it is more likely to strike down public policies if it assumes high media involvement, (Staton, 2006). Similarly, I assume that the desire to stay in power is the highest preference of state leaders in this model. Thus, these leaders base their decision to begin a nuclear weapons program on the preferences of their home audience, tempered by the international environment in which they operate.

The first move of the game starts with a leader who decides to begin (L) or not begin ($\sim L$) a nuclear weapons program (see Figure 1). If the leader decides not to nuclearize, the game ends ($\sim L$). The game operates in two states of nature: in democracies and in non-democracies. This can be further divided so that the game can take place in an environment where the leader faces a small and homogenous audience, a small and heterogeneous audience, a large and homogenous audience, or a large and

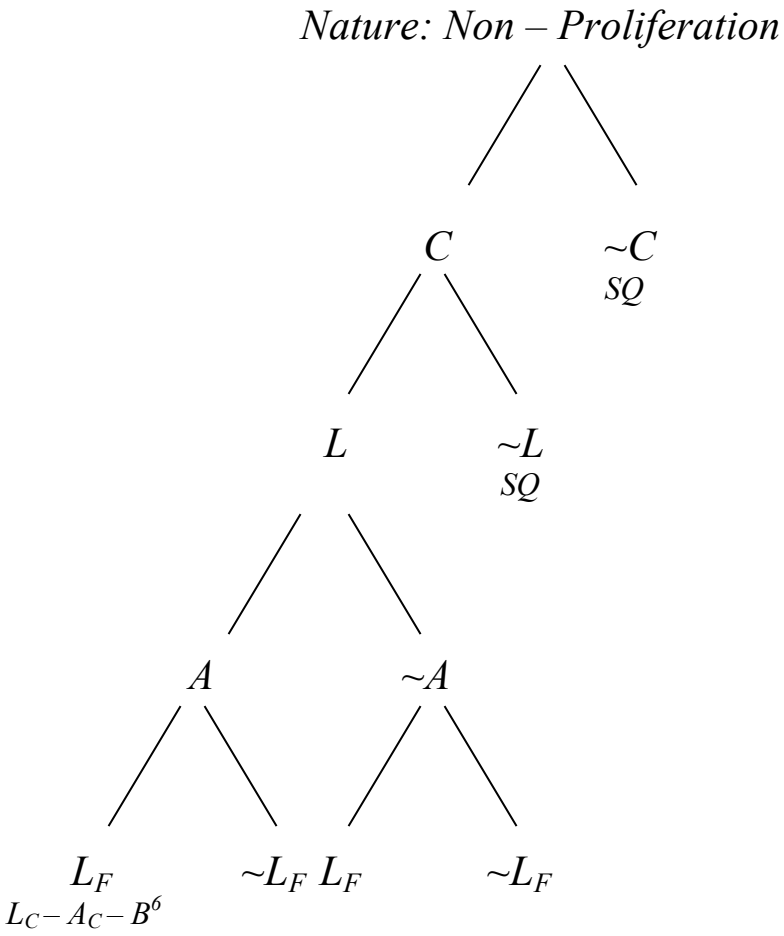
heterogeneous audience. I assume that both the leader and the audience have perfect information in this game, where the audience knows that the leader has started a nuclear weapons program and the leader knows the preferences of her audience. This is somewhat different than Staton's (2006) assumptions, but is appropriate given the nature of this game.

If a leader decides to begin a nuclear weapons program (*L)*, the audience makes the next move, either approving the leader's decision (*A*) or not approving the decision (~*A*). The leader has the same two options for both branches (*A* or ~*A*) at this stage of the game: she can either decide to halt the program and denuclearize (~L_F) or to continue forward with the nuclear weapons program (L_F). Each of these outcomes has different payoffs and consequences for the leader.

If the audience approves the leader's decision to begin a nuclear weapons program (*A*) and the leader continues to go forward with nuclearization (L_F), the game ends with the domestic audience and leader in congruence.[4] If the audience disapproves of the leader's decision (~*A*) and the leader concedes to the audience (~L_F), the game ends with denuclearization and the domestic audience and leader in congruence.[5]

If the audience approves of a leader's decision to nuclearize (*A*) and the leader is unable to continue with the nuclear weapons program (~L_F), the game ends with the leader and audience in discord. If the audience disapproves of a leader's decision to nuclearize and the leader continues forward regardless of her audience's wishes (~L_F), the game again ends in discord. Since this paper is concerned primarily with the decision-making process

[4] India and Pakistan represent these positive cases of nuclearization.
[5] Brazil represents this positive case of denuclearization.



L = Leader favors proliferation; ~*L* = Leader opposes proliferation; *A* = Audience favors proliferation; ~*A* = Audience opposes proliferation; L_F = Leader moves forward on proliferation; $\sim L_F$ = Leader does not move forward; L_C = Leader's value for proliferation; A_C = Cost of defying Audience position; B = Cost of losing International support; SQ = status quo.

Figure 4.1: Decision Tree

[6] $L_C - A_C - B$ is the same for all four terminal nodes; I have included it under "L_F" only for the sake of clarity.

of leaders, I bracket the game at the leader's last move. However, it is perfectly plausible to assume that when the leader has gone against her audience's wishes, the audience will play another round, deciding whether to oust or to concede to the leader. This is currently left aside for future research.

Figure 1 lays out the likelihood of a leader moving forward with a nuclear weapons program, based on the value she places on proliferating minus the cost of defying her domestic audience and the cost of losing support in the international system ($L_C - A_C - B$). Table 1 (below) presents four generalized cases formed from the combination of preferences for a leader and her audience. Two distinct states of nature are represented, State of Nature 1 (Democracy) and State of Nature 2 (Autocracy). For each, the leader's preferences and the audience's level of accord with these preferences are modeled. The leader has a preference to either continue forward with seeking nuclear weapons $(L_F > 0)$ or to denuclearize $(L_F \leq 0)$. The audience is either in discord with this decision $(A \leq 0)$ or in accord with it $(A > 0)$.

For a Democratic State of Nature, Case 1 represents a situation where a leader denuclearizes in conjunction with her audience's disapproval of a nuclear weapons program. In this case, $Prob(\sim L_F)$ is high, the leader listens to her audience's preferences. Case 2 presents a scenario in which a leader denuclearizes in discord with her audience's preferences. In this case $Prob(\sim L_F)$ is somewhat high, though it is less certain than in Case 1. Case 3 shows a situation where a leader continues a nuclear weapons program despite discord with her audience's preferences. In this case, $Prob(L_F)$ is somewhat high, but is less certain than in Case 4. Case 4 presents a scenario in which a leader continues

with nuclearization in accord with her audience's preferences. In this case, $Prob(L_F)$ is high.

For an Autocratic State of Nature, Cases 1 and 4 remain the same as its Democratic counterpart. Case 1 represents a situation where a leader denuclearizes in conjunction with her audience's disapproval of a nuclear weapons program. In this case, $Prob(\sim L_F)$ is high, the leader listens to her audience's preferences. Case 4 presents a scenario in which a leader continues with nuclearization in accord with her audience's preferences. In this case, $Prob(L_F)$ is high. However, Cases 2 and 4 have lower probabilities than in the former State of Nature due to the higher stakes of not acting in accord with a non-democratic audience who can oust or execute a leader far easier than under democratic norms and rules. Case 2 presents a scenario in which a leader denuclearizes in discord with her audience's preferences. In this case $Prob(\sim L_F)$ is low. Case 3 shows a situation where a leader continues a nuclear weapons program despite discord with her audience's preferences. In this case, $Prob(L_F)$ is low.

4.4 Measurement

The game operates in two distinct states of nature, in democracies and non-democracies. Based on these two states of nature, leader(s) will make policy decisions that maximize their hold on power. I measure a leader's audience holistically, so that according to whether or not the regime is autocratic or democratic, the leader must make concessions to her audience or repress the public if audience support is not garnered.

The size of a leader's audience corresponds to the selectorate, or the pool of people who keep him or her in power and the degree of homogeneity in an audience is measured by the degree of support given by the leader's public. It is plausible to assume

Table 4.1: Models of Leader Decisions in Nuclearization

Democracy		
	Audience's Preferences	
Leader Preferences	*Audience in Discord* $A \leq 0$	*Audience in Accord* $A > 0$
Denuclearize $L_F \leq 0$	CASE 1 Leader denuclearizes in conjunction with audience's disapproval, $Pr(\sim L_F)$ is high.	CASE 2 Leader denuclearizes despite audience's approval to move forward, $Pr(\sim L_F)$ is somewhat high.
Continue Forward with Nuclearization $L_F > 0$	CASE 3 Leader continues with nuclearization despite discord with audience, $Pr(L_F)$ is somewhat high.	CASE 4 Leader continues with nuclearization in accord with audience, $Pr(L_F)$ is high.
Autocracy		
	Audience's Preferences	
Leader Preferences	*Audience in Discord* $A \leq 0$	*Audience in Accord* $A > 0$
Denuclearize $L_F \leq 0$	CASE 1 Leader denuclearizes in conjunction with audience's disapproval, $Pr(\sim L_F)$ is high.	CASE 2 Leader denuclearizes despite audience's approval to move forward, $Pr(\sim L_F)$ is low.
Continue Forward with Nuclearization $L_F > 0$	CASE 3 Leader continues with nuclearization despite discord with audience, $Pr(L_F)$ is low.	CASE 4 Leader continues with nuclearization in accord with audience, $Pr(L_F)$ is high.

that the effect of the size and level of support of a leader's audience (*A*) have a curvilinear effect on a leader's preferences (*L*). In order to capture this effect, I create an interaction between selectorate size and public support. The measure for public support is slightly more nuanced and somewhat counterintuitive. I am after a measure that captures the level of contestation within the coalition. Due to data constraints, I cannot capture this directly through public opinion polls or similar surveys. Instead, the measure is one of internal conflict, which indicates whether or not there is peace within a regime in any given year. The size and level of contestation are interacted to create a new, more inclusive, measure of audience preferences, so that *A = size of winning coalition x audience support.*

The preferences of a leader are determined by the institutional structure of the regime-type in which they operate. Above, two states of nature were delineated, non-democracies and democracies. These states of nature and the preferences they create are parsed out further here. For the purposes of this project, I consider democratic preferences to remain consistent across types of democracies, allowing the democratic state of nature to serve as a baseline. However, I further breakdown the preferences of non-democracies based on the type of audience they face. I assume three distinct types of non-democracies: military dictatorships, personalistic dictatorships, and civilian or party regimes. Based on the institutions in each, it is possible to order leader preferences and payoff structures based on the respective audience types. This will be discussed in more detail in the next section.

4.5 Payoffs for Leaders:

Payoffs for leaders (L) are determined by the institutional environment they operate in. Those leaders who operate in a democratic state of nature are more likely to give policy concessions to the public. This means that the costs of going against public will are much higher in a democracy than in non-democratic regimes beholden to a much smaller portion of citizenry.

Leaders who operate in a non-democratic state of nature are beholden to smaller, more specific portions of their citizenry. Leaders who are beholden to a military audience are the least likely to proliferate. Evidence suggests that military regimes are far more susceptible to coup attempts (Weeks, 2012; Geddes, 2004), which means they will need to focus their resources on conventional weaponry. Personalistic dictators, sometimes known as "bosses", are the most likely to proliferate (Weeks and Way, forthcoming). Coupled with a small subset of citizens these leaders are beholden to, these leaders best exemplify the "explosive cocktail" of personality type that is drawn to the symbolic grandeur of being a part of the "nuclear club" (Hymans, 2006). Finally, leaders of civilian or party regimes are more likely than military regimes, but less likely than bosses to proliferate.

CHAPTER FIVE

RESEARCH DESIGN

I compile a new dataset for nuclear proliferation that covers all countries for the time period 1939 – 2013. I begin with the year 1939 in order to capture the first instance of a nuclear weapons program, the United States. This has several advantages. Firstly, it provides more variation on the nuclear development process. Further, it allows me to create a measure of "risk" for states to begin a nuclear weapons program by holding *t0* at 1939, the first year a nuclear weapons program is known to exist. This allows me to create a count variable for every year that a state has not developed a nuclear weapons program since 1939. I extend previous nuclear data to cover all years until 2013. Many of the measures that I use only have data until 2013, which I will discuss below.

I am interested in how state-level factors influence leaders' nuclear policy decisions. As such, in the first empirical chapter I code each country for audience size, audience support, internal conflict, and the decision to proliferate. In the second empirical chapter, I create a "sabotage" index that measures the level of force used to attempt to stop a state from gaining nuclear weapons. This measure ranges from rhetoric indicating threats to economic sanctions to more violent means such as the bombing of nuclear enrichment sites. A second index measures the type of positive inducements offered to a state, ranging from extending diplomatic ties to placing a would-be proliferator under a state's nuclear security umbrella. Controls are also included for those factors found to

consistently affect proliferation in previous studies: having an alliance with nuclear weapons, being in an ongoing rivalry with another state, enjoying status as a major power, and being a signatory to the NPT.

I rely on Singh and Way's (2012) updated coding of nuclear proliferation for the dependent variables. Both dependent variables are binary and represent whether or not a state has a nuclear weapons program and whether or not a state has obtained nuclear weapons. This coding scheme is most advantageous as it includes over a decade's worth of observations for nuclear proliferation than other datasets.

To operationalize the size of a leader's audience, I rely on BdM et al. (2003) winning coalition/selectorate (W/S) measure. To operationalize the degree of public support in a leader's audience, I rely on a proxy measure for ethnic fractionalization. Ideally, a measure of domestic political support would be derived from polling data on public satisfaction in leader performance; however, these types of data are unavailable for the countries that I am interested in over the time period I am examining. I use the Quality of Government (QOG) (2015) degree of ethnic fractionalization in a state, where the less a state is fractionalized the more homogenous it is. The variable ranges from 0 to 1, where a score of "0" indicates a completely homogeneous society and a score of "1" indicates a highly fractionalized society. The measure is created from the probability that two randomly selected people will belong to different groups. To account for the effects of audience size and level of support having an interactive effect on a leader's audience, I create an interaction between the W/S measure of size and the proxy measure for support. To operationalize internal conflict, I rely on UCDP's (2014) binary measure of whether or not internal conflict is present in a state in any given year. I create an interaction

between the W/S measure of size and the presence of internal conflict to account for the interactive effect of audience size and internal conflict.

In order to operationalize regime type, I use Geddes' (2012) coding of authoritarian regime types as a set of dummy variables: democracy, civilian, personal, and military. I exclude monarchies from this analysis, as there are so few of them with nuclear weapons programs that it leads to perfect predictions of nonproliferation in the statistical models. I use the democracy binary variable as a baseline comparison category to compare the behavioral differences of non-democracies.

I am also interested in strategies that the international community may take to reverse nuclear weapons programs. In order to most effectively get at these strategies, I create a "sabotage index" of nuclear reversal that includes an ordinal scale for both positive and negative inducements. The positive inducement scale ranges from 0 – 5 and includes extending diplomatic recognition to a state, including a state in the international order, offering economic aid, offering military aid, and finally offering to place a state under the sender state's nuclear security umbrella. The negative inducement scale ranges from 0 – 3 and includes the use of threats or rhetoric, imposing economic sanctions, and then finally the use of physical destruction, a category which includes computer sabotage, killing nuclear scientists, bombing nuclear facilities, and military intervention.

To code the positive inducements scale, I rely on US historical data for coding diplomatic recognition, noting if diplomatic ties were reinstated in any given year. For inclusion in the international order, I look at whether a state was not previously a member of the United Nations or the World Bank and code them as positive for this inducement if they joined either after reversing their nuclear programs. For economic aid, I rely on data

on world development indicators (WDI) that I accessed through the World Bank's data archive. I utilize a measure that includes the net total development assistance and official aid received in a given year. To capture military aid, I utilize data from the United States Agency for International Development (USAID GREENBOOK, 2015) to see if the United States offered economic or military aid at any time a state has a nuclear weapons program through the year 2013 (when this dataset ends). Finally, to be coded as positive for the nuclear umbrella I look to see if one of the five major nuclear powers (the United States, Russia, China, France, or the United Kingdom) has a specific security alliance outlining the providing of nuclear security with a potential reverser.

To code the negative inducement scale I rely on several sources. Firstly, I rely on Hufbauer et al. (2007) data on economic sanctions to code whether or not economic sanctions were levied (unilaterally or multilaterally) on a state. I rely on world news sources (where there must be at least three reputable news sources reporting the instance) to code whether or not a state's nuclear program was subject to a computer software attack as well as whether or not a state's nuclear scientists were targeted. For both of these, I also cross-reference scholarly articles as well. For whether or not a state's nuclear production sites were bombed I utilize Fuhrmann and Kreps (2010) data as a primary source and a Google search of reputable news reports, including CNN, BBC, New York Times, etc. as a secondary source. Table 7.1 outlines the nuclear sabotage index used in Chapter 7.

I also include controls for previous indicators of nuclear proliferation, including whether or not a state is a signatory to the Nonproliferation Treaty, whether or not a state is in an enduring rivalry, whether or not a state has an alliance with a nuclear weapons

state, and whether or not a state has status as a major power in the international system. I rely on the United Nations database of NPT signatories to create a binary measure of whether or not a state is a party to the NPT. I use Way and Weeks' (2014) updated coding of state rivalries and the Correlates of War index of formal alliances (2013) and major power status (2014).

Finally, I use Fuhrmann and Tkach (2015) indicator of the presence of uranium enrichment and reprocessing (ENR) facilities as a control for the choice to begin a nuclear weapons program. The ENR facilities are plants that provide states with the ability to produce the fissile material necessary for producing a nuclear weapon. There are 31 states that have developed ENR facilities (while the number of facilities in each state varies, for my purposes it is enough to focus on the presence or absence of the facilities). Of the 22 states that have attempted to begin a nuclear weapons program, Syria is the only state to not have an ENR facility. Combining coding schemes from Fuhrmann and Tkach (2015) and Singh and Way (2012) yields 37 cases of states with the capability to proliferate. See Table 5.1 below.

It should be noted that nuclear proliferation is a very rare event: only about five percent of the population of states in the international system have nuclear weapons. There are real issues of measurement for rare events such as nuclear proliferation. While quantitative studies of nuclear proliferation have advanced our understanding of the "correlates of proliferation" (e.g. Jo and Gartzke, 2007; Singh and Way, 2004), recent work by Bell (2016) and Fuhrmann (2016) suggest that scholars have placed too much emphasis on the strength of these findings and that we should pause to assess the robustness of the results. In the dissertation, I use a mixed-methods approach to garner

the strongest support for my findings. In this manner, I am able to determine broad patterns of proliferation as well as hone in on more specific causal processes in two cases of proliferation.

Table 5.1: Cases of Proliferation & Reversal
37 States with the Capability to Proliferate, 1939 – 2013

Country	Started Program	Acquired Weapons	Reversed
Algeria	No	No	No
Argentina	Yes (1978)	No	Yes (1990)
Australia	Yes (1961)	No	Yes (1963)
Belarus#	Yes (1945)	Yes (1949)	Y (1993)
Belgium	No	No	No
Brazil	Yes (1978)	No	Yes (1990)
Canada	No	No	No
China	Yes (1955)	Yes (1964)	No
Czech Republic	No	No	No
Egypt	Yes (1965)	No	Yes (1974)
France	Yes (1954)	Yes (1960)	No
Germany	No	No	No
India	Yes (1964)	Yes (1988)	No
Iran*	Yes (1985)	No	No
Iraq	Yes (1983)	No	Yes (1995)
Israel	Yes (1958)	Yes (1969)	No
Italy	No	No	No
Japan	No	No	No
Kazakhstan#	Yes (1945)	Yes (1949)	Yes (1995)
Libya	Yes (1970)	No	Yes (2003)
Netherlands	No	No	No
North Korea	Yes (1980)	Yes (2006)	No
Norway	No	No	No
Pakistan	Yes (1972)	Yes (1987)	No
Romania	No	No	No
Russia (Soviet Union)	Yes (1945)	Yes (1949)	No
South Africa	Yes (1974)	Yes (1979)	Yes (1991)
South Korea	Yes (1970)	No	Yes 1978)
Sweden	No	No	No
Syria	Yes (2000)	No	Yes (2011)
Taiwan	Yes (1967)	No	Yes (1977)
Ukraine#	Yes (1945)	Yes (1949)	Yes (1994)
United Kingdom	Yes (1947)	Yes (1952)	No
United States	Yes (1942)	Yes (1945)	No
Yugoslavia	No	No	No
TOTAL (+) CASES:	24	13	13

**Iran is the only ongoing case, still considered to be attempting to acquire nuclear weapons capabilities.*
#Each of these Soviet states already had nuclear arsenals on their land when the Soviet Union broke up, whether or not this can be characterized as "beginning" a nuclear weapons program is debatable.

CHAPTER SIX

PLAUSIBLE PROLIFERATORS: A MODEL OF CAPABILITY AND CHOICE

Possessing nuclear weapons (or having status as a nuclear state) holds a strong allure for many leaders. Nuclear weapons are more than instruments to promote national security. These weapons represent symbols of modernity in the international community and affect national identity. Thus, nuclear weapons, more than most weapons, include many benefits beyond security. Yet, leaders have experienced divergent paths toward proliferation. Some leaders, like Libyan leader Muammar Qadhafi, seek nuclear weapons for decades only to be thwarted from their attempts. Some proliferation attempts pass from leader to leader, as in the case of North Korean dictator Kim Il Sung to his successor and son, Kim Jong Un; while others die out when a leader leaves office, as in the case of Egyptian leader Gamar El Nasser to his successor, Anwar as-Sadat. Given the landmark nuclear deal between the United States and Iran, whether or not Iranian President Hojatolislam Hassan Rouhani is attempting to produce nuclear weapons is a question crucial to both U.S. policymakers and to international security.

These are but a few examples of divergent paths towards proliferation taken by leaders in the past. There are over thirty states with the capability to begin nuclear weapons programs (Fuhrmann and Tkach, 2015), though there are only nine nuclear weapons states (NWS). What makes some leaders decide to begin nuclear weapons

programs and others not, especially when they have the capability to do so? Under what conditions are leaders successful in their attempts to proliferate? How do domestic audiences influence the decision to seek nuclear weapons? I put forth a theory of strategic decision-making that better captures leaders' attempts at nuclear proliferation by putting leaders at the center of the analysis. By examining nuclear proliferation through the lens of strategic choice, I can assess how domestic audiences and institutional structures affect leaders' choices to proliferate. This is paramount if we want to understand the strategic environment in which leaders operate. From this, we can better understand leaders' preferences regarding proliferation; and if we can understand this, we may be able to formulate strategies that prevent or reverse proliferation.

Leaders may attempt to build nuclear weapons programs for a variety of reasons. Early studies of nuclear proliferation asserted that the desire for nuclear weapons was obvious: when a state faced a security threat that conventional weapons alone could not meet, then a leader may attempt to begin a nuclear weapons program (Deutsch, 1992; May, 1994). While a threat to national security may be a strong driver of nuclear proliferation, it is inadequate to assume that it is the only driver. Nuclear weapons are more than instruments of national security; they also carry a strong normative appeal as symbols of modernity and power. This symbolic power is two-fold: it projects a force to be reckoned with in the international community and it also affects national identity within a leader's audience, serving as a source of national pride.

Any leader who wishes to proliferate must weigh their domestic audience's preferences for nuclear proliferation against the international community's stated preference for nonproliferation. Using the assumption that a leader wants to maintain his

or her grasp on power, divided support from a domestic audience should decrease the likelihood that a leader will be able to successfully begin and maintain a nuclear weapons program as well as acquire nuclear weapons.

There may be a second, more complex, piece to the proliferation puzzle. A leader may attempt to capitalize on the symbolic power of nuclear weapons by beginning, maintaining, and acquiring nuclear weapons capabilities when they face internal conflict. We know from the diversionary war hypothesis that when a leader faces internal conflict at home, be it political or economic, they may pick a fight in the international system to distract their audience from the trouble at home and attempt to garner support through a 'rally around the flag' effect. This theory may be useful to extend to questions of nuclear decisions, where leaders may attempt to garner the same 'rally around the flag' effect through building nuclear weapons programs.

Using a dataset that examines 177 countries over the time period 1939 – 2013, I find that, on average, leaders are less likely to have an active nuclear weapons program and acquire nuclear weapons when they face a divided domestic audience. However, leaders are more likely to begin a nuclear weapons program and acquire nuclear weapons when they face armed internal conflict. This finding indicates that the diversionary war theory may extend to nuclear decisions and is a novel explanation for nuclear proliferation.

In the next section, I summarize the work on previous studies of nuclear proliferation and nonproliferation. I then lay out my theoretical framework for this study, showing how placing leaders at the center of analysis is crucial for understanding

proliferation attempts. After introducing my theoretical model, I describe how I test my predictions using ordered logistic regression models. The results and conclusions follow.

6.1 Assessing Nuclear Proliferation and Nonproliferation

Studies of nuclear proliferation, those studies focused on the conditions under which states proliferate, and studies of nonproliferation, those studies focused on how proliferation can be stopped, share a common debate: whether more nuclear weapons states (NWS) in the international system will be better (e.g. Ganguly and Hagerty, 2005; Waltz, 2003; Mearsheimer, 1984, 1985) or worse (e.g. Geller, 1990; Saideman, 2005; Bajpai, 2009) for international security and order. Most studies in this vein focus on dyadic or systemic levels of analysis to explain proliferation. Though understanding the systemic consequences of nuclear proliferation is important, looking inside the black box of states provides more leverage for understanding *why* a leader may seek nuclear weapons.

6.1A Why Seek Nukes?

Possessing nuclear weapons provides a certain level of status and power to a leader's country in the international system. Nuclear weapons represent modernity and affect national identity. As such, they can be alluring for many leaders. This section will outline the conditions under which leaders seek nuclear weapons, tracing the extant literature and pointing out gaps along the way.

Previous studies have found that the single best predictor of when a state will begin a nuclear weapons program is whether or not it is in an enduring rivalry with another state (Jo and Gartzke, 2007; Singh and Way, 2004). However, when a state is taken under the security umbrella of an alliance that possesses nuclear weapons, a state is

significantly less likely to begin a nuclear weapons program (Jo and Gartzke, 2007; Singh and Way, 2004). These seminal studies found that regime type provides no indication for whether or not a state may proliferate (for exceptions see Solingen, 2007 and Way and Weeks, 2014). Until recently, it has been one of the only areas of consensus among scholars of nuclear proliferation in both case-oriented and quantitative approaches (Sagan, 2011).

However, we know that there is great variation in the political institutional structures of autocracies, anocracies, and democracies. This variation influences the respective leaders' incentive structures for policy choices. Institutional stability decreases as regimes become less fully autocratic or democratic so that the least stable political systems are mixed regimes: dictatorships with high levels of political participation (Gates et al., 2006; Gandhi and Przeworski, 2007). Leaders who face a civilian audience, typified by anocracies and democracies, are more apt to provide policy concessions to gain public cooperation while personalistic, monarchical and military leaders of autocratic regimes are more likely to distribute private spoils to their cronies. As the size of a leader's winning coalition (that set of his or her population that determines whether or not he or she will stay in power) increases, a leader has more people to please in order to maintain their grasp on power. Thus, providing public goods or policy concessions is the most efficient way to do this. Conversely, leaders beholden to a smaller subset of his or her citizenry can buy off their winning coalition with bribes or private kickbacks to maintain support (BdM et al., 2003).

These divergent institutional settings therefore constrain the environment in which leaders make their foreign policy decisions. Recent work by Way and Weeks

(2014) provides a strong example of how regime type influences the incentive to proliferate, where the authors find that personalistic regime types, sometimes known as 'bosses', are the most likely type of regime to begin nuclear weapons programs. Coupled with a small subset of citizens to be beholden to, these leaders best exemplify the explosive cocktail of personality traits that draw them to the symbolic grandeur of obtaining status as a NWS (Hymans, 2006).

Leaders who choose to begin a nuclear weapons program must consider the consequences of their decision based on the environment in which they operate. Threats facing a leader's grasp on power come from both inside the ruling elite and from a leader's society at large. Those threats that come from inside the ruling elite are generally handled through including the elite in the distribution of private spoils. However, if a leader needs the cooperation of the citizens outside his or her ruling elite, he may make policy concessions. These concessions are public and codified as legal norms – thus they require an institutional setting (Gandhi and Przeworski, 2007).

A leader who chooses to proliferate also faces another audience: the international community. It is thus necessary for the leader to balance the preferences of his or her domestic audience with those of the international community. The inception of the nonproliferation treaty (NPT) in 1968 ushered in a second nuclear age (Solingen, 2007). Leaders seeking to obtain nuclear weapons after this point do so under different conditions than the original five proliferators (the United States, USSR/Russia, United Kingdom, France, and China). States that ignore the NPT risk being shunned, labeled as a rogue nation, and are subject to economic sanctions or even military intervention by the international community. This inherently means that a leader's decision-making process

for questions of nuclear programs is taking place on two-levels (as epitomized by Putnam, 1988).

Since a leader must balance the preferences of his or her domestic audience with the international norm of nonproliferation, I now turn to literature on audience costs as a means to better understand the conditions under which a leader may proliferate. One of the most influential ideas in the audience costs literature is that leaders who say they will do something, such as defend their country against international public threats, both militant and economic, and then fail to follow through on their promises lose popular domestic support (Tarar and Leventoglu, 2013; Snyder and Borghard, 2011; Trachtenberg, 2011; Martin, 1993; Dorussen and Mos, 2001; Chaudoin, 2014). As the international community has a generally stated preference for nonproliferation, a leader must weigh their ability to withstand heavy economic sanctions and military intervention from the outside world with the likelihood that their domestic audience will punish them if they are not able to withstand the international threat and are forced to reverse their nuclear programs. This ability to withstand international threats against proliferation, coupled with the resources a leader has at hand, leads to differentiation in strategic environments for proliferation among smaller and larger state powers.

6.1B What is required to obtain nuclear weapons capability?

Now that I have laid out the conditions under which a leader may seek nuclear weapons, I next outline what is required to obtain them. Recent quantitative empirical work on understanding proliferation incentives has been influential in determining the necessary capabilities for developing nuclear weapons (e.g. Singh and Way, 2004; Jo and Gartzke, 2007; Fuhrmann, 2009a & 2009b; Kroenig, 2010) where high levels of

economic development, physical resources, and technological knowhow are imperative. These measures range from scientific knowledge to the ability to enrich uranium and have been captured in various ways by scholars. Some measures focus more specifically on the economic capacity of a state (Singh and Way, 2004) while others include the natural resources and production of electricity (Jo and Gartzke, 2007). Most of these studies build on Meyer's 1984 study that developed ten indicators for nuclear weapons capability. The measures vary widely, from 69 states having latent nuclear capability (Barnaby, 2004), to somewhere in the high 40s (Hymans, 2006; Stoll, 1996), to 34 states having capability (Meyer, 1984). The variance is in large part due to the conceptualization and operationalization used to measure nuclear capability.

There is wide consensus throughout the scientific community on the materials necessary for producing fissionable weapons: uranium 235 (U-235) and plutonium 239 (Pu-239) (Mozley, 1998; Cochran & Paine, 1995; Albright, Berkhout, & Walker, 1997; Bunn & Wier, 2006). Uranium in its natural form is actually readily available in varying quantities throughout most of the world. In order to produce a nuclear weapon, uranium must be extracted from ore, be crushed into fine grains and separated from other materials. The resulting compound is known as "yellowcake" which must then be further purified (Mozley, 1998). This is why the ability of a state to be able to enrich uranium is the single best indicator of nuclear weapons capability to date (Fuhrmann and Tkach, 2015).

6.2 Theoretical Framework

I build my theoretical framework for this study by incorporating complimentary work on political survival and audience costs with domestic institutions. By utilizing

theories of domestic institutions and audience costs, I am able to fill a gap in the nonproliferation literature by looking at what factors incentivize leaders to proliferate in the first place.

It is, first, necessary to understand nuclear proliferation as a process – a process that does not necessitate a leader to move unilaterally forward through each stage, but rather one where a leader can reverse course at any given time. I assume that there are four distinct stages of nuclear proliferation; if a leader is in one stage, he or she is excluded from being in any other stage. Please see below for a graphic depiction of the stages.

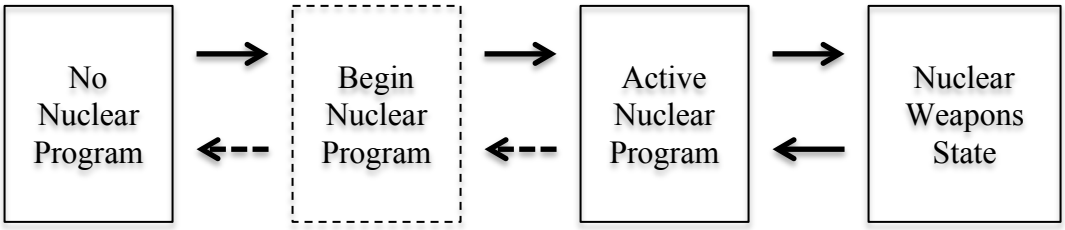


Figure 6.1: Stages of Nuclear Development, in Theory

The first stage represents the baseline category, "no nuclear weapons". The second stage represents the choice to begin a nuclear weapons program. This is important to separate from the third stage, having an active nuclear weapons program, because it represents a strategic change in a leader's decision-making. The final stage is acquiring status as a nuclear weapons state. This process is not uni-directional. A leader may give up their nuclear weapons program at any point due to monetary or time constraints, international pressure, a change in audience preferences, etc. It is also possible for a

leader to give up their status as a nuclear weapons state once they have acquired nuclear weapons, though this has only occurred once in history (in the case of South Africa). This theoretical framework directly informs my empirical analysis below.

Leaders may attempt to build nuclear weapons programs for a number of reasons. Early studies of nuclear proliferation asserted that the desire for nuclear weapons was obvious: when a state faced a security threat that conventional weapons alone could not meet, then a leader would begin a nuclear weapons program (Deutsch, 1992; May, 1994). While a threat to national security may be a strong driver of nuclear proliferation, it is inadequate to assume that it is the only driver. Nuclear weapons are more than instruments of national security; they also have a strong normative appeal as symbols of modernity and power.

This symbolic power of nuclear weapons is two-fold: it projects a force to be reckoned with in the international community and it also affects national identity within a leader's audience, serving as a source of national pride. Any leader who wishes to proliferate must weigh their domestic audience's preferences for nuclear proliferation against the international community's stated preference for nonproliferation. With the inception of the Nonproliferation Treaty (NPT), a codified norm emerged in the international system for no new nuclear states to exist so any leader who wishes to proliferate must be prepared to bear the reputational, economic, and security costs of defying this international norm.

I address incentives of political survival through examining the multilevel pressures a leader faces – externally from the international community and internally from the leader's domestic audience. Selectorate theory is one of the leading theories in

international relations and comparative politics for explaining political survival. Policy choices are based on the size of a leader's winning coalition, the portion of the total population who keeps a leader in power. Those elites in the winning coalition are pulled from the selectorate, the portion of the population eligible to gain access to the winning coalition (BdM et al., 2003). Thus a strong measure of audience size can be garnered from Winning Coalition/Selectorate (W/S).

Selectorate theory offers a novel way to conceptualize behavioral differences in the leaders of democracies and non-democracies. While elegant in its parsimony, the utility of selectorate theory is limited in its capacity for explaining variation among non-democracies, as all are typified by a small winning coalition. Therefore, I do not assume that it is only the size of a leader's winning coalition, but also the level of homogeneity that matters for determining a leader's nuclear policy choices. Using the assumption that a leader wants to maintain his/her grasp on power, a divided domestic audience should decrease the likelihood that a leader will be able to successfully begin and maintain a nuclear weapons program as well as actually acquire nuclear weapons.

> *$H1_A$_AudienceSupport_Program: A leader who faces an audience in consensus with their foreign policy aims will be more likely to maintain a nuclear weapons program than a leader who faces an audience in discord, holding all else constant.*
>
> *$H1_B$_AudienceSupport_Weapons: A leader who faces an audience in consensus with their foreign policy aims will be more likely to acquire nuclear weapons than a leader who faces an audience in discord, holding all else constant.*

Since nuclear weapons are more than tools of national security, it is also plausible that leaders may try and capitalize on their symbolic power by using them to quell public unrest. In this sense, nuclear weapons fit into the framework of diversionary war where leaders may try and garner a 'rally around the flag' effect through the symbolic strength nuclear weapons offer. The diversionary war theory posits that leaders who face internal problems may engage in external conflict to rally domestic support at home (e.g. Levy, 1989; Smith, 1996; Tarar, 2006; Oakes, 2006).

Though this hypothesis has been extended to examine a "domestic-level" diversion that focuses on targeting ethnic minorities at home to garner popular support (Tir and Jasinski, 2008); to whether or not democracy matters (Smith, 1996; Levy, 1988; Oneal and Tir, 2006); and to parsing out the type of conflict and level of force involved (Tir, 2010; Mitchell and Moore, 2002) it has not been extended to examine the pursuit of weapons of mass destruction.

The logic behind the diversionary war theory extends to explaining the pursuit of nuclear weapons, as nuclear weapons hold a symbolic power stronger than any other weapon in terms of representing a "force to be reckoned with" in the international community. This symbolic power may be sought as an attempt to rally support for the regime in times of domestic unrest.

It is plausible that we should see this effect more clearly on the front end (beginning and maintaining nuclear weapons programs) for leaders who face smaller audiences, those typified by non-democracies and anocracies. Leaders with smaller audiences may be especially drawn to the symbolic power of nuclear weapons and the status they afford for regime security. However, there should be no difference across

audience size for the effect of audience diversion on the actual acquisition of nuclear weapons, as this should have more to do with a leader's capability than strategic diversion.

> *$H2_A$_AudienceDiversion_Program: As the size of a leader's audience decreases and when internal conflict is present in a leader's state, the probability of beginning a nuclear weapons program should increase, holding all else constant.*
>
> *$H2_B$_AudienceDiversion_Weapons: There should be no difference in the probability of acquiring nuclear weapons across audience size when there is internal conflict present in a leader's state, holding all else constant.*

6.3 Cases and Data

I am interested in how state-level factors influence leaders' nuclear policy decisions. As such, I code each state for audience size, audience support, internal conflict, and the decision to proliferate. Controls are included for those factors found to consistently affect proliferation in previous studies: whether or not a state has the capability to proliferate, has an alliance with nuclear weapons, is in an ongoing rivalry with another state, enjoys status as a major power, and whether or not they are a signatory to the NPT. I also include controls related to audience support in the form of per capita gross domestic product (GDP) and population size. Appendix A outlines cases of proliferation for states with the capability to begin weapons programs based on if they

have uranium enrichment facilities, including both whether or not a state attempted to proliferate and if they were successful in the attempt.

I rely on Singh and Way's (2012) updated coding of nuclear proliferation for the stages of the dependent variable. Stage 0 represents the baseline category for the nuclear development process, when there is no nuclear weapons program present in a state. Stage 1 occurs when a state has an active nuclear weapons program and Stage 2 occurs when a state has acquired nuclear weapons and, thus, garnered status as a nuclear weapons state. Figure 2 shows the number of states and leaders present for each stage of the nuclear development process.[7]

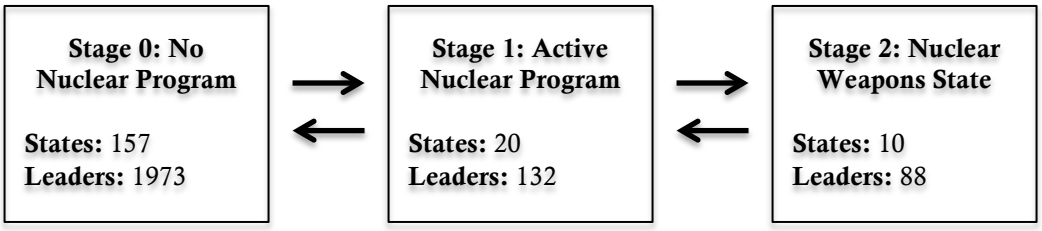


Figure 6.2: Stages of Nuclear Development in Practice, 1939-2013

To operationalize the size of a leader's audience, I rely on Bueno de Mesquita et al.'s (2003) W/S measurement that measures the size of a leader's winning coalition/size

[7] For the actual empirical analysis of the nuclear development process, I do not include the choice to begin a nuclear weapons program as a separate stage or 'cut point'. This is due to these cut points falling within one-tenth of a decimal point for the stages "begin program" and "active program" as beginning a program represents the moment in time that a leader begins a program and active program represents the maintenance of this choice. Whether or not I use two or three stages does not affect the empirical findings. See Appendix B.

of the selectorate. States with higher scores on the index have correspondingly larger audiences that keep them in power.

To operationalize the degree of public support in a leader's audience, I rely on a proxy measure for ethnic fractionalization. Ideally, a measure of domestic political support would be derived from polling data on public satisfaction in leader performance; however, this type of data is unavailable for the countries that I am interested in over the time period I am examining. I use the Quality of Government (QOG) (2015) degree of ethnic fractionalization in a state, where the less a state is fractionalized the more homogenous it is. The variable ranges from 0 to 1, where a score of "0" indicates a completely homogeneous society and a score of "1" indicates a highly fractionalized society. The measure is created from the probability that two randomly selected people will belong to different groups. To account for the effects of audience size and level of support having an interactive effect on a leader's audience, I create an interaction between the W/S measure of size and the proxy measure for audience homogeneity.

To operationalize internal conflict, I rely on UCDP's (2014) binary measure of whether or not internal conflict is present in a state in any given year. I create an interaction between the W/S measure of size and the presence of internal conflict to account for the interactive effect of audience size and internal conflict. I include controls related to audience support in the form of per capita gross domestic product (GDP) and population size. I rely on the IMF (2015) for measures of population size and per capita GDP.

I also include controls for previous indicators of nuclear proliferation. I rely on the United Nations database of NPT signatories to create a binary measure of whether or

not a state is a party to the NPT. I use Way and Weeks (2014) updated coding of state rivalries and the Correlates of War index of formal alliances (2013) and major power status (2014). Finally, I use Fuhrmann and Tkach (2015) indicator of the presence of uranium enrichment and reprocessing (ENR) facilities as a control for the choice to begin a nuclear weapons program. The ENR facilities are plants that provide states with the ability to produce the fissile material necessary for producing a nuclear weapon. There are 31 states that have developed ENR facilities (while the number of facilities in each state varies, for my purposes it is enough to focus on the presence or absence of the facilities). Of the 20 states that have attempted to begin a nuclear weapons program, Syria is the only state to not have an ENR facility. Appendix C outlines these summary statistics.

6.4 Statistical Models

To analyze my theoretical claims, I utilize ordered logistic regression models where the three stages shown in the nuclear development process become the cutpoints for the regression models, ranging from 0 (no nuclear program) to 2 (acquire nuclear weapons status). Once a state reaches the final stage, it drops out of the model. Since there is so little variation in this category, I cannot account for a state reversing its status as a nuclear weapons state. I run two versions of the ordered logistic regression models, first focusing on how audience size and homogeneity affects the decision to begin a nuclear weapons program and the acquisition of nuclear weapons. Then, I focus on how the presence of internal conflict influences the aforementioned decisions. I test each model using appropriate control variables.

6.5 Results

I am interested in two distinct conceptions of how domestic audiences influence nuclear events: (1) how domestic audience support influences the choice to begin a weapons program and the likelihood of maintaining a program and acquiring nuclear weapons and (2) whether leaders are strategically utilizing the nuclear development process as a means to garner support from their audience. I will first discuss how domestic audience support affects nuclear events and then how audience diversion influences them.

Table 6.1 outlines how domestic audience size and homogeneity influences nuclear events. For each stage of the nuclear development process, as the size of a leader's audience increases and as the level of ethnic fractionalization in a state increases, the likelihood of having an active nuclear weapons program as well as acquiring nuclear weapons decreases, holding all else constant. Figure 6.3 outlines this effect, providing evidence for hypothesis 1.

The control variables perform in the expected direction, with few having a significant effect on the outcome variable. Being in an enduring rivalry, enjoying status as a major power, and having ENR development facilities makes states, on average, more likely to maintain nuclear weapons programs as well as acquire weapons, holding all else constant. On average, having an alliance with a nuclear weapons state, being a signatory to the NPT, the level of per capita GDP, and the size of a state's population has no significant effect on having an active nuclear weapons program or acquiring nuclear weapons, holding all else constant.

Next, Table 6.1 outlines how audience size and the presence of internal conflict affect the nuclear development process. For this model, there is a significant curvilinear relationship between the presence of internal conflict in a state and the increase in size of a leader's audience. Findings indicate that leaders with smaller audience sizes (generally typified by non-democracies and anocracies) may begin nuclear weapons programs as a tactic for audience diversion through a show of strength. However, once audience size crosses a threshold, this effect reverses. This provides evidence for hypothesis 2A. Further, there is a significant positive relationship between the increase in size of a leader's audience and the presence of internal conflict on the propensity to acquire nuclear weapons. This runs counter to hypothesis 2B, where there is a significant effect of internal conflict and increasing audience size on the probability to acquire nuclear weapons, indicating that the diversionary war theory holds at all stages of the nuclear process.

On average, for every unit's increase in the size of a leader's domestic audience and when internal conflict is present in a leader's state, there is a corresponding 5.165 increase in the probability that a leader will have an active nuclear weapons program and acquire nuclear weapons, holding all else constant. This indicates both that leaders with larger winning coalitions and leaders facing an internal challenge are more likely to begin nuclear weapons programs and acquire weapons capability. Leaders who face armed internal conflict, especially those facing smaller audiences typified by non-democracies, may view beginning a nuclear weapons program as a means to quell internal dissent by capitalizing on the symbolically powerful nature of nuclear weapons. See Figure 6.4 for a graphical depiction of the effect of audience size * internal conflict on the probability of

TABLE 6.1: How Audiences Influence the Nuclear Process

	Homogeneity Coefficients (Robust SEs)	**Internal Conflict** Coefficients (Robust SEs)
W/S	-6.661** (2.079)	-2.601** (0.870)
Ethnic Fractionalization	-5.924** (1.986)	-
W/S * Ethnic Fractionalization	12.769** (2.679)	-
Internal Conflict	-	-1.935 (1.074)
W/S * Internal Conflict	-	5.165** (1.588)
Major Power Status	4.367*** (1.011)	2.958*** (0.827)
Enduring Rivalry	1.630** (0.484)	1.001 (0.563)
Alliance w/ Nukes	-0.062 (0.606)	-0.219 (0.547)
NPT Signatory	-0.361 (0.477)	-0.430 (0.425)
GDP Per Capita	0.000 (0.000)	0.000 (0.000)
Population Size	2.50e-07 9.01e-07	1.35e-06 (8.43e-07)
ENR Facility	4.020*** (0.473)	3.976*** (0.456)
Stage1: Active Program	1.785 (1.067)	3.319 (0.560)
Stage 2: Acquire Nukes	3.677 (1.058)	5.287 (0.574)
N	6321	7342
Wald Chi^2	174.47	164.30***
Pseudo R^2	0.586	0.562

*p<.05 **p<.01 ***p<.001

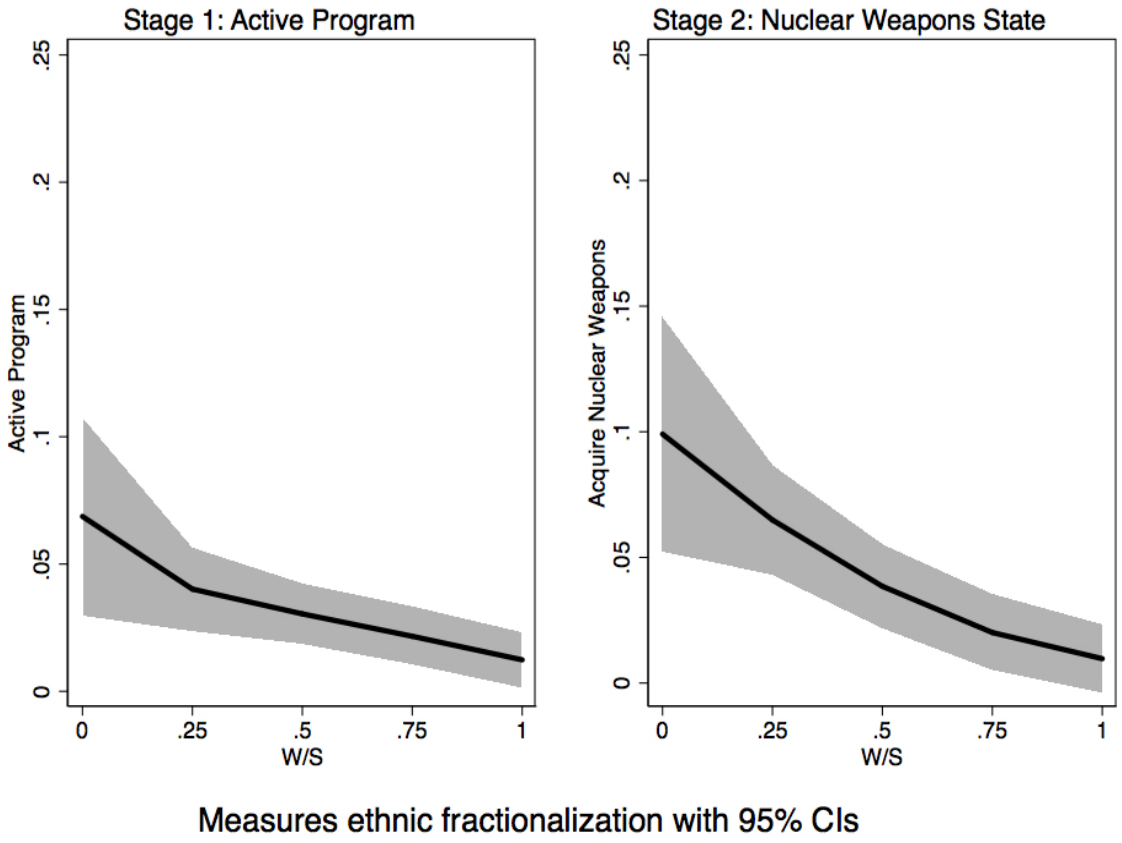


Figure 6.3: Influence of audience homogeneity on nuclear development process

having an active nuclear weapons program and acquiring nuclear weapons.

The control variables again perform in the expected direction, with few having a significant effect. Having an ENR development facility and enjoying status as a major power both have a positive effect on the nuclear development process, holding all else constant. Having an alliance with a nuclear weapons state, being in an enduring rivalry, being a signatory to the NPT, a state's per capita GDP, and a state's population size all have no significant effect on the nuclear development process, holding all else constant.

6.6 Conclusions

These findings provide a novel explanation for nuclear proliferation. In this project, I argue that domestic audiences are important for understanding both why leaders seek nuclear weapons and how successful they are at maintaining a nuclear weapons program and acquiring nuclear weapons. I tested these questions through the use of ordered logistic regression models using a dataset covering 177 countries for the time period 1939 – 2013.

The diversionary war theory has not yet been extended to examine the pursuit of nuclear weapons, though its logic is advantageous for explaining such an event. Nuclear weapons hold a symbolic power stronger than any other weapon in terms of representing a "force to be reckoned with" in the international community. This symbolic power may be sought as an attempt to rally domestic support in times of internal conflict, especially for leaders with smaller audiences. Further, heterogeneity in audience preferences has a significantly negative effect on the nuclear development process, particularly as audience

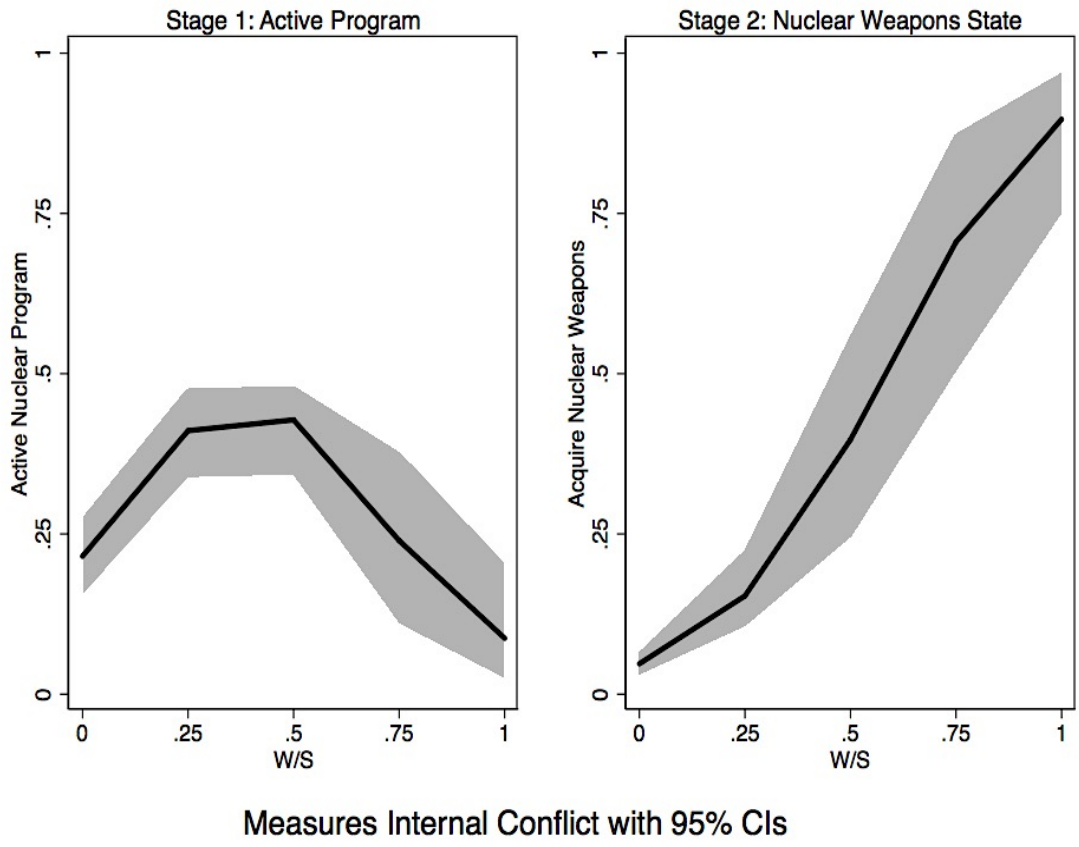


Figure 6.4: Influence of internal conflict on nuclear development process

size increases. The findings show the importance of domestic audiences for the study of nuclear proliferation. The institutional settings in which leaders operate lead to different incentive structures for foreign policy decisions, including the choice to begin a nuclear weapons program.

The implications of these findings speak to a broader need for understanding domestic audiences in security studies. If policy makers' goals are to prevent or reverse nuclear proliferation attempts, we must first understand why leaders seek nuclear weapons in the first place and how domestic audiences constrain their ability to maintain weapons programs and acquire nuclear weapons. Greater insight into how domestic audiences constrain nuclear decisions should greatly improve scholars and practitioners' understanding of nuclear proliferation.

CHAPTER SEVEN

STRATEGIC CHOICE AND NUCLEAR REVERSAL: WHY DO SOME LEADERS 'PRESS PAUSE'?

Now that I have outlined the strategic calculi for why leaders begin nuclear weapons programs, my next step is to explain why some leaders do not succeed in acquiring weapons. This is an occurrence known as "nuclear reversal." I rely on Levite's (2003) definition to capture reversals, so that "the phenomenon in which states embark on a path leading to nuclear weapons acquisition but subsequently reverse course, though not necessarily abandoning altogether their nuclear ambitions," (p. 61). Relying on this definition allows me to differentiate those states that succeed in acquiring nuclear weapons from those who fail to do so, as well as those states that never begin a nuclear weapons program in the first place.

A further, and perhaps more important, distinction has to do with the conditions under which a leader reverses their nuclear weapons program. If we can distinguish between when leaders choose to reverse their programs, because it is no longer a politically popular option in their home country versus when they are no longer capable of pursuing nuclear weapons due to international pressure in the form of economic sanctions or the threat or use of force, we can gain a better understanding of what triggers nuclear reversals in current proliferators, such as Iran. Will the United States, as a hostile nuclear power, be threatening enough for Iran to reverse their program? Will the lifting of

economic sanctions mean that Iran will continue to seek nuclear weapons capabilities, regardless of the deal struck with the United States? More generally, what factors contribute to the reversal of nuclear weapons programs? By studying the cases of nuclear reversal from a large *N* statistical perspective, we can determine which factors are most likely to trigger, or fail to trigger, nuclear reversal.

In this chapter, I first trace the extant literature on nuclear reversal and then outline my theoretical framework, showing where it expands and fills in gaps in this literature. I then introduce a new dataset on nuclear reversal, followed by a detailed case description of those states that have reversed their nuclear weapons programs. Utilizing this dataset, there are thirteen cases of nuclear reversal out of twenty-four attempts at nuclearization. Finally, I will use a combination of event history and selection models to analyze nuclear reversal outcomes and conclude this chapter with policy implications.

7.1 Nuclear Reversal and IR Literature

Using the major IR theories as a classification schema to focus on motives-based hypotheses, previous literature has three general explanations for why states reverse nuclear weapons programs, (1) security explanations, (2) norms-based explanations, and (3) domestic politics explanations. The first is predominately realist in nature, the second deals with ideational factors in the international community that influence state behavior, and the third with cost/benefit analysis and institutional factors that take place at the sub-state level. This is not a completely clear-cut categorization; there is overlap between each of the three general explanations, though classifying the literature in this way is advantageous in utilizing the IR theoretical framework. Sagan (1997) utilized this

framework to distinguish motivations for nuclear proliferation from explanations that focused on the capabilities to proliferate.

Security explanations of nuclear proliferation and reversal contend that states develop nuclear weapons programs when there is an existential threat to their security. The lifting of this threat is one explanation for reversing course (Levite, 2002; Paul, 2000). A general premise for these explanations, then, is that a leader should be more likely to abandon their nuclear weapons program when an external threat is no longer perceived. In security explanations, studies of nuclear proliferation focus on system level factors for the causes of proliferation, considering the state a unitary rational actor (Betts, 1993; Davis, 1993).

These studies, epitomized by Waltz (1981) "More May Be Better", fail to account for the strategic decision *not* to begin a nuclear weapons program, a decision that is far more common than to begin a program. The sole focus on system-level factors misses the dyadic, state, and especially sub-state level interactions that affect the nuclear decision-making process.

Norms-based explanations of nuclear proliferation are grounded in the security communities discussed by Deutsch (1957) where the international community has grown to view nuclear weapons proliferation as negative, devaluing the "prestige factor" that is associated with nuclear weapons (Adler, 1992). Also, central to this line of argument is the shared values of Western democracies, the "core" of the international community; where these values have led to cooperation in nonproliferation (Chafetz, 1993). A general proposition derived from norms-based explanations would be that a non-signatory of the

Non Proliferation Treaty should be less likely to reverse their nuclear weapons program than a signatory.

Though these explanations account for those states who chose to not begin nuclear weapons programs, they miss states who operate outside the norm of nonproliferation; further, they make a blanket statement that nonproliferation is a universal norm where there have clearly been instances of both states proliferating in flagrant disregard for the NPT (such as North Korea) as well as states looking the other way to proliferation attempts (such as the United States and Israel). Norms-based explanations also fail to account for instances of nuclear reversal that occurred for reasons other than reputational costs in the international community.

Finally, domestic politics explanations seek to look under the hood of the state at the decision-making process occurring for nuclear proliferation. For instance, Solingen (2004) uses a case study approach to look at proliferation from the lens of different regime types and whether or not the regimes are inward-looking (isolated) or outward-looking (seek to be a part of the international community). Other studies have mapped the likely domestic determinants of proliferation such as technological factors, whether or not the state is a party to the NPT, whether the state has the ability to enrich uranium, levels of GDP, etc. (Singh and Way, 2004; Jo and Gartzke, 2007). Though these studies represent some of the first quantitative approaches to nuclear proliferation, they bypass nuclear reversal and do not consider it to be part of the process of proliferation.

Much of the literature on the occurrence of nuclear reversal has been fragmentary, where studies focus on individual cases of reversal and seek to explain the *unique* characteristics that led to a state's reversal of their nuclear programs (e.g. Hughes, 2007;

Rublee, 2010). This individual approach means that studies are focused in on disparate reasons for nuclear reversal, without taking into account that the reasons in one instance may be similar to those of another. This approach is in many ways understandable, since nuclear reversal is a rare event. However, the phenomenon of nuclear proliferation is also classified as a rare event. Of the twenty-four states that have begun nuclear weapons programs, thirteen of them have reversed course.

7.2 Theoretical Framework

Note that past literature on nuclear reversal depicts the state as a black box due to its focus on the system level of analysis. While it explains a great deal about the phenomenon of nuclear reversal, there is still much to flesh out. By placing the leader at the center of my theoretical framework, I can directly test what factors trigger nuclear reversal in a leader's decision-making process. Under what conditions does a leader reverse their nuclear weapons program? Do the conditions that influence leaders to begin nuclear weapons programs also affect the decision to reverse them?

It is useful to characterize proliferation as a multi-directional process, where a leader does not necessarily move from stage one to the next until achieving status as a nuclear weapons state, but rather may reverse direction at any given time. In the previous chapter, my focus was on why leaders choose to begin nuclear weapons programs and what factors make them more or less successful in their attempts. In this chapter, I am interested in the inverse: what factors influence a leader reversing course, either from an active nuclear program to no nuclear program, or from having status as a nuclear weapons state to not? Do domestic or international factors have more influence on a

leader reversing weapons programs? See Figure 1 below for a graphic depiction of the stages of nuclear development.

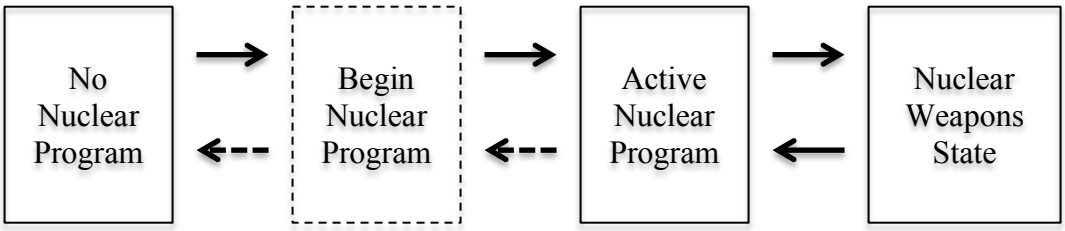


Figure 7.1: Stages of Nuclear Development Revisited

I begin with international factors that may influence a leader to reverse their nuclear development plans. A strain of research that has made strides in advancing our understanding of viable strategies to reverse nuclear proliferation fits within previous research on positive and negative inducements in economic sanctions literature. Here, the focus is on whether positive or negative incentives are more successful at getting a state to reverse course. Positive inducements come in two forms for nuclear reversal: (1) transferring resources such as technology, money, or knowledge to influence a leader to give up their weapons program (economic incentives) or (2) through offering security assurances to remove a perceived threat, such as placing a state under the nuclear umbrella of a nuclear power, building confidence by creating or strengthening alliances, or offering diplomatic recognition (security incentives). Negative inducements come in both economic and security forms as well. Strategies for negative inducements include imposing economic sanctions (either unilaterally or multilaterally) on a state, threatening to withhold promised aid, or through threatening or using military intervention (Baldwin,

1971; Cortright & Lopez, 1995; Bernauer & Ruloff, 1999; Drezner, 1999; Davis, 2000; Haas and O'Sullivan, 2001; and Solingen, 2007).

Leaders of states in the international system who oppose the proliferation of another state have several options available to them for attempting to halt nuclearization, including options that are unilateral and multilateral in nature. Leaders of states can offer *positive* inducements, such as offering to reinstate diplomatic ties, the chance to join the international order, providing economic or military aid, or offering to take a state under their nuclear security umbrella if weapons programs are reversed. *Negative* options include levying unilateral economic sanctions or banding with other states in the international system to do so; attempting to sabotage the progress of nuclear weapons programs through computer software; targeting scientists involved in the nuclear programs; bombing nuclear weapons production sites; or threatening large-scale military force. I create a scale for both positive and negative inducements, which I refer to as the "nuclear sabotage index". See Table 1 below.

Positive Inducements Hypothesis: As the type of positive inducement becomes stronger, there should be a corresponding increase in the probability of a state's nuclear reversal, holding all else constant.

Negative Inducements Hypothesis: As the type of negative inducement becomes stronger, the likelihood of nuclear reversal should increase, holding all else constant.

Next, I turn to domestic factors that may influence a leader to reverse their nuclear weapons program. Drawing on audience costs and institutions literature, we know that leaders want to maintain their grasp on power for as long as they can (Bueno de Mesquita et al., 2003). Further, the institutional settings leaders operate in differ not only between democracies and non-democracies, but also *among* non-democracies and democracies (Levitsky and Way, 2002; Geddes, 2003, 2004; Weeks, 2012; Gandhi & Prezworski, 2007). These institutional settings create the decision-making space under which leaders operate.

I address incentives of political survival through examining the multi-level pressures a leader faces—externally from the international community and internally from the leader's domestic audience. Bueno de Mesquita and associates' (2003) selectorate theory is one of the leading theories in both international relations and comparative politics for explaining political survival. According to the theory, policy preferences are based on the size of a leader's "winning coalition", the portion of the total population that keeps a leader in power; where those elites in the winning coalition are pulled from the "selectorate", the portion of the population eligible to gain access to the winning coalition (BdM et al., 2003).

Selectorate theory offers a novel way to conceptualize behavioral differences in the leaders of democracies and non-democracies. While elegant in its parsimony, the utility of selectorate theory is limited in its capacity for explaining variation among non-democracies, as all are typified by a small winning coalition. Therefore, I do not assume that it is only the size of a leader's winning coalition, but also the type (civilian or military), that matters for determining a leader's nuclear policy choices, as military

audiences are inherently more hawkish than their civilian counterparts (Nordlinger, 1977; Wahman, Teorell, and Hadenius, 2013).

There is great variation in the political institutional structures of autocracies, anocracies, and democracies. This variation influences the respective leaders' incentive structures for policy choices. Institutional stability decreases as regimes become less fully autocratic or democratic, so that the least stable political systems are mixed regimes – dictatorships with high levels of political participation (Gates et al., 2006; Gandhi & Przeworski, 2007). Leaders who face a civilian audience, typified by anocracies and democracies, are more apt to provide policy concessions to gain public cooperation while monarchical and military leaders of autocratic regimes are more likely to distribute private spoils to their cronies (BdM et al., 2003).

The proposed model hinges on these theories of political survival and leader preferences by assuming that leaders of non-democracies are beholden to a small subset of their population while leaders of democracies are beholden to a larger subset. Thus, decisions about the efficacy of nuclear weapons programs will be determined by interests which keep leaders in power, internally from their winning coalition and externally from relations with other states in the international system.

Distinctions in domestic audiences are important for nuclear reversal both in terms of the capability of a leader to maintain a nuclear weapons program once beginning it and a domestic audience's perception of said leader. Leaders who eschew the international community and instill this rhetoric in their citizens should be especially wary of the consequences of reversing nuclear programs due to international influence, as their citizens may perceive them as weak. This effect may not be uniform, however.

Capitulating to positive inducements that garner aid for the citizenry may be viewed as different than no longer having the capability to continue a weapons program due to economic sanctions or military intervention.

Regime Type & Negative Inducements Hypothesis: Leaders of all types of non-democracies should be less likely than leaders of democracies to reverse nuclear weapons programs due to negative inducements, holding all else constant.

Regime Type & Positive Inducements Hypothesis: The influence of positive inducements should be stronger than the influence of negative inducements on all regime types, holding all else constant.

7.3 Cases and Data

I use Singh and Way's (2012) updated coding of nuclear proliferation dates to create a dependent variable for nuclear reversal. This operational coding allows me to expand my temporal domain by a decade beyond other studies and data sets. The nuclear reversal measure is binary, capturing whether or not a state reversed nuclear ambitions in any given year. The cases are coded for regime type, audience size, and a new "nuclear sabotage" index for both positive and negative factors, as well as appropriate controls for factors affecting nuclear proliferation and audience support.

Combining coding schemes from Fuhrmann and Tkach (2015) and Singh and Way (2012) yields 37 cases of states with the capability to proliferate. Any state with the ability to proliferate may experience some form of positive or negative pressure from the

international community not to go nuclear. I code these 37 cases for an original nuclear sabotage index, discussed below, to ensure that I am not biasing the results of inducement by only selecting those states that have reversed their nuclear programs. In this manner, I am able to capture how positive and negative inducements affect all stages of the proliferation process.

Each nuclear sabotage index represents a scale of increasing positive or negative action targeted at a state in any given year. For the positive inducement scale, a score of "0" indicates no positive inducement, a score of "1" indicates offering diplomatic recognition, a score of "2" indicates inclusion in the international order, a score of "3" indicates providing economic aid, a score of "4" indicates providing military aid, and a score of "5" indicates taking a state under the nuclear umbrella of the inducer.

To code the positive inducements scale, I rely on US historical data for coding diplomatic recognition, noting if diplomatic ties were reinstated in any given year. For inclusion in the international order, I look at whether a state was not previously a member of the United Nations or the World Bank and code them as positive for this inducement if they joined either after reversing their nuclear programs. For economic aid, I rely on data on world development indicators (WDI) that I accessed through the World Bank's data archive. I utilize a measure that includes the net total development assistance and official aid received in a given year. To capture military aid, I utilize data from the United States Agency for International Development (USAID GREENBOOK, 2015) to see if the United States offered economic or military aid at any time a state has a nuclear weapons program through the year 2013 (when this dataset ends). Finally, to be coded as positive for the nuclear umbrella I look to see if one of the five major nuclear powers (the United

States, Russia, China, France, or the United Kingdom) has a specific security alliance outlining the providing of nuclear security with a potential reverser.

For the negative inducement scale, I use an ordinal measure ranging from 0 to 3, where a score of "0" represents no negative inducement, a score of "1" represents the use of rhetoric indicating a threat of some kind, a score of "2" indicates that economic sanctions were levied, and a score of "3" represents some kind of physical destruction, including sabotage through computer software, targeting and killing nuclear scientists, bombing nuclear production sites, or full-on military intervention.

To code the negative inducement scale I rely on several sources. Firstly, I rely on Hufbauer et al. (2007) data on economic sanctions to code whether or not economic sanctions were levied (unilaterally or multilaterally) on a state. I rely on world news sources (where there must be at least three reputable news sources reporting the instance) to code whether or not a state's nuclear program was subject to a computer software attack as well as whether or not a state's nuclear scientists were targeted. For both of these, I also cross-reference scholarly articles as well. For whether or not a state's nuclear production sites were bombed I utilize Fuhrmann and Kreps (2010) data as a primary source and a Google search of reputable news reports, including CNN, BBC, New York Times, etc. as a secondary source. Table 7.1 outlines the nuclear sabotage index used in Chapter 7. Below, Table 7.1 outlines the nuclear sabotage index.

Controls are included for those factors found to affect proliferation in previous studies: having an alliance with a state that has nuclear weapons, being in a long-term rivalry with another state, enjoying status as a major power, and being a signatory to the Nonproliferation Treaty (Way and Weeks, 2014; Jo and Gartzke, 2007; Singh and Way,

2004). Controls are also included for factors affecting audience support, namely, per capita GDP and population size (Fearon, 1994; Weeks, 2008). I rely on information from the United Nations treaty archive to code whether a state is a signatory to the NPT. I use Way and Weeks' (2014) updated coding of state rivalries and the Correlates of War index of major power status (2014). I rely on the IMF (2015) for a measure of population size and per capita gross domestic product.

In order to get a more accurate picture of a leader's payoff structure, I differentiate among authoritarian regime types using Geddes' (2012) coding of regime type to include military, civilian, and personalistic regimes with democracy serving as a baseline comparison category. I rely on Bueno de Mesquita et al.'s (2003) selectorate measure to measure the size of a leader's audience. These summary statistics can be found in Appendix B.

7.3B Cases of Nuclear Reversal

Since I have created a new variable to measure nuclear sabotage directed at reversal, this section will highlight those cases where reversal is positive. Of the thirteen states that reversed their nuclear weapons program, eleven of them had some form of both positive and negative inducements levied at them, and only two received positive inducements alone. Of the twelve states that have the capability to pursue nuclear weapons, but chose not to begin a program, all twelve received positive inducements and only one received a form of negative inducement (in conjunction with positive inducements). Of the ten states that acquired status as a nuclear weapons state, five received both positive and negative inducements intended to trigger nuclear reversal, one received positive inducements only, one received negative inducements only, and three

Table 7.1: Targeted efforts attempting to induce nuclear reversal, 1939-2013

Country	Positive Inducement Types	Negative Inducement Types
Algeria	1, 2, 3, 4	0
Argentina	3, 4	2
Australia	3, 4, 5	0
Belarus	1, 2, 3, 4, 5	0
Belgium	3, 4	0
Brazil	3, 4	2
Canada	3, 4, 5	0
China	4	3
Czech Republic	2, 3, 4	0
Egypt	3, 4	3
France	4	0
Germany	1, 3, 4	0
India	4	2, 3
Iran	3, 4	1, 2, 3
Iraq	1, 3, 4	1, 2, 3
Israel	4	1, 2
Italy	3, 4	0
Japan	3, 4, 5	2
Kazakhstan	1, 2, 3, 4, 5	2
Libya	1, 3	2
Netherlands	3, 4	0
North Korea	0	1, 2
Norway	3, 4	0
Pakistan	4	1, 2
Romania	1, 2, 3, 4	0
Russia (Soviet Union)	0	0
South Africa	3, 4	1, 2
South Korea	3, 4, 5	2
Sweden	3	0
Syria	3	3
Taiwan	3, 4	2
Ukraine	1, 2, 3, 4, 5	2
United Kingdom	0	0
United States	0	0
Yugoslavia	3	0

Positive Inducement Key	Negative Inducement Key
0 = No positive inducement 1 = Diplomatic recognition offered 2 = Inclusion in international order 3 = Economic aid extended 4 = Military aid extended 5 = Taken under the security umbrella of the inducer	0 = No negative inducement used 1 = Threat or rhetoric indicating attack 2 = Economic sanctions levied 3 = Physical destruction: Computer software sabotage, Targeting nuclear scientists, Bombing nuclear production sites, Full-scale military intervention

received no form of positive or negative incentive to reverse. For reference, these cases are outlined above in Table 5.1. Below, a detailed account of nuclear reversal is given for each case, indicating when a nuclear weapons program was started and tracing each state's path on the nuclear development process.

Argentina and Brazil have similar nuclear development stories. Both pursued nuclear weapons from 1978 to 1990. The United States began providing military assistance to Brazil in 1952 and to Argentina in 1960. This aid continues until the temporal end of my dataset, 2013. The United States provided economic aid in the form of electric power and energy to both Argentina and Brazil, from 1980 to 1991 in Argentina's case and from 1978 to present in Brazil's. Both states had multilateral economic sanctions imposed on them from the international community beginning in 1978. Sanctions ended 1990 for Argentina and 1991 for Brazil. No other known form of positive or negative inducement was offered to Argentina or Brazil. When Argentina's government reverted to a democracy in 1989, it allowed for an opening for nuclear discussions with Brazil. The two countries established a bilateral inspection agency known as the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) that led to an agreement between the two countries to reverse their nuclear weapons ambitions (Wise, 1991). For each of the countries, the lifting of the threat of enduring rivalry between the two was a strong factor for the two states reversing nuclear weapons programs.

Australian heads of state actively explored nuclear weapons for about a decade in the 1960s, but the choice was unpopular for each of the six leaders that attempted proliferation. When Australian Prime Minister Menzies entered into discussions with the

United Kingdom in the early 1960s to purchase nuclear weapons, the Cabinet rejected his proposal. Prime Minister Gorton later revisited the idea of nuclear weapons, this time arguing for Australia to develop its own nuclear weapon. However, this too lacked any real support and no substantive developments were made. Eventually, the lack of support culminated in Australia ratifying the NPT in 1973 (Hymans, 2000; Walsh, 1997). There was no known negative inducement levied against Australia. Australia received economic assistance from the United States from 1962 to 1966 for exploring electric power and energy and military assistance from 1959 – 2009 (USAID GREENBOOK, 2015). Finally, in 1970, the United States placed Australia under its nuclear security umbrella.

South Korea began seriously pursuing nuclear weapons in 1970 when its leaders felt that its security was threatened. However, before it acquired any fissile material, the United States pressured South Korea to give up their nuclear weapons capabilities. The US entered a bilateral pact with South Korea in 1967 that bans South Korea from seeking nuclear weapons while promising nuclear security (White House Fact Sheet, 2014), effectively placing South Korea under the United States' nuclear umbrella. South Korea ratified the NPT in 1975. South Korea received aid in the form of economic and military assistance, economic assistance from the international community from 1970 – 2004 and military assistance from the United States from 1970 – 1996. In terms of negative inducements, the international community sanctioned South Korea economically from 1975 – 1976. No other known positive or negative inducement was offered.

Taiwan pursued nuclear weapons for a decade from the mid-1960s to the mid-1970s. During this time, it received positive and negative inducements. Military assistance was provided in 1947 and from 1951 – 1959 (USAID Greenbook, 2015). From

1968 to 1971, aid was given for a power plant and multilateral general debt relief was provided from 1974 to 1991. From 1976 to 1977, the international community levied economic sanctions against Taiwan. No other known positive or negative inducement was offered.

South Africa represents a unique case of nuclear reversal, because it is the only state to acquire nuclear weapons before reversing course. South African leader Vorster began a nuclear weapons program under the auspices of apartheid, with the goal of quelling any anti-apartheid sentiments from perceived international adversaries. During the period of apartheid, South Africa's nuclear weapons program was an integral part of its national identity. However, as apartheid finally came to a close in the 1990s, the dismantlement of South Africa's nuclear weapons program ended as well (Stumpf, 1996). During this time period, South Africa faced positive and negative inducements. From 1962 – 2013 (the temporal end of this data), South Africa received military assistance from the United States (USAID GREENBOOK, 2015). From 1975 to 1982, the international community levied economic sanctions against South Africa. In 1976, the Soviet Union seriously considered bombing South Africa's nuclear program, approaching the United States for assistance, though the attack was never actually carried out. South Africa received economic aid from 1982 – 2013 (the temporal end of this data) for humanitarian relief and democracy building. No other known positive or negative inducement was offered to South Africa.

Egypt attempted nuclear proliferation for a decade from the mid-1960s to the 1970s. During this time, Egypt had two leaders, President Nasser, who was succeeded by President Sadat in 1970. President Nasser began Egypt's nuclear weapons program with

strong rhetoric, but the 1967 Six Day War devastated Egypt's economy and was the beginning of the end for nuclear ambitions (NTI). When Sadat assumed power in 1970, he began to shy away from the strong rhetoric Nasser used in calling for nuclear proliferation. Egypt faced both positive and negative inducements during this time. For negative inducements, Egyptian nuclear scientists were targeted from the 1950s through the 1990s. For instance, Ali Moustafa Mosharafa was assassinated in 1950 and Yahia Al-Masad was assassinated in 1980 (Peck, 2012; Ali, 2014). In terms of positive inducements, the World Bank provided economic aid to Egypt for natural gas, raw materials, and energy research from 1973 – 1981 and the United States provided Egypt military assistance from 1978 – 2013 (the temporal end of this data) (USAID GREENBOOK, 2015). No other known positive or negative inducement was offered to Egypt.

Iraq actively pursued nuclear weapons for over a decade in the 1980s and 1990s, though it was still suspected to have a nuclear program in the early 2000s. Iraq experienced negative inducements in all five forms, beginning in the late 1970s. From 1977-1981, Israel considered bombing Iraq's nuclear program, approaching Iranian officials to discuss a joint attack, though the attack was ultimately delayed. In 1980, Israel bombed nuclear facilities at Osiraq, causing minor damage. From 1980 to 2003, the international community levied sanctions against Iraq. The US began considerations of bombing Iraqi nuclear facilities in 1990, and carried out attacks against several facilities during the Gulf War in 1991, including the Tuwaitha Research Facility and Al Jesira. The United States again bombed in 1993 and carried out a joint attack in 1998 with the United Kingdom. Finally, in 2003, the United States launched a full-scale military intervention

under the auspices of removing Iraqi weapons of mass destruction. Further, news reports indicate that at least one Iraqi nuclear scientist was targeted and killed in 2004 (Peck, 2012). In terms of positive inducements, diplomatic relations were reinstated with the United States in 1984 and the United States offered military assistance to Iraq in 1997, 2000, and from 2002-2013 (when this dataset ends). No other known positive inducement was offered.

Libya sought nuclear weapons for thirty-three years under dictator Muammar Gaddafi beginning in 1970. During this time, Libya faced both positive and negative inducements from the international community. Negative inducements included the international community imposing economic sanctions on Libya from 1978 – 2004. Positive inducements included emergency humanitarian aid from 1990 to 2013 (when this dataset ends) and diplomatic ties between the United States and Libya being reinstated in 2004. No other known positive or negative inducement was offered to Libya.

Syria began its pursuit of nuclear weapons in 2000 and due to significant civil turmoil in 2011 was forced to reverse its program. In terms of positive inducements, Syria received economic aid for a power sector project from 2000 – 2006, and in 2011 for electricity generally (USAID GREENBOOK, 2015). In terms of negative inducements, Israel bombed a nuclear production facility in 2007 (Sanger and Mazzetti, 2007), and in 2014, Syrian nuclear scientists were killed by a gunman on a bus traveling to a research center near Damascus (Chumley, 2014). No other known positive or negative inducement was experienced by Syria.

Belarus, Kazakhstan, and Ukraine have similar stories of nuclear reversal. I do not code these states as actively pursuing nuclear weapons programs as they did not do so independently, but under the umbrella of the Soviet Union. When the Soviet Union fell apart in 1991, and Belarus, Kazakhstan, and Ukraine were recognized as independent states by the United Nations, they were left with active nuclear weapons programs on their soil. Each returned the operational nuclear weapons to Russia – Belarus in 1993, Ukraine in 1994, and Kazakhstan in 1995.

The newly independent Soviet states received several forms of positive inducements. In 1991, each of the three states was recognized as independent states by the United States and diplomatic relations were established with each. In 1992, each of the three states joined the World Bank. From 1992 to 2013 (when this dataset ends), Belarus and Kazakhstan received economic aid relating to energy and power and from 1991 to 2013 (when this dataset ends), Ukraine did (USAID GREENBOOK, 2015). Belarus, Ukraine, and Kazakhstan all received military assistance from 1993 to 1998 (USAID GREENBOOK, 2015). From 1994 on, Belarus and Kazakhstan fall under the nuclear security umbrella of Russia, codified by the Collective Security Treaty Organization and in 2013, China extended its nuclear security umbrella to encompass Ukraine. Economic sanctions were levied against Ukraine from 1993 – 1997 and against Kazakhstan from 1993 – 1996. No other known form of negative inducement was levied against Ukraine or Kazakhstan and no known negative inducement was levied against Belarus.

Although each of the thirteen states that have reversed its nuclear weapons programs is unique, there are patterns that emerge among them. In order to better

understand how international pressure in the form of positive and negative inducements and domestic pressure in the form of audience constraints affect the process of nuclear development, and particularly the process of nuclear reversal, I now turn to a large-N statistical analysis to better flesh out what triggers nuclear reversal and under what conditions.

7.4 Statistical Analysis

I use two types of models for this analysis. The first is an event history model that captures a time-to-event, in this case, the phenomenon of nuclear reversal. Utilizing this modeling strategy, I am able to capture how positive and negative inducements affect the phenomenon of nuclear reversal over time. What I am unable to capture with the survival model is the difference between states that began a nuclear weapons program and states that have not. In order to capture this process, I rely on a selection model, where the outcome of nuclear reversal is dependent on the outcome of the selection stage, having a nuclear weapons program. For both sets of models, the universe of cases includes all states in the international system for the years 1939 – 2013. In both modeling strategies, the significance and directionality of the main variables of interest hold, indicating robustness for the results.

For the event history models, I test the efficacy of several distributions and based on the results of scores from the Akaike Information Criterion (AIC) settle on a Weibull distribution as the most appropriate. I also test several versions of the nuclear reversal model, varying how the inducement scales are coded to ensure the results are robust. Based on the results from model-fit tests, I use an ordinal scale for the inducement variables and include zero-year, three-year, and five-year lags for each. Regardless of

coding criterion, the directionality and significance of the covariates remain consistent. The ultimate model that I settle on is chosen based on likelihood-ratio testing and AIC/BIC scores. See Appendix B for the auxiliary models.

When interpreting the effects of the coefficients for the Weibull model, it is important to first note that the coefficients are not equivalent to ordinary least squares regression coefficients where a 'unit's change in X causes a corresponding unit's change in Y'. Rather, the coefficients provide information about the hazard ratio of each independent variable's effect on the outcome variable, here the reversal of nuclear weapons programs, where a score of "1" indicates there is no change on the hazard rate, a score greater than 1 indicates that as the hazard ratio increases, the likelihood for reversing nuclear weapons programs also increases, and finally, a score less than 1 indicates that as the hazard ratio decreases, so does the likelihood for reversing nuclear weapons programs (Box-Steffensmeier and Jones, 2004).

The findings for my empirical analysis are presented in Table 7.2. As shown in column 1, the utilization of positive inducements has a significant effect on the reversal of nuclear weapons programs, increasing the hazard ratio for reversal by 4.744, holding all else constant. This provides evidence in support of the positive inducements hypothesis, where increasing the strength of the positive inducement offered leads to a corresponding increase in the likelihood of a state reversing its nuclear weapons programs. There is not a statistically significant effect for the three-year lag on positive inducements. The five-year lag indicates that positive inducements actually have a negative effect on reversal over time, reducing the hazard ratio for reversal by 0.533, holding all else constant. Column 2 of Table 7.4 shows that the use of negative

inducements have no significant effect on the reversal of nuclear weapons programs. This runs counter to what I expected to find based on the negative inducements hypothesis. Rather than seeing an increased likelihood for nuclear reversal as the strength of negative inducement increases, I found that there is no statistically significant effect on nuclear reversal.[8]

Figure 7.2 shows a graphical depiction of this result. Note that as the strength of positive inducement increases, the probability for reversing a program clearly increases as well. In the instance of placing a state under the security umbrella of a nuclear ally, the probability of nuclear reversal increases over time from 0.000 to 0.200. Offering a state military aid increases the probability of nuclear reversal over time from 0.000 to 0.005. Offering a state economic aid corresponds with a very slight increase in the probability of reversal and neither extending diplomatic ties nor including a state in the international order has any significant correlation with increasing the probability of a state reversing its nuclear programs.

A similar pattern emerges for negative inducements where there is an increase in the likelihood of nuclear reversal as the strength of inducement increases, though these findings are significant only at the $p<0.1$ level. Bombing a state's nuclear facilities, killing scientists, or full-scale military intervention (in other words, physical destruction) increases the likelihood of nuclear reversal over time from 0.000 to 0.030. The imposition of economic sanctions on a state increases the probability of reversal from 0.000 to 0.010 and the use of negative rhetoric that threatens some action against a state corresponds with a very slight increase in the probability of reversal.

[8] The negative inducement scale is statistically significant at the $p<0.1$ level.

Table 7.2: How Positive and Negative Inducements Affect Nuclear Reversal

	Positive Inducement		Negative Inducement	
	Hazard Ratio	**Clustered SE's**	**Hazard Ratio**	**Clustered SE's**
Risk	1.058*	(0.029)	1.058	(0.037)
Positive Inducement	4.267***	(1.014)	-	-
Positive Inducement, 3 Yr Lag	1.353	(0.365)	-	-
Positive Inducement, 5 Yr Lag	0.480**	(0.116)	-	-
Negative Inducement	-	-	2.846	(1.764)
Negative Inducement, 3 Yr Lag	-	-	0.712	(0.290)
Negative Inducement, 5 Yr Lag	-	-	0.393	(0.241)
Audience Size	1.614	(1.775)	2.369	(1.920)
Major Power	2.02e-08***	(2.57e-08)	7.13e-08***	(1.18e-07)
NPT Signatory	3.181	(2.784)	1.262	(1.272)
Population, logged	1.041	(0.094)	1.062	(1.920)
GDP Per Capita, logged	0.846	(0.092)	1.276*	(0.000)
ENR Facility	0.150	(0.181)	0.354	(0.436)
Constant	4.09e-07***	1.44e-06	4.09e-07	(1.72e-06)
N	7088		7088	
Wald Chi^2	542.96***		858.01***	
ln_p	0.818*	(0.388)	0.766	(0.589)
p	2.266	(0.879)	2.152	(1.268)
1/p	0.441	(0.171)	0.465	(0.274)

*p<.05 **p<.01 ***p<.001

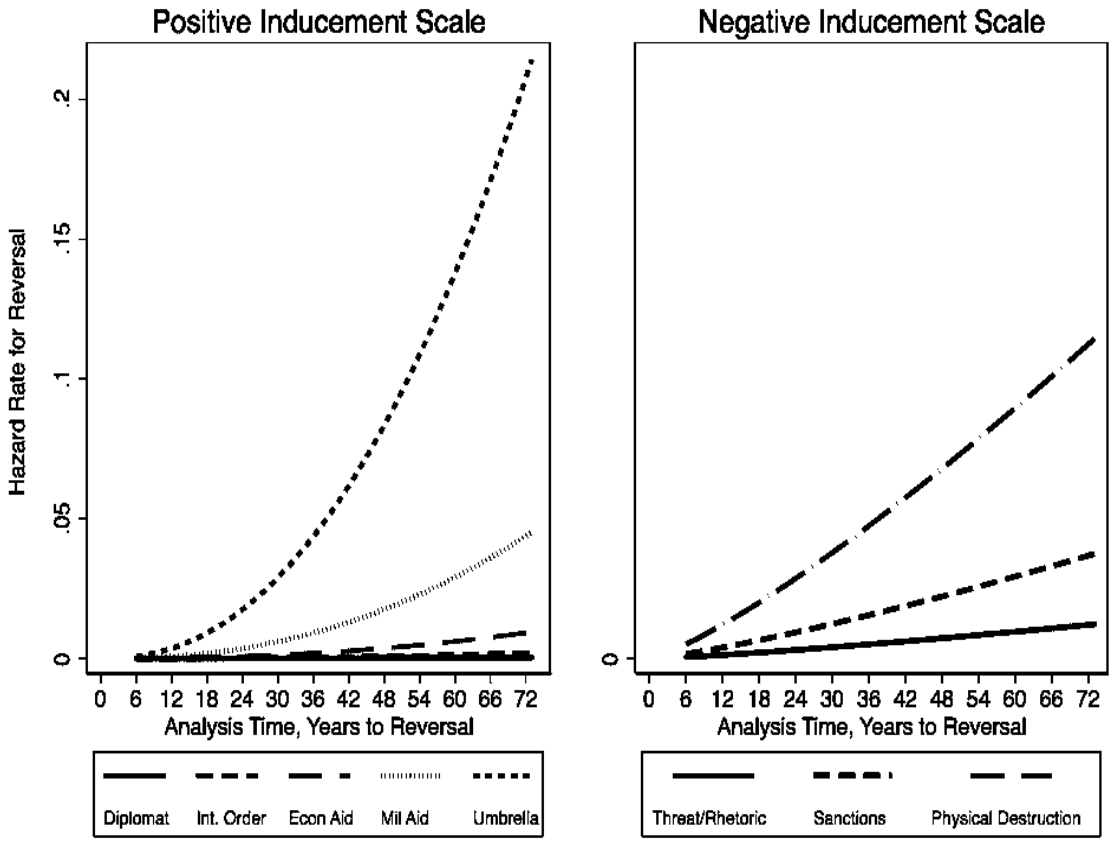


Figure 7.2: How Positive and Negative Inducements Affect the Hazard Rate for Nuclear Reversal

Surprisingly, only two of the control variables have a statistically significant effect on nuclear reversal. We expected more variables to influence nuclear reversal, but only major power status and per capita GDP have a significant negative effect on nuclear reversal, holding all else constant. Being a signatory to the NPT, having an ENR facility, and the size of a leader's audience do not have a significant effect on reversal.

Turning now to the selection model, I utilize Heckman Probit models that allow me to test the effects of nuclear reversal conditioned on whether or not a leader has a nuclear weapons program. Here, the same independent variables are included for the outcome stage of the model, where nuclear reversal is the dependent variable. I add a variable to capture regime type in these models. This variable utilizes Geddes' (2012) coding of non-democracies to determine how positive and negative inducements affect the rate of reversal for leaders of different regime types. I begin with a dummy variable to test the difference between democracies and non-democracies, but find no significant difference in the reversal rate of leaders of these regimes.[9] This is expected based on the theoretical argument I have outlined above. Similar to seminal studies of nuclear proliferation that found no significant effect between democracies and non-democracies for the rate of beginning a nuclear weapons program and acquiring nuclear weapons (e.g. Jo and Gartzke, 2007; Singh and Way, 2004) the story for nuclear reversal is also more nuanced. Thus, I compare how leaders of civilian, military, and personal dictatorships differ in their rate of reversal by using democracy as a baseline comparison category. The only further addition to the outcome stage of the model is the inclusion of t, t^2, and t^3, a

[9] Results for these models can be found in Appendix B.

count of the number of years until a state begins a nuclear weapons program in order to account for time (Carter and Signorino, 2010).

For the selection stage of the Heckman models, the dependent variable is a binary measure of whether or not a state has a nuclear weapons program in a given year. The independent variables included in this model are factors that effect whether or not a leader may begin a nuclear weapons program, including factors for both capability and choice. These include whether or not a state is in an enduring rivalry, has an alliance with nuclear weapons, has an uranium enrichment processing facility, the level of per capita GDP of a state, and the size of a state's population.

The results of the analysis are shown below in Table 7.3. As we see, there is a significant correlation between the selection and outcome stages of the model, evidenced by the rho term. The idea that the reversal of a nuclear weapons program is dependent on a state having a program to begin with may be obvious, however, this lends more credence to the use of a model that specifically addresses this dependency. Here, the outcome variable, "nuclear reversal", is specifically conditioned on the selection variable, "beginning a nuclear program". The directionality and significance of the main explanatory variables are consistent in this model, though the focus here is on how regime type conditions the use of positive and negative inducements for nuclear reversal. There is significant variation among regime types for reversal. The use of positive inducements has a strong effect on nuclear reversal for leaders of non-democracies, while the use of negative inducements has the opposite effect, marginally increasing the likelihood for nuclear reversal for leaders of democracies. This provides strong evidence for the hypotheses on the relationship between regime type and inducement.

Figure 7.3 shows a graphical depiction of these results. Here, we see that in the positive inducement model, military regimes are significantly less likely to reverse their nuclear weapons programs than democracies, though an increase in strength of positive inducement corresponds with an increased likelihood of reversal for civilian and personal regimes, holding all else constant. The effects are particularly noticeable when a state places a potential reverser under their nuclear umbrella, and offers a state military or economic aid. The marginal effects are not statistically significant for establishing diplomatic ties or recognizing the potential reverser in the international order. This may indicate that for leaders who are seeking nuclear weapons, status in the international order is not as important to leaders as status as a "nuclear state".

The effects for positive inducements influencing nuclear reversal are strongest for leaders of personalistic dictators. The findings show that while personalistic dictators may exhibit many of the traits described as an "explosive cocktail" for desiring nuclear weapons (Hymans, 2008), they may not have the opportunity nor willingness to see their nuclear programs to fruition. Way and Weeks (2014) show that personalistic dictators begin nuclear weapons programs at a higher rate than any other regime type, though the same cannot be said for acquisition of nuclear weapons. The results for this chapter indicate that providing personalistic dictators with positive inducements has a significant effect on reversing their nuclear weapons programs. Intuitively, this makes sense.

Leaders of personal dictatorships are beholden to a small subset of their population, and their reputation as a strong leader is necessary to keep them in power. Thus, to be seen as capitulating to the threat or actual use of economic sanctions or military intervention would seriously damage this reputation and potentially serve as a

threat to their regime. However, entering into a security pact or receiving economic aid can be spun as a mutual benefit to a leader's citizens, bettering their quality of life or making the state stronger or more legitimate in the international community. These findings further fit with selectorate theory's notion of regimes with smaller audiences using payoffs to line the pockets of their cronies (Bueno de Mesquita et al., 2003; Bueno de Mesquita et al., 2002; Bueno de Mesquita and Smith, 2009).

In the negative inducement model, all of the nondemocratic regime types are less likely to reverse their nuclear weapons programs than democracies, holding all else constant. However, the confidence intervals indicate that the differences are not significant. Looking again at Figure 7.3, it appears that imposing economic sanctions has the strongest effect on inducing the reversal of democratic states, though the confidence intervals indicate that this effect may only be marginal.

The control variables perform in the expected direction. Being a signatory to the NPT has a strong positive effect on the likelihood of nuclear reversal, while enjoying status as a major power has a significant negative effect on the likelihood of nuclear reversal. In the negative inducements model, having an ENR facility and the size of a leader's audience have a significant and positive effect on nuclear reversal, indicating that leaders with larger audiences are more likely to reverse their nuclear weapons programs, holding all else constant.

7.5 Conclusions

The results indicate that the use of positive inducements has a strong effect on nuclear reversal for leaders of all regime types, though particularly for leaders of personalistic, and to a smaller extent, civilian non-democracies. Positive inducements

Table 7.3: The Interactive Effect of Regime Type and Inducement Type on the Outcome of Nuclear Reversal

	Positive Inducement		Negative Inducement	
	Coefficients	**Robust SE's**	**Coefficients**	**Robust SE's**
Outcome, Reversal:				
Positive Inducement	3.043***	(0.647)	-	-
Negative Inducement	-	-	-0.547*	(0.283)
Regime:				
Civilian	1.552*	(0.645)	-0.516	(0.321)
Military	-2.484**	(0.776)	-0.703*	(0.284)
Personal	4.474	(1.499)	-1.090	(0.881)
PI*Regime	-0.339**	(0.100)	-	-
NI*Regime	-	-	0.280**	(0.086)
Audience Size	1.391	(0.960)	2.512*	(1.092)
NPT Signatory	3.356***	(0.467)	1.330***	(0.248)
Major Power	-6.308***	(0.656)	-6.298***	(0.550)
Per Capita GDP, logged	0.000	(0.000)	-0.000*	(0.000)
Population, logged	-3.52e-08	(4.89e-07)	-1.32e-06	(7.02e-07)
ENR Facility	-0.051	(0.360)	0.948***	(0.253)
t	0.802*	(0.380)	0.406*	(0.173)
t^2	-0.017*	(0.008)	-0.009*	(0.004)
t^3	0.000	(0.000)	0.000*	(0.000)
Constant	-27.842***	(7.604)	-9.992***	(2.755)
Selection, Begin:				
ENR Facility	2.256***	(0.249)	2.255***	(0.251)
Per Capita GDP, logged	2.27e-06	(0.000)	2.43e-06	(0.000)
Population, logged	3.34e-06***	(7.94e-07)	3.31e-06***	(7.91e-07)
Alliance w/ Nukes	-0.010	(0.242)	-0.021	(0.245)
Enduring Rivalry	0.900**	(0.273)	0.923**	(0.270)
Constant	-2.649***	(0.258)	-2.657***	(0.256)
N	9096		9096	
Wald test	652.360***		10966.020***	
Pseudo Loglikelihood	-1044.924		-1065.227	

*p<.05 **p<.01 ***p<.001

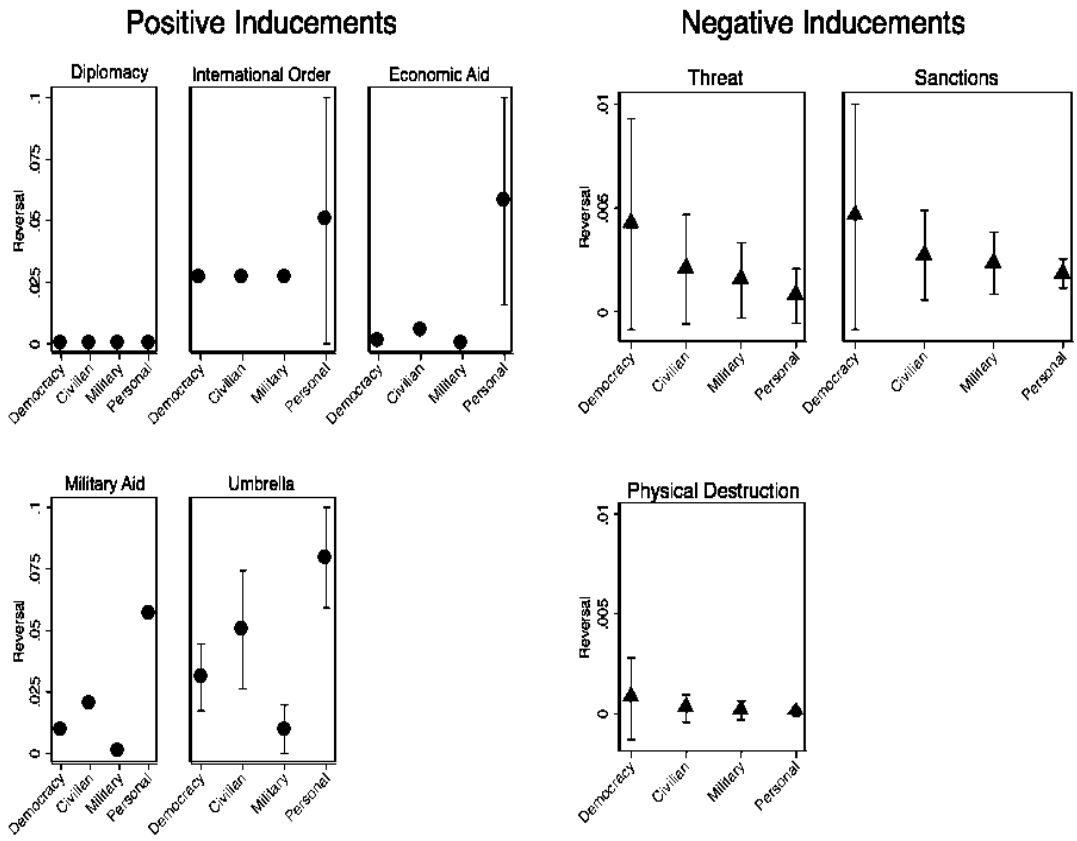


Figure 7.3: Effects of Inducement on Reversal, Conditioned by Regime Type

The results for negative inducements ran counter to what I expected to find. Negative inducements had no significant effect on nuclear reversal in any of the models except for those accounting for differences in regime type, where negative inducements only significantly affected the reversal of democratic regimes. Parsing out the findings through predicted probabilities indicates that economic sanctions have a stronger effect than any other type of negative inducement including computer software sabotage, targeting nuclear scientists, bombing nuclear production plants, and full-scale military invasion. However, the sabotage of nuclear programs is inherently a secretive operation so the data is limited to what is credibly reported in the news and made public to researchers. Regardless, the strength of the findings for positive inducements indicates that those who wish to see the nuclear programs of states reversed should be offering carrots rather than sticks.

In the next chapter, I delve deeper into the relationship between domestic and international audiences and the nuclearization process by focusing on the cases of Iraq and Pakistan. I will trace the evolution of each state's nuclear development process and the factors that led to nuclear reversal in the case of Iraq and to the acquisition of nuclear weapons in the case of Pakistan. This deeper understanding of how factors affect the decision-making process at different stages of nuclear development will be particularly useful to apply to the current case of Iran, which I will do in the concluding section of this dissertation.

CHAPTER EIGHT

MOST SIMILAR SYSTEMS CASE STUDY: WHAT FACTORS EXPLAIN SUCCESS AND FAILURE IN PAKISTAN AND IRAQ'S NUCLEAR DEVELOPMENT PATHS?

This final empirical chapter delves more deeply into the relationship between domestic and international audience preferences and the nuclear development process. In the previous empirical chapters, I first outlined factors that affect a leader's decision to begin nuclear weapons programs and then explored those factors that may trigger their reversal. These chapters revealed large-scale patterns throughout the international community for factors affecting nuclear proliferation, including domestic factors such as audience preferences, regime type, and economic capacity as well as international factors such as rivalries, alliances, and international norms. This chapter builds on these previous statistical analyses to trace the divergent nuclear development processes of Iraq and Pakistan through a most similar systems case study design. Utilizing a case study framework will let me hone in on the causal processes involved in Iraq and Pakistan's nuclear development process. Further, by utilizing a most-similar systems design, I am able to isolate what factors led to Pakistan succeeding in acquiring status as a nuclear weapons state (NWS) and Iraq, ultimately, failing to do so.

There are twenty-four states that have attempted to acquire nuclear weapons through building nuclear weapons programs. Of these states, thirteen were successful in

acquiring nuclear weapons and thirteen were not (South Africa acquired nuclear weapons before giving them up and Iran is the only state coded as still seeking them). The states are geographically diverse, spanning most of the globe: four states are located in the Americas, six in Europe, six in the greater Middle East, seven in Asia and the South Pacific, and one in southern Africa. The average length of a nuclear weapons program before a state reverses their ambitions is ten years. Libya holds the longest nuclear weapons program without succeeding, maintaining an active program for thirty three years, and Australia the shortest, reversing after only two years of an active weapons program. The average length of a nuclear weapons program before a state acquires nuclear weapons is 8 years. North Korea holds the longest nuclear weapons program before acquisition, maintaining their program for twenty-six years before finally succeeding in acquiring weapons and the United States has the shortest distance between beginning a program and acquiring nuclear weapons, succeeding after three years.

Iraq and Pakistan are representative of this universe of cases in several regards. Firstly, they experienced roughly the average number of years before ultimately succeeding or failing to acquire nuclear weapons. Both states are also geographically similar, located in the greater Middle East. Further, both states began their nuclear weapons programs for similar reasons, each seeing their contiguous rival as an existential threat to their national security. According to many scholars, being in an enduring rivalry is one of the main reasons for beginning a nuclear weapons program (Jo and Gartzke, 2007; Singh and Way, 2004). Given the similarities between the nuclear experiences of Iraq and Pakistan, what difference in conditions led Iraq to dismantle its nuclear weapons program and Pakistan to acquire nuclear weapons?

The rest of this chapter will proceed as follows. I will first discuss a most-similar-systems case design and outline those factors that make Iraq and Pakistan an ideal case-pair. Next, I will trace Iraq's nuclear development process, highlighting domestic and international audience constraints. Then, I will trace Pakistan's nuclear development and successful acquisition of weapons. Finally, I will synthesize the conclusions from each utilizing process tracing to show how the factors attributed to Pakistan and Iraq's divergent development paths can help us better understand other cases of nuclear proliferation.

8.1 Most Similar Systems and Case Selection

A most similar systems case design can measure pairs of cases in a number of fashions in order to isolate one particular difference among similar cases (Lijphart, 1971; Przeworski and Teune, 1970; Skocpol and Somers, 1980; Collier, 1993). In this instance, I will analyze Iraq and Pakistan as similar across relevant background conditions that may be expected to affect the outcome variable (acquire nuclear weapons), where the case-pair differs in the outcome. There are several benefits to this approach. Notably, while the statistical chapters were able to reveal larger patterns of proliferation, they were less focused on specific causal processes. Utilizing a case study framework will let me hone in on the causal processes involved in Iraq and Pakistan's nuclear development process. Further, by utilizing a most-similar systems design, I am able to isolate what factors led to Pakistan succeeding in acquiring status as a nuclear weapons state (NWS) and Iraq ultimately failing to do so.

Iraq and Pakistan are considered typical cases of the nuclear process in that they are typical examples of states' nuclear experiences rather than deviant or extreme

examples. The purpose of choosing typical cases is to find evidence that either confirms or disconfirms a given theory through understanding the causal mechanisms at play in the case-pair (Seawright and Gerring, 2008). The added benefit of choosing typical cases for the most-similar-systems design is that they provide the "strongest basis for generalization" to cases outside the case-pair (Seawright and Gerring, 2008, p. 298).

Iraq and Pakistan are similar across a host of attributes, meaning that I can hold these background factors constant in order to isolate what led to the difference in outcome for each. Both states are part of the greater Middle East, meaning that they are geographically similar. The official religion of both states is Islam, with over 90% of the population practicing in each state (Maoz and Henderson, 2013). Both states have seen several regime changes over the past six decades. Notably, Iraq changed from a civilian regime to a personalistic dictatorship, under the leadership of Saddam Hussein, prior to beginning a nuclear weapons program, while Pakistan changed from a military dictatorship to a democracy before beginning a nuclear weapons program (Gleditsch and Chiozza, 2014). Both states have a contiguous rival (Iran in the case of Iraq and India in the case of Pakistan) and in beginning their nuclear weapons programs, both saw this rival as an existential security threat (Hensel, 2006; Klein, Goertz, and Diehl, 2006). Further, Iraq and Pakistan can both be considered the "challenger" to a (rising) regional hegemon – Iran in Iraq's case and India in Pakistan's. Both states have had a turbulent relationship with the west, and in particular, the United States. Iraq and Pakistan proliferated within a decade of each other, Pakistan beginning its path towards nuclear weapons in 1972 and Iraq in 1983. Both states' programs lasted for a similar number of years, Pakistan for fifteen before acquiring weapons and Iraq for twelve before reversing

its program. Finally, Iraq and Pakistan have comparable levels of latent nuclear capability (Fuhrmann and Tkach, 2015; Jo and Gartzke, 2006; Singh and Way, 2004). With the background similarities of the two states laid out, I will now turn to tracing the nuclear paths of Iraq and Pakistan in order to uncover what led to the success of one and the failure of the other.

8.2 The almost nuclear power: Iraq and nuclear weapons

By all accounts, Iraq had both the opportunity and the willingness (Most and Starr, 1989) to successfully see its nuclear ambitions carried out. In order to understand why Iraq ultimately failed in acquiring nuclear weapons, I will first trace the motivations (willingness) and then the capability (opportunity) of the state. Next, I will turn to the factors that ultimately led to the reversal of its nuclear weapons programs. At the end of this section, I outline these factors in a condensed timeline. See Table 8.1 below.

8.2A Motivations for building a nuclear program

Iraq began its nuclear weapons program in 1983 under the leadership of Saddam Hussein. Hussein's experience with politics in Iraq began in 1957 when he joined the Ba`th Socialist Party. In 1959, he was one of ten militants who attempted to assassinate the Iraqi prime minister, Abdul Karim Kassem. After this coup attempt failed, he fled Iraq and resided in Syria and Egypt until the Ba`thists came to power in 1963, though they were overthrown the same year and Hussein went to prison. Once escaping prison, he became a leader of the Ba`thist party and played an instrumental role in the coup that reinstated the party to power in 1968. From 1979 to 2003, Saddam Hussein was the president and "absolute ruler" of Iraq (Schemmel, 2016; Bahgat, 2007). Before the Ba`thists returned to power, Iraq was under civilian control. With Hussein at the reins,

Iraq experienced a regime transition to a personalistic dictatorship (Geddes, 2014). Understanding Hussein's rise to power is crucial to the story of Iraq's nuclear development process as the search for nuclear weapons is intimately tied to Saddam Hussein and the domestic and regional vulnerabilities he faced.

Hussein's dictatorship was both nasty and aggressive, in part due to severe ethnoreligious turmoil. At the end of World War I, the collapsing of the Ottoman Empire led to the creation of Iraq, when Britain appointed a Sunni named Faisal Ibn Hussein king of the newly independent state in 1932. Iraq was created through joining three former provinces of the Ottoman Empire, Mosul, Baghdad, and Basra (Bahgat, 2007). The three provinces did not live together peacefully; rather, there have been several military coups throughout Iraq's modern history. There are two main divisions at play here: the first is an ethnic divide between Kurds and Arabs, and the second is a sectarian cleavage between Shi'ite and Sunni. The cleavages have led to fragmentation in the state and a lack of real national identity (Bahgat, 2007). When the Ba`thists retook power in Iraq in the 1960s, it meant that a Sunni dictatorship was reinstated over a Shi'ite majority and a Kurdish minority, doing nothing to ease tensions between the groups. Instead, the regime was characterized by extreme domestic violence and an aggressive foreign policy in the region. Saddam Hussein's tenure in Iraq was longer than any other leader in the state's history. It was also more brutal than any other leader's, both internally and externally, as outlined below.

Regionally, Iraq is fairly dependent on its neighboring countries for access to the Persian Gulf. It shares borders with six states and has limited access to the Gulf due to its narrow (thirty-six miles) coastline (Schofield, 1994). These boundaries have led to

several regional disputes over territory since Iraq's inception. Hussein's role in territorial disputes is most notable with regard to Iran. Hussein heightened the territorial tensions with Iran by attacking in 1980 following the Iranian revolution, ultimately leading to the eight year Iran-Iraq War. President Hussein first began efforts to "build the bomb" when he entered into war with Iran. He had two primary motivations for doing so, the first protecting Iraq's territory and the second ensuring his regime's security. Iran was seen as a rival that threatened Iraq on an existential level. The two states were asymmetrical in power, both in terms of geographic and demographic composition, leading Hussein to pursue nuclear weapons as an equalizer (Bahgat, 2007).

Iraq's relationship with Turkey is somewhat different, though no less tumultuous. Iraq's water comes predominately from the two major rivers in the region, the Tigris and Euphrates, both of which originate in Turkey. Further, Iraq ships a predominant amount of oil by pipeline to a Turkish port (Schofield, 1994). This reliance on Turkey is a source of vulnerability for Iraq and another motivator for Hussein to seek nuclear weapons capabilities.

The transferring of power from Egyptian President Nasser to his successor Sadat, upon Nasser's death, left a vacuum of power in the region for Hussein to fill in terms of promoting pan-Arabism. Nasser was a great promoter of pan-Arabism and was at the center of anti-western sentiment, especially in regards to anti-Israeli aims (Schemel, 2016). When Sadat took over as president, he both lacked Nasser's charisma at rallying the Arab states and had different priorities, signing a peace treaty with Israel in 1979 (Scheme, 2016). This peace treaty was seen as a betrayal to the aims of pan-Arab strategy and allowed Saddam Hussein to present himself as the new hero of pan-Arab aims in the

region. A nuclear armament was crucial to establishing this leadership in the region (Bahgat, 2007).

Further, foreign policy under Saddam's rule has been shaped by a mistrust of western power, particularly the United States. Iraq's tumultuous relationship with the west extends to its creation under British occupation. From the late 1950s on, Iraq's relationship with the west has been driven by its pan-Arabic aims. The United States continued support of Israel has negatively affected its relations with Iraq (Bahgat, 2007). The United States and Iraq allied against a common enemy in the form of Iran and Ayatollah Khomeini, though with the end of the Iran-Iraq war came the end of the alliance. Based on these regional and global relationships, Saddam Hussein saw nuclear weapons as the "ultimate equalizer", providing Iraq with a leadership role in the Middle East and securing its place in the Persian Gulf (Bahgat, 2007). Now that I have outlined Hussein's desire for nuclear weapons, I now outline Iraq's capability to produce a bomb.

8.2B Nuclear capacity

Nuclear capability is based on a combination of factors involving environmental constraints and manufacturing capacity (Jo and Gartzke, 2007; Siverson and Starr, 1990). Namely, nuclear capability comprises the knowledge necessary to manufacture nuclear weapons (including the necessary scientists and technology), the capacity to produce nuclear fissile material (enriched uranium or plutonium), and finally the economic capacity to bankroll a large-scale armament program (Jo and Gartkze, 2007).

In the late 1970s and early 1980s, Iraq was in a highly favorable position to acquire nuclear weapons capabilities. Firstly, when Saddam Hussein ultimately established himself as the absolute ruler of Iraq, he was able to quell a Kurdish rebellion

through an agreement with Iran, signing a treaty with the shah of Iran that forbid Iran to provide assistance to Kurdish Iraqis. In doing so, he not only consolidated his political power domestically, but also brought a substantial increase in oil revenues to the regime, providing the funding necessary to pursue a nuclear weapons program (Bahgat, 2007). Based on a 2005 OPEC account, Iraqi net oil exports climbed from $5.3 billion in 1972 to $54.8 billion in 1980 in constant 2005 US dollars (OPEC Fact Sheet). Secondly, Hussein employed thousands of engineers and scientists to aid in developing his nuclear weapons program. Iraq further benefitted from the diffusion of knowledge and technical assistance from several states including Russia, France, Italy, Brazil, and Portugal (Bahgat, 2007; Albright and Hamza, 1998; Snyder, 1983). Using Jo and Gartzke's framework for nuclear capability (2007), Iraq has six out of seven indicators of nuclear capability, making it a "highly capable" state. From 1982 on, the only factor it was missing was actual fissile materials. Utilizing Fuhrmann and Tkach's narrower measure of latent nuclear capability (2015), Iraq can still be considered a highly capable country, maintaining uranium enrichment and plutonium reprocessing (ENR) facilities from 1983 to 1991.

8.2C Failure to acquire nuclear weapons

So with the capacity to build a nuclear weapons program and the willingness to do so, what happened to ultimately prevent Iraq from acquiring nuclear weapons? The answer is complex, but I will show below how in many ways it boils down to external interference in Iraq's nuclear programs coupled with a highly fragmented domestic audience. Saddam's Ba'athist regime meant that a Sunni minority had rule over a Shiite majority and Kurdish minority. He was kept in power by a small subset of the Iraqi population, meaning that his regime was constantly susceptible to coups from outside the

ruling party. It also meant that the potential for the Iraqi population to oppose nuclear proliferation was greater than if the majority of his population supported his party. The case of Iraq fits with the first ideal case of autocracy produced by the formal model that is outlined in chapter four.

As mentioned above, Iraq benefitted from the technical assistance of several states. In 1976, President Hussein purchased a materials test reactor from France, known as Osiraq (Albright and Hamza, 1998), as well as other materials from Russia, Italy, Brazil, and Portugal. These early efforts moved rapidly, by many accounts the only thing still needed for Iraq to reach the status of a nuclear weapons state was fissile material (Motz, 2006).

However, Saddam Hussein's original efforts to acquire nuclear weapons were shattered on June 7, 1981, when Israel bombed the Osiraq facility. The attack was unique, because it represented the first preemptive attack on a nuclear weapons program. The bombing destroyed the reactor facility before it was able to become operational (Snyder, 1983). Israeli Prime Minister Begin had several reasons for ordering the bombing of Osiraq. These included President Hussein's anti-Israeli stance and foreign policy aims of uniting a pan-Arab Middle East that denied Israel's right to exist; the desire to remain the singular nuclear power in the Middle East; and a lack of confidence in the nuclear safeguards put in place by the IAEA and the UN Security Council (Bahgat, 2007). The last reason is most interesting for the reaction it caused in the international community. Israeli's preemptive strike was condemned almost unanimously and the UN Security Council passed a resolution two weeks after the attack in response citing that Israel's actions were in violation of the norms of international conduct (Feldman, 2003).

Israel refused to open its own facilities to inspections by the IAEA and also refused to compensate Iraq for Osiraq (Bishara, 1982). This vote of "no confidence" for the safeguards put the IAEA in a difficult position: the concern being a potential precedent set for using preemptive strikes rather than going through the channels of the nonproliferation regime (Bahgat, 2007). The IAEA eventually settled on temporarily suspending Israel's membership and further entreated the nonproliferation organization's members to suspend financial and technical aid to Israel.

Though the Israeli attack on Osiraq successfully thwarted the facility from becoming operational, it had the dual effect of intensifying President Hussein's desire for weapons of mass destruction. Though it is beyond the scope of this analysis, the proliferation of chemical and biological weapons to Iraq (as well as other Arab states in the Middle East) is one result of the bombing of Osiraq as a means to counterbalance Israel's nuclear capacity (Bahgat, 2007). More importantly for this analysis, it meant that President Hussein redoubled his efforts to acquire nuclear weapons, which he continued through the 1990s.

The 1991 Gulf War was a turning point for the Iraqi nuclear weapons program due to the repercussions of international inspection it presented. The UN Security Council issued several resolutions beginning in April of 1991 calling for Iraq to agree to cease efforts to acquire nuclear weapons or the materials necessary to make them fissile along with allowing inspectors from a UN special commission (UNSCOM) and the IAEA to confirm Iraq's capabilities (obtained from UN database). In 1995, it appeared as if there was a turning point in the mission when Saddam Hussein's cousin, Lt. Gen. Hussein Kamel defected. He was the director of Iraq's illicit weapons program and his

defection unearthed a treasure trove of documents on Iraqi programs, including a program that was initiated in 1990 to attempt to acquire a nuclear weapon within a year. However, serious issues were encountered due to deteriorating relations between Iraq and the inspectors, with accusations that the inspectors were spies for the United States. Ultimately, the inspections were halted and all inspectors were withdrawn from Iraq at the close of 1998 (Bahgat, 2007). After several failed attempts at reaching an agreement, Resolution 1441 was passed by the UNSC in 2000 which Iraq accepted (obtained from UN database). In March of 2003, the IAEA director general reported that there was no evidence or indicators of the "revival of a nuclear weapons program" (ElBaradei, 2003).

Though the IAEA made its report to the UNSC indicating Iraqi compliance, the United States was not satisfied and President Bush used Iraqi WMDs as one of the main rationales for invading Iraq in 2003. By all accounts (e.g. Jo and Gartzke, 2007; Singh and Way, 2004; Fuhrmann and Tkach, 2015) Iraq's nuclear weapons program was non-operational prior to the United States' invasion. There was mixed evidence from US intelligence agencies regarding Iraq's WMD capabilities, though a 2003 Iraq Survey Group indicated that the Gulf War led to Iraq reversing its nuclear weapons program ().

The implications for this are twofold. First, it appears that international efforts post-Gulf War to ensure that Iraq did not acquire nuclear capabilities were successful. In terms of the nuclear sabotage scale I created in the previous chapter, Iraq experienced every type of negative inducement except for an attack on its computer software (at least to my knowledge). The international community not only called for vigorous inspections of nuclear capabilities, it imposed heavy economic sanctions on Iraq, as well. Further, Israel's preemptive attack on the Osiraq facility was also a success in terms of preventing

the facility from becoming operational. What is perhaps most interesting about Iraq's nuclear weapons program after 1991 is President Saddam Hussein's rhetoric. He made every effort to hide the fact that from the 1990s to the removal of his regime in 2003 that the nuclear weapons program was no longer robust. This indicates that the symbolic power of nuclear weapons was a strong driver of Hussein's presidency, allowing him to project a formidable image both domestically and regionally.

What the case of Iraq shows is that it was neither a question of President Hussein losing the desire to continue forward with the pursuit of nuclear weapons (his reaction to the Osiraq bombing makes this most obvious) nor was it a question of Iraq's latent nuclear capability that resulted in the reversal of its nuclear weapons programs. Rather, through tracing the series of events that led to Iraq's nuclear disarmament, the most plausible answer is that a combination of negative inducements imposed by the international community led to Iraq's failure to acquire nuclear weapons. While it is not possible to parse out which negative inducements ultimately led to the failure of President Hussein to acquire nuclear weapons, what can be determined is that the combination of negative inducements imposed by the international community *was* successful in deterring Iraq from becoming a nuclear weapons state. I now turn to the case of Pakistan in order to highlight what differences in its nuclear experience contributed to its success of acquiring nuclear weapons.

8.3 Pakistan's Story of Success:

Pakistan has a similar beginning to its story of nuclear proliferation. The motivations (willingness) for seeking nuclear weapons were similar to those of President Hussein; it was faced with a threat from a contiguous rival that presented an existential

threat. Further, its levels of latent nuclear capability (opportunity) were quite comparable to Iraq's at the moment of beginning a nuclear program. To show how Pakistan reached such a different outcome from Iraq on its nuclear journey, I again trace both the factors that contributed to Pakistan's motivations for nuclear weapons and then the factors that contributed to its opportunity for nuclear weapons. Finally, I conclude this section with a discussion of what ultimately led Pakistan to acquire nuclear weapons. Following this discussion, a condensed timeline of these events is included. See Table 8.2 below.

8.3A Motivations for beginning a nuclear program

Pakistan began its nuclear weapons program in 1972. Unlike Iraq, Pakistan has experienced several leadership turnovers as well as regime changes since its quest for nuclear power. From the time Pakistan began a nuclear weapons program to acquiring status as a nuclear weapons state in 1987, there was one leadership turnover that resulted in a regime change. From 1988, there have been eighteen leaders of Pakistan, several resulting in democratic backsliding, either to military or civilian dictatorships. I will briefly outline the two leaders responsible for beginning Pakistan's nuclear program.

President and Prime Minister Zulfikar Ali Bhutto came to power in 1971 after founding the Pakistan People's Party (PPP) in opposition to a regime he accused of being a dictatorship (Schemmel, 2016). The PPP was victorious in West Pakistan, but not in East Pakistan. Bhutto refused to work with the Awami League that won in the east, causing the election to be nullified and the country to plunge into civil war.

The civil war sparked the 1971 Indo-Pakistani war. The civil war was brutal, with the Pakistani army conducting genocide on the East Pakistani population, particularly the Hindus that resided there. India initially opened its borders to allow refuge to this

population, but could not sustain the number of impoverished refugees. The prime minister of India and her government decided that it would be more effective to end the genocide through armed combat and the Indo-Pakistani war began. The war lasted thirteen days and ended in Pakistan's surrender and Bangladesh's independence (Peter, 2008).

In 1971, East Pakistan gained independence and emerged as what is now known as Bangladesh and Zulfikar Ali Bhutto became president of Pakistan on December 20th of the same year (Schemmel, 2016). The Indo-Pakistani war concurrently sparked Pakistan's desire for nuclear weapons, seeing the weapons as an equalizer against India's conventional power, to which it was inferior in terms of power asymmetry (Bluth, 2010). Prime Minister Bhutto famously declared after the war that, "If India builds the bomb, we will eat grass or leaves, even go hungry, but we will get one of our own" (Corera, 2006; Feorz, 2012; Markey, 2013). Bhutto appointed A.Q. Khan to direct the nuclear weapons program. Khan's role is paramount, not only to Pakistani nuclear weapons, but also to the illicit nuclear secrets he provided to Iran, North Korea, and Libya (Markey, 2013).

The constitution of newly democratic Pakistan made the role of president largely ceremonial, at which point Bhutto became prime minister. He remained prime minister from 1973 until he held elections in 1977. The elections were unsuccessful – Bhutto was charged with fraud, imprisoned in 1977, and finally sentenced to death on March 18, 1978. Army Chief of Staff Gen. Mohammad Zia-ul-Haq, whose bloodless coup gained him power on July 5, 1977, succeeded Prime Minister Bhutto (Schemmel, 2016). With this coup, Pakistan reverted to a military dictatorship (Geddes, 2014). Though he restored a version of Pakistan's democratic constitution in 1985, he later dismissed the

Table 8.1 Iraq's Nuclear Development Path

1969	Iraq ratifies the Nonproliferation Treaty.
1971	Saddam Hussein, then head of Iraq Atomic Energy Commission (IAEC), begins early efforts at acquiring nuclear weapons capabilities.
1976	Iraq purchases materials and technology from France, known as "Osiraq".
1979	Saddam Hussein comes to power, officially as president of Iraq. He declares himself Iraq's "absolute ruler".
	Egyptian President Nasser passes away, leaving a leadership vacuum in the region for a new 'hero' of pan-Arabism, and Saddam Hussein tries to fill this vacuum.
1980	The Iran-Iraq War begins. President Hussein initiates the war by invading Iran.
	The United States allies itself with Iraq, offering military support.
1981	Israel bombs Osiraq. This attack is the first preemptive strike on a nuclear weapons program. The nuclear facility is destroyed.
1983	Saddam Hussein redoubles efforts at a nuclear weapons program in response to the Israeli attacks and especially to equalize power against Iran.
1988	The Iran-Iraq War ends, and with it the alliance between the US and Iraq dissolves.
1990	The United Nations imposes comprehensive sanctions on Iraq in response to its invasion of Kuwait.
1991	The Gulf War begins and is a turning point for Iraq's nuclear program.
	The UNSC issues resolutions for Iraq to cease all efforts to acquire nuclear weapons.
	The IAEA and UNSCOM send inspectors into Iraq.
1995	Saddam Hussein's cousin, Lt. Gen. Kamel defects, and the IAEA and UNSCOM gain intricate knowledge of Iraq's nuclear programs.
1998	After serious issues arise between inspectors and Iraq's government, inspectors are withdrawn and the inspections are halted.
2000	The UNSC passes Resolution 1441, which Iraq accepts.
2003	The IAEA director general gives a report to the UNSC, stating that there is no evidence of a renewed Iraqi program.
	The US is not satisfied with the report and launches a full-scale military invasion of Iraq.
	Sanctions are lifted. President Hussein is removed from power. Iraq becomes foreign-occupied. An aid program is initiated to help with Iraq's development.

government in 1988 and announced new nonparty elections. Zia died later that year in a plane crash along with several top army officers and the US ambassador to Pakistan (Schemmel, 2016). After Zia died, Pakistan has seen close to twenty changes in leadership turnover, several resulting in democratic backsliding or violent coups. Through the regime changes, Pakistan's stance on nuclear weapons remained constant – it has not renounced its nuclear capabilities, signed the nonproliferation treaty, and has refused to be party to the comprehensive nuclear test ban treaty.

The primary driver of beginning a nuclear program was Pakistan's enduring rivalry with India. It saw India as an existential threat, a threat that was more powerful than Pakistan at the time of the Indo-Pakistani war of 1971 (Markey, 2013). Pakistan sought to maintain a regional balance of power in South Asia through acquiring nuclear weapons. With the motivations for seeking nuclear weapons laid out, I turn now to Pakistan's latent nuclear capacity for building a nuclear program.

8.3B Nuclear capacity

Utilizing the same indicators of latent nuclear capability as above, Pakistan's capacity for nuclear weapons is roughly equivalent to Iraq's. Pakistan, like Iraq, scores a six out of seven on Jo and Gartzke's (2006) capability index from the time it began its program through 1980. The only indicator of nuclear capability it did not possess was an explosive and electronic capacity measured through whether or not a state produces or assembles motors and produces a television or radios. From 1980 on, Pakistan scores a full seven on this capability index. Pakistan, like Iraq, benefited from outside assistance in the form of materials and the diffusion of technical knowledge from China and the Netherlands (Pillalamarri, 2015). Turning to Fuhrmann and Tkach (2015) narrower

measure of latent capability, Pakistan is considered a highly capable state as well, maintaining ENR facilities from 1973 on. The main distinction between Iraq and Pakistan in terms of latent nuclear capability is Iraq's lack of fissile materials needed for nuclear weapons. With roughly equivalent latent nuclear capabilities and almost identical motivators for acquiring nuclear weapons capabilities, what then made Pakistan succeed where Iraq failed?

8.3C Eating grass for bombs: Pakistan's success

The factors that differentiate Pakistan and Iraq's stories are, of course, complex and many layered. However, it is possible to make comparisons of both domestic and international factors at play in each case. When Prime Minister Bhutto came to power, his audience was far less fragmented than Saddam Hussein's. At the time, the Pakistani population was more concerned with the external threat of neighboring India than with internal divides. Pakistan represents the fourth ideal case of nuclear proliferation according to the formal model outlined in chapter four. Further differentiation exists between the two states in terms of the types of positive and negative inducements received by Pakistan to those that were outlined above. Recall that Iraq had every type of negative inducement thrown at it, from the use of threatening rhetoric, to the imposition of economic sanctions, and finally, types of physical destruction including bombing nuclear facilities and full-scale military invasion. In terms of positive inducements, Iraq received military and economic aid from the international community.

Pakistan's experiences with inducements from the international community differ from Iraq's in two main regards. Firstly, Pakistan suffered no form of physical destruction to its nuclear program. While Pakistan's nuclear facilities were threatened, no

state actually carried out an attack. In the 1980s, on three separate occasions, India seriously considered conducting attacks, though the 1982 and 1984 attacks were called off after India weighed the consequences of carrying out a preventive strike (Fuhrmann and Kreps, 2010; Karnad, 2008). From 1986-1987, India discussed undertaking joint action with Israel. In 1986, top military officials orchestrated the Brasstacks crisis in 1986 in an attempt to provoke Pakistani response with the hope of justifying attacks against its nuclear program. However, strikes were ultimately seen as too costly (Fuhrmann and Kreps, 2010). In 1988, India and Pakistan signed an agreement to not attack the nuclear infrastructure of either state, the treaty entered into force in 1991 (Fuhrmann and Kreps, 2010).

Secondly, the nonproliferation regime dealt with Pakistan's nuclear program in a much different manner than with Iraq. Pakistan is a non-signatory to the NPT. It originally expressed support for the regime, but when India refused to sign, it followed suit (Sidhu, 2009). Unlike Iraq's case, the UNSC's implementation of resolutions towards Pakistan has been contentious, due to shortcomings of the IAEA and a failure to reach a unanimous decision by the SC members for strategic and/or political reasons (Sidhu, 2009). The contention among the permanent members of the Security Council meant that Pakistan was never subject to inspections of its nuclear programs to which Iraq was subjected.

The role of the United States in Pakistan's nuclear programs is also much different than in Iraq. The United States and Pakistan have been declared allies since 1954, when it entered into the Mutual Defense Assistance Agreement (Khan, 1964). Unlike the brief alliance the United States held with Iraq that was dissolved after the Iran-

Iraq War, its alliance with Pakistan has continued despite interruptions caused by clashes between the two states (Markey, 2013). The alliance between Pakistan and the United States can be characterized as one of "mutual vulnerability" (Markey, 2013, p. 5). It is, perhaps, this mutual vulnerability that has led to a different nuclear experience for Pakistan. For instance, in 1979, the US cut off economic and military aid to Pakistan when it acquired uranium-enriched technology. However, this suspension of aid was rescinded only two years later, ensuring Pakistani support against the Soviet Union in Afghanistan (Sidhu, 2009). Pakistan remained a strategic ally to the United States throughout the 1980s, though it continued its search for nuclear weapons capabilities. When the Soviet Union was removed from Afghanistan in 1990, the US could not certify that Pakistan did not have nuclear capabilities and sanctions were once again imposed (Sidhu, 2009).

When India and Pakistan both exploded nuclear test devices in May 1998, the United States imposed sanctions on both states, buttressing the sanctions in place from 1990. Under the Arms Export Control Act of 1994, the US is obligated to impose sanctions on any non-nuclear weapons state that tests a nuclear device (Morrow and Carriere, 1999). At the time, Pakistan had a very fragile economy. It was already receiving economic aid and loans, particularly dependent on loans being dispersed by the International Monetary Fund (IMF). When the US imposed sanctions in June 1998, these loans were withheld and all aid was halted. The result was a crash in Pakistan's market and loss of foreign investors (Morrow and Carriere, 1999). However, the US sanctions did not remain in effect long-term, but were waived in November 1998, allowing the IMF to renegotiate loans causing Pakistan's market to shoot back up and aid to reenter the

state (Morrow and Carriere, 1999). After the attack of September 11th, the United States completely lifted all sanctions and reinstated Pakistan as a strategic ally in order to invade Afghanistan (Sidhu, 2009). Post 9/11, the United States dialogue with Pakistan regarding its nuclear programs has been largely concerned with the security of Pakistan's nuclear arsenal and ensuring it remained safe from terrorists.

Though the United States has not reached a tacit nuclear deal of the magnitude it has with India, the mutual vulnerability between the two states and the need for Pakistan's strategic alliance has meant that the United States did not take the aggressive role in halting its nuclear program that it did with Iraq. Further differences for Pakistan's experience include the lack of physical destruction from other states in the form of carrying out an attack on its nuclear facilities. Therefore, Pakistan, as a nonparty to the NPT, is only subject to the IAEA's safeguards of specified facilities. The IAEA has safeguards that cover specified facilities and materials in Pakistan and cannot, therefore, cover the totality of Pakistan's nuclear activities. Pakistan currently has six facilities that operate under IAEA safeguards and it has cooperated with the organization since the early 1960s to ensure the safety of the materials under these facilities (Khan and Mulla, 2014). This is a very different dynamic than Iraq experienced with the IAEA and other nonproliferation organizations. Pakistan ultimately achieved status as a nuclear weapons state in 1987, has conducted nuclear tests in 1998, and maintained its status as an "extra-NPT" nuclear weapons state ever since. Now that I have outlined the factors that contributed to Pakistan's success in acquiring nuclear weapons, I will compare the experiences of the two states in detail to show what diverging factors led to Iraq's failure and Pakistan's success.

8.4 Comparing the two states:

By comparing the timelines of Iraq and Pakistan's nuclear activities, I illuminate patterns that emerge, revealing those factors that contribute to success or failure in the acquisition of nuclear weapons. Four patterns in particular become important: similarities in latent capability and motivations for nuclear programs, similarities in positive inducements offered, differences in negative inducements imposed, and differences in each state's relationship with the international community. I discuss each of these patterns below and further depict the similarities and differences in Table 8.1 at the end of this section.

Firstly, Iraq and Pakistan have very similar levels of latent nuclear capability. Both are highly capable countries by several measures of capability (e.g. Jo and Gartzke, 2006; Singh and Way, 2004; Fuhrmann and Tkach, 2015). They both also began their nuclear weapons programs for identical reasons. Both states were the lesser power of a contiguous rivalry and sought nuclear weapons as an equalizer to its rival and a means to balance power in the region.

Secondly, both states received almost identical positive inducements. Iraq and Pakistan both received economic and military aid at strategic intervals, though aid to Pakistan has been more long-term. The only real difference in positive inducements offered is that US diplomatic ties with Iraq were reinstated 1984, under President Ronald Reagan, though they were once again severed in 1991 with the Gulf War.

Where we begin to discern noticeable differences in the nuclear development paths of Iraq and Pakistan is with the negative inducements imposed on each. Both Iraq and Pakistan were subject to threatening rhetoric and economic sanctions, though

sanctions against Pakistan were lifted almost immediately due to a strategic alliance with the United States. However, Iraq was subject to physical destruction of its nuclear weapons facilities, nuclear scientists, and full-scale military invasion in a way that Pakistan was not. This indicates that the actual physical destruction of nuclear programs may be the most effective means to nuclear reversal.

A second important difference between the nuclear development paths of the two states is the relationship each has with the international community and particularly with the United States. Iraq had a brief strategic alliance with the United States during the Iran-Iraq War in the 1980s, but the alliance was dissolved when the war ended. When Iraq invaded Kuwait two years after the Iran-Iraq war, the US re-imposed economic sanctions on Iraq as did the United Nations. Further, the UN Security Council was able to come to unanimous resolutions regarding Iraqi nuclear programs. The first of these resolutions called for inspectors from the IAEA as well as UNSCOM to be allowed into Iraq and to provide regular reports to the UNSC to ensure that Iraq's nuclear programs were defunct. Though the inspectors were withdrawn in 1998, the UNSC passed a further resolution in 2000 calling for Iraq to halt its nuclear programs. Iraq agreed to the resolution. Pakistan is a non-signatory to the NPT and the only imposition it has ever faced from the IAEA is to have specific facilities subject to IAEA safeguards, which it has followed. The UNSC has never been able to come to a unanimous decision on resolutions regarding Pakistani nuclear development, in large part due to strategic alliances. From 1954 on, the United States and Pakistan have been declared allies, after they signed a mutual defense pact. Though there have been some interruptions to this alliance, it has reformed several times, always with the result of sanctions being lifted,

Table 8.2 Pakistan's Nuclear Development Path

1954	Pakistan and the US enter into a mutual defense pact, becoming declared allies.
1960s	Pakistan begins early efforts at civilian and military nuclear programs, cooperates fully with IAEA on safeguards for its facilities.
1971	East and West Pakistan enter into a civil war. Civil war sparks the first Indo-Pakistani war. East Pakistan breaks off and becomes Bangladesh, gaining independence. Zulfikar Ali Bhutto comes to power in Pakistan.
1972	The Indo-Pakistani war sparks President Bhutto's desire for nuclear weapons and a program is officially started. Bhutto appoints A.Q. Khan to head the program.
1977	Elections are held, Bhutto is charged with fraud as a result and imprisoned. Army Chief of Staff Gen. Mohammad Zia-ul-Haq comes to power in a bloodless coup, reverting Pakistan to a military dictatorship.
1978	Bhutto is sentenced to death and hanged.
1979	Pakistan acquires uranium-enriched technology. The US cuts off economic and military aid as a result.
1981	Economic and military aid is reinstated in order to ensure Pakistani support against the Soviet Union.
1982	India considers bombing Pakistan's nuclear facilities for the first time, but does not go through with attack.
1984	India again considers bombing and again does not follow through with attack.
1985	Gen. Zia reinstates Pakistan's democratic constitution.
1986	India considers bombing for a third and final time, this time as a joint effort with Israel. The attack is not carried out.
1987	Pakistan officially achieves status as a nuclear weapons state.
1988	August: Gen. Zia dismisses government and holds nonparty elections. Later the same month, Gen. Zia is killed in a plane crash along with other top military officers. December: India and Pakistan sign non-attack agreement to not attack nuclear infrastructure.
1990	Soviet Union is removed from Afghanistan and US sanctions are re-imposed against Pakistan as a result.
1991	India-Pakistan Non-Attack agreement goes into force.
1998	May: Pakistan explodes nuclear device, following nuclear tests from India. June: further sanctions are imposed and all international aid and loans are halted. November: sanctions are waived and IMF loans renegotiated.
2001	The US lifts all sanctions and reinstates Pakistan as a strategic ally to invade Afghanistan.

aid being reinstated, and the discussion over Pakistan's nuclear programs being suspended. These comparisons can be seen in Table 8.1 below.

8.5 Conclusions:

Based on the comparison above, there are several important implications for both academics and policymakers interested in nuclear nonproliferation. Firstly, the use of physical destruction as a negative inducement may affect the outcome of a nuclear program. Though the bombing of Osiraq in 1981 only increased President Hussein's desire for nuclear weapons, he was never able to achieve his goal. A lack of strategic partnership with the United States or one of the other four permanent members of the UNSC meant that the Security Council was able to reach unanimous resolutions regarding Iraqi nuclear programs, giving them the power to act.

The strategic alliance between the United States and Pakistan allowed Pakistan to develop its program in a number of ways. Firstly, it meant that each time sanctions were imposed on Pakistan, they were subsequently lifted in order to ensure Pakistan's support against Afghanistan. Further, economic and military aid was also reinstated each time as well. Finally, and especially post-9/11, the United States dialogue with Pakistan regarding its nuclear weapons program was largely about ensuring the security of its facilities against terrorists.

These lessons are paramount. Strategic partnerships with the Permanent Five regarding regional interests seem to trump serious attempts at preventing nuclear weapons programs from continuing, or at least result in blocking Security Council resolutions from passing. Further, attacks of physical destruction including bombing nuclear facilities and full-scale military invasions seem to be effective at preventing

Table 8.3: Most Similar Systems Case Comparison of Iraq and Pakistan

	Iraq	Pakistan
Domestic Factors:		
Latent Nuclear Capability	High	High
Audience Structure	High fragmentation	Low fragmentation
Reasons for Beginning Program	Contiguous Rival	Contiguous Rival
Positive Inducements:		
1) Diplomatic Recognition	1) Yes	1) No
2) Accepted into International Order	2) No	2) No
3) Economic Aid	3) Yes	3) Yes
4) Military Aid	4) Yes	4) Yes
5) Placed under Alliance Nuclear Umbrella	5) No	5) No
Negative Inducements:		
1) Threat/Rhetoric employed	1) Yes	1) Yes
2) Economic Sanctions Imposed	2) Yes	2) Yes
3) Physical Destruction:	3)	3)
A. Computer Sabotage	A. No	A. No
B. Killing Nuclear Scientists	B. Yes	B. No
C. Bombing Nuclear Facilities	C. Yes	C. No
D. Full-scale Military Invasion	D. Yes	D. No
Relationship with International Community:		
IAEA	Inspectors sent in	Comply with safeguards
UNSC	Resolutions passed to halt program	Unable to pass resolutions
US	Strategic ally only from 1981-1988	Strategic ally from 1954
Outcome	**Reversal**	**Acquisition**

nuclear capabilities from developing. With these lessons in mind, I will conclude the dissertation by discussing what this may mean for the current developments with Iran's nuclear program.

CHAPTER NINE

CONCLUSIONS AND IMPLICATIONS

This project had three main objectives: (1) to understand why leaders begin nuclear weapons programs and how domestic and international audiences influence the decision to seek nuclear weapons; (2) to understand why some leaders fail to acquire nuclear weapons; and (3) to parse out what strategies available to the international community are most effective at reversing nuclear weapons programs. Given these three objectives, this project has focused on both domestic and international environments as a means to understand influences (enablers and constraints) on nuclear decision-making.

I began the project by tracing the evolution of international norms regarding nuclear proliferation. Understanding this evolution, and particularly the emergence of the Nonproliferation Treaty (NPT) in 1968, is paramount to understanding the current international environment for leaders who wish to acquire nuclear weapons. Next, I outlined the colossal body of literature on nuclear proliferation and nonproliferation by tracing the many contributions of this literature to our understanding of why and how leaders seek nuclear weapons. I tied this body of literature to works in comparative politics and international relations on a leader's desire for political survival, and how audiences and differences in regime type influence survival. Tying these works together allowed me to better understand the strategic environment for nuclear proliferation,

which I explored in the fourth chapter of this dissertation by creating a formal model outlining a leader's path to proliferation. Chapter five outlined the research design for the empirical chapters and described the dataset created for this project. Chapters six through eight each explored one of the project's main research questions. Chapter six attempted to explain why leaders seek nuclear weapons programs and how differences in domestic audiences influence both the decision to begin a nuclear weapons program and also the likelihood for acquiring nuclear weapons. Chapter seven focused on how the international community influences attempts at acquiring nuclear weapons by looking at the strategies available to the international community to reverse nuclear weapons programs and which of those strategies are most effective at inducing reversal for leaders of different regime types. Finally, chapter eight looked more in depth at the relationship between the international community and domestic audiences by comparing the nuclear development paths of Pakistan and Iraq through a most similar systems case study design. This chapter was able to hold several background factors constant for each state in order to isolate what factors led to the success of Pakistan in acquiring nuclear weapons and the failure of Iraq to do so.

The lessons from these chapters are of value to both academics and policymakers concerned with understanding why nuclear proliferation occurs and potentially halting its progress. The current security environment makes understanding how nuclear weapons are acquired paramount. What does the nuclear deal between Iran and the permanent members of the United Nations Security Council mean for Iran's nuclear weapons program? If the results of this analysis are correct, then Iran should be more willing than ever to halt its nuclear weapons programs for several reasons. Firstly, the United States

and the European Union have lifted severe economic sanctions from Iran after the IAEA concluded that Iran is keeping its commitments to the deal. This is particularly important because it allows Iran to export its oil again, meaning that it not only benefits its domestic audience but also has a stronger inclusion in the international community. Positive inducements work particularly well in states like Iran, and President Rouhani's comments on Twitter outline this effect, where he noted that the nuclear agreement was a step towards Iranian interaction with the world, "there is no doubt that cooperation and interaction will benefit all," (April 3, 2015). What remains to be seen is whether or not the nuclear deal extends further ties between Iran and the international community or whether Iran will secretly continue its nuclear development program as it has done for the past three decades. If further ties are extended, then it will bolster the strength of the positive inducements offered to Iran and thus bolster the likelihood of reversing its weapons programs.

The contributions of this project show what factors contribute to a leader's decision to begin a nuclear weapons program, what factors make a leader more likely to succeed in acquiring nuclear weapons, and what strategies are most effective for reversing nuclear ambitions. There are several future avenues for research.

Firstly, an interesting point to consider is what actually happens to a leader's post-tenure fate when he or she begins a nuclear weapons program and then fails to acquire nuclear weapons and whether this fate is different for leaders of different regime types. Here, leader-level factors such as personality type and past experiences will be incredibly important to consider. Secondly, in keeping with the case study comparison of the last empirical chapter, a next step is to extend this comparison to several more pairs of states

to see how the findings translate across case-pairs. Further, I will explore how the findings translate to other weapons of mass destruction and what this means for changes in the strategic environment of states. Also important to consider is how the process of nuclear development affects regime stability. This dissertation has been largely concerned with how domestic institutions affect the development process, but it is plausible to consider that the relationship may work in both directions. For instance, how does the length of time between beginning a nuclear weapons program and acquiring nuclear weapons affect regime stability? A final point to consider is how the strategic environment changes for nonstate actors, something that has been beyond the scope of this analysis. Extremist groups such as ISIS have repeatedly made claims for their desire to acquire nuclear weapons to further their organization's aims. Though they do not have the same capacity as a state to begin nuclear weapons programs, they also do not have the same restraints and thus deterrence as it has previously been conceived may not hold the same credible threat for preventing the use of nuclear weapons if acquired. These future avenues for research provide a rich and diverse beginning for my scholarly career.

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APPENDIX A: AUXILARY MODELS FOR CHAPTER SIX

Model Testing Shows that the Directionality of the Hypotheses Remains Robust to Various Model Specifications

Table A.1: How Audiences Influence the Nuclear Process:
Using Polity Instead of W/S as a Measure of Audience Size

	Homogeneity Coefficients (Robust SEs)	**Internal Conflict** Coefficients (Robust SEs)
Polity	-0.274** (0.086)	-0.082* (0.039)
Ethnic Fractionalization	1.842 (1.041)	-
Polity * Ethnic Fractionalization	0.510*** (0.146)	-
Internal Conflict	-	0.768 (0.464)
Polity * Internal Conflict	-	0.192** (0.060)
Major Power Status	4.359*** (1.043)	3.335*** (0.806)
Enduring Rivalry	1.803** (0.519)	1.342* (0.550)
Alliance w/ Nukes	-0.188 (0.632)	-0.286 (0.605)
NPT Signatory	-0.367 (0.497)	-0.230 (0.466)
GDP Per Capita	0.000 (0.000)*	0.000 (0.000)
Population Size	-6.52e-07 9.94e-07	1.30e-06 (1.16e-06)
ENR Facility	3.950*** (0.440)	3.962*** (0.448)
Stage1: Active Program (cutpoint 1)	5.946 (0.932)	4.775 (0.510)
Stage 2: Acquire Nukes (cutpoint 2)	7.919 (0.925)	6.540 (0.559)
N	7464	8022
Wald Chi^2	156.720***	160.990***
Pseudo R^2	0.592	0.556

*p<.05 **p<.01 ***p<.001

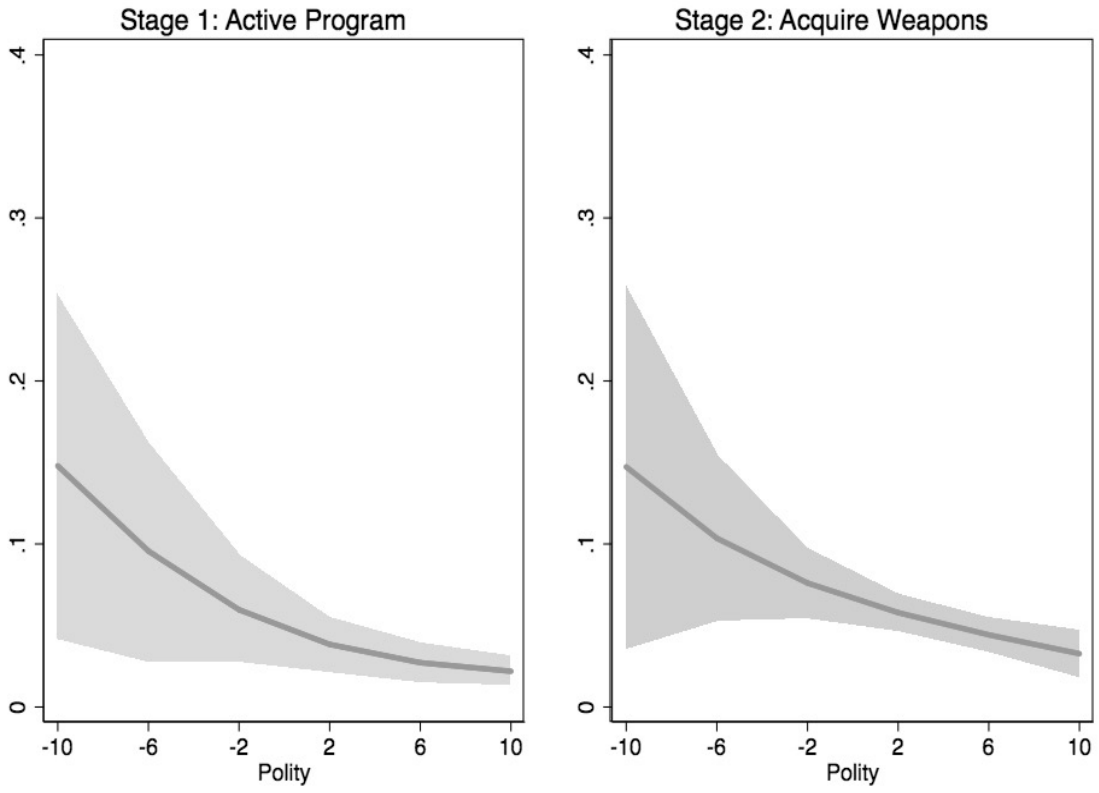

Figure A.1: Influence of Audience Homogeneity on Nuclear Development Process: *Using Polity Instead of W/S as a Measure of Audience Size*

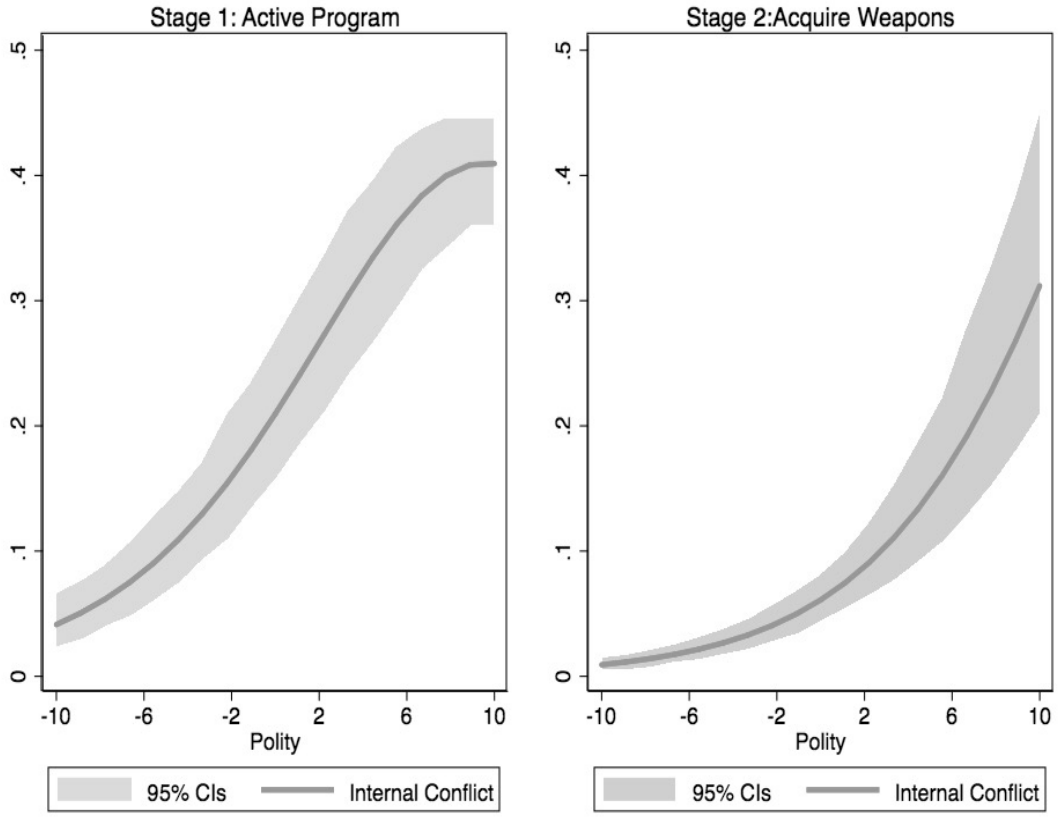

Figure A.2: Influence of Internal Conflict on Nuclear Process:
Using Polity Instead of W/S as a Measure of Audience Size

Table A.2: Influence of Regime Type on Nuclear Process:
Using Regime Dummies for Nondemocratic Regimes, holding Democracy as the Baseline Category

	Coefficients (Robust SEs)
Civilian Dictator	0.284 (0.556)
Personal Dictator	1.036 (0.692)
Military Dictator	0.078 (0.741)
Major Power Status	2.414*** (0.656)
Enduring Rivalry	1.630** (0.556)
Alliance w/ Nukes	-0.730 (0.457)
NPT Signatory	-0.839* (0.420)
GDP Per Capita	0.000 (0.000)
ENR Facility	3.752*** (0.498)
Stage1: Active Program (cutpoint 1)	4.200 (0.497)
Stage 2: Acquire Nukes (cutpoint 2)	5.909 (0.607)
N	7200
Wald Chi^2	123.710***
Pseudo R^2	0.514

*p<.05 **p<.01 ***p<.001

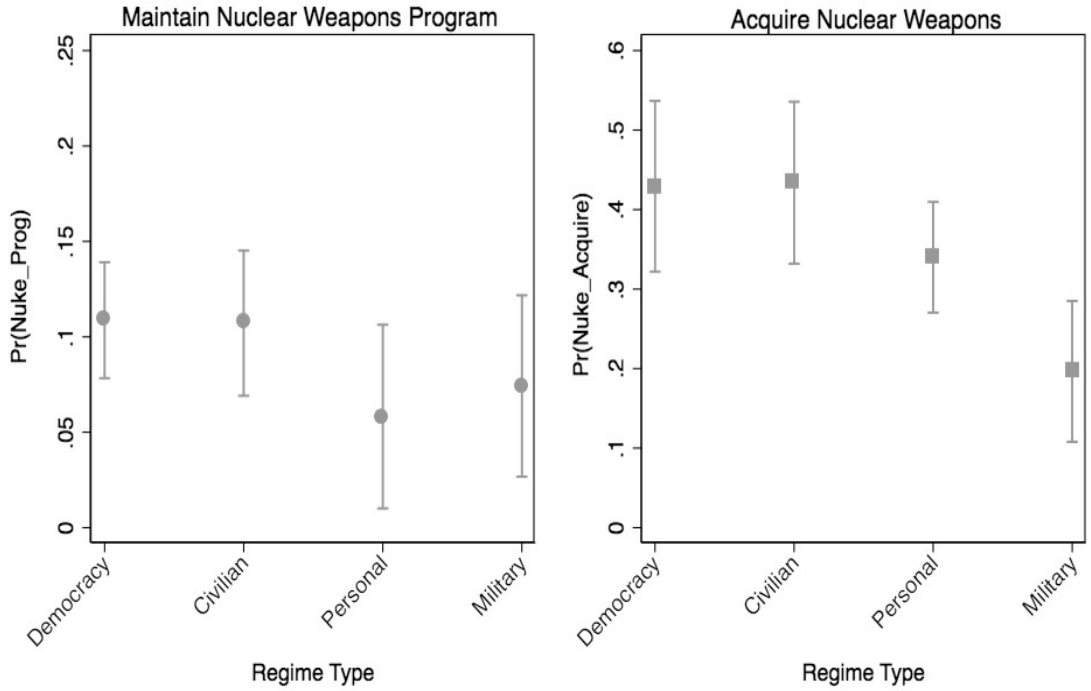

Figure A.3: Influence of Regime Type on Nuclear Process:
Using Regime Dummies for Nondemocratic Regimes, holding Democracy as the Baseline Category

Table A. 3: Influence of Domestic Audience on the Nuclear Process
Using 4 Stages Instead of 3:
(0 = 'No Program', 1 = Begin Program, 2 = 'Active Program', 3 = Acquire Weapons)

	Homogeneity Coefficients (Robust SEs)	**Internal Conflict** Coefficients (Robust SEs)
W/S	-5.407** (1.938)	-2.258* (1.029)
Ethnic Fractionalization	-5.930** (1.778)	-
W/S * Ethnic Fractionalization	10.632** (3.092)	-
Internal Conflict	-	-2.626* (1.304)
W/S * Internal Conflict	-	5.197** (1.922)
Major Power Status	1.581 (1.418)	0.877 (0.679)
Enduring Rivalry	1.674** (0.553)	1.322* (0.551)
Alliance w/ Nukes	0.074 (0.593)	-0.078 (0.552)
NPT Signatory	0.461 (0.478)	0.534 (0.502)
GDP Per Capita	-0.000 (0.000)	-0.000 (0.000)
Population Size	2.27e-06 (1.51e-06)	3.78e-06*** 9.64e-07
ENR Facility	3.658*** (0.560)	4.030*** (0.563)
Stage1: Begin Program (cutpoint 1)	1.989 (1.035)	3.649 (0.597)
Stage 2: Active Program (cutpoint 2)	2.091 (1.035)	3.753 (0.600)
Stage 3: Acquire Nukes (cutpoint 3)	6.706 (0.930)	8.182 (0.657)
N	5963	6864
Wald Chi^2	234.27***	205.310***
Pseudo R^2	0.382	0.377

*p<.05 **p<.01 ***p<.001

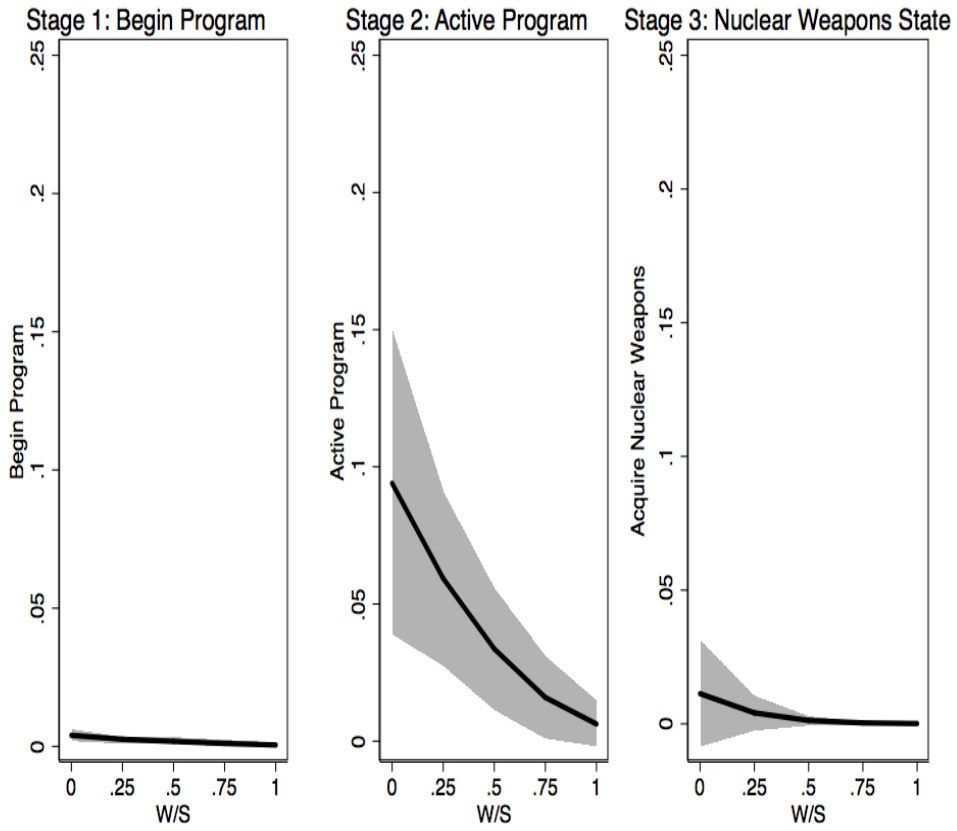

Figure A.4: Audience Homogeneity

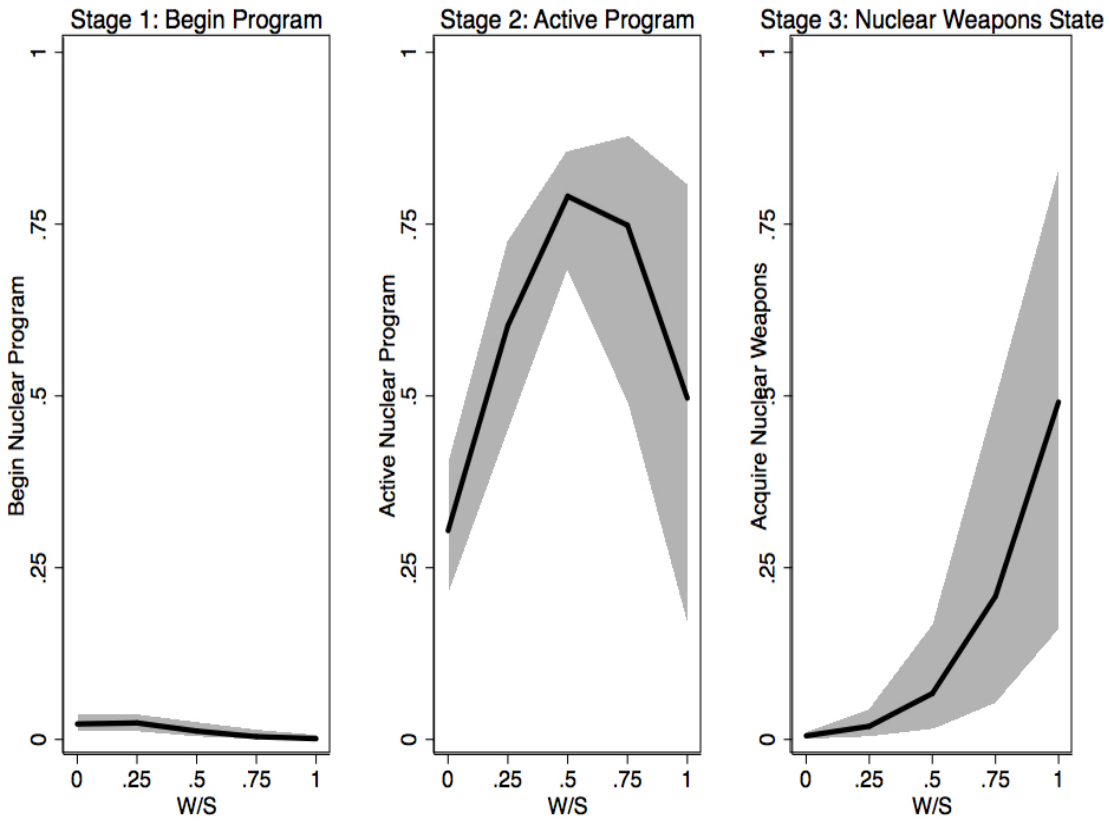

Figure A. 5: Internal Conflict

Table A1.4: Summary Statistics for Key Variables

	# Obs.	Mean (SD)	Min Value	Max Value
W/S	8076	0.610 (0.297)	0	1.303
Internal Conflict	10357	0.135 (0.342)	0	1
Ethnic Fractionalization	8600	0.463 (0.265)	0.002	1
W/S * Internal Conflict	7552	0.072 (0.208)	0	1.001
W/S * Ethnic Fractional	6486	0.241 (0.192)	0	1.001
Major Power Status	10357	0.040 (0.197)	0	1
Enduring Rivalry	10432	0.214 (0.410)	0	1
Alliance with Nukes	10432	0.611 (0.488)	0	1
NPT Signatory	10357	0.606 (0.489)	0	1
ENR Plant	10357	0.098 (0.298)	0	1
GDP Per Capita	9381	4805.718 (7232.932)	5.426	112560.200
Population Size	10404	16905.240 (90815.380)	0.01	1331400.000

APPENDIX B: AUXILARY MODELS FOR CHAPTER SEVEN

Table B.1: Democracy Regime Dummy for Inducements Models

	Positive Inducements		**Negative Inducements**	
	Coefficients	**Robust SE's**	**Coefficients**	**Robust SE's**
PI	1.123***	.285	-	-
NI	-	-	1.043	.618
Democracy	.559	1.198	.837	1.013
PI * Democracy	-.239	.238	-	-
NI * Democracy	-	-	-.306	.915
NPT	.715	1.262	.578	1.021
Per Capita GDP	-.000	.000	.000	.000
Population	-.000*	.000	-.000	.000
ENR	.242	.539	2.128**	.743
Audience Size	-.422	1.438	-.602	1.014
t	.133	.135	.116	.215
t^2	-.047	.004	-.006	.007
t^3	.000*	.000	.000	.000
constant	-5.322***	1.364	-4.206***	.799

*p<.05 **p<.01 ***p<.00

Table B.2: Summary Statistics for Key Variables

Variable	*N*	Mean	Min	Max
Reversal	14937	0.001	0	1
Positive Inducement	15252	0.372	0	5
Negative Inducement	15252	0.023	0	5
Regime	7974	0.937	0	3
Positive Inducement * Regime	7973	0.361	0	15
Negative Inducement * Regime	7973	0.057	0	15
W/S	8076	0.610	0	1.303
Population	10404	16905.240	0.01	1331400.000
Per Capita GDP	9381	4805.718	5.426	112560.200
ENR Facility	10357	0.098	0	1
NPT Signatory	10357	0.606	0	1
Nuclear Program	10357	0.075	0	1
Alliance w/ Nukes	10432	0.611	0	1
Enduring Rivalry	10432	0.214	0	1