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Understanding The Behavior Of States As Their Nuclear Status Changes

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ABBREVIATION LIST

2SLS: Two-Stage Least Square

AEB: South African Atomic Energy Board

ASEAN: Association of Southeast Asian Nations

CEA: Atomic Energy Commission or Commissariat a l'Energie Atomique

CINC: Composite Index National Capabilities

COW: Correlates of War

DMZ: Korean Demilitarized Military Zone

DPRK: Democratic People's Republic of Korea

GLM: Generalized Linear Model

IAEA: International Atomic Energy Agency

IGO: Intergovernmental Organization

JSA: Joint Security Agreement

MID: Militarized Interstate Dispute

NATO: North Atlantic Treaty Organization

NLL: Northern Limit Line

NPT: Non-Proliferation Treaty

NWDP: Nuclear Weapons Development Program

OPEC: Organization of the Petroleum Exporting Countries

OSCE: Organization for Security and Co-Operation in Europe

S-Score: Similarity Score

CHAPTER 1: Nuclear Weapons Literature Review

1.1 Introduction

Can a state's nuclear status influence its behavior in dyadic relationships? The dissertation evaluates the implications of nuclear status on state behavior (hostility and cooperation) in dyadic relationships. The study examines the role played by nuclear weapons development programs on state behavior[1] and tests whether proliferation changes the level of hostility and cooperation in a dyadic relationship. This argument is based on whether the proliferating state is experiencing a security problem and has a guaranteed security commitment from a nuclear patron. The basic argument is straightforward: nuclear status interacting with security problems and security commitments (military alliance partnerships) will determine state behavior. In addition, the study will also control for alternative explanations to state behavior.

According to Gartzke and Jo (2009) nuclear proliferation occurs in two stages. First, the establishment of nuclear weapons program, and second, the possession of nuclear weapons. For example, the USSR/Russia was in the first stage during 1943-1948 and moved to the second stage in 1949. It should be noted that not all states make it to the second stage of nuclear proliferation, for example, Iraq and Libya, failed to possess nuclear weapons, and were only in the development stage, 1982-2003 and 1970-2003, respectively. The study will focus only on the first stage of nuclear proliferation, where states are

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[1] This includes states that were successful and not successful in acquiring nuclear weapons. Once states tested their first nuclear weapon they were dropped from the sample, for example, France was included in the sample up until 1959, and was dropped afterwards since it had possessed a nuclear bomb in 1960. In February 1960, Operation Gerboise Bleue was France's first nuclear bomb test in the Algerian Sahara desert.

attempting to acquire nuclear weapons.

One issue that is generally missing from the literature is the examination of the behavior of states with nuclear weapons development programs. Thus, this dissertation attempts to improve on previous scholarship about nuclear weapons in two ways. First, I intend to establish a causal mechanism between nuclear weapons development programs and state behavior in order to examine how changing nuclear status influences state behavior in terms of hostility and cooperation in dyadic relationships. Second, the literature has almost exclusively focused on symmetric nuclear dyads and the United States-Soviet Union/Russia dyad, and so the dissertation will break from this pattern and examine both symmetric and asymmetric nuclear dyads. This gap in the literature is critical in the post-Cold War era because major crises are no longer between two nuclear superpowers but between nuclear states and non-nuclear states.

There are two basic components to this dissertation. The first part, represented by chapters 1 and 2, contains the bulk of the dissertation's literature review and theoretical discussion, respectively. The second part of the dissertation, represented by chapters 3 through 6, subjects my theoretical argument to empirical tests. The remainder of this chapter will examine two issues. First, I discuss the major operationalization terms utilized in the following chapters of the dissertation. Second, I discuss the literature on nuclear weapons with respect to deterrence, militarized disputes, and conventional wars.

1.2 Operationalization of Key Terms

This section will discuss the dissertation's operationalization of nuclear weapons development programs applied in the study.

Nuclear Weapons Development Program:

In order to distinguish between nuclear program for peaceful means and program for weapons development, the following distinctions are applied. First, when a state has a research program or has nuclear material and a research program, but only to use it for research and energy production, than its program is acknowledged to be for peaceful means. To further distinguish between peaceful means and weapons development, another criterion was applied. When a state has a nuclear reactor but only has low enriched uranium at about 3-5% of U-235, then its programs is presumed to be suited for peaceful means (Ware, 2013). The Giafenrheinfield nuclear power plant in Germany is a clear example of this classification. Second, when a state makes it clear that it intends to join the nuclear club and has made efforts to acquire nuclear weapons (nuclear material and research program), than its program is determined to be used for weapons development. In that instance, when a state moves to have highly enriched uranium beyond the 5% level and up to the 90% level or more, then this is a clear example of having a program for the purpose of developing weapons (Ware, 2013).

An example, 1942 was selected as the start year for the United States nuclear weapons development program because on January 19, 1942, President Roosevelt had authorized the National Defense Research Committee to develop nuclear weapons (Nichols, 1987). Second, the USSR/Russia's nuclear weapons development program start year was 1943

because in February 1943 the State Defense Committee authorized the establishment of a nuclear program (Holloway, 1994). Khariton and Smirnov (1993) stated that "the Soviet Union did not keep an historical record of the Soviet atomic project" (p. 20); however, a letter by Soviet physicist Igor V. Kruchatov, who was the scientific director of the Soviet nuclear project, indicated that the Soviet nuclear weapons program had been initiated in late 1942-early 1943 (Moscow: Russian Scientific Center, 1993). Igor V. Kruchatov's letter to Lavrenti Beria, chief of the secret police, stated the following:

> "In our letters to you, Comrade M.G. Pervukhin [Deputy Chairman of the Council of People's Commissars and a key atomic administrator] and I reported on the status of work on the uranium problem and of the colossal development of this work abroad. ...around this issue there has been created abroad a concentration of scientific and engineering-technical power on a scale never been seen in the history of world science, and which has already achieved the most priceless results. In our country, despite major improvement in work on uranium in 1943-44, the situation remains completely unsatisfactory..." (Wilson Digital Archive International History Declassified, 1993).

In addition, the start year for the United Kingdom's nuclear weapons development program is 1941 because in September 1941, Prime Minister Churchill decided to move with the establishment of a nuclear program and later the *Directorate of Tube alloys* project was begun (Goldschmidt, 1990). France's nuclear weapons development program start year was 1954 because Prime Minister Mendes-France had given authorization to initiate the program (Sublette, 1999). Moreover, China's start year for its nuclear weapons program was 1956 a on January 15, 1956, Chairman Moa Zedong gave authorization for the initiation of the country's nuclear weapons program known as '02' project (Lewis and Litai, 1988).

In the case of Israel, its nuclear weapons start year is 1955. Many have debated about Israel's nuclear program, particularly since Israel has yet to confirm its program and

eventual weapons acquisition; rather Israel's nuclear program had operated in secret. In that light many have argued that Israel's nuclear weapons program either started in 1955, 1958, or 1979; for the purpose of this study I follow the same logic applied by Gartzke and Jo (2006) in selecting 1955 because the Research and Planning Division began to recruit scientists and engineers for a "most secret national project" (Cohen 1998, p. 43). Next, India, which offers an interesting case since it started its nuclear program twice: in 1964 and 1972. India's first start year for its nuclear program was 1964 because that year Prime Minister Shastri had given authorization for the Subterranean Nuclear Explosive Project, but in 1966 India's nuclear program was restored for peaceful purpose upon his death by Prime Minister Gandhi (Perkovich, 1999). So India's first nuclear weapons development program was from 1964-1965. However, in 1972, Prime Minister Indira Gandhi's nuclear policy changed from peaceful means to weapons development, and that year India's nuclear program was restarted due to political pressures and geopolitical issue with China and Pakistan.

Another interesting state with a nuclear weapons development program was South Africa, where in 1961 it became the first African country to have a nuclear weapons development program, and in 1993 it was the first state to have nuclear reversal. The South African Atomic Energy Board began its nuclear research in 1955, where the early years of research were mainly focused on peaceful use of nuclear technology (Stumpf, 1995/1996). However, a shift occurred when South Africa moved from peaceful use of nuclear technology to military use in the mid-1970s. South Africa's nuclear doctrine was based on the fear of invasion from the Soviet Union in the 1960s and second as a means to garner US military support, notwithstanding its apartheid system (CIA Report, 1984). Since

establishing its first nuclear reactor in 1965, South Africa had claimed that its nuclear program was for peaceful purpose; however, in 1977 it became apparent that it was used to develop nuclear weapons for the purpose of deterrence (Stumpf, p. 4). Based on these circumstances, South Africa's start year is 1964 and its end year is 1978.

In addition, Pakistan's start year is 1972 because that year Prime Minister Bhutto supported several nuclear scientists in developing nuclear weapons and recruited several additional nuclear scientists (Wiessman and Krosney, 1981).

South Korea's start year is 1971 because the Weapons Exploitation Committee was instructed by President Park to find ways to develop nuclear weapons, and more importantly, South Korea came into an agreement with France a year later to build nuclear reprocessing center (Spector, 1984). In 1972, the United States and South Korea signed the ROK-US Atomic Energy Agreement, where South Korea purchased a nuclear reactor from the United States for the purpose of nuclear energy production (Sheen, 2011). However, in 1974, it became clear to the United States that South Korea aimed at developing nuclear weapons, and so the United States began pressuring the Park government to give up on its nuclear ambition (Wilson Center Digital Archive - South Korean Nuclear History). The United States did not approve of South Korea's nuclear development program for two reasons: first, South Korea's nuclear weapons program might initiate a nuclear arms race in the region, and second, a nuclear armed South Korea will change the power balance in the United States-South Korea alliance partnership. Despite pressure from the United States to end its program, South Korea continued with its program, as evident with the National Security Council repost about the potential sale of a Canadian CANDU nuclear reactor to South Korea in 1974 (NSC Report, November 18, 1974)

Iran, like India, had 2 start years for its nuclear weapons development program, the first in 1974, and the second, in 1984. Like South Africa, Iran had initially sought nuclear research and technology for peaceful purpose, such as nuclear energy. In the 1970s, Shah Mohamed Reza Pahlavi signed several agreements with West Germany, France (supported the spread of nuclear technology), and the United States to purchase and build nuclear reactors strictly for the purpose of producing energy.[2] The US-Iran treaty "...agreement closely restricted Iran's ability to produce plutonium or any other nuclear weapons fuel using US supplied material without Washington's agreement" (Burr, 2009). Despite signing this agreement and becoming party to the NPT, the Shah's nuclear policy in 1974 shifted towards developing weapons.

The 1979 Iranian Revolution, which ousted the Shah from power and established the Islamic Republic of Iran, had greatly curtailed Iran's nuclear relationship with Western powers, particularly the United States. The 1979 Revolution and subsequently the Iran-Iraq war slowed down Iran's nuclear program. Following the revolution, the international community was uncertain about Iran's nuclear program, however evidence showed that Ayatollah Khomeini had revived the country's nuclear program for the purpose of establishing nuclear weapons in 1984, after years of opposing nuclear technology (Cordesman and Al-Rodham, 2006: p. 24).[3] Iran's nuclear doctrine to proliferate, like many of its nuclear counterparts, is driven by its security dilemma from the past (1980s, to deter Iraqi aggression) and present (Israel and the United States conventional and nuclear

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[2] Iran has signed the Safeguard Agreement with the IAEA in 1974, but has been deemed by the IAEA to be non-compliant of the agreement as it pushes forward with its nuclear technology for the purpose of military use, not peaceful use.

[3] Ayatollah Khomeini's opposition was evident in his closure of the Bushehr nuclear reactors.

superiority). In addition, Iran's nuclear proliferation is driven by its goal to have greater regional and global clout in international politics. Moving forward with its nuclear aspiration, Iran signed two cooperation agreements with Pakistan in 1987 and China in 1990 (Cirincione, Wolfsthal and Rajkumar, 2005). In the 1990s, Russia had agreed to help Iran build the Busher nuclear power plant and assist in other nuclear technology, and on the other hand, Argentina had agreed to sell Iran enriched uranium and heavy water production facilities. However, due to suspicion that Iran was using its nuclear technology for military purpose and pressures from the United States, China and Argentina suspended their support to Iran. Despite IAEA investigations, sanctions and political pressures from the international community, Iran continues to pursue its nuclear weapons program for the purpose of military use as well as continues to deny. Chapter 6 will provided a detailed discussion of Iran's nuclear weapons development program.

The next nuclear candidate state from the Middle East was Iraq, from its start year for nuclear weapons development in 1982. In 1972, Iraq agreed with to start negotiations to buy nuclear reactors from France; despite this, Iraq's nuclear program was still at the research stage, and did not advance until 1982 (Hamza, 2000).

Two states from South America are represented in the list of states which have had nuclear weapons development programs; they are Argentina and Brazil. Argentina's start year for its program was 1978 because Argentina's military junta developed plans to build the Atucha II nuclear power plant for the purpose of weapons production. Later, it was revealed that the military regime began to build reprocessing facilities (Reiss, 1995). Argentina's nuclear program only lasted 11 years and later was dismantled in 1990 after Argentina and Brazil signed the Joint Declaration of Common Nuclear Policy. Second, like

Argentina, Brazil's start year for its program was 1978 because in 1975 Brazil signed a nuclear accord with Germany to expand its nuclear facilities. In addition, Brazil had established secret 'parallel programs' for the purpose of developing nuclear weapons, which were not known by International Atomic Energy Agency [IAEA, hereafter] (Reiss, 1995). Like Argentina, Brazil also dismantled its nuclear program after signing the agreement with Argentina.

In the case of Libya, 1970 was selected as start year for the program because Qadhafi had taken power on September 1st 1969, and since taking power he had asserted the country's determination to acquire nuclear weapons (Arms Control Association, 2013). Despite ratifying the NPT agreement 1975 (signed in 1968 by the previous regime), Qadhafi's actions illustrated his determination to develop a nuclear program. For example, throughout the 1970s and 1980s, Libya purchased lightly processed uranium and nuclear reactors from the Soviet Union (Arms Control Association, 2013).

Like Israel, North Korea's start year for its nuclear program is debatable between 1980 and 1982. In 1982, South Koran intelligence discovered the construction of nuclear reactors in the Yongbyun (Central Intelligence Agency, 9 July 1982). Since North Korea has been attempting to establish its nuclear research program in the 1950s and 1960s with the assistance of the Soviet Union and later China, the study assumes that its nuclear program had occurred earlier and thus selected the earlier year of 1980. Chapter 5 will provided a detailed discussion of North Korea's nuclear weapons development program.

For all states the end year for nuclear weapons development program is when they possessed a nuclear weapon and have tested their first bomb or abandoned its program. It should be noted that states continue to have a program after this date, but it is hypothesized

that their behavior changes once they join the nuclear club. For this reason, states were dropped out of the study once they possessed nuclear weapons, since the study exclusively focuses on the behavior of states in the first stage of nuclear proliferation.[4] Table 1.1 presents a complete list of the start and end date for the states of interest with nuclear weapons development programs.

Table 1.1: Nuclear Weapons Development Program States

State	*Nuclear Program Years*	
United States	1942-1944	-Dropped from sample once nuclear test is conducted
USSR/Russia	1943-1948	-Dropped from sample once nuclear test is conducted
United Kingdom	1941-1951	-Dropped from sample once nuclear test is conducted
France	1954-1959	-Dropped from sample once nuclear test is conducted
China	1956-1963	-Dropped from sample once nuclear test is conducted
Israel	1955-1972	-Dropped from sample once nuclear test is conducted
India	1964-1966 1972-1974	-Abandoned program and 1967 - 1971 - Dropped from sample once nuclear test is conducted in 1974
South Africa	1961-1978	- Dropped from sample once nuclear test is conducted
Pakistan	1972-1989	- Dropped from sample once nuclear test is conducted
North Korea	1980-2005	- Dropped from sample once nuclear test is conducted
Libya	1970-2003	- Abandoned program
South Korea	1970-1978	- Abandoned program
Argentina	1978-1990	- Abandoned program

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[4] The temporal scope for the study is 1930-2002, chapter 3 will discuss the logic behind this selection in more detail.

Brazil	1978-1990	- Abandoned program
Iraq	1982-2002	- Abandoned program
Iran	1974-1978 1985-2015	- Abandoned program in 1978 - Program restarted in 1985

Source: Jo and Gartzke (2006)
a. The list for the states with nuclear weapons development program is similar to the one used by Jo and Gartzke (2006)
b. The nuclear weapons programs of Germany (1941-1945) and Japan (1943-1945) were not included in the sample. Both cases were excluded in order to avoid a bias in the empirical findings as a result of their engagement in World War II.
c. Israel, India, and North Korea developed nuclear weapons outside of the Nuclear Non-Proliferation Treaty.
d. The following states signed the Nuclear Non-Proliferation Treaty: United States (1968), USSR/Russia (1968), United Kingdom (1968),France (1992), China (1992), South Africa (1991), North Korea (1985, withdrew in 2003), Libya (1968), South Korea (1975), Argentina (1995), Brazil (1998), Iraq (1968), and Iran (1968). India, Israel, and Pakistan have never signed the NPT (UNODA - Treaty on the Non-Proliferation of Nuclear Weapons).

1.3 Nuclear Weapons Literature

Since 1945, the destructive power of nuclear weapons has transformed the international environment, and particularly the features of disputes and armed conflicts between states. Much has been written about the implications of nuclear weapons for international security and the effect nuclear proliferation has had on militarized disputes and conventional war (Betts, 1987; Narang, 2013; Gartzke, 2010; Geller, 1990; Jervis, 1989; Mueller, 1989; Paul, 2000; Sagan & Waltz, 1995). Largely, the literature on nuclear proliferation has attempted to explain how nuclear weapons have some bearing on coercive diplomacy[5] (Schelling, 1966; Powell, 1989 and 1990; Snyder & Diesing, 1977; Jervis,

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[5] In coercive diplomacy, states use military threats and non-military threats to achieve a certain goal. George notes that "[t]he general idea of coercive diplomacy is to back one's demand on an adversary with a threat of punishment for noncompliance that he will

1989; Beardsley & Asal, 2009), militarized interstate disputes (Geller, 1990; Gartzke & Jo, 2009; Horowitz, 2009), and finally conventional wars (Asal & Beardsley, 2009; Rauchhaus, 2003).

Deterrence and Coercive Diplomacy

A great deal of the literature on deterrence attempts to explain the utility of nuclear weapons in coercive diplomacy.[6] The Cuban Missile Crisis presents a clear example of how nuclear weapons can be a useful tool for coercive diplomacy. Snyder (1961) argues that "one deters another party from doing something by the implicit or explicit threat of a cost, punishment if the act is not performed" (p. 9). Classical deterrence theorists have argued that nuclear weapons increase the cost of conflict for states if nuclear weapons were to be introduced, thus preventing both conventional and nuclear attacks (Kahn, 1965; Schelling, 1960; Snyder, 1961).[7] George and Smoke (1974) write that deterrence "[i]n its most general form, is simply the persuasion of one's opponent that the costs and/or risk of a given course of action he might take outweigh its benefits" (p. 11). Proponents of classical deterrence

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consider credible and potent enough to persuade him to comply with the demand" (1991, p. 4).

[6] It should be noted that deterrence literature developed in the post-WWII era as a consequence of the nuclear world. Jervis (1979) saw deterrence theory as "the most influential school of thought in the American study of international relations" (p. 289). The notion of deterrence existed long before the development of nuclear weapons; however, deterrence vernacular was not used directly in international relations literature. Dougherty and Pfaltzgraff (1996), for example, argued that the notion of deterrence was evident in the writing of early realists, such as Thucydides and Machiavelli, and also in the balance of power theory. Most significantly, the basic assumptions of deterrence theory can be traced to realist political thought and balance of power politics; for example, deterrence theory assumes that states are rational actors that base their decisions on cost-benefit calculations (Khan, 2009).

[7] On classical deterrence theories, see Schelling, 1960 and 1966, Snyder, 1961; on prefect deterrence, see Zagare, 2004; and on extended deterrence see Huth, 1990, Huth and Russett, 1988, and Geller, 1990.

have argued that stability in the post-war era can be attributed to the existence of the bipolar system and nuclear deterrence.[8] Essentially, the destructive force of nuclear weapons generally increases the cost of conflict, and so Schelling (1966) argues that nuclear weapons act to convince conflicting states to back down in confrontations because of the potential that the conflict might escalate to the nuclear level. Deterrence theories advance the idea that nuclear states are able to deter the aggressive action of adversaries only when a nuclear state can present a credible nuclear threat and an intention to retaliate. In order for a threat to be credible, two conditions must exist: the nuclear state must have the political will to threaten the use of nuclear weapons and a sufficient stockpile of nuclear weapons to mount a retaliatory threat. According to Huth (1999), "a threat is considered credible if the defender possesses the military capabilities to inflict substantial costs on an attacker in an armed conflict and if the attacker believes that the defender is resolved to use its available military force" (p. 29). It should be noted that opponents of deterrence theory have argued that the destructive nature of nuclear weapons and the development of second-strike capabilities have undermined the credibility of the threat posed by nuclear weapons (Muller, 1989; Jervis, 1984; Holsti, 1972; Morgan, 1983b). In order to deal with the credibility problem present in nuclear deterrence theory, Schelling (1966) argues that the idea of leaving something to chance solves the credibility problem when states make a nuclear threat. Schelling contends "a response that carries some risk of war can be plausible, even reasonable at a time when a final, ultimate decision to have a general war would be implausible or unreasonable" (p. 37-38). The central conclusion of deterrence theorists was that war in a nuclearized world is irrational for state actors to undertake

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[8] Stability refers to the absence of war between superpowers.

because of the overwhelming destructive force of nuclear weapons (Ellsberg, 1959; Kahn, 1962; Powell, 1989; Schelling, 1966).

Waltz (1990) argued that nuclear weapons add an uncertain element to conflicts, which means that conflicting states are not completely certain that a nuclear state will not introduce nuclear weapons in conventional war; this element of uncertainty deters states from attacking nuclear states. Several scholars have argued that not only can nuclear weapons deter nuclear attack, but that nuclear weapons can also deter conventional conflict from developing with a nuclear state (Bueno de Mesquita & Riker, 1982; Russett, 1989; Huth & Russett, 1993). From a different perspective, several scholars have argued that even if an explicit threat to use nuclear weapons has not been made, the mere possession of nuclear weapons can deter and influence the behavior of adversaries in a militarized dispute. Betts (1987), for example, illustrates that the move by the United States to place bombers on alert in Iraq in 1958, following a military coup, clearly influenced Soviet behavior in the region. Thus, nuclear deterrence was achieved without the United States making an explicit threat to use nuclear weapons.

Despite attempts to explain the coercive use of nuclear weapons through deterrence, several scholars insist that deterrence theory is plagued with several shortcomings that reduce the theory's explanatory power. For example, Muller (1988) argues that nuclear weapons are irrelevant and he further rejects the idea of credible nuclear threats proposed by deterrence theorists. Rather, Muller notes that the destructive nature of the weapons and the development of second-strike capabilities have limited the credible threat posed by nuclear weapons. On the other hand, many have questioned the assumption that decision makers for the state act rationally, which deterrence theory has relied upon extensively to

support its claims of the credible threat. Jervis (1984) questioned deterrence theory's reliance on rationality in decision-making and argued that this reliance overlooks other important factors such as the emotions and perceptions of decision makers. The Cuban missile crisis literature also questioned deterrence theory's reliance on rationally, where the literature showed that the effect of bureaucratic politics as well as loss of command and control can influence decision-makers (Allison, 1972 and 1969; Krasner, 1972; Bendor, 1992)

In a conflict situation, Jervis argued that decision makers rarely have complete information about an opponent's goals and resolve; therefore, they may misinterpret signals made by another actor (who assumes the message is clearly understood by the opponent). Additionally, Holsti (1972) argues that state actors may act irrationally; therefore, they may not be deterred from taking aggressive actions. Holsti writes that deterrence "is likely to prove ineffective against a nation led by a trigger-happy paranoid, or by someone seeking personal or national self-destruction or martyrdom, or by decision makers willing to play a form of international Russian roulette" (1971, p. 8-9).

Organski and Kugler (1980) have concluded that nuclear weapons have failed to deter the outbreak of militarized conflict between states. A handful of studies have questioned the value of nuclear weapons in conflict involving nuclear states and non-nuclear states (Geller, 1990; Huth, 1990; Huth & Russett, 1984; Organski & Kugler, 1980); for example, Geller concludes that in a military confrontation, nuclear weapons have no apparent deterrent effect on the behavior of non-nuclear states. Huth (1990) considered the relationship between nuclear status and conventional weapons capabilities. His study yielded two relevant conclusions: first, that nuclear deterrence has had the greatest impact

when a nuclear state was relatively weak in conventional weapons capabilities, and second, that nuclear deterrence mattered least when a nuclear state was relatively strong in conventional weapons capabilities.

An alternative understanding to nuclear deterrence theory is the tradition of non-use (Paul, 1995, 2009) and nuclear taboo theory (Tannenwald, 2005, 2007; Price & Tannenwald, 1996). Paul (1995) maintains that the tradition of non-use has significantly impacted the deterrent effect of nuclear weapons in terms of credible threat and the failure to deter the aggressive actions of non-nuclear states. In terms of taboo, Paul (2009) concludes that "the apparent boldness of non-nuclear states in initiating war against a nuclear adversary has been partially influenced by the tradition of non-use that all nuclear states have thus far observed" (p. 144). The tradition of non-use, put forward by Paul, diverges from the realist perspective that nuclear weapons have not been used since Hiroshima and Nagasaki because of nuclear deterrence, the bipolar Cold War system, as well as states acting in terms of security interests and *Realpolitik* concerns. Paul's explanation for the tradition of non-use is based on material and reputational factors. First, the material factor of the non-use tradition suggests that in the context of nuclear weapons, the costs of war increase since the effects of nuclear weapons are too difficult to control, the expectation of victory is eliminated, and finally that the destructive aftermath of the use of nuclear weapons is too severe for states to accept (p. 22-36). Second, the reputational factor suggests that nuclear states will be reluctant to use nuclear weapons because of possible damage to their reputation internationally and among their allies. The reputational factor is especially notable when nuclear action is threatened against a non-nuclear state.

The Korean War, according to Paul (2009), was the initial instance of the non-use tradition.[9] The United States refrained from using nuclear weapons in the crisis because of international and domestic public opinion, especially after Hiroshima and Nagasaki. Paul (1995, 2009) argued that political elites in America, most notably the Secretary of State Dean Acheson, feared that an American nuclear attack would harm the US's international reputation and negatively affect its relationships with its allies (p. 45-57).[10] Given this, Paul (2009) argued that a causal linkage exists between material factors, reputational factors, and self-deterrence.

Moreover, when self-deterrence prevails over the years, it becomes a tradition among nuclear states; as a result of this tradition, non-nuclear states will come to understand the tradition and they themselves will not be deterred from taking aggressive actions against a nuclear state. This is clearly illustrated in the Afghan War (1979-1989), the Falklands War (1982), and the Gulf War (1990-1991), to name a few cases. Interestingly, Paul (2009) comments that new nuclear states are still in the process of understanding the tradition of non-use. For example, Pakistan's nuclear weapons were developed for a specific reason, as a response to India's conventional weapons superiority and nuclear status. Since acquiring nuclear weapons, Pakistan has been challenging the tradition of non-use of nuclear weapons indirectly by not taking all possible measures to ensure that the weapons

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[9] Refer to T.V. Paul (2009) *The Tradition of non-use of Nuclear Weapons since 1945* for a complete overview of the development of the tradition of non-use among nuclear states.
[10] It is important to note that the use of nuclear weapons was rejected for two other reasons: (1) the United States lacked the nuclear capability to attack large targets sufficiently; (2) the military opposed using nuclear weapons in Korea because it would contribute to the depreciation of the weapon, especially when faced with a much stronger enemy, and so the military preferred to keep the war a conventional one. (Paul 2009, p. 45-57).

are not used accidentally or without authorization.[11] Arguably, this concern noted by Paul is similar to Sagan's concern that the military organizations of new nuclear states may be a problem for international security. Additionally, Paul argues that Pakistani elites view nuclear weapons as having a single function, which is to gain territory in Kashmir from India through limited conventional wars, backed up by the threat of nuclear war in Pakistan (2009, p. 137-141). In general, Pakistan is still in the early stages of nuclear learning and incorporation of the tradition of non-use of nuclear weapons.

Alternatively, constructivist explanations (most notably Tannenwald) attribute the non-use of nuclear weapons to nuclear taboo theory. Tannenwald contends that, "the nuclear taboo refers to a powerful prohibition against the [first] use of nuclear weapons. The taboo is not the behavior (of non-use) itself but rather the normative belief about the behavior" (2007, p. 10); the nuclear taboo "is associated with widespread popular revulsion against nuclear weapons and widely held inhibitions on their use" (Tannenwald, 1999, p. 435).[12] Price and Tannenwald (1996) reject claims about material and reputational factors made by Paul (1995) as well as deterrence and cost-benefit calculations made by realist theorists (Schelling, 1960; Waltz, 1995). Rather, Tannenwald and other proponents of nuclear taboo theory contend that the taboo originated from societal pressures to respect laws of war and human rights, especially following the aftermath of Hiroshima and Nagasaki, as well as political costs.

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[11] Frankly, Paul is not completely certain that Pakistan will break the tradition of non-use with India, since there is no concrete evidence of this fact, and only time will tell.

[12] In referring to norms this means "a criteria for right or of wrong, a prescription of a prohibition of a behavior for a given identity" (Tannenwald, 2005, p. 8). Tannenwald does not suggest that the taboo can explain all of the non-use of nuclear weapons in crisis situations, or that the taboo did not exist in 1945.

Militarized Interstate Disputes and Conventional Wars

Deterrence theory has dominated the literature on nuclear weapons in the Cold War era; however, in the post-Cold War era, attention has shifted from understanding deterrence to understanding militarized disputes, civil wars, and conventional war propensity. International relations literature has attempted to explain the implications of nuclear proliferation on militarized interstate disputes and crises. Several recent studies have explored whether nuclear weapons influenced the escalatory behavior of conflicting states in conventional wars or whether nuclear states are more aggressive in militarized disputes and their non-nuclear counterparts are more tractable. For instance, Gartzke and Jo (2009) examined whether nuclear proliferation improved a state's political leverage in conflict situations and the influence nuclear weapons have on dispute propensity. Interestingly, Gartzke and Jo conclude that nuclear proliferation has no bearing on war and peace in international relations, but in the area of diplomatic issues and bargaining, nuclear weapons have a significant impact (2009, p. 226). By studying proliferation patterns, Gartzke and Jo confirmed that states engaged in interstate crisis because of "security problems, greater interest in international affairs, or significant military capabilities" (p. 221), irrespective of nuclear status.

Other works have suggested that the possession of nuclear weapons has an important impact on the severity of violence in militarized disputes and crises between states, especially between nuclear states. For example, Asal and Beardsley (2007) examine the relationship between the possession of nuclear weapons and the severity of violence in a crisis and noted that the level of violence in a crisis was inversely related to nuclear weapon status (p. 152). Most significantly, Asal and Beardsley's study attempted to empirically test

Waltz's question: *do nuclear weapons increase or decrease the chance of war?* The empirical results showed that nuclear weapons have a restraining impact on state behavior when it comes to crisis situations; for example, crises involving nuclear states tend to end short of full-scale war (2007, p. 148-151). Asal and Beardsley agree with Waltz at least to the extent that nuclear weapons have a restraining effect on crisis situations; however, the empirical results of Asal and Beardsley only demonstrate a weak causal relationship between the number of nuclear states in a conflict and their crisis behavior. As a consequence, Waltz's claim that "more is better" was not fully supported by empirical results. When the number of nuclear states increases in a militarized dispute, this does not prevent the dispute from escalating into a full-scale war. For example, in militarized disputes such as the Suez Crisis in 1957, the Berlin Crisis in 1961, the October Yom Kipper War in 1973, the Iraq No-Fly Zone in 1992, and the Gulf War in 1990, only two ended without escalating into a full-scale war. Asal and Beardsley's results suggest that increasing the number of nuclear states in a crisis will likely have a destabilizing effect, which contradicts claims made by proponents of nuclear proliferation that nuclear weapons have a stabilizing effect. The conclusions made by Asal and Beardsley are consistent with several studies that indicate that nuclear states tend to be involved in more minor militarized disputes than full-scale conventional wars, as opposed to their non-nuclear counterparts. In a more recent study, Beardsley and Asal (2009) assessed the impact of nuclear weapons on the expected costs of conflict, and how such costs influence a state's behavior in a crisis situation. Beardsley and Asal arrived at several interesting conclusions. First, nuclear weapons provide leverage for nuclear states, especially in a militarized dispute with a non-nuclear state. In a conflict situation between nuclear states, for example, the challenger is

less likely to achieve concessionary gains and a nuclear defender is less likely to force a nuclear challenger to back down. In contrast, in a conflict situation between a nuclear state and a non-nuclear state, the outcomes are drastically different: a nuclear state is able to achieve significant concessionary gains and force a non-nuclear defender to back down. In this manner, Beardsley and Asal (2009) concluded that in asymmetric dyads, nuclear weapons have given nuclear states leverage in salient conflicts, thereby reducing the probability of escalation. Beardsley and Asal's conclusions about nuclear weapons in asymmetric dyads are inconsistent with those of Rauchhaus (2009) and Geller (1990), where the latter studies confirm that nuclear weapons increase the probability of escalation in a crisis. Nonetheless, Beardsley and Asal's empirical findings are consistent with Gartzke and Jo (2009), where they find that nuclear status gives states an advantage in the international arena, especially with the bargaining process and in crisis situations. This outcome offers a good explanation for why states choose to go nuclear, especially when a rival already possesses the weapons: India and Pakistan are clear examples of this. However, Beardsley and Asal's findings are again inconsistent with much of the past literature on nuclear weapons and militarized disputes, where several of these studies have confirmed that nuclear weapons offer no clear advantages in militarized disputes (George & Smoke, 1974; Huth & Russett, 1988; Huth, 1988; Huth, Bennett, & Gelpi, 1992; Organski & Kugler, 1980).

In a related study, Horowitz (2009) analyzes the effects of nuclear weapons on crises and whether the length of time a state has had nuclear weapons will influence its behavior in crisis situations. Horowitz raised this question: "Does the fact that new nuclear states lack experience in dealing with nuclear weapons influence the way they behave and

the way they are treated by potential adversaries?" (2009, p. 234). The study adds another dimension in the research on nuclear weapons by taking into account nuclear experience, and more specifically by looking at the separate behavior of old and new nuclear states.[13] Horowitz concludes that new nuclear states will be more likely to reciprocate disputes initiated by other states than their more experienced nuclear counterparts, and at the same time will also have their challenges reciprocated by other states (p. 250-251). Horowitz attributes the difference in crisis behavior between new and old nuclear states to nuclear learning; he argues that states over time learn that they cannot use the "nuclear card" in every militarized interaction—nuclear states with more experience learn to distinguish the merit of challenges by other states and take the appropriate action. Thus, new nuclear states tend to overuse the nuclear card in low-level militarized disputes, in turn reducing the credibility of nuclear deterrence and exposing the bluff of a nuclear threat. According to Horowitz, this increases the likelihood of escalation in militarized disputes where a new nuclear state is involved. Gartzke (2010) also finds that nuclear experience plays a critical role in international conflict by confirming that new nuclear states are more likely to be involved in militarized conflicts than older nuclear states. The findings by Gartzke support the ideas proposed by Horowitz that new nuclear states aggressively use the nuclear card, which leads to the escalation of militarized disputes. Gartzke notes that "as nuclear powers age, either they or their opponents learn to interact less conflictual, though this decay in dispute propensity itself declines with time" (2010, p. 18). In Beardsley and Asal (2009),

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[13] Horowitz notes that "through interactions over time, opponents learn what the new nuclear state is likely to do with its arsenal, and the new nuclear state learns how to most effectively leverage its capabilities. Interactions provide information that reduce uncertainty" (2009, p. 239).

Gartzke and Jo (2009), Horowitz (2009), and Rauchhaus (2009), it was confirmed that nuclear weapons have a significant impact on the intensity, duration, and timing of conflicts between states, and especially between nuclear states. Nuclear weapons, Rauchhaus and others have discovered, shifted crises from full-scale war to more low-level disputes among nuclear states. Recent empirical studies confirm that nuclear weapons to a certain extent replaced full-scale wars with low-level crises, and in doing so destabilized the international arena, as Waltz and other supporters of nuclear proliferation contend.

Another area of the literature has focused on the implications of nuclear weapons in the probability of conventional wars. A recent study by Rauchhaus (2009) explored whether the possession of nuclear weapons reduced the probability of war in conflicting dyads. The study concluded that the existence of nuclear asymmetry tends to increase the propensity for escalation in militarized disputes and interstate wars, in contrast to nuclear symmetry, where the propensity for war dropped significantly. Rauchhaus' findings were consistent with Geller's in that the deterrence effect of nuclear weapons was more evident in symmetric power balances than in asymmetric ones (1990, p. 300). In contrast, Rauchhaus finds that the probability of crisis initiation and limited use of force to be much higher with nuclear symmetry, as opposed to nuclear asymmetry (p. 269-271). The assumption about nuclear symmetry drawn by Rauchhaus supports the *stability-instability* paradox developed by Snyder (1965). The *stability-instability* paradox contends that nuclear weapons simultaneously promote stability and instability between nuclear states: stability is established through the reduction of major wars between nuclear states, and instability is established through the increase of low-level conflicts among nuclear states, such as low-level escalation in proxy wars or militarized disputes (Snyder, 1965). The *stability-*

instability paradox was first developed to explain the lack of major wars between the United States and the Soviet Union during the Cold War; in addition, many have applied the paradox to the India-Pakistan dispute over Kashmir, where major wars occurred more frequently during earlier periods of nuclear asymmetry than in periods of nuclear symmetry, where limited use of force was more evident. Rauchhaus concludes that additional research is needed to examine a vital area that is genuinely overlooked in the literature, specifically the conflict relationships between nuclear states and non-nuclear states.[14] The theoretical logic that would explain why non-nuclear states should be aggressive in confrontation with nuclear states can be attributed to the tradition or non-use and nuclear taboo, which was discussed in previous sections of the chapter.

Waltz vs. Sagan: More or Less Better

The question of nuclear proliferation and its impact on war and peace have dominated traditional international security studies, where many have theorized and debated about the implications of nuclear weapons on conflict. A debate emerged between Waltz and Sagan about nuclear proliferation.[15] Waltz (1995) argued that nuclear proliferation would act as a stabilizing agent in international relations: for example, Waltz asserts that the Long Peace between the United States and the Soviet Union was mainly due to nuclear weapons.[16] The

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[14] Rauchhaus (2009) notes that the treatment of nuclear asymmetry in the literature has strictly relied on 2X2 games, and so Rauchhaus suggests that additional models are needed to address this weakness in the literature. In Rauchhaus' statistical model, the nuclear asymmetry approach performs badly in terms of significance of the coefficients.

[15] Bueno de Mesquita and Riker (1982) have also argued in favor of nuclear proliferation, contending that a world with universal membership in the nuclear club will less likely be associated with nuclear war than a world with limited membership in the nuclear club.

[16] Waltz (1979, 1990) and Mearsheimer (1990) employ a structural realist argument to the Long Peace between the United States and the Soviet Union during the Cold War, arguing that the peace was a result of bipolarity and nuclear deterrence. The neorealist explanation

notion of a "Long Peace," supported by Waltz and other proponents of nuclear deterrence, insists that the "probability of major war among states having nuclear weapons approaches zero" (Waltz, p. 740).[17] According to Waltz, the cost of nuclear war is exceedingly high and the smallest risk of nuclear war thus deters a state from acting aggressively. Waltz raised the issue about nuclear weapons, weak states, and the conventional weapons balance, where he argued that the mere possession of nuclear weapons by weak states makes disparities in conventional weapons capabilities meaningless. Nuclear weapons, Waltz argued, compel states to behave rationally and take cautionary actions in crisis situations in order to prevent a crisis from escalating to a full-scale war. In a conventional world, states cannot be persuaded to act rationally because conventional weapons do not hold the same destructive power as nuclear weapons, and so states take on more aggressive and risky behavior (Waltz, 1995). The logic underpinning Waltz's argument for nuclear proliferation is that "new nuclear states will feel the constraints that present nuclear states have experienced. New nuclear states will be more concerned for their safety and more mindful of dangers than the old ones have been" (1995, p. 45). Waltz (2012) has applied his "more is better" idea to

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for the Long Peace contrasts with other scholars' explanations of the Long Peace. Building on early liberals, such as Kant in *Perpetual Peace* (1795), modern liberals have asserted that the Long Peace was a result of democracy, trade regimes, and institutionalism (Keohane & Nye, 1977; Keohane, 1984, 1989; Keohane & Martine, 1995; Maoz & Russett, 1993).

[17] In order for nuclear deterrence to succeed, Waltz (1981 and 1994) argued that the ability to punish has to be severe. From that viewpoint, Waltz insists that nuclear proliferation will make nuclear deterrence efficient because state actors will recognize that the high cost of nuclear war and therefore nuclear deterrence is more robust than conventional deterrence (2003). Thus, as nuclear deterrence and defensive capabilities increase through nuclear proliferation, the likelihood of war will profoundly decrease, because nuclear weapons increase the cost of war and make winning wars more difficult for states. Thus, the logic of nuclear deterrence asserts that a state will not use nuclear weapons because of fear of retaliation by another nuclear state. Thus, proponents of nuclear proliferation apply this logic to their arguments in support of nuclear proliferation.

Iran's nuclear weapons development program by arguing that nuclear weapons will make the country feel more secure and in turn, Iran will act less aggressive in the region. Waltz has further argued that the United States and Israel's nuclear weapons will act as a deterrent on Iranian aggression, and thereby Iran will become less aggressive once it acquires nuclear weapons.

Van Creveld (1991) further supports Waltz by suggesting that interstate wars, especially among enduring rivalries, have declined significantly once states acquire nuclear capabilities—for example, India and Pakistan. Bueno de Mesquita and Riker (1982) endorse Waltz and other proponents of nuclear proliferation by arguing that nuclear proliferation will reduce the likelihood of conventional conflicts and, more importantly, reduce the likelihood of conventional conflicts becoming nuclear. In other words, Bueno de Mesquita and Riker encourage nuclear proliferation in areas where non-nuclear states are facing nuclear adversaries because nuclear deterrence will prevent the outbreak of conflict.

Alternatively, Sagan (1994) has argued that nuclear proliferation would instead act as a destabilizing agent in international relations by increasing the likelihood of conventional war and, more importantly, nuclear war; thus, Sagan rejects the claim of deterrence through nuclear weapons. Sagan further rejected the claim made by Waltz that nuclear weapons are responsible for the Long Peace between the United States and the Soviet Union. In that light, Sagan argued in opposition to Waltz, as he suggests that new nuclear states have more difficulty maintaining stable nuclear deterrence than their old nuclear counterparts. From that viewpoint, Sagan (1995) argued that new nuclear states and potential nuclear states lack tight civilian control on nuclear arsenals, and that the majority of these states have

authoritarian or military governments, which makes nuclear acquisition more dangerous.

Given all this, the organizational behavior of the military in new nuclear nations will lead

to the failure of nuclear deterrence, and in turn instability. Additionally, Sagan counters

Waltz's sanguine claim for nuclear proliferation by arguing that new nuclear states lack

"stable civil-military relations, historical learning experience or extensive command and

control mechanisms" (1995, p. 49). Decision makers, according to Sagan, are not as

rational as Waltz and other nuclear optimists contend; rather, Sagan writes that nuclear

weapons in these states are controlled by imperfect military organizations. Likewise, Aron

(1965) maintains that new nuclear states pose a danger to international security because

they will not be as rational as their older nuclear counterparts. Sagan and others argue that

new nuclear states are more likely to take risky postures in crisis situations as a means to

justify the cost spent developing nuclear weapons; this is especially troubling in unstable

and autocratic regimes (Aron, 1965; Sagan, 1995; Blair, 1993; Feaver, 1992). A final

counterargument by Sagan deals with Waltz's claim about stable nuclear deterrence.[18]

Sagan contends that proponents of nuclear proliferation are too optimistic in their claims

that stable nuclear deterrence will hold with new nuclear states, and that new nuclear states

will automatically be deterred from using nuclear weapons against their adversaries. The

assumptions put forth by nuclear optimists that new nuclear states will be deterred are

problematic. Sagan utilizes India and Pakistan as a case to make his point, arguing that if

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[18] Waltz argued that several operational requirements are needed. First, during the period
of transition from conventional status to nuclear status, the first state must not undertake a
preventive war against an opponent so as to avoid a greater war when the second state
achieves nuclear status. Second, a nuclear state must develop second-strike capabilities in
order to impose a sufficient level of unacceptable damage to another state. Third, accidental
use of nuclear weapons must not be possible (Sagan 1995).

Pakistan had become nuclearized before India, then the military government in Pakistan would have preferred a preventive war with India.[19] In supporting his argument about preventive war with Pakistan, Sagan uses the case of India, illustrating that India's military considered a preventive war against Pakistan's Kahuta nuclear facility in the early 1980s (2001, p. 1069). The next section will discuss the gap in the literature on nuclear weapons.

1.4 Gap in the literature

Over the last decade, scholars have devoted renewed attention to nuclear weapons, which were central to scholarship in the Cold War. Despite this extensive research, a limited number of studies have examined the role played by nuclear weapons development programs on state behavior (Horowitz, 2012; Fuhrman & Kreps, 2010).[20] Sobek, Foster, and Robison (2012) examined "...the relationship between nuclear proliferation process and the frequency with which proliferators are targeted in conventional militarized conflicts" (p. 149). Although, Sobek, Foster, and Robison (2012) and other studies have examined the implication of nuclear weapons development program on militarized disputes as well as state behavior, these studies have overlooked the behavior of states attempting to develop nuclear weapons. Thus, this study will examine the behavior of states that are attempting to developing nuclear weapons in dyadic relationships. This study will help to fill the gap in the literature.

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[19] Sagan pointed out the problems with preventive war during the transition period as a means to counter the claim made by Waltz concerning preventive war between states.
[20] For the purpose of the study, nuclear weapons development program status is classified in the following way: a state that moves from having a nuclear program for peaceful means to one that is used to develop nuclear weapons.

Much has been written about the behavior of states with nuclear weapons; however, little information exists about the behavior of states with nuclear weapons development programs. Understanding the behavior of states with such development programs is essential because since the mid-1960s, it has been countries in the developing world attempting to proliferate. Clear examples of this are Iran, Libya, Iraq, Pakistan, and North Korea. These cases are a cause for concern because these states exist in fragile positions, prone to conflict and political instability, and for these reasons understanding their behavior in terms of hostility and cooperation in dyadic relationships is vital for future international stability. The timeline to obtain the bomb for these countries is much longer than their nuclear predecessors, where the average for nuclear acquisition for the latter group has been seven years and for the former group seventeen years (Hymans, 2012).[21] This situation leaves an extensive void of information about the behavior of states at this stage of the nuclear game because the timeline to nuclear acquisition has increased. In addition, many states operate in a much different security environment than then previous states with nuclear weapons development programs, as the latter group were major players in Cold War politics, whereas the former group have been more engaged in regional conflicts. In summary, the study seeks to answer this question about the behavior of states with nuclear weapons: How does a state's behavior vary as it advances in its nuclear weapons ambitions? Understanding the behavior of states with nuclear weapons development programs will better equip the international community to deal with proliferation. The direction of this change in behavior and the logic for state behavior is discussed in more detail in chapter 2.

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[21] With the exception of Iran, Libya, and Iraq.

1.5 Dissertation Plan

This dissertation consists of six chapters. In Chapter 2, I characterize the theoretical argument about nuclear status and state behavior, which will be tested in the quantitative and qualitative chapters of the dissertation. In Chapter 3, I present the statistical approach applied in the dissertation as well as the data used. Chapter 4, I test the implications of nuclear status on state patterns of behavior.

Recognizing the inherent limitation of quantitative analysis in international conflict studies, Chapter 5 conducts a detailed case study analysis of North Korea in an effort to examine whether changing nuclear status has influenced a change in the country's behavior in its dyadic relationships. Finally, Chapter 6 provides an overall summary of the study and future research to be completed on nuclear status and state behavior. In addition, Chapter 6 provides a discussion and analysis about Iran's behavior as its nuclear status changes. A discussion of Iran's behavior provides a good test of external validity, in that the results found in Chapters 4 and 5 can be generalized to Iran.

CHAPTER 2: Nuclear Weapons Development Programs and Patterns of State Behavior

2.1 Introduction: The purpose of this study

What is the implication of changing nuclear status on a state's pattern of behavior in the international system? Can nuclear status bolster or deter hostility behavior of states in dyadic relationships? What role does nuclear status play on state cooperative behavior in the international system? These questions are central to the dissertation's theoretical framework about nuclear weapons development programs and patterns of state behavior. This dissertation attempts to test the effect of nuclear weapons development programs on states' hostile and cooperative behavior. It is important to note that the behavior of states with nuclear weapons development programs is examined in dyadic relationships. In order to estimate the effect of nuclear status on the behavior of states, two interacting factors must be accounted for in the overall argument of the study: first, security problems; and second, security commitments from a nuclear patron. These two factors provide insight into the hostile and cooperative behavior of states with nuclear weapons development program and will be discussed in detail in the Chapter.

Over the last decade scholars have devoted renewed attention to the effect of nuclear weapons—often employing quantitative analysis (Horowitz, 2009; Kroenig, 2013; Narang, 2013; Bell & Miller, 2013; Sechger & Fuhrmann, 2013); however, the literature lacks attention to the time period when states are in the process of developing nuclear weapons capabilities. Therefore, there is relatively little work done to examine whether nuclear weapons development programs change the behavior of states in the international system. This is clearly a gap in the literature that needs to be examined, because the time to acquire nuclear weapons has increased. For example, the United States and the Soviet Union, first-

generation states, only took three (Manhattan Project 1942-1945) and six years, respectively, to acquire nuclear weapons; on the other hand, North Korea (1980-2006) took twenty-five years to become nuclearized. Since the time frame for procurement of nuclear weapons for states is prolonged, there is a time period in the nuclear literature that is never examined.[22] Thus, the literature lacks an understanding about state behavior during this time period, which is critical in understanding the future behavior of states once they acquire nuclear weapons. For this reason, the study of nuclear status in terms of nuclear weapons development programs is essential. This study will help fill the gap of information and theoretical argument regarding nuclear weapons development programs and state behavior.

This chapter proceeds in two parts. First, I will discuss the theoretical argument about nuclear status and patterns of behavior in the international system. In the second part of this chapter, I will present the hypotheses to be tested in the quantitative section of the dissertation (Chapter 4) and the qualitative section of the dissertation (Chapters 5 and 6).

2.2 Theoretical argument about nuclear status and patterns of state behavior

Current Literature

Much of the literature on nuclear proliferation and nuclear weapons has focused on the determinants of nuclear acquisition and nuclear deterrence. Existing nuclear proliferation scholarship maintains that national security concerns are the driving force

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[22] There are several factors that determine the length of time it takes for a state to acquire nuclear weapons, but the main factors are international pressure to remain non-nuclear, financial burden of carrying out the program, domestic policy of proliferating states, and access to nuclear technology and materials. For example, both India and Iran's nuclear program was shut down due to a change in domestic policy regarding nuclear weapons.

behind why states go nuclear (Dunn & Kahn, 1976; Jo & Gartzke, 2007). Jo and Gartzke (2007) further argue that in addition to security concerns, states move towards establishing nuclear weapons programs when they have the technological capabilities to do so. In several cases, states, despite having the capability to proliferate, will refrain from doing so because they do not face an existential security threat. States that proliferate tend to do so when they face an existential security threat and they believe that acquiring nuclear weapons will give them sufficient bargaining leverage as their deterrence capability is enhanced with nuclear weapons.

The literature on nuclear weapons and international conflict contends that nuclear weapons are likely to reduce the probability of conventional wars, since the possible introduction of nuclear weapons to the battlefield could significantly increase the cost of war (Schelling, 1960; Morgan, 1983; Powell, 1990; Sagan, 2003). From that viewpoint, the possession of nuclear weapons has a deterrent effect in disputes between nuclear states as well as non-nuclear states through classical deterrence and extended deterrence, respectively (De Mesquita & Riker, 1982; Betts, 1977; Russett, 1989; Huth & Russett, 1993; Mearsheimer, 1984/1985). Waltz (1981) notes that nuclear weapons deter states from initiating a conventional attack on a nuclear state because of the fear that the conflict might escalate to a nuclear level. Organski and Kugler (1980), on the other hand, found that deterrence does not work in a crisis where only one state has nuclear weapons, and instead crises between nuclear states and non-nuclear states were more likely to escalate to war than crises between nuclear weapons states.

Even the new literature on nuclear weapons (Kroenig, 2013; Narang, 2009; Horowitz, 2009; Beardsley & Asal, 2009) lacks a clear understanding of state behavior as they move

from not having a nuclear weapons development program to having one. In one study, Horowitz (2013) finds that states with nuclear weapons development programs are more likely to initiate militarized disputes. Despite this study, there is limited research about the behavior of states with nuclear weapons development, who have yet to join the nuclear club. In addition, several quantitative studies have found that states with nuclear weapons development programs and nuclear weapons are either less or more likely to initiate militarized disputes (Beardsley and Asal 2013; Fuhrmann and Kreps 2010; Geller 1990; Kroenig 2013; Horowitz 2009). Looking closely at these studies, it seems that researchers have assumed "a one size fits all" idea; however, this is a limitation in the literature. Thus, in order to move beyond this one-dimensional understanding of states with nuclear weapons development programs and nuclear weapons, this study casts the issue of nuclear status in the context of a state's security environment. It is important to note that "security environment" for the purpose of this dissertation refers to a state experiencing a security problem and a security commitment from a nuclear patron.[23]

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[23] For the purpose of this dissertation security problem and security commitment from a nuclear patron are classified as follows: First, security problem is exclusively defined in military terms. A security problem is present only when the state developing nuclear weapons is trapped in an interstate rivalry and/or there is a potential conventional military threat from another state(s). For interstate rivalry the study applied the same definition as Bennett (1996):

> "an interstate rivalry is a dyad in which two states disagree over the resolution of some issue(s) between them for an extended period of time, leading them to commit substantial resources (military, economic, or diplomatic) toward opposing each other, and in which relatively frequent diplomatic or military challenges to the disputed status quo are made by one or both of the states. The specific issues at stake in rivalries could include control over territory, external political policies (such as promotion of a religion or ideology), or internal political policies with international effects (such as the treatment of ethnic minorities or the presence of a particular leader)" (p. 160).

In summary, the study examines the effect of nuclear weapons development programs on state patterns of behavior. The theoretical argument put forward in this dissertation asserts that a state's behavior in terms of hostility and cooperation[24] is likely to change as the state's nuclear status changes. The direction of state behavior will be discussed in more

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North Korea (1980-2006), for example, would be classified as a state with a nuclear weapons development program that is experiencing a security problem as evident with the potential conventional military threat from South Korea and the United States. In addition, Iran would be viewed as a state developing nuclear weapons experiencing a security problem because of the interstate rivalry with Iraq, Israel, and Saudi Arabia. It should be noted that the Iranian-Saudi rivalry become more intense following the 1979 Islamic Revolution, which is due to the division within Islam, notably between Sunni (Saudi Arabia) and Shi'a (Iran) sects.

Second, commitment from a nuclear patron is broadly defined to include military alliance or political support in the international system. It should be noted that not all states with nuclear weapons development programs had a security commitment from a nuclear patron. Also, several states had nuclear patrons, but once they decided to establish a nuclear weapons development program this relationship was either weakened or ended. A clear example of this is in 2010, where Iran refused to halt its nuclear weapons program and in response the international community imposed sanctions on Iran. As a result of this situation, Iranian and Russian security commitment was slightly weakened.

[24] A few notes should be made about the indicators for hostility and cooperation. First, states developing nuclear weapons can exhibit both hostile and cooperative behavior in their dyadic interactions. This is due to the operationalization of the indicators, where hostility and cooperative behavior are assumed in the study *not* to be mutually exclusive. Along these lines, hostility and cooperation can both increase or decrease concurrently. Refer to Chapter 3 for a more detailed discussion of hostile and cooperative scores. Hostile behavior is measured based on the level of hostility in militarized disputes between states attempting to develop nuclear weapons and other states. Cooperative behavior encompasses diplomatic representation/exchange, joint-IGO membership, and formal agreements between states attempting to develop nuclear weapons and other states. Therefore, hostility can increase in terms of militarized disputes, but cooperation can also increase as states participate in IGOs or form agreements. For example, in the Iran-Iraq dyad, despite becoming very hostile during the 1980s Iran-Iraq war, they continued to cooperate in OPEC. Second, for the purpose of the study, a decrease in cooperation means nonparticipation and indifference in formal agreements or IGOs by states attempting to develop nuclear weapons in given dyads. It should be noted that a decrease in cooperation does not indicate more violence committed by states attempting to develop nuclear weapons. Third, a decrease in hostility does not mean states attempting to develop nuclear weapons become more cooperative.

detail in the following paragraphs. For the purpose of the dissertation, changing nuclear status refers to a state moving from not having a nuclear weapons development program to having one. For example, France's nuclear status changed in 1954 to a nuclear weapons development program because that was the year it began to pursue nuclear weapons as part of its foreign policy. The basic argument is straightforward: nuclear status interacting with a security problem and a security commitment will determine state behavior. Thus, the study will first discuss the role security problems play on the relationship between nuclear status and patterns of state behavior, and then includes a discussion of the role of security commitments.

Argument about nuclear status and state behavior:

The study examines the movement towards nuclearization through nuclear weapons development program status and the effects it has on the behavior of states (hostile and cooperative behavior) with weapon programs.[25] Thus, the study is interested in only the behavior of states developing nuclear weapons in dyadic relationships; Chapter 3 will discuss in detail how this behavior is isolated in the dyadic relationship and tested[26]. In order to understand the behavior of states developing nuclear weapons, first a discussion of international reaction to nuclear development is necessary. Beardsley and Asal (2013) found that states with nuclear weapons development programs tend to engender violence from other states in the international system more than nuclear weapons states because nuclear weapons development programs tend to create "vulnerability and opportunity for

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[25] That's before joining the nuclear club.
[26] The study also examines the behavior of non-proliferating states in order to fully understand the implication of nuclear status on state behavior.

aggression from other states in the system" (p. 83). In accordance with these authors, this fear does not stem from the existential threat of nuclear use but rather the fear of losing political leverage in international politics, as the bargaining power of states increases as they acquire nuclear capabilities. Fuhrmann and Kreps (2010) assert that opponents to states with nuclear weapons development programs are likely to take preemptive action (military attack or international sanctions) towards developing states[27] in order to prevent the shift in bargaining power in the international system. Additionally, Sobek, Foster, and Robison (2012) found that as developing states moved closer to acquire nuclear weapons this had increased the likelihood they would be attacked by other states. The authors noted that other states do not attack, sanction, or threaten developing states for the sole purpose of preventing nuclear weapons acquisition, but rather they do so in order to prevent the developing state from possessing nuclear weapons, and eventually altering the bargaining position of states. In 2007, the international community imposed sanctions on Iran for its nuclear weapons development program in the hopes that it would prevent the country from becoming nuclear.

Since this is understood about the behavior of other states towards states developing nuclear weapons, the study also will seek to explain the behavior of the latter group. The study draws on security problems and alliance partnerships to explain the behavior of states as their nuclear status changes. Consequently, other states understand that once nuclear acquisition occurs by proliferating states, this shifts the power balance in the dyadic relationship in two ways. First, if both states have nuclear weapons, the bargaining leverage

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[27] Developing states refers to states with nuclear weapons development program, who are attempting to acquire nuclear weapons.

the older nuclear weapons state had is now reduced, and second, if only one state has nuclear weapons, then the balance in the dyadic relationship is tilted towards the newly nuclearized state. This situation is even more precarious when states in the dyad are rivals; a rival state would be eager to carry out preventive attacks against the state with a nuclear weapons development program. This was clearly seen with the case of *Operation Babylon* in 1981. In 1981, Israeli airstrikes destroyed the Osirak nuclear reactor near Baghdad city, the 70-megawatts uranium powered reactor was near completion (Vandenbroucke, 1984). Israel's preemptive attack on Iraq's Osirak reactor was based on fear that a nuclear Iraq would use the weapons to attack Israel.

For this reason, a state developing nuclear weapons will likely exhibit a change in its hostile behavior towards another state in a given dyad in order to avert potential preemptive attacks and international sanctions from its adversaries.[28] Applying the logic from Fuhrmann and Kreps (2010) as well as Beardsley and Asal (2013), the present study argues that a state developing nuclear weapons will take on a less hostile posture in response to potential or actual threats of retaliation from its adversaries if it's experiencing a security problem. This reduction in hostile behavior is due to the fact that a developing state wants to avoid becoming embroiled in an international conflict, which could disrupt its nuclear ambition as resources will have to be diverted away from the program and towards the conflict. The economic cost of conflict will be the greatest when the developing state becomes involved in a protracted war. Additionally, nuclear facilities might be damaged in

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[28] In terms of hostility, this includes the threat, display, and use of force as well as engagement in interstate war. Hostility also refers to proliferating state's challenging aggressive actions by another state in a given dyad as well as initiating a crisis. Chapter 3 will offer a more detailed discussion and operationalization of hostile behavior applied in the study.

potential conflicts, which could setback a state's nuclear ambition. This was clearly seen with the case of Iraq with the first Gulf War. Thus, acting less hostile states with a nuclear weapons development program can continue to develop their nuclear weapons capabilities, and they will eventually be able to acquire nuclear weapons and the benefited associated with the weapons. Besides a military advantage, nuclear weapons also provide states with non-tangible benefits. The literature on state motives for nuclear development asserts that in international politics nuclear weapons become a source of pride for states as well as a means to enhance their status in the international system (Prosser 2008). This situation was clearly evident with North Korea's desire to become nuclear so as to become a major player in the region, in addition to protecting and ensuring the longevity of its regime from US preemption attacks. Moreover, nuclear weapons offer states a major power status or great power status in the international system; this was clearly evident with China shortly after it tested its first nuclear bomb. Thus, the case of China, gives second-tier states a greater incentive to pursue nuclear weapons because they perceive nuclearization as an important move towards "regional paramountcy" (Dunn and Kahn, 1976). In addition to improving a state's status in the system, nuclear weapons can also improve a state's influence and deterrent credibility because the weapons create a reputation for power and resolve for the state (Jervis 1989). Furthermore, nuclear weapons purportedly offer states greater bargaining power and political leverage over international politics; and to a lesser extent nuclear weapons give reasons to invite the states developing nuclear weapons to the bargaining table. The effect of a security problem interacting with nuclear status on patterns of behavior implies the following hypotheses with respect to hostility:[29]

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[29] A change in nuclear status refers to a state moving from not having a nuclear weapons

Hypothesis 1(a): changing nuclear status will increase proliferating states hostile behavior in dyadic relationships.

Hypothesis 1(b): changing nuclear status will decrease proliferating states hostile behavior in dyadic relationships when a security problem is present.

The following section will discuss the role of a security commitment from a nuclear patron [security commitment, hereafter] to the overall theoretical argument of the study. Since nuclear proliferation changes the distribution of power among states, particularly in an asymmetric dyad where only one state has nuclear weapons, this situation might lead to preemptive military actions by other states in order to uphold the status quo. How does security commitment affect the behavior of a state developing nuclear weapons? A state's attempts to proliferate will likely draw the attention of other states in the international system, and these states might make preemptive military attacks on a state developing nuclear weapons or establish sanctions against the developing state in order to prevent it from acquiring nuclear weapons. This argument about the behavior of other states towards a state developing nuclear program is consistent with the findings of Beardsley and Asal (2013) and Fuhrmann and Kreps (2010) that other states will likely view nuclear proliferation as threat to their security and thus will move to prevent their adversaries from acquiring nuclear weapons.

Turning to security commitment, the interaction between nuclear status and security commitment provides two different perspectives on the behavior of the developing state within a dyadic relationship.[30] Security commitment includes formal military alliance with

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development program to having one. In addition, a change in nuclear status also refers to a shift in developing state's nuclear policy from peaceful purpose to weapons development.
[30] The first perspective is the effect of having a security commitment on the behavior of

nuclear weapons states, such at the Rio Pact between the United States and Argentina, and neutrality agreement with nuclear weapons states. It should be noted that in the context of security commitment, this commitment goes beyond a nuclear umbrella, and that *just* having an agreement with a nuclear patron will influence the behavior of states developing nuclear program, even if there is no complete guarantee that the nuclear ally would come to the aid of the state developing nuclear weapons in an preemptive attack by other states.

The first implication security commitment has on the behavior of developing states is consistent with the literature on alliance partnerships and state behavior, where the literature finds that military alliance partnerships can either provoke and expand an existing conflict or deter and prevent war (Morgenthau, 1967; Waltz, 1979; Siverson & Starr, 1991; Leeds, 2003; Vasquez, 1993). Applying this logic to the nuclear status thesis presented in the study, a developing state's partnership with a nuclear ally will likely deter preemptive attacks by other states that oppose its nuclear ambitions.[31] Along these lines, a state developing nuclear weapons that is closely aligned with a nuclear weapons state is protected by its ally's extended deterrence, and thus is able to continue with its program without the threat of preemptive military attacks.[32] For that reason, the state developing

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proliferating states and the second perspective is the effect of not having a security commitment on the behavior of proliferating states.

[31] It should be noted that in several cases a nuclear ally has either pressured or offered inducement to its proliferating ally to halt its nuclear program; however, since the study is examining the effect of nuclear programs on a developing state behavior and not proliferation itself, the study assumed that the merely having alliance with a nuclear state gives the proliferating state assurance and confidence against potential threats towards its nuclear ambitions.

[32] It could be argued that the logic of extended deterrence can work against the proliferating state's need to get its own nuclear weapons. However, as stated above, nuclear weapons offer states intangible benefits, such as political leverage and bargaining power. In addition, alliance partnership can fall apart as regimes change and so extended deterrence itself is not always guaranteed. This was clearly evident with Iran, where it lost its extended

nuclear weapons does not need to be cautious in its dyadic interaction, and when faced with a possible threat or involved in a dispute with another state, the state developing nuclear weapons will be inclined to take on a more aggressive posture because it has the patronage of a powerful nuclear state. This situation illustrates a security commitment where the alliance with a nuclear ally represents a nuclear umbrella for states developing nuclear weapons. An example of this was the 1961 *Sino-North Korean Mutual Aid and Cooperation Friendship Treaty*, which represented a nuclear umbrella for North Korea.[33]

Moreover, even if the nuclear ally does not intervene in a crisis involving its developing ally, the mere partnership it has with the state developing nuclear weapons and the shadow of nuclear weapons can still have a vital effect on the developing state's behavior. Again, the state developing nuclear weapons could take on more bold and aggressive behavior in its dyadic interactions because it understands that its adversaries will be greatly influenced by its alliance with a nuclear state. Thus, the shadow of an ally's nuclear weapons allow a state developing nuclear weapons to act more hostile because of the safety net its nuclear alliance grants.

Beyond the idea of nuclear umbrella, *just* having an agreement with a nuclear state can influence the behavior of states developing nuclear weapons in dyadic relationships. In accordance to Leeds (2003), non-defense agreements can "...increase the confidence of a challenger in his ability to succeed through aggression" (p. 437). Thus, the study assumes that non-aggression and neutrality agreements with nuclear states can alter the behavior of states developing nuclear weapons by giving them more confidence to increase their level

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deterrence from the United States once they were no longer allied after the fall of the Shah's regime in 1979.

[33] After 1964, the treaty represented a nuclear umbrella for North Korea.

of hostility in dyadic relationships; this is especially evident when developing states are challenged by other states in militarized conflicts. A clear example of this is the Indo-Pakistani war in 1971.[34] During this conflict, India displayed more aggressive posture against Pakistan than in previous interactions, despite having a nuclear weapons development program at the time. India's hostile behavior could have sparked a preemptive military attack from its adversaries against its nuclear facilities; however, this situation did not transpire. India's alliance with the Soviet Union[35] in the 1970s may have been sufficient to deter military strikes from its adversaries, particularly China and the United States, which were allied with Pakistan, and perhaps most importantly China had an existing dispute with India. In 1971, India deviated from its non-aligned foreign policy stance and signed the *Indo-Soviet Treaty of Peace, Friendship, and Cooperation,* which sought to promote peace and security between the two states.[36] India signed the treaty with the Soviet Union several months prior to the 1971 conflict with Pakistan. The treaty had offered India credible assurance that the Soviet Union would assist in an event of war. This was clearly

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[34] The Indo-Pakistani war of 1971 occurred after India and the Soviet Union signed an alliance in August 1971.

[35] The 1971 treaty was a deviation from India's non-aligned stance during the Cold War and was a response to the increasing ties between the United States and Pakistan. Many have argued that India has had a non-aligned foreign policy during the Cold War, however, following China's invasion in 1962, Prime Minister Nehru had first approached the United States to establish a treaty of cooperation (Chaudhry & Vanduzer-Snow, 2011).

[36] Article IX of the *Indo-Soviet Treaty of Peace, Friendship, and Cooperation* treaty stated that:

> "Each High Contracting Party undertakes to abstain from providing any assistance to any third country that engages in armed conflict with the other Party. In the event of either being subjected to an attack or a threat thereof, the High Contracting Parties shall immediately enter into mutual consultations in order to remove such threat and to take appropriate effective measures to ensure peace and the security of their countries" (1971).

evident in Article IX of the treaty. In summary, the treaty implied that a strategic relationship existed between India and the Soviet Union, which in turn played a vital role in determining India's behavior in the 1971. The effect of security commitment interacting with nuclear status on states hostile behavior implies the following hypothesis:

Hypothesis 1(c): changing nuclear status will increase proliferating states level of hostility in dyadic relationships when they have a security commitment from a nuclear patron.

Moreover, the cooperative behavior of a state with nuclear weapons development program will likely change when a security problem is present. For the purpose of this study cooperative behavior refers to a state's level of participation in diplomatic representation/exchange, joint-IGO membership, and formal agreements with other states. For example, in the Iran-Iraq dyad, despite becoming very hostile during the 1980s Iran-Iraq war, they continued to cooperate in OPEC. Again applying the security problem component of the study, two possible outcomes can occur. First, if a state is experiencing a security problem and it is attempting to proliferate, it will likely be more cooperative in its dyadic relationships. The rise in cooperative behavior occurs because the presence of a security problem will likely heighten the probability of preemptive military attacks or international sanctions against the developing state; therefore, making that state more likely to want to cooperate in dyadic relationships. In addition, states attempting to become nuclear will be more engaged in diplomatic exchange/representations, regional as well as global IGOs, diplomacy, and agreements with other states, while they bide their time and continue to develop their nuclear capabilities. In that respect a strategy of cooperation is carried out in order to avoid possible international disruption to their program. It could be argued that this was the strategy by North Korea with the various agreement and diplomacy

with the United States, South Korea, China, the IAEA, and the United Nations between 1993 and 2003. During this period, North Korea exhibited cooperative behavior in its dyadic relationships with the United States, South Korea, and China. Also, this was clearly evident in the case of Iran, where it signed the Paris Agreement in 2004 with EU-3 in order to avoid additional sanctions. Chapter 6 will discuss this issue in greater detail about the cooperative behavior of Iran. Second, a developing states can become less cooperative when a security problem is absent. This decline in cooperative behavior occurs in response to scrutiny and pressure for non-proliferation by the international community, and the lack of threatening environment (security problem is absent). Given the potential loss in bargaining power (it is well known that nuclear weapons acquisition increases a state's bargaining power) as well as the financial loss associated with current nuclear weapons program, a developing state would be less inclined to cooperate about possible nonproliferation. In that light, developing states might begin to withdraw from international treaties, organizations, and break diplomatic relations when international pressure increases due to their nuclear program. As was evident with North Korea and its withdrawal from the NPT, and its eventual noncooperation with the nuclear freeze agreement. Chapter 5 will discuss these various issue in greater detail. The effect of a security problem interacting with nuclear status on patterns of behavior implies the following hypotheses with respect to cooperation:

Hypothesis 2(a): changing nuclear status will decrease proliferating states cooperative behavior in dyadic relationships.

Hypothesis 2(b): changing nuclear status will increase proliferating states cooperative behavior in dyadic relationships when a security problem is present.

In contrast to the hypothesized effect of security commitment on the hostile behavior

of proliferating states, the study argues that having a security commitment will make proliferating more cooperative. The effect of security commitment on cooperative behavior is dependent (cooperation due to nuclear proliferation) on nuclear procurement. The implication of security commitment on cooperative behavior of states with nuclear weapons development program is linked to the proliferating state's ally response to its nuclear ambition. Reiter (2014) argued that having a security commitment discourages states from proliferating, as evident with Norway and West Germany's entry into the North Atlantic Treaty Organization in lieu of acquiring nuclear weapons. Thus, in-line with Reiter's (2014) argument, security agreements can make proliferating states more cooperative because a nuclear ally will attempt to prevent this nuclear acquisition in order to maintain the existing power balance in alliance partnership. This was clearly evident with China's attempt to prevent North Korea from acquiring nuclear weapons, where China was actively involved in the Six-Party Talks (2003-2006) to prevent North Korea's nuclear acquisition. It should be noted that once a state becomes a nuclear power its power position and leverage in an alliance with a nuclear state shifts in its favor. Thus, the study argues that the motive behind a nuclear ally's behavior towards its proliferating partner is strictly based on the need to maintain existing power relationship in the alliance. To be more specific, a nuclear ally will want to continue to have a power advantage over its ally partner in an alliance, and is not in favor of power equality in this partnership. Given this situation a proliferating state will become more cooperative as it engages in various nuclear talks. The effect of security commitment interacting with nuclear status on states cooperative behavior implies the following hypothesis:

Hypothesis 2(c): changing nuclear status will increase proliferating states level of cooperative in dyadic relationships when they have a security commitment from a

nuclear patron.

2.3 Conclusion

The theoretical argument presented in this dissertation addresses how state behavior changes in dyadic relationships as nuclear status changes—that is, as a state moves from not having a nuclear weapons development program to having one. Much of the research has looked at the implications of nuclear weapons, whereas a limited number of studies (Horowitz, 2013; Fuhrmann & Kreps, 2010) have examined the implications of nuclear weapons development programs. Thus, this study fills a void of information about the behavior of states with nuclear weapons development programs. The subsequent chapter (Chapter 3) will discuss the research method and data to be applied in Chapter 4 (quantitative analysis) and Chapters 5 and 6 (North Korea and Iran case studies) to understand state behavior as nuclear status changes.

CHAPTER 3: Research Method and Data

3.1 Introduction

The preceding chapter illustrated the theoretical argument made in the dissertation; the following chapter will discuss the mechanism for testing the proposed theory about state behavior and nuclear status. The main aim of the dissertation is to answer the following question about symmetric and asymmetric nuclear dyads: Does a state's pattern of behavior for hostility or cooperation in interstate interactions change as its nuclear status shifts? This research will give insight into the proliferation debate by testing the effects of nuclear weapons development programs on state behavior.

3.2 Research Method

The study applied a Tweedie Generalized linear models [Tweedie GLM, hereafter] with a log link because the variables violate one of the four linear regressions assumption.[37] The assumption about normality is violated by the hostile and cooperation dependent variables because both variables are skewed, and thus this can distort the causal relationship and significance tests.[38] Figure A3.1 in appendix A illustrates the distribution of the hostile and cooperative dependent variables. And so Tweedie GLM approach deals with this normality issue found in the data. Tweedie GLM is made up of three components: random, systematic, and link function. First, the random component is the dependent variables (y)

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[37] The four linear regression assumptions are as follows:
1) Variables are normally distributed
2) Little to no multicollineartiy
3) No autocorrelation
4) Homoscedasticity
[38] Hostile behavior is positively skewed because it militarized interstate disputes and war are rarer events between states, and so in the data there are a lot of 0 present for the measure of hostility.

in the study. Second, the systematic component is the linear independent variables (x) in the study. Third, the link function is the key that connects the random and systematic components of the regression, and specifies the relationship between the components (McCullagh and Nelder, 1989).[39] The Tweedie GLM equation applied in this study is as follows:[40]

Conflict / Cooperative Behavior $_{t-1}$
$=$ β_0

$+ \beta_1$ *Nuclear Status*

$+ \beta_2$ *Security Problem*

$+ \beta_3$ *Security Commitment From Nuclear Patron*

$+ \beta_4$ *Nuclear Status *Security Problem*

$+ \beta_5$ *Nuclear Status *Security Commitment*

$+ \beta_6$ *Controls*

Possible problems facing the study

There are two main possible problems facing the statistical results in the study: (1) spurious relationship and (2) reverse causality. First, in order to avoid a spurious relationship between changing nuclear status and developing state behavior (hostile and cooperative behavior), the study includes a control group of states of similar size and power characteristics as states developing nuclear weapons. The control group is included to

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[39] There are several possible links that could be selected and selection is based on the response variable for the study.

[40] B_6 Controls includes the following variables measures separately: contiguity, major power status, relative capability ratio, ln distance capital, global s-score, regional s-score, and Democratic Peace Effect. The control variable will be discussed in greater detail in the following paragraphs of this chapter.

ensure that argument and causal direction proposed about changing nuclear status and the behavior of developing state in the study is valid and not based on coincidence.[41] For the purpose of the study, the control group of non-proliferating states includes states that have not established a nuclear program for the purpose of developing weapons. Latent nuclear capability is used as the independent variable for this group of non-proliferating states.[42] According to Sagan (2010), nuclear latency is defined as how quickly a state could develop nuclear weapons if it decided to do so from the existing state of its technology. Thus, the study assumes that the non-proliferating state, despite having limited or full capability to build a bomb based on their latency measures, have decided to remain non-nuclear and follow the NPT regime. On the other hand, the study assumes that the developing states, having reached a certain nuclear latency level, have decided to shift their nuclear policy towards weapons development. For example, in 1974 and 1985 Iran's nuclear latency level was 7, which is the highest level of latency (Jo & Gartzke, 2006), and at this time Iran shifted its nuclear policy from peaceful means (research and energy) to weapons development. In 1974 and 1985 that Iran's foreign policy shifted towards developing a nuclear bomb.[43] Refer to table A3.2 in appendix A for the categorization of the Index of Latent Nuclear Weapons Production Capabilities by Jo and Gartzke.

In addition, the control group is tested separately using the same indicators for hostile

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[41] The affect of security problem is complex, since security problems can affect states MIDs propensity (hostility) as well as developing nuclear weapons; therefore, making the causal mechanism between having a nuclear weapons development program and hostile behavior spurious. Thus, Chapter 4, will discusses whether security problem influences both nuclear status and hostility.

[42] The study will use Jo and Gartzke (2007) measure of nuclear latency.

[43] Refer to Chapter 1 discussion for the underlying shift in state policies towards states developing nuclear weapons.

and cooperative behavior as the one for the main states developing nuclear weapons in the study.[44] Refer to table A3.1 in the appendix for a complete list of states used in the control group. The selection of non-proliferating states in the control group is based on three criteria: military power (Composite Index of National Capability), economic power (GDP per capita), and demographic (population size). The results for the control group of non-proliferating states are reported and discussed in Chapter 4 of the dissertation.[45]

The second possible problem facing the study is the issue of causality and whether it is nuclear status that leads to more or less hostility and cooperation, or whether it is more hostility and less cooperation that leads to change in nuclear status. In order to deal with this identification issue, the study applies an estimation of simultaneous equations to test for reversed causality. The study applied a Two-Stage Least Square (2SLS, hereafter) regression because it is the most common technique for estimating the coefficient of a simultaneous equation. 2SLS regression analysis is carried out in two stages, where *state behavior* (hostility or cooperation behavior) is the dependent variable and nuclear status is the independent variable in the first stage, and *nuclear status* is the dependent variable in the second stage.[46] By running a 2SLS regression analysis, this will determine whether

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[44] Nuclear Latency is used as a predictor variable for the control group because the categorical measure (first independent variable used in the study), which is applied for the states developing nuclear weapons is not applicable for states not developing nuclear weapons. For the developing and non-developing states, nuclear latency is used a predictor variable to compare and trace the behavioral patterns of both groups. A discussion of nuclear latency is presented below in the chapter.

[45] The same control variables as well as interaction variables (security problem and security commitment) were also applied in the non-proliferating states control group.

[46] Nuclear weapons development program is used as a measure for nuclear status in the 2SLS regression analysis. A more detailed discussion is carried out in the following paragraphs of Chapter 3.

reverse causality exists between nuclear status and state behavior.[47] The results are reported and discussed in Chapter 4 of the dissertation.

3.3 Data

Dependent Variables

The first dependent variable captures the hostile pattern of behavior of a state with a nuclear weapons development program. The hostility dependent variable measures behavior of states developing nuclear weapons starting in 1930 and ending either in 2001 or when they test their first nuclear bomb.[48] Refer to appendix A section 3.1, for a complete discussion of the *Dynamic Interstate Interaction* Crescenzi and Enterline (2001) used in the construction of the hostility score.

In constructing the hostility dependent variable, dyads from the MIDs data were selected if developing states were engaged in a crisis for a given year.[49] The years that the dyad was not engaged in a crisis were coded as 0 and the years that the dyad were engaged in conflict were coded occurring to its hostility level. The levels of hostility from the CoW project are used to construct the hostility dependent variable, where threat to use force is the lowest level of hostility and interstate war is the highest level of hostility observed for

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[47] The *ivreg* command is used in STATA to run the 2SLS regression analysis. *ivreg* command combines the 2SLS regression equations into a single command.

[48] It should be noted that not all states start year is 1930. Israel, for example, hostile IIS measures its behavior from 1948 to 1972 and Libya's hostile IIS measures its behavior from 1951 to 2001. 1948 was selected as the start year for Israel because this was the year the country declared independence and 1951 was selected as the start year for Libya because it was the year the country was released from British and French oversight.

[49] The study only used dyadic interstate interaction to determine the behavior of a developing state since hostility is two-way, but then the study isolated the behavior of the other state in the dyad. The hostile behavior of the other state is not used in constructing the hostile IIS.

a state developing nuclear weapons. For this measure the study focuses on military forms

of hostility and excluding non-military forms of hostility because the cooperation portion

of the study includes diplomatic relations, particularly, whether states maintain or break

relations. This will be discussed in detail below. Table 3.1 presents the coding for the raw

data for constructing the hostility dependent variable.

Table 3.1: Correlate of War hostility levels used to construct the hostile dependent variable

Hostility Level	Description
Threat to use force	State in a dispute will threaten the following: use force, blockade, occupy territory, declare war, and use nuclear weapons.
Display of force	State will go on alert, mobilize inactive military forces, show troops, ships, and planes, fortify borders, go on nuclear alert, and carry out border violation (includes crossing land, sea and air of adversary for less than a 24 hour period).
Use of force	State will carry out a blockade, occupy territory of adversary, seize material or military personnel from another state, clash with armed forces, declare war, and use CBR weapons against adversary.
Interstate war	Military combat battle related deaths ≥1000 [Small and Singer (1982), criteria] †

Source: Jones, Bremer, and Singer (1996), p. 171-173.
† This dissertation will employ the Small and Singer criteria for war, which asserts that "militarized interstate disputes evolve or escalate to the point where military combat is sufficiently sustained that it will result in a minimum of 1000 total battle deaths" (1982, p. 171). At that point, MIDs become interstate war

In some cases, the dyad may be engaged in more than one dispute per year [n>1];

in those instances, the dissertation applies the same logic as Crescenzi and Enterline

(2001)[50]. Thus, for multiple MIDs in a given year, the level of hostility for the developing

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[50]The Dynamic Model of Interstate Interaction was applied to test reputation and interstate conflict (Crescenzi, 2007), the role of history and war (Crescenzi, Long, & Kathman, 2007), and alliance formation (Crescenzi, Kathman, Kleinberg, and Wood, 2012). Others

state in a dyad is aggregated across all disputes in a given year.[51] For example, the Indian-Chinese dyad in 1958 was engaged in 2 militarized interstate disputes, where the level of hostility for India in each MID was 4 and 3 respectively; thus for that given year India's hostility level was 7 for that selected dyad.[52] The hostile measure for India for the Indian-Chinese dyad is generated using the frequency of interaction and the level of hostility in each crisis. The hostile dependent variable is lagged by one year this is done for theoretical and methodological reasons. First, the hostile dependent variable is lagged for 1 year because the current level of hostility is greatly determined by its previous levels. Second, hostile dependent variable is lagged in order to reduce autocorrelation.

The second dependent variable captures the cooperative behavior in the dyadic relationship. Crescenzi, Enterline, and Long (2008) applied a cooperation dimension to the original *Dynamic Model of Interstate Interaction* developed by Crescenzi and Enterline (2001) in order to understand interstate relationships.[53] In developing the cooperative dependent variable, the authors used only joint membership in Intergovernmental Organization [joint-IGO membership, hereafter] to explain cooperative behavior among

have also used the model to test international conflicts (Kalbhenn, 2012)

[51] This hostility measure includes both crisis initiations and challenges by states developing nuclear weapons.

[52] It should be noted that the study only examines the behavior of states developing nuclear weapons within dyads, and isolates the hostile behavior of other states within those dyads. The study assumes that hostility is two-way, and that the development of nuclear weapons program may attract the hostility of others towards states developing nuclear weapons. Also, the hostile behavior of other states towards developing states might be may be due to existing rivalry or dispute. However, since the study is strictly interested in the behavior of developing states within given dyads, than only the hostile behavior of developing states are used to create the hostility score. The hostility of other states are only used a means to determine whether states developing nuclear weapons become more or less hostile.

[53] The dyads in the hostility sample were used for the cooperative dyads.

states. Crescenzi, Enterline, and Long (2008) studied how cooperation and conflictual behavior influences state involvement in disputes.

Several empirical studies have found that institutions play a critical role in increasing cooperation among states: for example, the North Atlantic Treaty Organization [NATO, hereafter] has enhanced cooperation among member states (Duffield, 1992). In addition, Wallender (1999) found that the Organization for Security and Co-Operation in Europe [OSCE, hereafter] has improved cooperation between Russia and Germany. Many scholars have claimed that institutions tend to improve cooperation among states because institutions increase concern for mutual concerns, and so allow states to interact in a friendlier environment, improving communication among member states. In that light, joint-IGO membership is an important variable to include in the construction of the cooperative dependent variable for the study.

However, despite Crescenzi, Enterline, and Long's attempt to statistically explain cooperation through joint-IGO membership, the cooperative measure performed poorly,[54] especially when compared to the conflict measure; therefore, it is evident that additional factors are needed in calculating states' cooperative behavior in interstate relationships. Thus, the dissertation goes beyond Joint-IGO membership to measure the level of cooperation in dyadic relationships by examining additional factors such as diplomatic exchanges and alliance patterns. In constructing the cooperative dependent variable,

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[54] The cooperative measure was found to be statistically significant in the politically relevant dyads ($p \geq 0.05$) and not significant when tested against all dyads in the system. On the other hand, the hostility measure was found to be statistically significant in both the politically relevant dyads and all dyads ($p \geq 0.001$) (Crescenzi, Enterline, & Long, 2008, p. 276). See Crescenzi, Enterline, and Long (2008) for additional information about the statistical results.

regional joint-IGOs, global joint-IGOs, formal agreements, and diplomatic exchanges or representations were applied. For the purpose of the dissertation, an IGO is defined according to Wallace and Singer (1970, p. 2):

> (1) An IGO must consist of at least two members of the COW-defined state system; (2) An IGO must hold regular plenary sessions at least once every ten years; (3) An IGO must possess a permanent secretariat and corresponding headquarters.

Table 3.2 presents the coding for the raw data applied in the construction of the cooperative dependent variable.

Table 3.2: Cooperation levels used to construct the cooperative behavior dependent variable

Type of Cooperation	Level of Cooperation	Source
Formal Agreement[55]	4	The Correlates of War Data Set
Joint-IGO Membership (regional)	3	The Correlates of War Intergovernmental Organization Data Set (V2.3)
Joint-IGO Membership (global)	2	The Correlates of War Intergovernmental Organization Data Set (V2.3)
Diplomatic Representation / Exchange	1	The Correlates of War Diplomatic Exchange Data Set (Version 2006.1)

In coding the joint-IGO part of the cooperative dependent variable, the decision of both states in the dyad to join the same organization is coded as a cooperative action in the dataset. Crescenzi, Enterline, and Long (2008) distinguished between "co-joining into larger IGOs (such as the United Nations) versus more localized (and we assume more

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[55] It should be noted that formal agreements used for the construction of cooperative behavior is different from the one used in measuring security commitment. For the cooperative dependent variable, formal agreements are between states developing nuclear weapons and other states in selected dyads. Whereas, for security commitment, formal agreements includes all agreements developing states have with nuclear weapons states.

intensely cooperative) settings (such as ASEAN)" (p. 272). Thus, the study will follow this approach by assuming that localized IGOs allow for greater and denser interactions among states than larger global IGOs; thus, cooperation is more intense in the former. For this reason, regional IGOs are given greater value than global IGOs. In 1965, the United States and Mexico both became members of the IAEA (global organization), so the year 1965 is coded as 1 and the following years are coded as 0.5. Then this value is multiplied by the global cooperation level of 3, and so the final value for this IAEA membership from 1965 to 2001 is 37.

In addition to joint-IGO membership as a measure of cooperation, formal agreements (The Correlates of War Project, alliance dataset) are also included in the construction of the cooperative dependent variable. Thus, any formal agreements within a dyadic relationship are coded as cooperative shock and terminations of formal agreements are coded as cooperative decay. The date for establishing a formal agreement was coded as the highest level of cooperation.

The diplomatic representation component of the cooperative dependent variable included any type of diplomatic representation between a nuclear weapons program development state or nuclear weapons state and any other state in the international system. Diplomatic representation included chargé d'affaires, Minister, Ambassador, and other. Since the data set was collected for every five years (1920-1940 and 1950-2005), the missing values for the interval years were weighed less in the data set. Every diplomatic representation within a dyadic relationship was coded as a cooperative shock, where the highest level of cooperation (peak in cooperation) was the initial interaction between government officials. The absence of diplomatic representation causes the cooperation

score to decay over time and move back to neutrality (0). Thus, the decay function increases as the number of diplomatic representation events occur over time, and on the other hand, the decay function decreases as the number of diplomatic representation events slow down over time. The cooperative dependent variable is lagged by one year this is done for theoretical and methodological reasons.[56] Table 3.3 illustrates the dependent variables applied in the dissertation.

Table 3.3: Dependent Variables Operationalization

Variable Name	Operationalization	Ranges	Mean	S.D
Hostile Behavior	-1 = hostile interstate interaction 0 = neutral interaction	-.994 - 0	-.232	.365
Cooperative Behavior	+1 = cooperative interstate interaction 0 =neutral interaction	0 - .964	.210	.273

Independent Variables

For the purpose of this study, nuclear status will be the main independent variable of interest. The independent variable is a categorical variable of 16 states developing nuclear weapons.[57] The inclusion criteria for the developing states is and the logic for the selected cases are discussed in Chapter 1. The coding for the nuclear status independent variable is as follows: when a state does not have a nuclear weapons development program, it is coded as 0, and when a state has a program, it is coded as 1. For example, China is

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[56] The same logic applied for hostile dependent variable is also applied for the cooperative dependent variable.

[57] In order to avoid a spurious causal inference about nuclear weapons development program and the behavior of states developing nuclear weapons the study examines the behavior of states before and after they establish a program. The operationalization of the first independent variable deals with this issue.

coded as not having a program from 1930-1954 and as having a program from 1955-1963.

Additional independent variables capture the interaction approaches applied in the study. First, the security problem variable is coded as a dichotomous variable, where 1 indicates that the state developing nuclear weapons is experiencing a security problem and 0 indicates otherwise. Again as stated in Chapter 2, security problem includes interstate rivalries, threats from insurgent groups, and terrorist groups. The *Bennett Rivalry* Dataset and *Terrorism, Insurgencies, and Guerrillas in Education and Research (TIGER) Suicide Attacks Worldwide* Dataset, were used to construct the security problem variable.[58] In constructing the security problem dataset, the study looked at two factors: (1) whether a developing state was engaged in an interstate rivalry; (2) whether a developing state faced a potential conventional military threat from other state(s).

Second, the security commitment from nuclear patron independent variable is coded as 1 if the state developing nuclear weapons has a security commitment from at least one weapons nuclear patron and 0 if the developing state lacks a security commitment. The security commitment from nuclear patron independent variable is measured as a defense alliance and agreements between the state of interest and at least one nuclear weapons state. Both of these variables are used to create the two-way interaction effect with the nuclear status variable

Control Variables:

The study includes several control variables in order to evaluate and test alternative theories about state patterns of behavior as nuclear status changes. In order to determine whether a control variable is theoretically relevant, the Most and Starr (1989) classification

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[58] A more detailed discussion of security problem is found in Chapter 2

of willingness and opportunity to engage in conflict is applied in determining the inclusion and exclusion of control variables. For the purpose of this dissertation, the willingness and opportunity aspects of the Most and Starr (1989) classification are applied to determine whether a state develops conflictual or cooperative patterns of behavior in the international system. For example, what factors give a state the opportunity to be more conflictual than cooperative? This opportunity to be more conflictual is then translated into a state's behavior in the international system. Table 3.5 presents the control variables in order to test for alternative explanations for the dependent variable.

Table 3.4: Control Variables Operationalization

Variable Name:	Operationalization	Mean	S.D	Source
Contiguity	1 = Common land borders or separation by less than 150 miles of water 0 =No contiguity	.226	.418	COW Project Direct Contiguity Data (V.3.1)
Land/Water Contiguity	1 = Water contiguity 2 = Land contiguity 0 = No contiguity	.429	.495	COW Project Direct Contiguity Data (V.3.1)
Distance	Natural log of the distance between capital cities	7.266	1.049	COW Project Direct Contiguity Data (V.3.1)
Major Power	1= One state in dyad is a major power 0 = Neither state in dyad is a major power	.399	.490	COW Project State Membership List Data
Democratic Peace Effect *(Weak Leak Approach Applied)*	10 = Full democracy 0 = Full autocracy	1.894	2.472	Polity IV Project: Political Regimes Characteristics and Transition 1800-2010
S-Score	1 = Policy similarity -1 = Policy	. 546	.373	Signorino and Ritter (1999)

	Dissimilarity			
Relative Capability Ratio	CINC of stronger state/CINC of weaker state	1.643	1.745	COW Composite Indicator for National Capabilities Index

In terms of the classification of opportunity, the dissertation includes three control variables: contiguity, capital distance, and major power status. First, the contiguous control variable measures the level of contiguity within a selected dyad of interest in a given year. Contiguity between states includes five categories: one for land contiguity and four for water contiguity. More specifically, land contiguity is defined as the intersection of territory between two states through land boundaries (Stinnett, Tir, Schafer, Diehl, & Gochman, 2002). Water contiguity is defined as the intersection of water between two states, which is further divided into four categories based on separation by water of 12, 24, 150, and 400 miles. The contiguous variable is categorized as a dichotomous variable, where 1 is any common land or water separation of less than 150 miles within a selected dyad, and 0 represents no contiguity within the dyad. Moreover, the contiguous variable is further categorized into an additional control variable. The second categorization distinguishes whether contiguity is based on land or water, where 1 represents water contiguity, 2 represents land contiguity, and 0 represents no contiguity. Second, the distance control variable measures the natural log of the distance between capital cities in a given dyad. The natural log was taken because the distance variable is skewed. The literature on contiguity has found that geographic proximity contributed to a higher likelihood that states will engage in conflict (Geller & Singer, 1998; Bremer, 1992; Diehl, 1985). Diehl (1985) further found that land contiguity between disputing states increased the likelihood for conflict

escalation. Thus, in order to rule out alternative explanations for the dependent variable, contiguity and distance were controlled for in the dissertation.

Third, the major power status control variable measures whether one of the states in the dyad is a global power. The major power status variable utilizes the COW project's *State Membership List* (2011). Small and Singer's (1982) operationalization of major power is based on scholarly consensus on what constitutes a major power in the international system. The major power list developed by Small and Singer has achieved a degree of reliability based on inter-coder agreements. Thus, Small and Singer (1982) identify several states as major powers in the international system; the list is presented in table 3.6.

Table 3.5: COW Project Major Power List

Major Power List	Years
USA	1898-2011
United Kingdom	1816-2011
France	1816-1940 1945-2011
Germany	1816-1918 1925-1945 1991-2011
Austria-Hungary	1816-1918
Italy	1860-1943
Russia USSR Russia	1816-1917 1922-1991 1992-2011
China	1950-2011

Japan	1895-1945
	1991-2011

Note: Post-Cold War Germany and Japan were included in the list because they had achieved significant economic growth since 1965.

Major power variable was controlled for in the dissertation. The major power control variable is categorized as a dichotomous variable, where the variable is coded as 1 when at least one state in the dyad is a major power and 0 when neither state in the dyad is a major power. The dissertation uses the list of major powers categorized by the COW Project's state membership list to code these two variables.

For the willingness classification, the dissertation includes three control variables: democratic peace effect, S-Score, and relative capability ratio. First, the democratic peace effect control variable measures the level of democracy among the dyad of interest for a given year. In constructing the democratic peace effect control variable, the Polity IV Project's DEMOC and AUTCO variables were used. The DEMOC and AUTOC variables measure competitiveness of political participation, openness and competitiveness of executive recruitment, as well as constraints on the chief executive (Marshall, Jaggers, & Gurr, 2010). In order to construct the democratic peace effect control variable, the following equation was used:[59]

$$\frac{(DEMOC-AUTOC)+10}{2}$$

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[59] In 1959, for example, the Soviet Union's DEMO score was 0 and AUTOC was 7; therefore, applying the above equation the democracy effect score for the Soviet Union for that year was 1.5.

Thus, the democratic peace effect control variable for each state in the dyad ranged from 0 to 10, where 0 indicated full autocracy and 10 indicates full democracy. The study applies the "weak link" approach by O'Neal and Russett (1997), where only the lowest polity score for a given dyad year is reported. The weak link approach assumes that in a dyadic relationship, the degree of democracy in the less democratic partner would more likely influence the relations between the states. It is important to note that the democratic peace effect is included in the study because of the overwhelming effect democracy has on the impact of conflict and particularly conflict onset (see Bueno de Mesquita et al., 1999; Russett & O'Neal, 2001). Thus, the democratic peace effect control variable can also impact a state's behavior in the international system. For example, in more democratic states, disputes would be dealt with through diplomatic channels (cooperation) as opposed through military means (conflictual); thus the imperative to control for the democratic peace effect in order to rule out alternative explanations to the dependent variables.

Second, the S-Score control variable measures the similarity in policy preferences in a given dyad. The Similarity Score [S-Score, hereafter] captures the level of foreign policy similarity and dissimilarity in a given dyad. The dissertation applies the Signorino and Ritter (1999) S-Score. According to Signorino and Ritter (1999), the S-Score is an improvement on the Kendall's Tau-b score of similarity because the S-Score includes a measurement of foreign policy similarity based on alliances, trade, UN voting, diplomatic missions, and other types of data on state interactions, whereas the Tau-b score measures the similarity through alliance commitments. EUGene was used to generate the S-Similarity Score (Signorino & Ritter, 1999) for the relevant cases examined in the dissertation. For the purpose of the dissertation, the regional S-Score and global S-Score

are used. The S-Scores ranges from -1 to 1, where -1 indicates foreign policy dissimilarity and 1 indicates foreign policy similarity between the proxy state and the observing state. For example, the S-Score for the United States and Syria dyad in 1975 is -.020, which indicates that the dyad does not have complete dissimilarity; on other hand, in the Finland-Iraq dyad in 1953, the S-Score is 0.39, which indicates that the dyad is moderately similar. The S-Score as a control variable ensures that policy similarity or dissimilarity does not influence the state's hostile and cooperative behavior as its nuclear status changes. To be more specific, if two states in a dyad have similar policy preferences, then they may be less likely to demonstrate hostile behavior and more likely to demonstrate cooperative behavior. And for this reason the study will control for this variable in order to determine more clearly whether nuclear status influences the hostile and cooperative behavior of states.

Another control variable is the relative capability ratio within a dyad. This control variable is included in the study because capabilities can lead a state to behave in a certain way in a dyad. The Composite Indicator for National Capabilities [CINC, hereafter] index includes six measures to assess a state's capability: military personnel, military expenditure, total population, urban population, iron and steel consumption, and energy consumption (Singer, 1987). The dissertation examines the level of power similarity between states in a dyadic format by calculating an average between the two states. In order to calculate that average, the log of the ratio of the CINC scores for the dyad is applied, where the larger CINC score was the numerator and the lower CINC score was the denominator.

$$\log \frac{LrgCINC}{SmlCINC}$$

This approach measures the dyadic power balance between states, where it equals the natural log of the ratio of the stronger state's CINC to that of the weaker state's CINC. The remainder of the chapter will discuss the method applied in the case study analysis.

3.4   Methods: Case Study Analysis

This section discusses the process tracing tests for causal inference applied in the case study portion of the dissertation. George and Bennett (2005: 206) defined process tracing as the "method [that] attempts to identify the intervening causal process - the causal chain and causal mechanism - between an independent variable (or variables) and the outcome of the dependent variable." To be more specific the study will apply theory-testing process tracing method, which is a deductive research method. Through this theory-testing approach a theory is first developed and predicated patterns are outlined; next data is collected and analyzed to determine whether the predicated patterns are present or absent, in order to validate or reject the hypotheses.

In addition, there are several tests for causal inference in the process tracing approach, which were first formulated by Van Evera (1997) and later adapted by Bennett (2010) and Collier (2011). The present study will apply the Collier (2011) understanding of process tracing, where the author defined it as "the systematic examination of diagnostic evidence selected and analyzed in light of research questions and hypotheses posed by the investigator" (p. 823). The Collier approach is the most comprehensive approach to applying process tracing to the selected cases in the present study because, as Collier noted himself, many studies have frequently failed to adequately or rigorously apply process

tracing to their case study analysis and the causal inference tests suggested by Collier offer a much better approach to hypothesis testing.

There are four process tracing tests for causal inference applied by researchers to test a hypothesis and determine whether to accept or reject their proposed hypothesis; the four test are as follows: "straw-in-the-wind," "smoking-gun," "hoop," and finally "doubly decisive." Table 3.7 presents Collier's understanding of the four tests for causal interference in process tracing approaches

Table 3.6: Process Tracing Tests

		SUFFICIENT FOR AFFIRMING CAUSAL INFERENCE	
		No	**Yes**
NECESSARY FOR AFFIRMING CAUSAL INFERENCE	**No**	**1. Straw-in-the-Wind**	**3. Smoking-Gun**
		a. Passing: Affirms relevance of hypothesis, but does not confirm it.	**a. Passing:** Confirms hypothesis.
		b. Failing: Hypothesis is not eliminated, but is slightly weakened.	**b. Failing:** Hypothesis is not eliminated, but is somewhat weakened.
		c. Implications for rival hypotheses: Passing *slightly* weakens them. Failing *slightly* strengthens them.	**c. Implications for rival hypotheses:** Passing *substantially* weakens them. Failing *somewhat* strengthens them.
	Yes	**2. Hoop**	**4. Doubly Decisive**
		a. Passing: Affirms relevance of hypothesis, but does not confirm it.	**a. Passing:** Confirms hypothesis and eliminates others.
		b. Failing: Eliminates hypothesis.	**b. Failing:** Eliminates hypothesis.
		c. Implications for rival hypotheses: Passing *somewhat* weakens them. Failing *somewhat* strengthens them.	**c. Implications for rival hypotheses:** Passing *eliminates* them. Failing *substantially* strengthens.

Source: Collier (2011), p. 825.

For the purpose of this study, the "smoking-gun" test for causal inference will be applied to test the causal mechanism between nuclear status and the behavior of proliferating states in dyadic relationships. The "smoking-gun" test was preferred over the other three tests because when the evidence fails to support the hypothesis, this does not require elimination of the hypothesis altogether. In that light, for the "smoking-gun" approach passing the test is a sufficient but not necessary condition for the validity of a given hypothesis (Collier, 2011; Bennett, 2010; Van Evera, 1997). Based on this criteria,

the "smoking-gun" test is best for the present study because nuclear weapons development programs operate at times in a veil of secrecy, as in the case of Israel. Therefore, it is difficult to determine with the highest level of confidence when a state has established a nuclear weapons development program, and perhaps more importantly, when it has advanced in its nuclear production; this lack of certainty will affect the support of the hypothesis. For example, with North Korea it is not clear when the state decided to start its nuclear program, and so many have argued that North Korea started its program in 1980, whereas others have declared 1982. Thus, this disagreement in start time may lead to a type I error (rejection of a true hypothesis), and so applying the "smoking-gun" test ensures that a possible true hypothesis is not completely eliminated but rather weakened.

In addition, the study relies on diverse primary and secondary sources, such as official government documents, historical narratives and data, and declassified documents (letters, reports, minutes of various government sessions, CIA reports) to test the proposed hypotheses about changing nuclear status and the behavior of states in dyadic relationships. It is important to note that process tracing does not merely rely on qualitative information, but that it also sometimes relies on quantitative information; this study will apply both in analyzing the behavior of North Korea (Chapter 5). The temporal scope of analysis for North Korea is from 1952 to 2006.

3.5 Conclusion

Chapter 3 presented the quantitative and qualitative research method approach as well as data applied in the study. The remaining Chapters of the study will report the results about the behavior of states developing nuclear weapons. Chapter 4 , will present the statistical results for the study. In addition, Chapter 5 presents a case analysis of North

Korea's behavior since 1952 and Chapter 6 provides concluding remarks about the study as well as a brief discussion about Iran's behavior.

CHAPTER 4: Empirical Results for Nuclear Weapons Development Program States

4.1 Introduction

This chapter discusses the empirical results that test the effect of changing nuclear status on state behavior. This chapter is divided into three parts. First, I will discuss the empirical results for the regression model, which tests hypotheses 1(a-c) and 2(a-c) of the study. This model will be applied to hypothesis 1(a-c) and 2 (a-c) in order to confirm the results and rule out alternative explanations to state behavior in dyadic relationships. The final part of this chapter discusses the various tests undertaken to verify the robustness of the empirical results of the study. For the purpose of this chapter, descriptive statistics and the correlation matrix are found at the end of the dissertation in appendix table A4.1 and A4.2, respectively.

4.2 Empirical Results and Discussion

In this section, the chapter presents and analyzes the empirical findings of the study. To test the argument about nuclear status and the behavior of states, the study examined the hostile and cooperative behavior of proliferating states in dyadic relationships. In addition, the chapter will compare the behavior of states developing nuclear weapons to the control group of non-proliferating states. The statistical results for the control group of non-proliferating states are found in table 4.3.

Before discussing the results, the following paragraph provides a brief overview of the statistical method and the main variables in table 4.1.The study applied a Generalized Linear Model, Tweedie with log link approach because of the skewed distribution of the

dependent variable. A more detailed discussion of this statistical approach is presented in Chapter 3.

The two dependent variables are the hostile and cooperative behavior of states with nuclear weapons development programs. The hostile dependent variable measured the level of hostility of developing states in interstate interactions. For the hostile dependent variable, the CoW levels of hostility in MIDs are used to construct the variable. The hostile dependent variable ranges from 0 - .999, where .999 indicates the highest level of hostility from developing states and 0 indicates neutral relations between states . Figure A4.1 in appendix B presents the hostility trends for states with nuclear weapons development programs between 1930 and 2001.

On the other hand, the cooperation dependent variable measured the level of cooperation of developing states in interstate interactions. Four components were used to construct the cooperation dependent variable: formal agreements, regional joint-IGO membership, global joint-IGO membership, and diplomatic representation/exchange. The cooperation dependent variable ranges from 0 to .998, where 0 indicates neutral interactions and .998 indicates the highest level of cooperation from developing states.[60]

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[60] A few notes should be made about the indicators for hostility and cooperation. First, states developing nuclear weapons can exhibit both hostile and cooperative behavior in their dyadic interactions. This is due to the operationalization of the indicators, where hostility and cooperative behavior are assumed in the study *not* to be mutually exclusive. Along these lines, hostility and cooperation can both increase or decrease concurrently. Refer to Chapter 3 for a more detailed discussion of hostile and cooperative scores. Hostile behavior is measured based on the level of hostility in militarized disputes between states attempting to develop nuclear weapons and other states. Cooperative behavior encompasses diplomatic representation/exchange, joint-IGO membership, and formal agreements between states attempting to develop nuclear weapons and other states. Therefore, hostility can increase in terms of militarized disputes, but cooperation can also increase as states participate in IGOs or form agreements. For example, in the Iran-Iraq dyad, despite becoming very hostile during the 1980s Iran-Iraq war, they continued to

Figure A4.2 in appendix B presents the cooperative trends for states before and after they establish a nuclear weapons development program between 1930 and 2001. This time frame includes when states did not have a nuclear program and when they had a nuclear weapons development program, this was done to show a change in their behavior in terms of hostility and cooperation.

The independent variable of interest is nuclear status, which is measured through a dichotomous categorical variable of 16 states, where 0 indicates they do not have a nuclear weapons development program and 1 indicates they have a nuclear program. For the purpose of the study, a security problem is present only when states developing nuclear weapons are trapped in an interstate rivalry and/or there is a potential military threat from another state(s). The security problem variable is coded as a dichotomous variable, where 1 indicates the presence of a security problem and 0 indicates otherwise. Next, security commitment includes any form of military alliance or agreement developing states have with nuclear states. The security commitment variable is coded as 1 if developing states have a security commitment from at least one nuclear patron and 0 if developing states lack a security commitment. For a more detailed discussion of the variables applied in the study, refer to Chapter 3. Table 4.1 displays the estimates for nuclear status and hostile behavior.

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cooperate in OPEC. Second, for the purpose of the study, a decrease in cooperation means nonparticipation and indifference in formal agreements or IGOs by states attempting to develop nuclear weapons in given dyads. It should be noted that a decrease in cooperation does not indicate more violence committed by states attempting to develop nuclear weapons. Third, a decrease in hostility does not mean states attempting to develop nuclear weapons become more cooperative.

Table 4.1: Estimate for nuclear status and state behavior (hostile behavior) 1930-2001

Generalized Linear Model (Tweedie with log link)			
	Model 1 *β(SE)*	*Model 2* *β(SE)*	*Model 3* *β(SE)*
Nuclear status	-.889 (.060)***	-.303 (.106)***	-.449 (.113)***
Security Problem	-1.14 (.072)***	-.815 (.088)***	-1.15 (.072)***
Security Commitment	.057 (.073)	.053 (.073)	.267 (.087)***
Nuclear status*Security Problem		-.852 (.127)***	
Nuclear status * Security Commitment			-.601 (.132)***
Contiguity (Land/Water)	-.771 (.085)***	-.796 (.084)***	-.791 (.084)***
Contiguity Less 150 miles	-.307 (.080)***	-.261 (.080)***	-.303 (.080)***
Major Power Status	-.535 (.079)***	-.529 (.079)***	-.551 (.079)***
Relative Capability Ratio	-.062 (.018)***	-.067 (.018)***	-.062 (.018)***
Ln Distance Capital	-.147 (.037)***	-.145 (.037)***	-.150 (.037)***
Global S-Score	-2.05 (.249)***	-2.08 (.248)***	-2.03 (.249)***
Regional S-Score	.781 (.165)***	.825 (.166)***	.783 (.167)***
Democratic Peace Effect (Weak-Link)	.028 (.012)**	.026 (.011)**	.033 (.012)**
Intercept	2.45 (.281)***	2.16 (.284)***	2.30 (.283)***
Maximum Likelihood Estimate	1.46 (.029)	1.44 (.028)	1.45 (.029)
Number of Observation	4788	4788	4788

*ρ≤0.10; **ρ≤0.05;***ρ≤0.01 (two-tailed test)
Notes:
 (1) Once a state achieved nuclear weapons capability it was dropped from the sample.

(2) Standard Errors are shown in parentheses below coefficients.
(3) Dependent Variable is hostile behavior of developing states.
(4) Model 1 is the linear additive regression estimate, Model 2 is the nuclear status and security problem interaction regression estimate, and Model 3 is the nuclear status and security commitment interaction regression estimate.
(5) Refer to table 1.1 in Chapter 1 for a complete list of the 16 proliferating states examined in the study.
(6) The data in the study treats all the state dyads as independent observations.

Model 1 in table 4.1 presents the results for hypothesis 1(a), which posits that the establishment of a nuclear weapons development program will increase the hostile behavior of proliferating states in dyadic relationships. The coefficient on the nuclear status variable was negative and statistically significant at the $\rho \leq 0.01$ level. Thus, the opposite has occurred, where states level of hostility decreased as they moved from not having a nuclear weapons development program to having one. In that respect, hypothesis 1(a) was not supported by the results in the study.

This decline in hostile behavior by developing states can be associated to the cost of militarized conflict and the economic cost of potential imposition of sanctions by other states. First, because militarized crisis is costly (monetary and political), and the potential for the crisis to escalation presents an even greater cost to states attempting to develop nuclear weapons; thus, the high cost of engaging in a crisis offers an explanation to why developing states become less hostile. And since it is a known fact that nuclear acquisition changes the bargaining position of developing states, particularly for states with limited conventional weapons capabilities, the potential of becoming nuclear gives them an incentive to become less engaged in conflict, and instead devote their resources to developing nuclear weapons as opposed to engaging in a costly militarized crisis. China, for example, refrained from attacking the Soviet Union's border until it was able to possess

nuclear weapons in 1969. This conflict avoidance argument could also partially explain why Iran has not engaged in the current Syrian civil war or offer direct military support to Hezbollah in 2006.

Second, the potential imposition of sanctions by other states can also influence the hostile behavior of states attempting to develop nuclear weapons. For example, several Western states have applied economic sanctions on Iran, Iraq, and North Korea for their attempts to develop nuclear weapons. Iran agreed to the Protocol Agreement with the IAEA and the Paris Agreement with Britain, France, and Germany in order to avoid additional sanctions by the United Nations Security Council and the United States. Again, in this situation, developing states would want to avoid potential sanctions, which could slow down or even halt their nuclear ambitions. Despite not supporting the argument made in Chapter 2 about the hostile behavior of states with nuclear weapons programs, this outcome warrants further theoretical and empirical inquiry.

Model 2 in table 4.1 presents the interaction effect between nuclear status and security problem in the study. The *nuclear status*security problem* interaction tests hypothesis 1(b), which predicts that a change in nuclear status from not having a nuclear weapons development program to having a program is associated with a decrease in the hostile behavior of developing states when a security problem is present. The study interprets the interaction according to Brambor et al (2006) suggestion to include all of the constitutive terms when specifying a multiplicative interaction model (p. 66). Thus, the effect of nuclear status on hostility is a combination of the coefficient estimate for the constitutive term and the interaction term. Since hypothesis 1(b) assumes that hostility decreases when the security problem condition is present, therefore, it is expected that β_1(nuclear status) +

β_3(nuclear status*security problem) is negative. This means that the interaction coefficient in model 2 should be negative. Examining model 2 the results indicate that *nuclear status* has a strong significant at the $\rho \leq 0.01$ level and negative effect on proliferating states' hostile behavior when no security problem is present. The effect of nuclear status on hostility is -.303 when the security problem condition is absent ($\beta_3 = 0$). Additionally, the coefficient on the *nuclear status*security problem* interaction is negative and statistically significant at the $\rho \leq 0.01$ level. The estimated effect of β_1(nuclear status) + β_3(nuclear status*security problem) is -.303 + [-.852], therefore, when nuclear status changes to having a nuclear weapons development program and a security problem is present proliferating states' level of hostility decreases by $\beta_1 + \beta_3$ = -1.16, with a .00215 standard error.[61] The effect of β_1(nuclear status) and β_3(nuclear status*security problem) interaction term are jointly significant at the $p \leq .01$ level. This outcome is 90% confident that proliferating states hostile behavior results from the interaction between nuclear status and security problem, with the limits between -1.16 $\pm$ .0035.

Thus, hypothesis 1(b) was supported by the statistical results, where a change in nuclear status was associated with a decrease in hostile behavior when developing states were experiencing a security problem. This conclusion supports the claim made in Chapter 2, that proliferating states attempt to avoid conflict by acting less hostile while they seek to procure nuclear weapons. An additional study is necessary to examine the hostile behavior of states once they acquire nuclear weapons or reverse their nuclear status, such as South

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[61] The standard error for $\beta_1 + \beta_3$ was calculated using the following equation:

$$\sqrt{\text{var}(\beta_1) + \text{var}(\beta_3) + 2\text{cov}(\beta_1\beta_3)}$$

β_1 = Nuclear Status
β_3 = Nuclear Status * Security Problem

Africa (1994-present) and India (1967-1971).

Model 3 in table 4.1 includes the interaction effect between nuclear status and security commitment in the study. The *nuclear status*security commitment* interaction tests hypothesis 1(c), assumes that when states nuclear status changes from non-developing to developing nuclear weapons is associated with an increase in the hostile behavior of developing states when they have a security commitment. Thus, the effect of nuclear status on hostility is a combination of the coefficient estimate for the constitutive term and the interaction term. Since hypothesis 1(c) assumes that hostility increases when the security commitment condition is present given that nuclear status changes from not having a program to having a program, therefore, it is expected that β_1(nuclear status) + β_3(nuclear status*security commitment) is positive. This means that the interaction coefficient in model 3 should be positive. Examining model 3 the results indicate that *nuclear status* has a strong significant at the $\rho \leq 0.01$ level and negative effect on proliferating states hostile behavior when no security commitment is present. The effect of nuclear status on hostility is -.449, when the security commitment condition is absent from the equation ($\beta_3 = 0$). Additionally, the coefficient on the *nuclear status*security commitment* interaction is negative and statistically significant at the $\rho \leq 0.01$ level. The estimated effect of β_1(nuclear status) + β_3(nuclear status*security commitment) is -.449 + [-.601]; therefore, when nuclear status changes to having a nuclear weapons development program and a security commitment is present proliferating states level of hostility decreases by -1.05 [$\beta_1+\beta_3$], with a .034 standard error.[62] The effect of nuclear status and the nuclear status * security

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[62] The standard error for $\beta_1 + \beta_3$ was calculated using the following equation:

$$\sqrt{\text{var}(\beta_1) + \text{var}(\beta_3) + 2\,\text{cov}(\beta_1 \beta_3)}$$

β_1 = Nuclear Status β_3 = Nuclear Status * Security Commitment

commitment interaction term are jointly significant at the $p \leq .01$ level. This outcome is 90% confident that proliferating states hostile behavior results from the interaction between nuclear status and security commitment, with limits between $-1.05 \pm .056$.

Thus, hypothesis 1(c) was not supported by the statistical results since proliferating states hostility levels decreased when they had a security commitment. In order to disentangle the linkage between nuclear weapons development program, security commitment, and the hostile behavior of developing states, a look at alliance literature is necessary. Within alliance literature, a consensus has been reached about the effect of alliance partnership on the strategic calculation of states, in that states are less likely to want to engage in conflict that has the potential to become a multilateral conflict (Leeds, 2003; Siverson & Starr, 1991; Gartner & Siverson, 1996). Additionally, even though a state has an alliance with another state, this does not necessarily mean that an ally will act on behalf of a partner and join the conflict; however, the mere notion of having an alliance partnership will still influence the behavior of adversaries (Leeds, 2003). Thus, understanding the benefits of having an alliance partnership with a powerful nuclear state, the proliferating state has more of an incentive to act hostile.

Moving on to the cooperation section of the study, table 4.2 displays the estimates for nuclear status and cooperative behavior.

Table 4.2: Estimate for nuclear status and state behavior (cooperative behavior) 1930-2001

Generalized Linear Model (Tweedie with log link)			
	Model 4 β(SE)	*Model 5 β(SE)*	*Model 6 β(SE)*
Nuclear status	-.568 (.031)***	-.555 (.078)***	1.06 (.074)***
Security Problem	-.052 (.046)	-.046 (.057)	-.060 (.046)
Security Commitment	.231 (.041)***	.231 (.041)***	.040 (.049)
Nuclear status*Security Problem		-.015 (.084)	
Nuclear status* Security Commitment			.596 (.081)***
Contiguity (Land/Water)	-.026 (.045)	-.026 (.049)	-.027 (.044)
Contiguity Less 150 miles	.058 (.047)	.058 (.047)	.064 (.047)
Major Power Status	.373 (.041)***	.373 (.041)***	.389 (.041)***
Relative Capability Ratio	-.027 (.010)***	-.026 (.009)*	-.029 (.009)***
Ln Distance Capital	.025 (.020)	.026 (.020)	.033 (.020)
Global S-Score	1.28 (.148)***	1.28 (.148)***	1.31 (.148)***
Regional S-Score	-.789 (.095)***	-.789 (.095)***	-.801 (.095)***
Democratic Peace Effect (Weak-Link)	.019 (.006)***	.019 (.006)**	.016 (.006)*
Intercept	-1.44 (.157)***	-1.44 (.159)***	-1.37 (.156)***
Maximum Likelihood Estimate	.678 (.013)	.678 (.013)	.671 (.012)
Observation Number	4788	4788	4788

$*\rho \leq 0.10$; $**\rho \leq 0.05$; $***\rho \leq 0.01$ (two-tailed test)
Notes: (1) Once a state achieved nuclear weapons capability it was dropped from the sample.
(2) Standard Errors are shown in parentheses below coefficients.

(3) Dependent Variable is cooperative behavior of developing states.
(4) Model 4 is the linear additive regression estimate, Model 5 is the nuclear status and security problem interaction regression estimate, and Model 6 is the nuclear status and security commitment interaction regression estimate.
(5) Refer to table 1.1 in Chapter 1 for a complete list of the 16 proliferating states examined.
(6) The data in the study treats all the state dyads as independent observations.

Model 4 for table 4.5, reports a negative and strong statistically [ρ≤0.01] significant coefficient on *nuclear status*, this means that as proliferating states establish a nuclear program their cooperative behavior decreases in dyadic relationships. Thus, the statistical results lend support to hypothesis 2(a). It is common knowledge that nuclear proliferation is frowned upon in the international community, when states establish a nuclear weapons development program this tends to generate international outcry and condemnation. And since nuclear weapons programs are costly in terms of finances and political reputation, states undergoing nuclearization do so with the clear intention of becoming a nuclear power and gaining the benefits bestowed on nuclear states. Thus, when faced with pressure to halt their nuclear weapons program, states will likely become less cooperative by withdrawing from international treaties, organizations, and breaking diplomatic relations. This situation is clearly evident with Iran in 2014 and North Korea in 2009.

Model 5 in table 4.2 presents the interaction effect between nuclear status and security problem for cooperative behavior in the study. The *nuclear status*security problem* interaction tests hypothesis 2(b), which predicates a change in nuclear status is associated with a decrease in cooperative behavior of proliferating states when they have a security problem. The coefficient on the *nuclear status*security problem* interaction was not found to be statistically significant, therefore, no support is found for hypothesis 2(b).

Finally, model 6 in table 4.2 includes the interaction effect between nuclear status and

security commitment in the study. The *nuclear status*security commitment* interaction tests hypothesis 2(c) that a change in nuclear status from not having a program to having one will increase their level of cooperation when a security commitment is present. The effect of nuclear status on cooperation is a combination of the coefficient estimate for the constitutive term and the interaction term. Since hypothesis 2(c) assumes that cooperation increases when the security commitment condition is present, therefore, it's expected that β_1(nuclear status) + β_3(nuclear status*security commitment) is positive. This means that the interaction coefficient in model 6 should be positive. Examining model 6 the results indicate that *nuclear status* has a strong significant at the $\rho \leq 0.01$ level and positive effect on proliferating states cooperative behavior when no security commitment is present. The effect of nuclear status on cooperation is 1.06 when the security commitment condition is absent ($\beta_3 = 0$). Additionally, the coefficient on the *nuclear status*security commitment* interaction is positive and statistically significant at $\rho \leq 0.01$. The estimated effect of β_1(nuclear status) + β_3(nuclear status*security commitment) is 1.06 + .596, therefore, when nuclear status changes to having a nuclear weapons development program and a security commitment is present proliferating states level of cooperation increases by 1.66 [$\beta_1 + \beta_3$], with a .001 standard error.[63] The effect of β_1(nuclear status) and β_3(nuclear status*security commitment) are jointly significant at the $p \leq .01$ level. This outcome is 90% confident that proliferating states cooperative behavior results from the interaction between nuclear status

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[63] The standard error for β_1 + β_3 was calculated using the following equation:

$$\sqrt{\mathrm{var}(\beta_1) + \mathrm{var}(\beta3) + 2\,\mathrm{cov}(\beta_1\beta_3)}$$

β_1 = Nuclear Status
β_3 = Nuclear Status * Security Commitment

and security commitment, with the limits between $1.66\pm .002$.

Thus, hypothesis 2(c) was supported by the statistical results since proliferating states cooperative levels increased when they had a security commitment. This cooperative behavior can be linked to nuclear ally's response to nuclear procurement by states, where a diplomacy track is used to prevent possible proliferation.[64] Reiter (2014) argued that security commitments discourage states from nuclear proliferation, where both Norway and West Germany had "accepted third party security commitments in lieu of pursuing nuclear weapons" (p. 73). For example, Norway and West Germany's entry into NATO provided them with the security they needed from Soviet aggression. In line with this argument, alliance ties can make proliferating states more cooperative because a nuclear ally will attempt to prevent this nuclear acquisition. This was clearly evident with China's attempt to prevent North Korea from acquiring nuclear weapons, where China was actively involved in the Six-Party Talks (2003-2006) to prevent North Korea's nuclear acquisition. Additionally, North Korea was engaged in various meetings and negotiations with the international community, which eventually lead to establishment of the 1994 Agreed Framework, the 1991 Joint Declaration on the Denuclearization of the Korean Peninsula, and the 1992 Safeguard Agreement with the IAEA. It could be argued that the motive behind a nuclear ally's behavior towards its proliferating partner is strictly based on the need to maintain existing power relationship in the alliance. To be more specific, a nuclear ally will want to continue to have a power advantage over its ally partner in an alliance, and is not in favor of power equality in this partnership. The results here warrant further

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[64] As noted in Chapter 3, proliferating states has security commitment in terms of military alliance, neutrality agreement, and cooperation agreement with a nuclear weapons state(s).

research into the role of security commitment has on the cooperative behavior of proliferating states.

4.3 Alternative Explanations to State Behavior

Moving on to rival explanations to the hostile and cooperative behavior of proliferating states in dyadic relationships. As shown in table 4.1, several of the control variables were found to be statistically significant. The results for several control variables had comparable effects on the hostility and cooperation samples. The regional S-Score control variables in the hostility and cooperation sample, for example, were found to be statistically significant with positive coefficients. This outcome means that the greater the degree of foreign policy similarity in a given dyadic relationship, the more hostile the nuclear developing state in the hostility sample will become, and the more cooperative it will become in the cooperation sample. On the contrary, the major power control variable had contrasting effects on the hostility and cooperation samples. In the hostility sample, the major power control variable was found to be statistically significant with a negative sign, meaning that when one state in the dyadic relationship is a major power, the state of interest's level of hostility declined. In the cooperation sample, the result was statistically significant with a positive sign, meaning that when one state in the dyadic relationship is a major power, the state of interest was more cooperative.

4.4 Robustness Check

This section will discuss the robustness tests applied in order to investigate the performance of the statistical estimates under various conditions. The first set of robustness tests examine the general results of the study as various changes are made to the sample of

proliferating states. The first measure applied is the removal of certain control variables in the model. After removing several control variables as well as including additional control variables, the effects of nuclear weapons development program, latent nuclear production capabilities, and the interaction terms on hostile as well as cooperative behavior were still found to be statistically significant. For example, the global S-Score for foreign policy similarity was replaced with the regional S-Score for foreign policy similarity, and the major power status variable was replaced with a major/minor power status variable; the effect of nuclear weapons development program and latent nuclear production capabilities on proliferating state behavior were still found to be statistically significant. Thus, the statistical findings in this chapter passed this robustness check.

The second measure to test the robustness of the results is the examination of outliers in the sample. When dyadic relationships in the hostility and cooperation models were examined for possible outliers in the data, no outlier problem was found in either model. Refer to figure A4.3 in the appendix for hostility and cooperation boxplots.

Third, the measure of hostility and cooperation in the *Dynamic Interstate Interaction* were originally lagged for year because the effects of state interaction are not always immediate on state behavior and interactions can have lingering effects on dyadic relationships. In order to test the robustness of the statistical results, the lagged dependent variables for hostility and cooperation were omitted, and another model was recalculated with un-lagged dependent variables (hostility and cooperative behavior). Again, the results with the omitted lagged dependent variables remain consistent with the original models in section 4.2 of the chapter, where they were found to be statistically significant with the same signs for the coefficients.

Finally, several goodness-of-fit statistics were calculated to assess the goodness of fit for the GLM applied in the study. The criteria for assessing goodness-of-fit included the following tests: deviance, scaled deviance, Pearson Chi Squared, Scaled Pearson Chi Squared, Log Likelihood, Akaike's Information Criterion, Finite Sample corrected AIC, Bayesian Information Criterion, and Consistent AIC. This outcome was evident for the nuclear weapons development program variable and latent nuclear production capabilities variable. Refer to appendix at the end of the dissertation for goodness-of-fit values in table A4.11 and A4.14. In summary, the results reported in section 4.2 of the study are robust when changes are made to the model specification.

4.5 Control Group of Non-Proliferating states:

The following section will discuss the results for the non-proliferating states control group. Table 4.3 presents the statistical results for this group of states, which was tested separately from the states attempting to develop nuclear weapons in tables 4.1 and 4.2. Recall, that latent nuclear production capabilities variable measures states technological and nuclear expertise, and how quickly they can acquire nuclear weapons *only* if they decided to do so. For this group of states, the study assumes that they have decided not to establish a program for the purpose of developing nuclear weapons. Rather, their nuclear policy is directed towards nuclear energy and research. For a more detailed discussion of the non-proliferation control group refer to Chapter 3. For the non-proliferating states control group, nuclear status is measured through latent nuclear production capabilities and the decision by these states not to establish a program for the purpose of obtaining nuclear weapons.

Table 4.3: Estimate for nuclear status and state behavior (hostility and cooperation), 1965-2001

Dependent Variables:	Generalized Linear Model Tweedie with log link			
	Model 7 Hostility	Model 8 Hostility	Model 9 Cooperation	Model 10 Cooperation
	β(SE)	β(SE)	β(SE)	β(SE)
Nuclear Status	-.016 (.038)	-.150 (.254)	-.067 (.003)***	-.456 (.026)***
Security Problem	-1.59 (.154)	.194 (.444)	.103 (.018)***	.636 (.041)***
Security Commitment	-.965 (.150)****	-2.87 (1.57)	-.107 (.015)***	-3.08 (.160)***
Nuclear Status * Security Problem		-.322 (.075)***		-.112 (.007)***
Nuclear Status * Security Commitment		.300 (.249)		.473 (.025)
Intercept	-3.12 (.266)***	-.183 (.152)***	-2.05 (.026)***	.566 (.162)***
Maximum Likelihood Estimate	7.34 (.216)	7.727 (.214)	.268 (.002)***	.265 (.002)
Observation Number	33 062	33 062	33 062	33 062
*ρ≤0.10; **ρ≤0.05;***ρ≤0.01 (two-tailed test) Notes: Standard Errors are shown in parentheses below coefficients. Nuclear status for non-proliferating states is measured through Latent Nuclear Production Capabilities. For a detailed discussion of this variable refer to Chapter 3. Refer to table A3.1 in appendix A for a complete list of states examined in the non-proliferation group sample				

Model 7 presents the effect of latent nuclear capabilities on hostile behavior of non-proliferating states, which was found to be nonsignificant. Comparing the results between the non-proliferating control group and proliferating group, the latter found that nuclear weapons development program had a negative effect on the hostile behavior of proliferating states.

Turning to the interaction effects in model 8, only the *nuclear status*security problem*

interaction was found to be statistically significant at the $\rho \leq 0.01$ level. The estimated effect of β_1(nuclear status) + β_3(nuclear status*security problem) is -.150 + [-.322], therefore, when latent nuclear capabilities increase and non-proliferating states choose to follow the NPT regime despite a security problem their level of hostility decreases by $\beta_1 + \beta_3 = $ -.472. Again examining the predicated outcome, the results suggest that as nuclear latency increases, while nuclear policy remains directed towards nuclear energy and research, hostility decreases with the presences of a security problem. Comparing this to the estimates for the proliferating states sample, the results for both non-proliferating and proliferating states were the same; thereby indicating that another variable determines the hostile behavior of states. This outcome calls for further research into the role of nuclear status, and possibly taking into account the political and security context of state when its nuclear status changes. In that respect, other factors interacting with changing nuclear status might better explain state behavior.

On the other hand, the *nuclear status*security commitment* interaction for the non-proliferating states was not found to be statistically significant. Comparing this to the proliferating states sample, which was negative and statistically, each interaction effect presents a different picture about the hostile behavior of states with respect to security commitment. For the proliferating states, the result indicated that the presences of a security commitment contributed to a decrease in the hostile behavior of states. Despite, failing to achieve statistical significant, the coefficient for the *nuclear status*security commitment* interaction is positive for the non-proliferating states, which indicates that the presences of a security commitment and an increase in latent nuclear production capabilities made this group of states more cooperative. But since the coefficient failed to achieve statistical

significance, one cannot make this claim about the hostile behavior of non-proliferating states.

In addition, model 9 presents the results for the cooperative behavior of non-proliferating states. The coefficient on the nuclear status variable was negative and statistically significant at the $p \leq .01$ level. Thus, the results indicate that as non-proliferating states latent nuclear production capabilities increase and they continue abide the NPT regime, their cooperation level decreases. The estimates for the non-proliferating states is similar to the one found for the proliferating states, where the latter groups level of cooperation also decreased when nuclear status changed.

In model 10, the results indicate that *nuclear status* has a strong significant at the $\rho \leq 0.01$ level and negative effect on non-proliferating states cooperative behavior when no security commitment is present. The effect of nuclear status on cooperation is -.456 when the security commitment condition is absent ($\beta_3 = 0$). Additionally, the coefficient on the *nuclear status*security commitment* interaction is negative and statistically significant at the $\rho \leq 0.01$ level. The estimated effect of β_1(nuclear status) + β_3(nuclear status*security commitment) is -.456 + [-.112], therefore, when latent nuclear capabilities increases and non-proliferating states continue to abide by the NPT regime their level of cooperation decreases by $\beta_1 + \beta_3 = $ -.568. The effect of β_1(nuclear status) and β_3(nuclear status*security commitment) interaction term are jointly significant at the $p \leq .01$ level. It should be noted that when non-proliferating states nuclear latency increases this does not mean that the program is being used to develop weapons, but rather for nuclear energy or other non-military means.

4.6 Dealing with reverse causation: Two Stage Least Square

In addition, in order to determine whether an issue of reverse causality is present in the theory proposed in the study about state behavior (hostility and cooperation) and nuclear status, the study conducted a 2SLS regression analysis. As noted in Chapter 3, the problem of reverse causality is whether it is nuclear status that leads to more or less hostility and cooperation, or whether more hostility and less cooperation leads to change in nuclear status. Thus, a 2SLS regression analysis was estimated in order to determine whether reversed causality is present in the theory. The results for the 2SLS regression analysis are presented in table 4.4.

Table 4.4: Estimation of simultaneous equations to test for reversed causality

Two-Stage Least Square		
	Model 11 β(SE)	**Model 12** β(SE)
Hostility	.015 (.038)	
Cooperation		-.013 (.360)
Constant	1.53 (.012)***	1.54 (.186)***
Adjusted R-Square	.0045	.000
F	0.16	0.00
N	4635	4664
*ρ≤0.10; **ρ≤0.05;***ρ≤0.01 (two-tailed test) Robust Standard Errors are shown in parentheses below coefficients Model 11: Instruments is security problem and instrumented: is hostility. Model 12: Instruments is security problem and instrumented: is cooperation.		

Model 11 reports the results for the 2SLS regression analysis between hostility and

nuclear status.[65] The coefficient on *hostility* is found to be nonsignificant; thereby, indicating that no causation exists between nuclear status and state behavior. This outcome gives indication that nuclear proliferation is not driven by increase hostility, and perhaps more importantly, shows that reverse causality in not present in the data. This is clearly evident with the case of India and Pakistan and Israel. Pakistan, for example, developed its nuclear weapons development program to balance against India's conventional military and nuclear status.

Next, model 12 reports the results for the 2SLS regression analysis between cooperation and nuclear status, in order to determine whether increasing/decreasing cooperative behavior lead to nuclear proliferation or whether nuclear status lead to increasing/decreasing cooperative behavior.[66] Again, like the previous model, the coefficient on cooperative behavior was found to be nonsignificant, thereby indicating that cooperation had no effect on the proliferation attempts by states in the study. In summary this outcome shows that reverse causality is not present between nuclear status and cooperation.

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[65] As previously stated in Chapter 3, the dependent variable in the first stage is *hostility*, which was regressed against security problem (instrumental variable). Security problem was used as the instrument variable since it had a strong influence on the hostile behavior of states in the study, as evident from the GLM models in table 4.1. In the first stage hostility is an endogenous variable meaning that it is determined within the model. Then the dependent variable in the second stage is *nuclear status,* which was regressed against the predicated value of *hostility*.

[66] The dependent variable in the first stage is *cooperation*, which was regressed against security problem (instrumental variable). Security problem was used as the instrument variable. Then the dependent variable in the second stage is *nuclear status,* which was regressed against the predicated value of *cooperation*.

4.7 Conclusion

The statistical results above are a starting point for understanding the behavior of states as their nuclear status changes. Arguably, the statistical results provided mixed support for the theoretical arguments made in the dissertation. With respect to hostility, only hypothesis 1(b) was supported by the statistical results, while hypotheses 1(a) and 1(c) the opposite effect was found. Hypothesis 1(b) indicated that the presences of a security problem decreased proliferating states level of hostility when nuclear status changed. On the other hand, the statistical results for model 1, which tested hypothesis 1(a), confirmed that hostility decreased when nuclear status changed. The statistical estimates indicate that hostility tends to have a downward effect when states moves to establish a nuclear program for the purpose of developing weapons, however, in the case studies (North Korea and Iran), the results indicated that hostility tended to increase as states program progressed. This differing outcome between Chapters 4, 5 and 6, was attributed to the fact that the statistical results only captured state behavior up to 2001[67] because of data limitation, whereas the case studies temporal scope went beyond 2001. Thus, if additional data were available to capture the militarized behavior of North Korea (2002-2006), Iran (2002-2015), Iraq (2002), and Libya (2002-2003), the statistical estimates would probably confirm similar results as the case studies in Chapters 5 and 6.

In terms of cooperation, only hypothesis 2(b), which tested the interaction between nuclear status and security problem was not supported by the statistical, where hypotheses 2(a) and 2(c), where both supported by the statistical results. Although, model 5, which tested hypothesis 2(b), was not found to be statistically significant, the negative coefficient

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[67] The CoW MIDs measure of hostility for dyadic interaction ends at 2001.

indicated that when nuclear status changed and a security problem was present, proliferating states were less cooperative. However, since it was not found to be statistically significant, this outcome cannot be fully supported. Finally, model 4, which tested, hypothesis 2(a), showed that proliferating states' level of cooperation decreased when nuclear status changed, where model 6, which tested hypothesis 2(c), showed that proliferating states' level of cooperation increased when a security commitment was present, and nuclear status changed.

CHAPTER 5: Case Study: North Korea's Nuclear Behavior

5.1 Introduction

The previous chapter presented the quantitative analysis of the dissertation regarding nuclear status and behavior of states. This chapter engages further with the argument about state behavior and nuclear status in a more detailed case study analysis of the Democratic People's Republic of Korea [North Korea, hereafter]. In order to analyze the behavior of North Korea from non-nuclear weapons development program status to nuclear weapons development program status, the study will apply a process tracing approach. Through historical evidence and quantitative data, the study will make inferences about the causal explanations for North Korea's behavior in its dyadic relationships as it attempts to develop nuclear weapons. The chapter is divided into three sections. The first section discusses the geopolitical environment in the peninsula following the Korean War in 1950s. Section two presents a discussion of North Korea's nuclear weapons development program. Finally, section three reports the historical narrative about the hostile and cooperative behavior of North Korea from 1954 until 2006 and tests the various hypotheses made about North Korea's behavior as its nuclear status changes.[68]

5.2 Historical Background to the Korean peninsula in the post-Korean War

In July 1951, the Korean War reached a stalemate. Originally a civil war between the North and South, the Korean War was eventually internationalized when the United

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[68] It should be noted that in the context of changing nuclear status this change can have several meanings, such as moving from not having a nuclear weapons development program to having one, and then reverting back to not having a program. This was clearly seen with South Africa, Brazil, and Argentina. For the purpose of the North Korean case in this chapter, a change in nuclear status refers to North Korea moving from not having a nuclear weapons development program to having one.

Nations, China, and the Soviet Union took part in the conflict.[69] It should be noted that Soviet involvement in the war was limited to supplying China with military equipment and air support because of fear of a direct confrontation with the United States (Jian, 2013). The stalemate lasted two years until an armistice agreement was signed on July 27, 1953 between North Korea, China, and the United Nations, where they agreed to a demarcation line near the 38th parallel between the North and South (Adas, Stearns, & Schwartz, 1994).[70] It was further agreed in the armistice that both North Korea and South Korea would maintain and patrol the Korean demilitarized zone [DMZ, hereafter], which would later prove to be much more difficult in reality and a reason for future clashes between the adversaries. The Korean DMZ has remained "the most heavily fortified conflict zone in the post-Cold War world, where more than 1.8 million military personnel confront each other, armed to the teeth with the latest weapons system" (Kim, 2002, p. 5). When the armistice agreement came into effect, it was only a ceasefire agreement between the North and South and their respective allies, rather than a peace treaty agreement to end the conflict. Consequently, both parties failed to achieve their goal of unifying the country under their preferred political system and instead the Korean peninsula was divided into two separate entities.

Subsequently, the Korean peninsula followed a dual pattern of development, where the

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[69] The United Nations forces under the leadership of the United States included military personnel and support from Australia, Belgium, Canada, Colombia, Ethiopia, France, Greece, Luxembourg, the Netherlands, New Zealand, the Philippines, South Africa, Thailand, Turkey, and the United States.

[70] South Korea abstained and refused to sign the armistice agreement, and therefore, the agreement was never replaced with a formal comprehensive peace agreement. In that respect, North Korea, South Korea, and the United States are technically still at war with each other.

totalitarian communist regime was isolated from the rest of the world and the command economy failed to develop. On the other hand, South Korea, initially an authoritarian regime, through massive financial as well as military assistance developed economically and politically. For example, North Korea had negative economic growth, while South Korea had a positive growth of 8% in the 1990s (Cha, 2002). During the Cold War, North Korea had aligned with the Soviet Union/Russia as well as China, and perhaps more importantly, North Korea played on the Soviet-Chinese rivalry to elicit military and economic assistance from both allies (Nanto & Manyin, 2010). Nonetheless, North Korea's diplomatic relations with Russia and to a lesser extent with China in the post-Cold War changed considerably. Russia had grown wary of the North Korean regime in the 1990s, and this was evident in Russia's desire to improve its diplomatic relations with South Korea and the West (Kim, 2002). For example, Russia moved to recognize the South Korean government. According to Yahuda (1996):

> with the end of bipolarity there was no longer any compelling strategic or political logic for the Soviet Union to continue to lend costly support to an ally whose leader and regime it disliked, especially as North Korea had the capacity to drag the Soviet Union into conflicts that were highly damaging to the new Soviet interests. Moreover, the Soviet Union had every reason to develop cooperative relations with the South in the hope of attracting much-needed investment and managerial know-how and as part of demonstrating to the United States and the West in general that the Soviet Union had genuinely put the Cold War behind it (p. 264).

In a similar manner, China, concerned about the security of its northeast border region and the potential encroachment of the US or its allies, sought to reduce but not completely eliminate its diplomatic relations with North Korea, in part due to China's desire to ensure the survival of a common communist regime and stability in the region (Yahuda, 1996). Thus, Beijing continued to maintain its military alliance with and economic assistance to North Korea. Despite continued and yet at times strained relations with North Korea, China

in the 1980s also moved to improve its diplomatic and economic relations with South Korea. In the 1990s, China pledged not to veto South Korea's UN membership application and later recognized the South Korean government. Thus, this normalization of relations between China, Russia and South Korea put an end to one of the Cold War alliances in the region. Besides attempting to improve geopolitical relations, China created several economic agreements with South Korea (Yahuda, 1996), all of which might have caused some unease in North Korea.

5.3 North Korea's nuclear weapons development program

Nuclear doctrine:

North Korea's nuclear doctrine can be traced back to its political goals and national strategy since the regime was created in 1948, which are state survival, the protection of national sovereignty, and unification with the South (Cha, 2002).[71] North Korea's nuclear aspirations were influenced by its opponents, such as the United States, South Korea, and Japan. This influence is entwined with North Korea's primary goal of state and regime survival. During the Korean War in the 1950s, the United States with its nuclear monopoly had threatened on several occasions to use nuclear weapons to end the conflict in its favor (Norris & Kristensen, 2006). Following the war and the re-establishment of the 38th north parallel which divides North and South Korea, the United States continued its political and military support of the South as well as Japan. For example, starting in 1958 and by 1967, the United States deployed 950 nuclear warheads in Southern Korea (Norris & Kristensen, p. 64). This situation created a security dilemma for North Korea, and in response to this

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[71] Unification with the South was known as songong t'ongil (Cha, 2002).

situation, Kim Il Sung became determined in the late 1970s to acquire nuclear weapons in order to balance the threat posed by the United States (Cha, 2002). Additionally, North Korea's nuclear program was and still is driven by an existential threat posed to its survival by South Korea's economic growth and military partnership with the United States. More importantly, in the post-Cold War era, North Korea's economic growth was dismal compared to South Korea. Moreover, South Korea had developed its own nuclear weapons program in 1970; this situation posed an existential threat to North Korea's survival due to their close proximity.

The Soviet Union and China:

North Korea's nuclear program developed without significant assistance from the Soviet Union and China, as they only aided North Korea in its nuclear research program, to be used for strictly peaceful means. According to Szalontai (2006), the Soviet Union provided North Korea with the initial help to establish its nuclear research program for peaceful purpose, such as energy, in the 1950s. The Soviet Union's nuclear assistance to North Korea can only be understood in the context of the Cold War, when "both superpowers found it politically useful to give nuclear technology to their Third World allies in order to demonstrate their technological superiority and political generosity" (Szalontai, p. 7). In 1959, the Soviet Union and North Korea signed an agreement in which the Soviets agreed to provide technical assistance to North Korea in order to help them establish a nuclear research center to be used for peaceful means—the production of nuclear energy in the Northern Pyongyang province of the country (Che, 1994). Thus, the Soviet Union provided North Korea with technical assistance, and later it provided support

with the installation of a Soviet nuclear research reactor.[72] However, Soviet and North Korean political relations became strained as the Soviet Union began to mistrust North Korea's true intentions for having a nuclear research center, and as a result the Soviet Union began to have major reservations about assisting in North Korea's nuclear research (Radchenko, 2006).[73]

As relations between the Soviet Union and North Korea became more strained in the 1960s, North Korea turned towards China for help in its nuclear research program. In the next two decades, China provided North Korea with various kinds of nuclear support. Following China's first nuclear test in 1964, North Korea asked China to share its nuclear weapons technology; however, China refused to do so (Bermudez, 1999). Thus, the Soviet Union and China only provided North Korea with assistance in developing its nuclear research program because of their competition with the West—particularly, the United States—but in reality, they had no intention of helping North Korea build its nuclear weapons program. Therefore, despite having initial assistance for its nuclear research program from the Soviet Union and China, North Korea's nuclear program for weapons development can largely be credited to Abdul Qadeer Khan (Norris & Kristensen, 2005). Since the 1970s, Pakistan and North Korea have had economic and diplomatic ties. It should be noted that Pakistan along with the Soviet Union/Russia and China are the few states that have relations with North Korea. In 1980, for example, Pakistan and North Korea signed a commercial agreement, which included the export of cotton, textile products,

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[72] The following section will discuss the USSR and China's formal alliance and security commitment to North Korea.
[73] Political relations between the Soviet Union and North Korea were also strained as a result of North Korea moving closer to China in 1962-1963 and openly criticizing Soviet revisionism (Radchenko, p. 25-26).

crude oil, and petrochemicals to North Korea (MOL, XIX-J-1-j Pakistan, 1982).

The move from peaceful use to weapons development:

In the 1970s, North Korea began to acquire plutonium reprocessing technology for the purpose of establishing nuclear weapons, and by early 1975, North Korea had successfully separated plutonium in hot cells (Nikitin, 2013, p. 5). By 1985, however, North Korea was under pressure by the Soviet Union to join the NPT. Eventually, North Korea signed the NPT (on December 12, 1985); however, despite signing the treaty, North Korea continued developing nuclear weapons (Nikitin, 2013) and despite their membership in the NPT, North Korea did not accept the safeguards and inspection regime set by the IAEA. Thus, North Korea's nuclear weapons program and eventual nuclear weapons acquisition were developed under a veil of secrecy from the international community.

In the 1980s, North Korea established a large plutonium separation facility at the Yongbgon Nuclear Research Center, which was not declared to the IAEA but was detected by US satellites (Wampler, 2003; CIA Report, 1982). In the 1990s, Pakistan's chief nuclear scientist Abdal Qadeer Khan "transferred nearly two dozen P-1 and P-2 centrifuges to North Korea. He also provided North Korea with a flow meter, some special oils for centrifuges, and coaching on centrifuge technology, including visits to top-secret centrifuge plants" (Musharraf, 2006: p. 296). Additionally, Pakistan assisted in North Korea's nuclear weapons development program, where in early 2000s "...Pakistan was the likely source of North Korea gas centrifuge uranium enrichment program" (Kampari, 2002: p. 108).

A move towards diplomacy 1991-2003:

This section will discuss the diplomacy that led to the three key agreements about

nuclear proliferation on the Korean peninsula: (1) the 1991 Joint Declaration on the Denuclearization of the Korean Peninsula between North Korea and South Korea; (2) the 1992 Safeguard Agreement with the IAEA; and the 1994 Agreed Framework between the North Korea and the United States.

First, the Joint Denuclearization of the Korean Peninsula was a result of the post-Cold War environment, where relations between South Korea, Soviet Union, and China were normalized. For example, South Korea in the 1990s established diplomatic relations with the Soviet Union and China. Additionally, in 1991, both North Korea and South Korea became members of the United Nation's General Assembly. In 1991, the United States withdrew its nuclear weapons abroad, which included 100 nuclear weapons in South Korea, and in turn, the Soviet Union reciprocated (Norris & Kristensen, 2005). Following this change in relations, both North Korea and South Korea signed the Joint Declaration on the Denuclearization of the Korean Peninsula on December 31st 1991, wherein "North Korea and South Korea pledged not to possess nuclear weapons, not to possess plutonium reprocessing or uranium enrichment facilities, and to negotiate a mutual nuclear inspection system" (Niksch, 2005: p. 10). Despite reaching this agreement, at the end of 1992, North Korea broke off discussion with South Korea about bilateral inspection as agreed upon in the declaration on denuclearization.

North Korea ratified the comprehensive Safeguard Agreement on January 30th 1992 with the IAEA, which permitted the IAEA to conduct a wide range of inspections of North Korea's nuclear facilities. It should be noted that North Korea had completed the Safeguard Agreement six years after signing the NPT. As a result of the Safeguard Agreement, the IAEA carried out six inspections of North Korea's nuclear facilities between June 1992 and

February 1993, which confirmed that North Korea had reprocessed more plutonium than the amount it had disclosed to the IAEA (Albright & Brannan, 2010). Due to discrepancies in North Korea's report to the IAEA on its nuclear program, in February 1993, the IAEA "invoked a provision in the safeguards agreement and called for a 'special inspection' of two concealed but apparent nuclear waste sites at Yongbyon" (Niksch, p. 10). The IAEA's decision was based on the belief that North Korea has been cheating on its commitment under the NPT about reprocessing plutonium, and that this special inspection would determine the amount of plutonium North Korea had been producing since 1989. In response to the IAEA's demand for special inspection, North Korea refused the IAEA request for special inspection, and in turn threatened to withdraw from the NPT in March 1993. Thus, North Korea's threat to withdraw from the NPT led to diplomatic talks between North Korea and the United States, and eventually led to the Agreed Framework between the United States and North Korea.

The Agreed Framework, which was signed October 21, 1994, sought to freeze North Korea's nuclear weapons development program and prevent further proliferation. A bit of background is needed about North Korea's uranium and plutonium programs. Since the early 1960s, North Korea had maintained a small research reactor for the purpose of plutonium production. In 1975, North Korea was able to separate a small quantities of plutonium, but this amount was insignificant to produce weapons-grade plutonium. Subsequently, in the 1980s, North Korea began construction on a secret nuclear reactor at Yongbyon capable of producing weapons-grade plutonium (Department of State Briefing Paper, ca. January 5, 1985). Throughout the mid-1980s and until 1994, North Korea had separated a significant amount of plutonium from the point of view of weapons. On the

other hand, in the 1950s with Soviet assistance, North Korea began mapping uranium ore deposits, which North Korea would later mine in small quantities (Radchenko, 2006). Subsequently, in the late 1970s, North Korea approached Czechoslovak for assistance in acquiring uranium-mining equipment, in order to increase its uranium ore extraction needed for weapons development. Figure 5.1 illustrates an excerpt from a telegram from the Hungarian embassy in North Korea to the Hungarian Foreign Ministry, February 17 1979.

Figure 5.1: Telegram from Hungarian embassy in North Korea in 1979.

The Czechoslovak ambassador said that on 12 February the Korean secretary of the Korean-Czechoslovak Intergovernmental Economic, Technical, and Scientific Consultative Commission officially told the first secretary of the Czechoslovak Embassy that the DPRK asked Czechoslovakia to:
1) deliver uranium-mining equipment to the DPRK
2) construct a 440-megawatt nuclear power plant in the DPRK. (I heard from the Soviet ambassador that the DPRK has two important uranium quarries. In one of these two places, the uranium content of the ore is 0.26 percent, while in the other it is 0.086 percent.)

Ferenc Szabó
ambassador

Source: XIX-J-I-j Korea, 1979, 81. doboz, 81-5, 001583/1979. Obtained and translated for CWIHP by Balazs Szalontai.

By the late 1980s and early 1990s, North Korea's uranium program developed significantly. North Korea, for example, had increased its uranium ore extraction at the Pyongsan mine and constructed a uranium milling facilities, in order to enrich uranium beyond the 3 - 5% enrichment threshold.

The bilateral talks were sparked by North Korea's refusal to abide by the IAEA's

special inspection and regular inspections under the safeguard agreement of its nuclear facilities. In response, the United States established a negotiations team in order to deal with North Korea's proliferation. In June 1993, North Korea suspended its withdrawal from the NPT and agreed to high-level meetings in Geneva with the Clinton Administration (Niksch, 1994; Pritchard, 2005).[74] Following several rounds of negotiations between the United States and North Korea, the Agreed Framework was adopted. The Agreed Framework called for the "move toward full normalization of political and economic relations" (as cited by Carline & Lewis, 2008: p. 5) between the United States and North Korea. The agreement included three obligations for the United States and North Korea to meet (Niksch, 2005; Carline and Lewis, 2008): first, that barriers to trade and investment would be reduced within three months of signing the agreement; second, that both the United States and North Korea would open a liaison office in each other's capital city; third, that bilateral relations between the United States and North Korea would be enhanced to the ambassadorial level.[75] Additionally, the agreement also included separate obligations for the United States and North Korea. The framework also stipulated that the United States would commit to providing North Korea with economic and diplomatic benefits, such as alternative energy, food supplies, light-water reactors, and assurance that they would not make threats or use nuclear weapons against North Korea.[76] In return, North Korea was obligated to remain party to the NPT, allow IAEA inspections, implement the joint

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[74] According to Niksch (2005), "the Pentagon also developed a contingency plan to bomb the Yongbyon nuclear facilities if North Korea began to reprocess the 8,000 fuel rods into weapons-grade plutonium" (p. 10).

[75] It should be noted that only the first requirement was met, and the others were never achieved.

[76] The Agreement was only between the United States and North Korea.

declaration of denuclearization, and perhaps more importantly, freeze and eventually dismantle its nuclear facilities.[77]

Breakdown in Agreements and a move towards nuclearization:

In 2003, North Korea announced that it would withdraw from the NPT; it was the first country to do so.[78] It should be noted that Article X of the NPT provides member states the right to withdraw from the treat:

> "Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests" (Article X.1, the Treaty on the Non- Proliferation of Nuclear Weapons).

Despite continued negotiations between the United States and North Korea, political tensions between the two states also continued to deteriorate their relations, and so in January 2003 "...Kim Il Jong decided that they were not producing enough value for North Korea to stay within the NPT. So it withdrew..."(Bunn and Rhinlander, 2005). And so, North Korea's withdraw from the NPT led to the breakdown of the 1992 Joint Declaration on the Denuclearization of the Korean Peninsula between North Korea and South Korea, the 1992 Safeguard Agreement with the IAEA, as well as the 1994 Agreed Framework between the North Korea and the United States.

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[77] North Korea's plutonium program was froze between 1997 and 2002 and unfrozen between 2002 and 2007 (International Institute for Strategic Studies, 2015).

[78] North Korea was pressured into signing the NPT in 1985 by the Soviet Union, and perhaps more importantly, it was a necessary condition to get nuclear research assistance from the Soviet' Union.

It was revealed in 2004 that "[i]n the second half of the 1990s, Abdul Qadeer Khan, scientist and 'father' of Pakistan's nuclear program, supplied uranium enrichment equipment and perhaps even warhead designs to North Korea" (Norris & Kristensen, p. 64).[79] In February 2005, North Korea announced internationally that it had acquired nuclear weapons capabilities and intended to manufacture multiple bombs (Nikitin, 2013). North Korea has stated that its nuclear weapons capabilities are to "[d]eter a U.S. invasion and hostile policy against it, such as U.S. sanctions and joint military exercises with South Korea. Pyongyang believes the United States desires regime change" (Kim, 2013).[80]

Since 2006, North Korea has conducted three underground nuclear tests; however, its nuclear weapons are very limited. According to the Center for Arms Control and Non-Proliferation, North Korea possesses four to eight nuclear weapons; despite this nuclear possession, North Korea has only been able to test short-range and medium-range missiles, and it so far lacks long-range missile capabilities (2013). According to Secretary of State Powell, the United States "now believe[s] [the North Koreans] have a couple of nuclear weapons and have had them for years" (Nikitin, p. 4). The following section will analyze the link between nuclear status and the behavior of states with respect to North Korea.

5.4 North Korea Analysis

Through a process tracing approach, this chapter attempts to unravel North Korea's hostile and cooperative behavior. It should be noted that the study examines North Korea's

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[79] Abdul Qadeer Khan is "the father of Pakistan's nuclear program" (Norris & Krisensen, p. 64).

[80] In 2003, the United States had intervened in Iraq with the pretense that Iraq had possessed nuclear weapons.

hostility levels towards other states in order to see how this level of hostility varies pre and post nuclear weapons development program. The following section presents four propositions made about North Korea's behavior as its nuclear status changes over the years as well as reports the historical narrative about its behavior from 1954 until 2006. The study applies in-depth case analysis to test four main objectives about North Korea's behavior as its nuclear status changes:

> *Proposition 1:[81]* North Korea's changing nuclear status resulted in a decline in its hostile behavior.

This proposition assumes that that North Korea's hostile behavior would decline when it moves to establish and maintain a nuclear weapons development program. The study argues that states will reduce their level of hostility when adversaries threaten to use sanctions or military force to prevent this proliferation attempt by North Korea, especially a much more powerful opponent. The logic behind this proposition is that states, such as North Korea, seek to avoid triggering preemptive attacks against their nuclear facilities and so they will likely take on less hostile actions in their dyadic interactions. The study will examine the following dyadic relationships: North Korea-South Korea, North Korea-United States, and North Korea-Japan.

> *Proposition 2:* North Korea's security commitments (guaranteed military support or *just* having the agreement) with the Soviet Union/Russia and China played a role in determining in its hostile behavior as North Korea's nuclear status changed since 1980.

Proposition 2 asserts that North Korea would become more hostile as its nuclear status

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[81] Due to the militarized dispute over the Korean peninsula between the North and South, the study assumed that a security problem was always present. Thus, proposition 1 mirrored hypothesis 1(b).

changes over time, given its security commitments from the Soviet Union/Russia or China. This proposition examines the interaction between nuclear status and security commitment in the case of North Korea. The logic for this proposition is that a security commitment from a nuclear patron will give North Korea the confidence to take on more aggressive and bold behavior in their dyadic interstate interactions.

Proposition 3: Changing nuclear status makes North Korea more cooperative in its dyadic relationships.[82]

For the purpose of this study, three dyadic relationships are examined they are as follows: North Korea-South Korea, North Korea-United States, and North Korea-Japan. The assumption here is that North Korea would prefer to be more cooperative in order to prevent any preemptive attacks and thus continue with its nuclear weapons development program. Essentially, North Korea is cooperating in order to complete its costly nuclear program without any disruptions through sanctions or military threats.

Proposition 4: North Korea's security commitment with the Soviet Union/Russia and China played a role in increasing its cooperative behavior as its nuclear status changed in 1980.[83]

North Korea's Hostile Behavior:

Figure 5.2 presents a historical timeline of North Korea's main hostile interstate interactions since 1954.

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[82] Again, it should be noted that hostility and cooperation are not mutually exclusive, where cooperation measure IGO membership, formal agreement, diplomatic representation/exchange, but does not measure a decline in hostile behavior.

[83] The logic for the four propositions are driven from the theoretical argument presented in chapter 2 about the behavior of states.

Figure 5.2 North Korea's hostility timeline

1950s

February 16 1958: North Korea hijacked a South Korean airliner

1960s

April 24 1965: North Korean jet fighters attacked a U.S. RB-47 reconnaissance plane over the Sea of Japan

June 3 1967: North Korean commandos entered South Korea's eastern coast

January 21 1968: North Korea launched the blue house raid

January 23 1968: North Korea attacked and seized the U.S. intelligence ship *Pueblo**

April 15 1968: North Korea shots down EC-121 U.S. spy plane over the sea of Japan

October 1968: North Korean commandos infiltrated the eastern coast of South Korea

March 1969: North Korean infiltrators killed a South Korean policeman on guard duty in an eastern coastal area

March 1969: North Korean infiltrators attack & kill American soldiers along the DMZ

April 15 1969: North shots down EC-121 U.S plane over the sea of Japan

June 1969: North Korean commandos carried out an attack on Huksan Island

October 1969: American soldiers attacked & killed along the DMZ by North Korea

December 11 1969: North Korea hijacked a South Korean airliner YS-11

1970s

June 5 1970: North Korea attacked & captured a South Korean broadcast vessel near the military demarcation line*

January 1971: North Korea attempted to hijack a Korean Airline plane

October 23 1973: North Korea crosses the NLL

December 7 1973: North Korean boat violated South Korean water

December 11 1973: North Korean torpedo boats in combat formation carried out provocative acts against South Korea

December 18 1973: North Korean patrol boats entered South Korean water

February 15 & 25 1974: North Korea attacks two South Korean fishing boats

June 28 1974: North Korea sinks a South Koran police patrol boat

November 1974: North Korean tunnels dug across the DMZ are found

August 1974: North Koran agent attacks South Korean President

March 19 1975: South Korea discovered more tunnels along the DMZ

March 24 1975: North Korean fighter jets violate South Korean airspace

September 1975: Two South Korean soldiers killed by North Korean infiltrators

June 1976: South Korea kills 3 North Korean infiltrators along the DMZ

August 17-September 16 1976: Poplar Tree Crisis

July 13 1977: North Korea shoots down an American helicopter

October 1978: A third North Koran tunnel is discovered along the DMZ

November 1978: North Korean armed agents kill several South Korean citizens

October 1979: North Korean agents attempt to infiltrate eastern section of the DMZ

* In response to previous aggression directed towards North Korea.

1980s

March 1980: North Korean agents attempt to infiltrate the South across the Estuary of Han River

November 1980: North Korean agents attempt to infiltrate the South again

May 1982: North Korean agents attempt to infiltrate the east coast of South Korea.

October 9 1983: Attempted assassination of South Korean president

December 16 1983: North Korea captures Japanese boat that violated its water*

December 16 1983: North Korea captures Japanese boat that violated its water*

September 1984: North Korean agent kills South Korean

October 1985: North Korean spy ship sunk by South Korea*

1990s

March 1990: Another North Korean tunnel is discovered along the DMZ

May 1992: North Korea fires shots south of the DMZ

May 1995: North Korean patrol vessel fires shots at South Korean fishing boat

October 1995: Armed North Koran agents move into the Imjin River just south of the DMZ

April - June 1996: Armed North Korean soldiers cross the DMZ

May & June 1996: North Korean vessels cross the NLL & standoff results with the South Korean navy.

1990s:

September 18 1996: North Korea infiltrates South Korean territory through submarine

September 18-December 29 1996: Naval crisis between North Korea and South Korea

April 10 & July 10 1997: North Korean soldiers cross the DMZ

April 1997: North Korean soldiers opened fired at South Korean soldiers after crossing the DMZ

June 1997: North Korean patrol boats fire at South Korean patrol boats south of the DMZ

July 1997: North Korean soldiers enters south of the DMZ, which lead to exchange of heavy gunfire.

September 1997: North Korean spy vessels enter Japanese water

October 25 1997: North Korea and China exchange fire

August 1998: North Korea test-fired missiles in an arc over Japan.

December 1998: Firefight between South Korea and North Korea.*

March 21 1999: North Koran spy vessel enters Japanese water

June 15 1999: North Korea and South Korea clash along the Yellow Sea border

2000s

April 9 2001: North Koran patrol boats entered South Korean water, on the southern side of the NLL. (This incident occurs several times over the year)

November 27 2001: North Korean soldiers fired at South Korean guard post

December 2001: North Korean spy vessels enter Japanese water

December 22 2001: Exchange of gunfire between North Korea and Japan*

January 5 2002: North Korean patrol vessel infiltrated South Korean waters off Yonpyong Island

June 16 & 29 2002: Yeonpyeong battles between North Korea & South Korea

June 29 2002: Another Yellow Sea clash between North Korea & South Korea

* In response to previous aggression directed towards North Korea.

2000s

February 19 2003: North Koran fighter jet crossed into South Korean airspace

March 2 2003: North Korean fighter jets intercepted a US reconnaissance plane over the Sea of Japan

March 10 2003: North Kora fired non-ballistic missiles into the Sea of Japan

July 17 2003: North Korea & South Korea exchange machine-gun fire at the DMZ.

August 23 2003: North Korean navy vessel crossed the NLL*

November 24 2003: North Korean patrol boat crossed the NLL*

November 4 2004: North Korean patrol boat crossed the NLL

May 1 2005: North Korea fired a short-range missile into the Sea of Japan

Sources: Wilson Center, Digital Archives, International History Declassified (2013); Correlates of War Project, Dispute Narrative (2004); Fischer, Hannah (2007) North Korean Provocative Actions 1950-2007, CRS Report of Congress.
Note: * In response to previous aggression directed towards North Korea.

The above historical timeline, which illustrates North Korea's conflictual behavior since the end of the Cold War, shows that North Korea has mainly had conflictual interactions with South Korea, the United States, and Japan. It should be noted that North Korea's hostile behavior often occurs as a result of US-South Korea joint military exercises. The study takes this into account and analyzes North Korea's hostile behavior in response to this military exercises pre and post nuclear weapons development program. Thus, this section will focus specifically on these dyadic relationships to understand North Korea's hostile behavior as it moves to establish its nuclear weapons development program in 1980.

In the case of North Korea-South Korea dyadic interaction and the North Korea-US dyadic interaction, it appears that following the Korean War, the level of hostility between North Korea and South Korea leveled out but began to steadily escalate in the 1960s. On January 11, 1968, Pyongyang radio issued an unyielding warning to the United States,

stating that "as long as US troops conduct reconnaissance by sending spy boats, our naval ships will continue to take determined counter measures" (Wilson Center Digital). This threat was made against the U.S.S. Pueblo, which was an electronic submarine intelligence ship stationed 14 miles off the cost of North Korea. Following this stern warning from North Korea, on January 23, 1968, North Korea captured the Pueblo and forced it to enter the Wonsan harbor (Telegrams from Pyongyang, Eliza Gheorghe). The crisis led to several minor clashes between North Korea, South Korea, and the United States.

North Korea took another hostile action in 1969 when it shot down EC-121 a US Navy reconnaissance plane over the East Sea south of Cheongjin in North Korea. In the early 1950s the Peacetime Aerial Reconnaissance Program [PARPRO, hereafter] was established in order to provide "...intelligence on the Soviet Union and its Communist neighbors" (National Security Agency Report, 1989: p. 4). The EC-121 was part of PARPRO, which North Korea asserted had violated its airspace. In a letter from UN Commissioner for the Unification of Korea Zouheir Kuzbari to UN Chef de Cabinet Narasimhan, Zouheir commented that:

> "prior to that plane incident, the North Korea army has been put under a state of complete combat readiness thus giving the impression that the North Koreans were expecting, before shooting the plane, an immediate retaliatory action from the U.S. Government". (April 19, 1969)

The North Korean military provocation increased tension between North Korea and the United States. This hostile incident by North Korea was followed by several other crises at the end of the 1960s—for example, the Blue House raid and violation of South Korean territory. A glance at the first panel in figure 5.3, the North Korea-US dyad, reveals that the spike in North Korea's hostility can be attributed to the U.S.S. Pueblo crisis and events that followed that engulfed the Korean peninsula. The hostility scores are based on the

Crescenzi and Enterline (2001) *Dynamic Interstate Interaction* model discussed in Chapter

3. The North Korea-South Korea dyad exhibited increased North Korean hostility in 1965

and onward, as opposed to the North Korea-US dyad, where in several periods, there was

a decline in North Korean hostility towards the United States.

Figure 5.3: North Korea's hostility levels for selected dyads and total hostility levels

a. North Korea and United States dyad

b. North Korea and South Korea dyad

c. North Korea and Japan dyad

d. North Korea's hostility
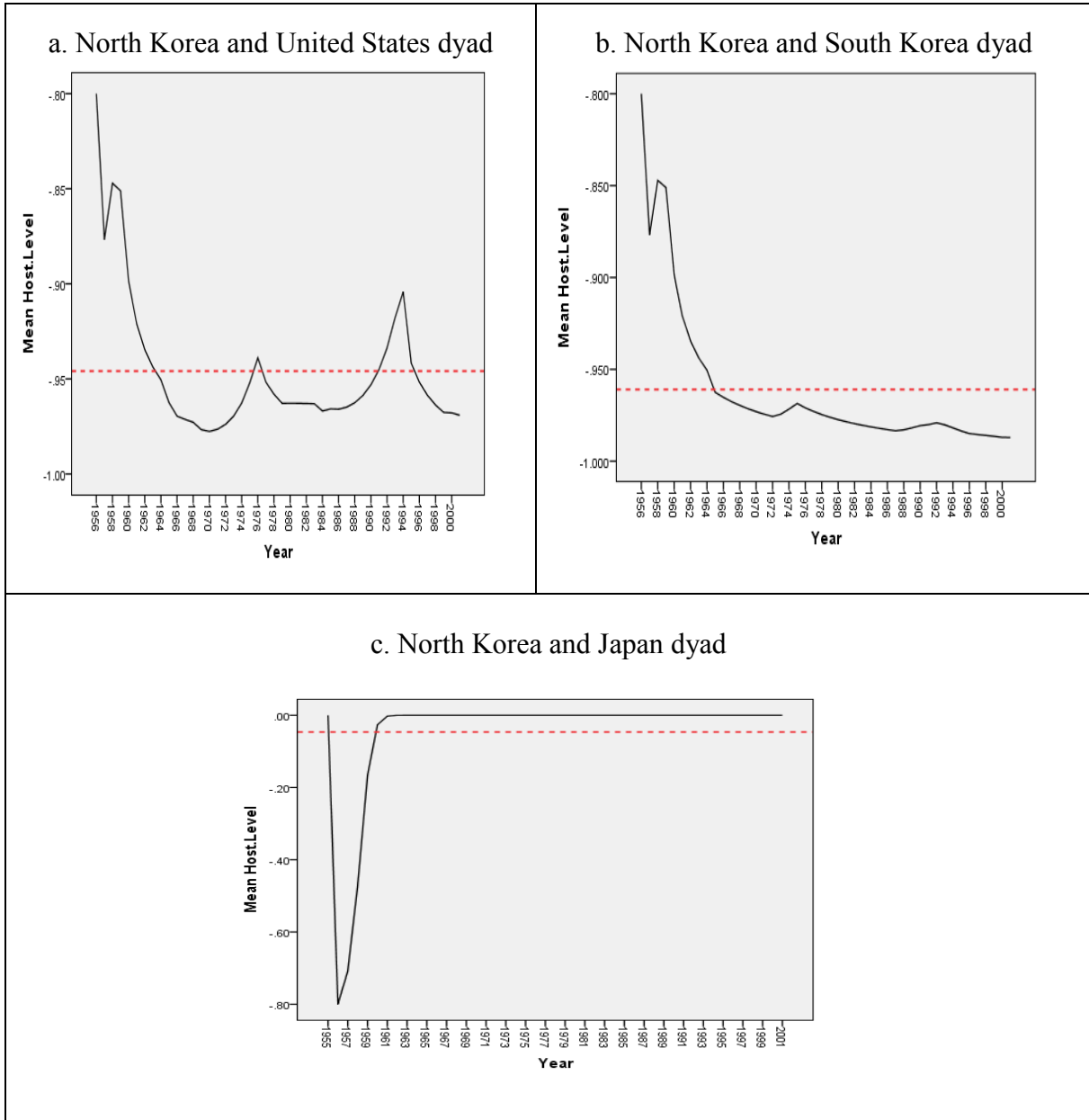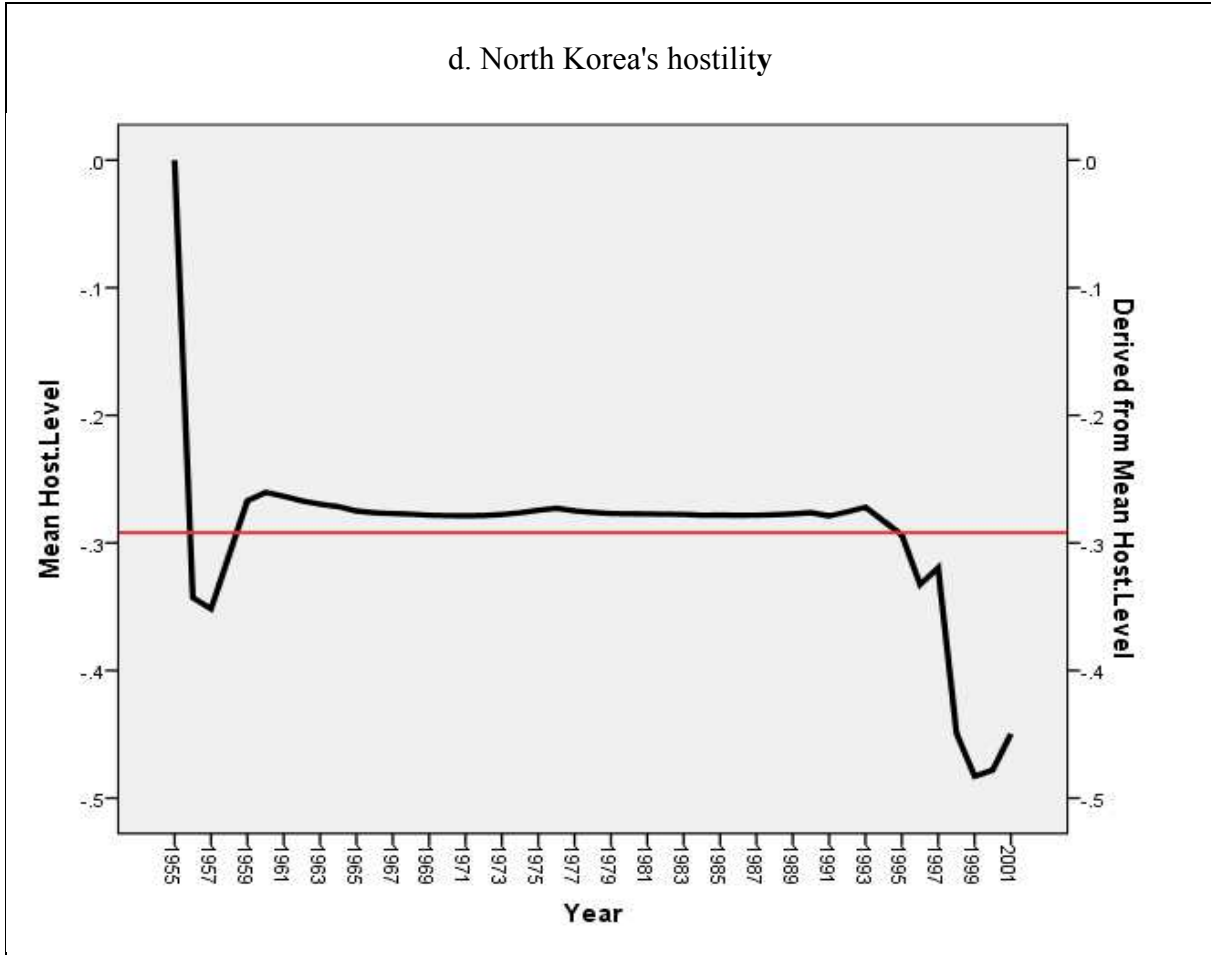
Notes: This measures North Korea's hostility level in various dyadic relationships as its nuclear status changed. The red dashed line in the x-axis is the mean hostile score. The hostile score ranges from -1 to 0, where -1 indicates the highest level of hostility in a dyad and 0 indicates neutrality. For example, in the North Korea-US dyad, North Korea was least hostile in 1956 and most hostile in 1970. Panels a-c, presents North Korea's hostile behavior in its dyadic relationships with South Korea, United States, and Japan. On the other hand, panel d, presents North Korea's overall hostility level in all of its dyad relationships measured on the study.

Moving on to the 1970s, North Korea's hostile behavior seems to further escalate. A glance at figure 5.2 reveals the various crises North Korea was involved in the 1970s. Again, much of North Korea's aggression was towards South Korea, the United States, and to a lesser extent Japan. On October 23, 1973, for example, North Korean gunboats and torpedo boats crossed the NLL; however, they fell short of violating the three nautical miles

"contiguous" zone in the Northwest Island (Wilson Center Digital). This violation of the NLL was repeatedly committed by North Korea that year, when it was estimated that North Korea violated the NLL 43 times between October and December. In one instance on the 10th of December, North Korea entered South Korea's water and was much bolder than in previous attempts to violate the South's territory; it came close to 3.6 nautical miles to Beak-Ryeong Island. On several occasions, North Korea attacked South Korean fishing vessels as well as violated South Korea's territory. It should be noted that North Korea's hostile behavior was at times in response to aggression from other states, mainly South Korea. On June 5th 1970, for example, North Korea's militarized action near the DMZ was in response to earlier aggression by South Korea. On April 4th 1970, South Korean soldiers has shot and killed 3 North Korean soldiers south of the DMZ (Fischer, 2007).

Notably, the Poplar Tree crisis in 1976 in the DMZ between North Korea and the United States illustrated North Korea's hostility as escalating from the previous decade. The DMZ is a space prone to high tensions and instantaneous military flare-ups between North Korea, South Korea, and the United States; the Poplar Tree crisis is a serious example of these military flare-ups in the Korean peninsula. The Poplar Tree crisis developed following the events on August 6, 1976, when South Korean construction workers and UN guards attempted to cut down a poplar tree along the DMZ zone that was obscuring the view of a UN observation post. Subsequently, North Korean guards at the DMZ ordered them to withdraw from the area, and they complied without a violent incident occurring. The situation developed into a full-scale crisis when on August 17, 1976, UN guards and the North Korean army clashed, resulting in the death of UN guards (US soldiers) in the joint security area of the DMZ (NKIDP, 1976). In response to this incident, the United

States dispatched F-111s and a navy task force to South Korea. The United States' military actions triggered the North Korean army to be put on alert and assume a war posture. A series of clashes occurred between them until September 6 when the United States and North Korea signed a JSA agreement; it came into effect on September 16, ending the crisis. During this crisis North Korea was still in the research phase, and in the early 1970s North Korea began to acquire technology for reprocessing plutonium (Byeong-gu et al., 1999).

Throughout the 1980s, North Korea engaged in various clashes with South Korea and the United States. Figure 5.3 for panel d, presents the overall trend in North Korea's hostility levels, confirming that in the 1980s and early 1990s, North Korea's hostility levels were fixed with only a slight increase, though hostility eventually begins to spike. In the case of North Korea, hostility increased due to a security dilemma in which North Korea's rivals (South Korea, Japan, and the United States) feel greater threat with its nuclear program and so they have reacted hostilely towards North Korea.

The North Korea and South Korea dyad experienced various hostile flare-ups through the 1990s and 2000s. Two notable crises occurred in 1996 and 2002 that warrant discussion. The former occurred on September 18 and lasted until December 29. In 1996, both North Korea and South Korea were enmeshed in another major military crisis: a North Korean submarine infiltrated South Korean territory in Gangreung. The North Korean submarine was on an espionage/reconnaissance mission. As a result of North Korea's military provocation, South Korea responded with a 49-day manhunt for the submarine crew in which 12 were eventually killed in battle with South Korean troops (Fischer, 2007: p. 13). South Korea even went as far as stating that the submarine incident was an act of war. The crisis between North Korea and South Korea was eventually resolved through third party

mediation efforts by the United States. Moreover, North Korea had additional clashes in the 1990s. The clashes in the 1990s, were during the freeze in North Korea's nuclear development under the 1994 Agreed Framework with the United States. In 1997, North Korea and China exchanged gunfire at the border (COW, 2004). Additionally, a North Korean spy vessel violated Japanese water in 1999; Japan responded to this incident through military means. In response to Japanese aggression, North Korea placed fighter jets near Japanese water.

Testing Proposition 1 - 2:

The following paragraphs will present an analysis of North Korea's hostile behavior and apply the "smoking gun" test for causal inference. Following the end of the Korean War and the signing of the armistice in 1953, North Korea's hostility level gradually began to increase and eventually became fixed from the 1960s until early 1990, where no major spikes occurred in North Korea's hostile behavior during this time period, as evident in figure 5.3. Analyzing North Korea's dyadic relationships with the United States, South Korea, and Japan, it is evident that North Korea's behavior was most hostile in the late 1950s and gradually declined in the 1960s until the early 1990s. Much of the conflictual interactions with the United States, South Korea, and to a lesser extent Japan were initiated by North Korea. In that respect, on several occasions military clashes occurred along the DMZ, which were due provocations by North Korea.[84] This provocation by North Korea

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[84] For the purpose of the study provocation "...is defined to include armed invasion; border violations; infiltration of armed saboteurs and spies; hijacking; kidnapping; terrorism (including assassination and bombing); threats/intimidation against political leaders, media personnel, and institutions; incitement aimed at the overthrow of the South Korean government; actions undertaken to impede progress in major negotiations; and tests of ballistic missiles and nuclear weapons. Information in this report was taken from South

can be attributed to the United States-South Korea war games, North Korea's national unification goal, to deter possible attacks from South Korea, and finally, to bolster the regimes power. According to Fischer (2007) "...the latter half of the 1960s,when North Korea staged a series of limited armed actions against South Korean and U.S. security interests" (p. 2).

Now looking at North Korea's nuclear status between 1960 and 1979, North Korea's nuclear research program was not in the position to develop nuclear weapons given that North Korea lacked both the equipment for uranium enrichment as well as chemical separation plants (Norris & Kristensen, 2005). However, in the 1980s, North Korea's nuclear status changed to nuclear procurement because during this time period North Korea attempted to pursue gas centrifuge technology (Albright & Brannan, 2010) as well as began building a nuclear reactor at the Yongbyon Nuclear Research Center (CIA Report, 1982). Again, during 1980s North Korea's hostility levels had no major spikes; rather its hostile behavior was fixed with minor changes (increases), as evident with its various military actions along the DMZ.

During the 1990s, the Korean peninsula experienced a series of crises, mainly due to North Korean provocations of South Korea, and to a lesser extent, Japan. Assuming that North Korea established its nuclear weapons in 1980, its level of hostility was fixed between 1980 and 1992 and there was no evidence of a major rise or decline in its hostile behavior. Nonetheless, in 1993, North Korea's hostility level spiked, due in part to the nuclear crisis of 1993-1994 when tensions over North Korea's nuclear production were at

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Korean and Western sources, but typically is denied by the North Korean government" (Fischer, 2007: p. 2).

an all-time high. In 1994, North Korea was able to achieve major advancement in its nuclear production: it had major plutonium production and was capable of producing 4 or 5 bombs (Norris & Kristensen, 2005). This spike in North Korea's hostile behavior can be seen in 1993 and 1994 with the second and third nuclear crisis, respectively. This behavior was a result of hostility directed at North Korea from its adversaries as well as hostility by North Korea directed at South Korea and a lesser extent Japan. Following the nuclear crises, tensions between North Korea and South Korea were heightened, mainly due to North Korean provocation. Following these nuclear crises, North Korea signed the Agreed Framework in 1994, which eventually led to the freeze of its nuclear development program. This included a freeze of its plutonium program and uranium enrichment program. Regardless of the freeze, however, North Korea continued its provocative actions, where on several occasions North Korean troops had crossed the military demarcation line into the joint security line of the DMZ. This encroachment along the DMZ was a result of North Korea's assertion that "it no longer would abide by the armistice provisions concerning the integrity of the DMZ" (Fischer, p. 13). A bit of background about the political context of the region is needed to understand North Korea's encroachment along the DMZ. First, during the 1990s, Russia's rapprochement with the West, and more importantly, Russia's economic ties with South Korea was a cause of concern for North Korea. This was particularly problematic for North Korea because had received significant aid in the past from the Soviet Union. Second, in the 1990s an economic gap between the North and South developed. According to Cha (2002) an "[a] nnual 8 percent growth in the ROK (before the 1997 Asian financial crisis) versus successive years of 3-8 percent negative growth in the North between 1991 and 1998 resulted in a nearly twenty-fold gap in the gross domestic

product of the two economies and a ratio of South to North per capital income as high as 11:1"(p. 215). In particular, this gap in growth between the North and South was a concern for North Korea because it posed as a potential threat for the regime itself as well as national security concerns.

Arguably, after North Korea initiated its nuclear weapons development program in 1980, its level of hostility was fixed, but it eventually began to increase in the 1990s and was at its highest level in 1999. As evident from North Korea's behavior between 1994-2003 (nuclear freeze period) North Korea did not exhibit a decline its hostile behavior as postulated by the findings in Chapter 4, where statistical estimates indicated a decline in hostile behavior as nuclear status changed. This issue was discussed in detail in the concluding section of Chapter 4.

Several propositions can be extrapolated from this conclusion about North Korea's hostile behavior. First, the more North Korea advanced in its nuclear program, the more hostile it became in its dyadic relationships; this could be due in part to its adversaries' objections—for example, the responses of South Korea and the United States prior to the nuclear freeze. Even after the nuclear freeze occurred between 1994 and 2003, North Korea's hostile behavior was still increasing, and even became more hostile with its decision to withdraw from the NPT, arguing that it was "...“most seriously threatened” by the United States" (Fischer, p. 25).[85] This suggestion that the behavior of states developing nuclear weapons, in that they are more hostile as their nuclear status changes, due in part

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[85] On February 5, 2003 "North Korea announced it had reactivated its 5-megawatt nuclear reactor at Yongbyon. The reactor could produce enough material for a nuclear bomb in about a year. North Korea, however, had apparently not restarted the nuclear fuel reprocessing facility at Yongbyon which could generate weapons-grade plutonium more quickly from the 8,000 fuel rods in storage" (Fischer, p. 25).

to their adversaries' potential or actual threat for preemptive strikes against their nuclear facilities. Consequently, this makes evident that states developing nuclear weapons behave in a similar fashion despite their power status in the international system.

Second, the establishment of a nuclear weapons development program does not contribute to a change in state behavior, but rather where a state stands in its nuclear development is a better determinant of its behavior. For North Korea, its nuclear program did not make a major milestone until 1986, where it "began operating a newly constructed 20-megawatt thermal (MWT) reactor near the city of Yongbyon" (Norris & Kristensen, p. 64). And by 1990, North Korea began separating plutonium, and by 1994 it was producing up to 10 kilograms of plutonium (Dreicer, 2005). Despite signing the Agreed Framework to freeze its nuclear development, the US Department of State noted that:

> "North Korea was pursuing a covert program to produce enriched uranium – in violation of the Agreed Framework, the North-South Joint Declaration on the Denuclearization of the Korean Peninsula, the Nuclear Non-Proliferation Treaty, and the D.P.R.K.'s Safeguards Agreement with the International Atomic Energy Agency. In fact, we [United States] determined that North Korea had been pursuing the program for a number of years, even as it was negotiating with senior American officials to improve relations (Kelly, 2014)"

Thus, in the early-to-mid 1990s, it is believed that A.Q Khan and his centrifuge associates at the Khan Research Laboratories [KRL, hereafter] had assisted North Korea in making centrifuges. In 1995, with KRL assistance North Korea began a clandestine uranium enrichment program. In that respect, North Korea had two significant periods, 1985 and 1995, where it achieved breakthrough in its nuclear weapons development program. Following these breakthroughs, North Korea's level of hostility seems to have increased as evident in the North Korea-United States dyad and North Korea-South Korea dyad. In both of these dyads, North Korea's level of hostility was above the mean hostility level for each

given dyad. This increased level of hostility can be attributed to several factors. First, United States-South Korea military exercises. Second, North Korea's behavior can be attributed to hostility directed towards it by the United States and South Korea. As discussed above, in 1994 North Korea signed the Agreed Framework with the United States, in turn leading to a freeze in its plutonium production between 1994 and 2003 (Nikitin, 2013).

Third, this conclusion suggests that hostile behavior has more to do with general activities in international politics than strictly with the establishment of a nuclear weapons development program and the move towards nuclearization. Now testing the proposition 1 regarding North Korea's hostile behavior as its nuclear status changes, the proposition predicted that North Korea would be less hostile as it established its nuclear weapons development program and advanced with its nuclear production; this was not supported. Proposition 1 was rejected because, as evident from the above narrative, North Korea's hostility level was fixed for rather long periods and did not exhibit increase or decrease over the years; in the 1990s, its hostility level actually began to gradually increase. Nevertheless, since the "smoking gun" test for causal inference was applied in the analysis, proposition 1 is not eliminated but instead is weakened.[86]

Turning to the security commitment component of the study, North Korea has had two important alliance partnerships with the Soviet Union/Russia and China.[87] Both of these alliance partnerships appeared to have had an important influence on North Korea's hostile

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[86] Chapter 3 provides a detailed discussion of the smoking gun test for causal inference. Smoking gun test requires sufficient condition for affirming causal inference, but not necessary condition (Collier, 2011).

[87] In the case of the Soviet Union/Russia, the study will refer to the Soviet Union and Russia separately.

behavior as its nuclear status changed in 1980. Following the Korean War, the Soviet Union was considered one of North Korea's strongest allies; however, this alliance partnership was far from perfect, and at times, the Soviet Union was in conflict with North Korea. In late 1962, the Soviet Union and North Korean military alliance was at its all-time low (Szalontai,2006), due in part to the North Korean and Chinese open criticism of the Soviet Union's revisionist policy. The gradual decline of the Soviet "empire" and its eventual demise led to a change in the North Korean-Soviet military alliance. In the late 1980s, as the Soviet Union sought to create detente with the West, and more importantly as part of its *perestroika* policy, the Soviet Union reduced its military aid and assistance to North Korea (French, 2007; Bauer, 2009). According to Zhang (1997):

> [d]uring the 1980s, Pyongyang maintained a closer relationship with Moscow than with Beijing. By 1989, however, an increasing rift between North Korea and the Soviet Union had emerged, as the latter gradually distanced itself from its old communist alliance and moved towards East-West détente. (p. 81)

The Soviet rapprochement with South Korea created further tensions between the Soviet Union and North Korea, and in turn led the latter state to move into isolation. In the 1990s, Russia ceased its military and technical aid to North Korea as it moved to create link with the West. According to Bauer (2009), "it is clear that Russia has no interest in propping up the current North Korean regime and it would most certainly not support the North militarily in the event of a war" (p. 53).

In testing proposition 2 about North Korea's hostile behavior patterns as its nuclear status interacts with its security commitment from the Soviet Union and China, it is discernible that proposition 2 is not supported by the narrative of its hostile behavior and alliance partnership with the Soviet Union. A parallel examination of North Korea's hostile behavior and military alliance partnership indicates that from the 1950s and until the late

1980s, this alliance partnership played no significant role in increasing North Korea's hostile behavior. Rather, the opposite happened in the 1990s, when Russia no longer supported North Korea, and in turn, the latter state's hostility level increased while its nuclear development efforts increased as well. Even so, since the "smoking gun" test for causal inference is used in the analysis,[88] proposition 2 regarding the Soviet Union/Russia is not eliminated but instead is weakened by the historical narrative.

Moving on to North Korea's alliance with China, this alliance partnership cannot be understood in a vacuum: it must be seen in the context of Cold War competition. Principally, China's military intervention during the Korean War to aid North Korea was the beginning of Chinese-North Korean relations and Chinese military support of the North. In 1961, North Korea and China signed the *Sino-North Korean Treaty of Friendship, Cooperation and Mutual Assistance*, which stipulated that in the case of a military attack, each party to the treaty agreed to intervene if the other side were attacked (Nanto & Manyin, 2010). In particular, in 1962 and 1963, North Korean-Chinese military cooperation was perceived to be at its highest level since signing the agreement. This mutual defense alliance would connect both countries militarily for the next 30 years; however, in the 1990s the alliance would be weakened as China moved to improve relations with South Korea. In 1992, China established full diplomatic relations with South Korea and sought to establish economic ties with the South as part of the latter state's economic reforms. Despite the increasing incompatibility between North Korea and China over the years, due in part to North Korean isolation and Chinese economic reform policies, the North Korea-Chinese

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[88] As noted in Chapter 3, when a hypothesis fails to find support in the data it is not eliminated entirely but rather it is weakened.

military alliance remains, albeit much weaker than in previous years.

When testing proposition 2, the interaction between nuclear status and military alliance with China yielded mixed results about North Korea's hostile behavior. While comparing North Korea's overall hostility level in figure 5.3, panel d, with its military alliance partnership with China, several insights can be discovered. First, between 1955 and 1960, North Korea's hostility level was increasing, especially in 1958 (their hostility score was -.380). Despite supporting the North in the Korean War, China was not yet in a formal military alliance with North Korea, and during this period of time, North Korea's hostility level was much higher than the succeeding years. Second, in 1961, North Korea and China established their formal military alliance with the *Treaty of Friendship, Cooperation, and Mutual Assistance,* which created a mutual defense alliance between the two states. Now, comparing North Korea's overall hostility level preceding the mutual defense alliance agreement demonstrates that in 1961, North Korea's hostility level had declined significantly from previous years, and the following years it was fixed with insignificant increases and decreases. In 1980, the year North Korea established its nuclear weapons development program, there seems to have been no change in its hostility level, even when it still had a strong military alliance with China. Nevertheless, in 1993 and onward, North Korea's hostility level began to increase significantly, but during these years its mutual defense alliance with China was much weaker than in previous years. This weakening alliance was due in part to North Korea's isolation as well as China's move towards economic reform. When applying the "smoking gun" test for causal inference to proposition 2, again no support was found for the proposition made above. To be more specific, the results were mixed, because in the 1980s North Korea's hostility level did not

experience significant increases despite having a mutual defense alliance with China—thus, for the 1980s, the hypothesis did not find support. On the other hand, during the 1990s and 2000s, North Korea displayed a significant rise in its hostility level (hostile score for 1999 was -.498, the highest level). During this time period, North Korea still had a mutual defense alliance with China, though a much weaker one due in part to domestic politics and geopolitics in respective states; this condition supported the claim made in proposition 2 for the North Korean and Chinese alliance partnership. Thus, due to the later events, the proposition is partially accepted.

North Korea's Cooperative Behavior:

This section of the chapter will present the historical narrative of North Korea's cooperative behavior as well as analyze the causal mechanism between nuclear status and North Korea's cooperative behavior in selected dyadic relationships. With the in-depth case analysis of North Korea, this section seeks to examine two propositions about its state behavior: first, whether changing nuclear status makes North Korea more cooperative; and second, whether North Korea's security commitment with the Soviet Union/Russia and China played a role in decreasing its cooperative behavior as its nuclear status changed in 1980. Figure 5.4 presents a timeline of North Korea's cooperative behavior from 1954 to 2006.

Figure 5.4: North Korea's Cooperation Timeline

June 12 1973
3rd Red Cross coordinating committee DPRK refuses to participate in any scheduled activities

August 25 1975
DPRK becomes member of NAM

December 1st 1973
DPRK rejected NLL

September 18 1985
4th DPRK & ROK economic conference

September 2 1999
DPRK nullified the NLL

January 28 1974
DPRK reject non-aggression pact proposed by ROK

August 25 1972
DPRK & ROK hotline agreement

May 17 1974
DPRK joined the WHO

December 12 1985
DPRK signed NPT

June 13 2000
Inter Korean summit

July 11 1961
Sino-DPRK Treaty signed

July 26 1972
Red Cross talks stalled Because DPRK demands

September 16 & October 17 1974
DPRK joined IAEA and UNESCO

December 31 1991
DPRK & ROK signed declaration on the denuclearization of the Korean peninsula

1960   **1970**

1980   **1990**   **2000**

March 1 1972
DPRK – Japan trade begins

January 19 1981
DPRK rejected ROK proposal about reciprocal visits

May 27 1991
DPRK reversed stance on UN & applied for accession

September 20 1971
Red Cross negotiations begin between DPRK & ROK

March 10 1972
Several talks between DPRK & ROK

May 28th 1985
8th Red Cross talks

September 18 1991
DPRK joined UN

September 22 1971
JSA hotline established

January 11 1980
DPRK proposed the resumption of the hotline operation

March 12 1993
DPRK withdraws from NPT

February 21 1972
1st Working level preparatory Red Cross meeting

August 28 1973
DPRK leaves coordinating committee

April 4 1996
DPRK announced giving up managing the DMZ

September 13 1972
DPRK & ROK Red Cross committee held in Seoul

April 5 1982
DPRK proposed tripartite talks with US & ROK

November 19 1996
DPRK closed the liaison office in Panmunjeon

Source: Wilson Center, Digital Archives, International History Declassified (2013)

Since the end of the Korean War, North Korea has moved to create diplomatic ties with several states in the international system—particularly, states with mutual interest. For instance, in 1972, North Korea moved to establish trade relations with Japan. In a letter from the *United Nations Commission for the Unification and Rehabilitation of Korea*, it states that the "[g]overnment and Liberal Democratic Party leaders decided Tuesday (18 January 1972) to send an LDP mission to North Korea" ("Letters between Narasimhan and Ozbudun" January 27, 1972), and in response to this move by Japan, "North Korean Premier Kim Il Sing is ready to send a mission to Japan if its visit is accepted by the Japanese government" (Ibid., 1972). In summary, this North Korean responsiveness to Japan implies cooperation on the part of North Korea to improve relations with Japan.

Figure 5.5, panel c, illustrates that after 1975, the North Korea-Japan dyad becomes more cooperative, with only few incidents where cooperation in the dyad dropped.

Figure 5.5: North Korea's cooperation levels for selected dyads and total cooperation levels

a. North Korea – USA Dyad

b. North Korea – South Korea Dyad

c. North Korea – Japan Dyad

d. North Korea's cooperation trends
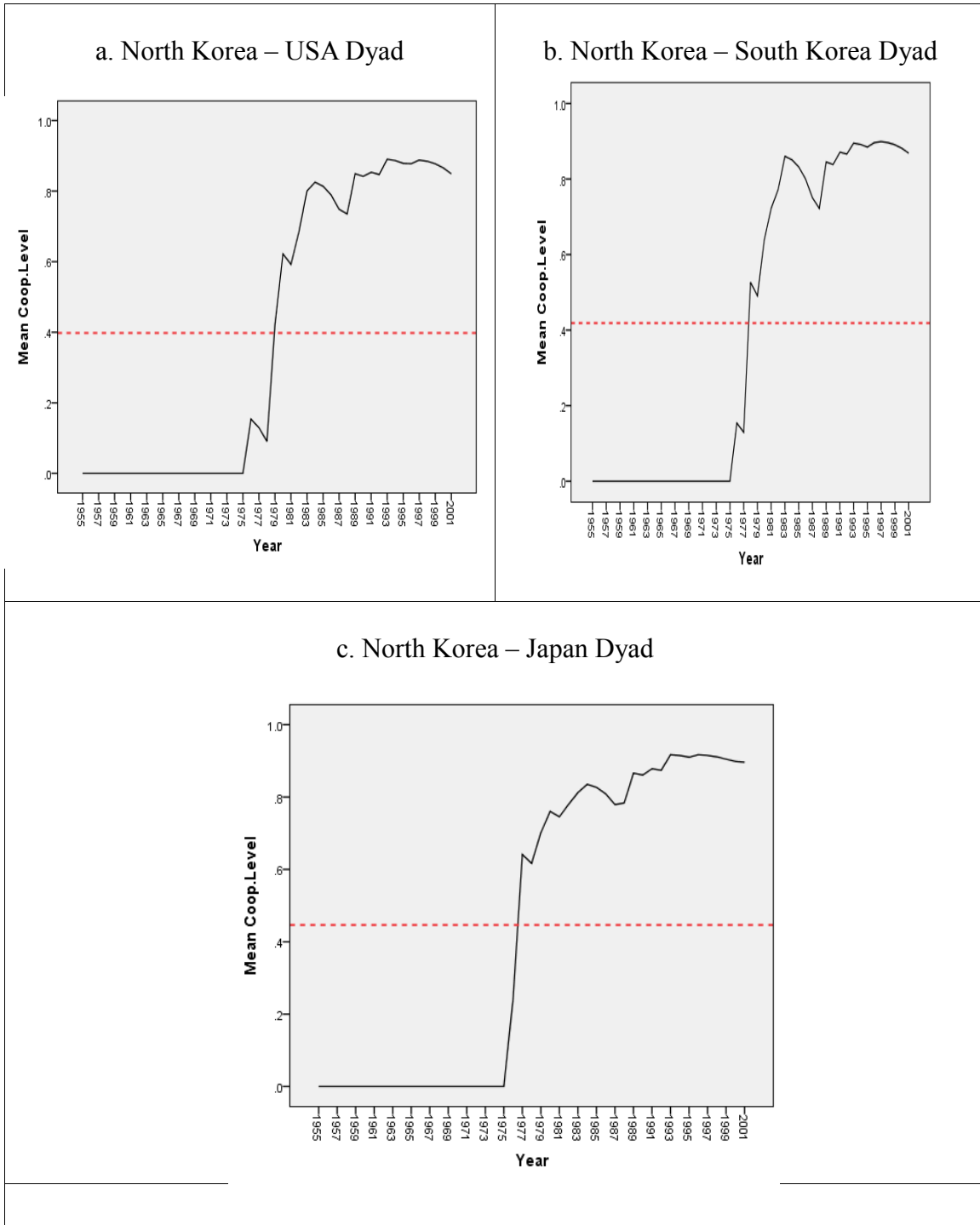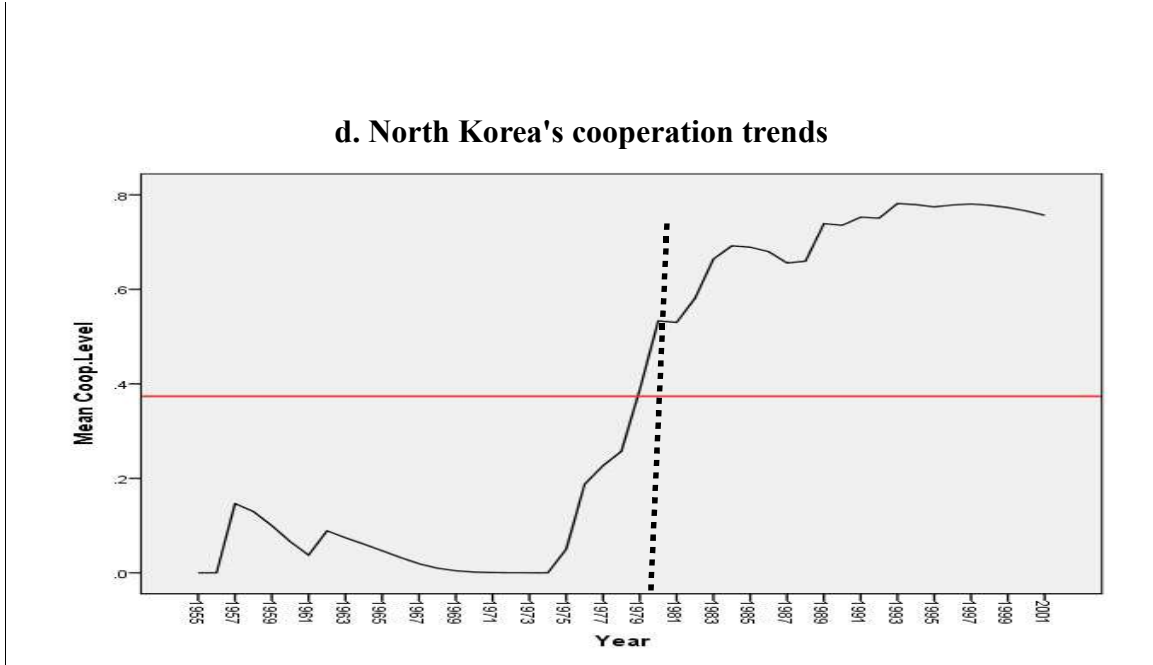
Notes: This measures North Korea's cooperation level in various dyadic relationships as its nuclear status changed. The red dashed line in the x-axis is the mean cooperation score. The cooperation score ranges from 1 to 0, where 1 indicates the highest level of cooperation in a dyad and 0 indicates neutrality. Panels a-c, presents North Korea's hostile behavior in its dyadic relationships with South Korea, United States, and Japan. On the other hand, panel d, presents North Korea's overall cooperation level in all of its dyad relationships measured on the study.

In 1958, North Korea and China moved to develop friendly relations. This cooperation between North Korea and China was further evident in 1961 with the *Sino-North Koran Mutual Aid and Cooperation Friendship Treaty.* In accordance to the treaty, China agreed to provide military assistance to North Korea as well as support its ally in an event of an attack, primarily from South Korea and the United States. The treaty further deepened North Korean and Chinese cooperation.

In the decades following the Korean War, diplomatic contact between the North and South was absent. However, in 1971, contact between North Korea and South Korea slowly began to emerge due to the Red Cross talks between North Korean and South Korean Red

Cross officials. The Red Cross officials attempted to initiate inter-Korean dialogue and eventually ease tension in the Korean peninsula, hoping it would lead to a peaceful reunification of the country. The first Red Cross talks between North Korea and South Korea began in 1971 and dealt with the reunification of separated families ("Preliminary Meeting between North and South Korea" November 20, 1971). Alongside the Red Cross talks, secret high-level meetings between South Korean Vice Premier Park Sung-chul and *intelligence chief* Lee Hu-rak with North Korean intelligence director Kim Yong-ju began to take place in the early 1970s, resulting in the North-South joint communiqué on July 4, 1972 ("Note on Information provided by DPRK Deputy Foreign Minister, Comrade Kim Yong-taek, on 3 July 1972 for the Ambassadors and Acting Ambassadors of Poland, Bulgaria, Czechoslovakia, Mongolia, Romania, Hungary, and the GDR" July 4, 1972). The communiqué outlined the agreement between North Korea and South Korea about the eventual unification of Korea: that this unification was to occur through peaceful means and without the interference of other states (mainly the United States and the Soviet Union). Besides the issue of unification, the communiqué also established an agreement about a direct phone line between Pyongyang and Seoul with the purpose of preventing "a military attack and to solve all upcoming operational questions" (Ibid., July 04, 1972). In summary, North Korea's move to agree to deal with the unification issue through peaceful means and their improvement in terms of transparency indicated an increase in cooperative behavior. In Figure 5.5, panel b, cooperation spikes can be attributed to the initiation of the Red Cross talks and secret high-level meetings between North Korean and South Korean officials starting in the 1970s.[89] Prior to the 1970s, cooperation between North Korea and South

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[89] Prior to the deadlock in inter-Korean dialogue, North Korea and South Korea were

Korea was simply non-existent.

Despite the numerous Red Cross talks, progress in the North-South dialogue was at times complicated and cooperation was low. In July 1974, the Red Cross talks reached a deadlock, a sign of future disagreement between North Korea and South Korea. The 1974 deadlock resulted from "the question of postponement of Korea deliberations at the forthcoming session of the UNGA" ("Letters between Ahmet H. Ozbudun and C.V. Narasimhan" August 17, 1972). In addition to these issues, there were several disagreements about procedural matters that contributed to the deadlock in the talks. As a result of the deadlock, the talks were suspended in August 1973. In a statement by Hu Rak-lee, Seoul co-chairman of the NSCC, he notes that:

> Kim Yong-ju, Pyongyang co-chairman of the North-South Coordinating Committee, at 6p.m. August 28 abruptly issued a statement declaring unilaterally that he would not proceed any further in the coordinating committee activities with myself, Lee Hu-Rak (as cited by Hu Rak-lee, 1973, p. 1)

He further notes that "the Seoul co-chairman of the North-South Coordinating Committee failed to translate into action those items agreed upon in the South-North joint communiqué and avoided taking actual steps while calling, by words only, for complete opening both societies" (as cited by Hu Rak-lee, 1973, p. 1).

In the 1980s, inter-Korean dialogue reopened with numerous Red Cross talks and economic council meetings. On May 28, 1985, for example, North Korea and South Korea took part in eight Red Cross talks. In addition, North Korea proposed the resumption of the direct phone line between Pyongyang and Seoul. Despite reopening the inter-Korean dialogue, agreement was never reached on several issues, and later in February 1986, North

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engaged in a total of three North-South Coordinating Committees and seven Red Cross talks (this does include the various Red Cross preliminary meetings).

Korea again withdrew from the talks in protest over the US-South Korea Team Spirit military exercises. A glance at figure 5.5, panel b, shows a drop in cooperation in the North Korea-South Korea dyad in the mid-1980s. The inter-Korean dialogue was reopened again in 1988 by resuming the Red Cross talks. Additionally, bilateral trade occurred between North Korea and South Korea. In 1988, North Korea and South Korea established the *Declaration for National Self-Esteem Unification and Prosperity,* which sought to promote diplomatic exchange and cooperation. The declaration led North Korea and South Korea to implement the *Basic Agreement on Reconciliation Non-Aggression and Exchange Cooperation* and the *Joint Declaration on Denuclearization of the Korean Peninsula*. In the latter agreement, both North Korea and South Korea agree "not to test, manufacture, provide, receive, possess, store, deploy or use nuclear weapons" (Wilson Center, Digital Archives, 2013). Like previous inter-Korean dialogue, the exchange and cooperation established in 1988 was temporarily put on hold when North Korea submitted a withdrawal notice from the NPT in 1993. In summary, North Korean and South Korean relations demonstrated fluctuations in North Korean cooperative behavior.

Another dyad to be examined more closely is the North Korea-US dyad. Relations between North Korea and the United States were limited due in part to the geopolitics of the Cold War and the US armed forces stationed in South Korea. Notably, an important cooperative behavior on the part of North Korea was the establishment of the 1994 United States and North Korea Agreed Framework, which deals with North Korea's nuclear weapons production. Once negotiations began between the United States and North Korea regarding the Agreed Frameworks, North Korea removed its earlier withdrawal notice to the NPT, and so remained a party to the treaty. Thus, this situation demonstrated North

Korea's cooperative behavior, and perhaps more importantly, North Korea was still subject to the obligations by the treaty and inspections required by the IAEA.

Despite removing its withdrawal notice from the NPT in 1993, North Korea submitted another withdrawal notice in 2003 due to mounting international pressure to halt its nuclear weapons development program. The Security Council had failed to effectively prevent North Korea from leaving the NPT because of "...among the P-5, notably China and the United States. In the absence of Council action, the NPT states parties found themselves without any mechanism or authority to act, even though the integrity of the NPT was put at stake" (Bunn & Rhinelander, 2005). The mechanism for withdrawal from the NPT as stated in Article X was discussed earlier in the chapter. Thus, due to North Korea's withdrawal from the NPT, and possible threat to international peace and security from its nuclear weapons development program (possible nuclear acquisition), the Six Party Talks was established. The Six Party Talks included North Korea, South Korea, China, Japan, the United States, and Russia. Table 5.1 presents the various round of talks with the 6 participating states.

Table 5.1: Six Party Talks Rounds 2003 - 2005

Round	Date	Issues / Achieved
1	August 27 - 28, 2003	*North Korean:* I. Nominalization of relations II. Non-aggression pact with the United States III. Ending nuclear weapons program not possible *Outcome:* IV. United States rejected non-aggression pact V. All participants agreed to hold additional talks VI. Nothing achieved
2	February 25 - 28, 2004	*North Korean:* VII. Agreed to partial reversal. North Korea will end its

		nuclear weapons program, but will keep their peaceful nuclear activities (energy and research) *Outcome:* VIII. United States, Japan, and South Korea rejected this partial reversal and instead wanted full reversal. They argued that the peaceful nuclear program would be a front for weapons development. IX. All parties agreed to the denuclearization of the Korean peninsula X. All participants agreed to hold additional talks in 2004
3	June 23 - 26, 2004	*North Korean:* XI. North Korea was willing to accept a nuclear freeze in return for compensation. *Outcome:* XII. All participants agreed to hold additional talks in 2005
4 †	July 26 - August 7, 2005 (Phase 1)	*North Korean:* XIII. Returns to the talks in July because the United States had agreed to recognize North Korea as a sovereign state and offered a statement that it will not invade North Korea *Outcome:* XIV. No agreement on reached on North Korea's nuclear program. XV. Agree to continue the round in a few weeks
	September 13 - 19 2005 (Phase 2)	*Outcome:* XVI. A joint statement was agreed between the participants, which opened the way for the denuclearization of the Korean peninsula. XVII. North Korea agreed to end its nuclear weapons program, abandon its current nuclear weapons, become party to the NPT, and allow IAEA inspectors. XVIII. The United States and South Korea agreed not to deploy nuclear weapons on the Korean peninsula. XIX. The other members to the talks agreed to provide aid and normalize relations with North Korea.
5 ††	November 9 - 11, 2005	*Outcome:* XX. No agreement was made to agree to the next round of

			talks.	

Source: Liang (2012) Arms Control Association; BBC News (2015)
Notes:
† February 2005, North Korea stated for the first time that it has developed nuclear weapons for the purpose of self-defense and it will not attend the Six-Party Talks (BBC News, 2015).
†† Round 6 held December 18 - 22, 2006 was dropped from the analysis because the study only examined North Korea's behavior before acquiring nuclear weapons, and so round 6 was dropped because North Korea tested its first nuclear bomb on October 9, 2006.

In addition, North Korean cooperative behavior is also demonstrated in its engagement in international institutions. For example, in 1974, North Korea joined the WHO, IAEA, UNESCO, and later in the 1970s it became a member of NAM and FAO, to name a few. Additionally, in 1991, North Korea reversed its stance about the United Nations and applied for UN accession as a separate entity. The remainder of this section will apply a process tracing test for the causal inference to evaluate the proposed hypotheses about the cooperative behavior of North Korea.

Testing Proposition 3 - 4:

The remainder of this chapter will test the propositions about North Korea's cooperative behavior as it established its nuclear weapons development program. A historical narrative was used to pinpoint North Korea's cooperative behavior as it began to establish its nuclear weapons production. The present study assumes that North Korea initiated its nuclear weapons development program in 1980 when South Korean intelligence discovered the construction of nuclear facilities weapons grade in Yongbyun (CIA Report, 1982). Proposition 3, it predicted that North Korea would become more cooperative as it moved to establish its nuclear weapons development program; the test found mixed results in the historical narrative and North Korea's cooperative score above.

From 1960 until 1980, North Korea was more cooperative than in preceding years, and only displayed a handful of cooperative behaviors in the 1980s and onwards. For example, North Korea withdrew from the NPT, but at the same continued to engage in the Red Cross talks as well as the Six Party Talks. Table 5.1 had presented the various round of talks between North Korea, South Korea, China, Japan, Russia, and the United States. In examining the talks, it's clear that North Korea's cooperation was mixed and due to the concessions given to them during the talks.

From the above discussion, it is difficult to clearly assert that North Korea was completely cooperative in its behavior. However, since the "smoking gun" test for causal inference was applied, the proposition was not eliminated but rather weakened by the outcome. North Korea's cooperative behavior tended to fluctuate over time, unlike its hostile behavior, which saw a period of fixed behavior patterns. Between 1955 and 1973, North Korea's cooperative behavior was at its all-time low, due in part to the geopolitical situation on the Korean peninsula and Cold War politics. Beginning in the early 1970s, North Korea's cooperative behavior began to spike upwards, due in part to the onset of the inter-Korean dialogue. The historical narrative reports that North Korea was more cooperative than anticipated but that this cooperation tended to decline when a crisis occurred between North Korea and its adversaries. In spite of failing to support the hypothesis about North Korea's cooperative behavior, two comments are necessary about this conclusion. First, hostile and cooperative behaviors are interdependent on each other, and thus, for future research and a better understanding of state behavior as nuclear status changes, both of these of elements should be studied jointly. Second and perhaps more importantly, the 1993-1994 nuclear crisis brings up the issue of causality and whether North

Korea's nuclear status has led to more hostility and less cooperation (breakdown of inter-Korean dialogue and North Korea's withdrawal from the NPT), or whether it is more hostility that led North Korea to the change in its nuclear status. Again, this brings up another issue to be studied about the hostile and cooperative behavior of North Korea.

Finally, the following section examines North Korea's cooperative behavior as its changing nuclear status interacted with security commitments from the Soviet Union/Russia and China since 1954. This section will first discuss the North Korean and Soviet Union/Russian military alliance, and then discuss the North Korean and Chinese military alliance. Again, as in the previous discussion of the North Korean and Soviet Union military alliance, this alliance fluctuated over the years; however, despite the tension at times between the two allies, the Soviet Union maintained its commitment to North Korea until the mid-1980s. Now examining North Korea's cooperative behavior in figures 5.5, it indicate that North Korea was least cooperative in the 1950s and 1960s and later became more cooperative over the years, with the highest level of cooperation in the 1970s. As North Korea's nuclear status changed in the 1980s, its cooperative behavior did not decline but rather increased, with only a few minor decreases in the late 1980s. Examining North Korea's overall cooperation score in figure 5.5 above shows that its cooperative level has increased significantly since the 1980s. Two comments can be made about North Korea's increasing cooperative behavior. First, international knowledge about its nuclear program led to an international outcry and the eventual establishment of the Six Party Talks over its nuclear program. Second, North Korea's deteriorating economy and famine necessitated greater cooperation with the West in order to generate greater financial and humanitarian aid.

In testing the proposition 4 for North Korea and Soviet Union/Russia security commitment, the hypothesis was not supported by the cooperative narrative. The Soviet Union's security commitment to North Korea was the strongest during the 1950s and the 1960s, but at this time North Korea did not possess a nuclear weapons development program, and its cooperative behavior was at its lowest point. Thus, for this time period, the results contradicted proposition 4, and instead North Korea behaved less cooperatively. Looking further into the time period prior to establishment of a nuclear weapons development program, 1970-1979, the Soviet Union continued to provide North Korea with support—however, North Korea's cooperative behavior increased despite still not having an active nuclear weapons development program. Finally, examining the time period while North Korea's nuclear status changed from 1980 until 2006, the Soviet Union and later Russia's security commitment to North Korea gradually diminished until the point of non-existence (1991-2006), and during this time period North Korea became more cooperative. This outcome offers further evidence against proposition 4 because North Korea behaved more cooperatively as its nuclear status changed, despite having declined a security commitment from the Soviet Union/Russia. Since the "smoking gun" test for causal inference was applied, proposition 4 was not eliminated but rather weakened by this outcome.

Finally we turn to the security commitment between North Korea and China. Unlike the Soviet Union/Russia, China's security commitment to North Korea extended into the post-Cold War era, albeit to a lesser degree than during the Cold War era. From the above narrative about North Korea and China's security partnership, it is evident that this relationship was cemented with the 1961 agreement. In testing proposition 4 for the

Chinese security commitment to North Korea, the hypothesis was supported by the narrative nor by the overall cooperation score for North Korea. An examination of North Korea's overall cooperation score between 1954 and 2001 as well as the cooperation narrative between 1950 and 2006 in figure 5.5 offers evidence about the link between nuclear status, security commitment, and cooperation.

5.5 Concluding Remarks about North Korea's behavior:

This chapter examined North Korea's hostile and cooperative behavior as its nuclear status changed in 1980. With respect to hostility, the study examined North Korea's militarized behavior with respect to its three main adversaries the United States, South Korea, and Japan. The study applied the smoking gun for causal inference in order test proposition 1, which posited that North Korea's hostile behavior will likely decrease as its nuclear status changes. It should be noted that due to the militarized dispute over the Korean peninsula between the North and South, the study assumed that a security problem was always present. Thus, proposition 1 mirrored hypothesis 1(b). The historical narrative did not support proposition 1 because North Korea's hostile behavior did not exhibit increase or decrease over the years; in the 1990s, its hostility level actually began to gradually increase. This outcome differed from the one found in the statistical findings in Chapter 4, where the estimated results showed a decline in hostile behavior when nuclear status changed with or without the presence of a security problem (model 1 and 2). This differing outcome between Chapters 4 and 5, was attributed to the fact that the statistical results only captured state behavior up to 2001[90] because of data limitation, whereas the case studies

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[90] The CoW MIDs measure of hostility for dyadic interaction ends at 2001.

temporal scope went beyond 2001. Thus, if additional data were available to capture the militarized behavior of North Korea (2002-2006), Iran (2002-2015), Iraq (2002), and Libya (2002-2003), the statistical estimates would probably confirm similar results as the case studies in Chapters 5 and 6.

Next, the chapter examined the interaction between nuclear status and security commitment in the case of North Korea. The study examined North Korea's alliance partnerships with the Soviet Union/Russia and China between 1954 and 2014. Proposition 2 posited that North Korea would become more hostile as its nuclear status changed when it had a security commitment from Soviet Union/Russia and China. With respect to Soviet Union/Russia security commitment to North Korea, the historical narrative did not support the claim made in proposition 2. This alliance partnership played no significant role in increasing North Korea's hostile behavior. Rather, the opposite happened in the 1990s, when Russia no longer supported North Korea, and in turn, the latter state's hostility level increased while its nuclear development efforts increased as well. On the other hand, China's security commitment to North Korea, the historical narrative again showed no support for proposition 2.

Finally, this Chapter also examined North Korea's cooperative behavior as its nuclear status changed in 1980. Proposition 3, it predicted that North Korea would become more cooperative as it moved to establish its nuclear weapons development program; the test found mixed results in the historical narrative and North Korea's cooperative. Chapter 4, indicated a positive correlation between nuclear status and cooperation, the results in Chapter 5, despite the mixed outcome, further supported the claim made in Chapter 4 that a change in nuclear status increases state cooperative behavior. This increased cooperative

behavior could be due to the international community's effort to get the proliferating state to reverse its nuclear policy, as was evident with North Korea. Finally, proposition 4, which asserted that North Korea would become more cooperative when it has a security commitment was only supported for the North Korea-China alliance partnership, but failed to find support for the North Korean-Soviet Union/Russia alliance partnership. This outcome for North Korea-China alliance partnership supported the claim estimated results in Chapter 4.

CHAPTER 6: Conclusion

6.1 Discussion

The dissertation tested the effect of nuclear status on the behavior of states developing nuclear weapons in dyadic relationships, attempting to answer the following questions: What are the implications of a changing nuclear status on developing state's pattern of behavior in the international system? Does nuclear status bolster or deter hostility in dyadic relationships? What role does nuclear status play on state cooperative behavior in the international system? To assess these questions, several statistical estimates and case study analyses were conducted. The statistical estimates and case studies yielded interesting results about the behavior of proliferating states. Much of the past scholarship on nuclear weapons has overlooked the importance of nuclear weapons development program status and its potential effects on the behavior of proliferating states, and so this study offers a novel approach towards the issue of nuclear weapons.

A central issue in the study was whether the security environment (security problem and security commitment from a nuclear patron) interacting with nuclear status influenced the behavior of proliferating states. In chapter 4, the study examined the behavior of states with nuclear weapons development programs between 1930 and 2001. This portion of the study posited several arguments about the behavior of developing states. First, the study argued that changing nuclear status[91] had a direct effect on the hostile and cooperative

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[91] To recap previous discussion of changing nuclear status in Chapter 1, this refers to a state moving from not having a nuclear weapons development program to having a program. Changing nuclear status was measured through two variables in the study: first, it was measured through a simple categorical variable of not having and having NWDP; second, it was measured through latent nuclear production capabilities and the decision by a state to acquire nuclear weapons. It should be noted that the study did not examine whether state behavior changes when states revert back to not having a nuclear weapons development

behavior of developing states. The statistical results in Chapter 4 indicate that changing nuclear status did not make states more hostile—rather, the opposite occurred, where developing states became less hostile. As discussed in Chapter 4, the decrease in hostility can be associated to the cost of militarized conflict and the economic cost of potential imposition of sanctions by other states. Turning to cooperative behavior, the study found that cooperation decreased when both security problem and security commitment were absent.

Another element the study examined was whether the presence of a security problem interacting with changing nuclear status influences a developing state's hostile and cooperative behavior. The study found that this interaction decreased proliferating states hostility when a security problem was present. The study found that security problem interacting with nuclear status has no significant effect on the cooperative behavior of states with nuclear weapons development programs. Next, the study examined the interaction between security commitment and nuclear status, where it was found that the presence of a security commitment decreased the hostile behavior of states with nuclear weapons development program. On the other hand, the presence of a security commitment increased the cooperative behavior of states with a nuclear weapons development program.

After completing the statistical analysis portion of the study on all proliferating states (Chapter 4), the hypotheses varied in level of support. These particular findings open up a new avenue for research about the implications of nuclear status on the behavior of proliferating states, and perhaps more importantly, on the behavior of non-proliferating

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program, as in the case of Romania 1981-1989 (Jones & McDough, 1988), Yugoslavia 1948-1963 and 1982-1987 (Potter et al., 2000), and South Africa.

states and states party to the NPT.

Despite failing to support some of the theoretical arguments made in the study, the results should not be discounted, and instead an alternate argument can be made. The alternate argument posits that proliferating states act less hostile as they move further in their nuclear production, especially when they are experiencing a regional security problem; this is in order to avoid potential threats or preemptive attacks by their adversaries against their nuclear facilities. Since nuclear weapons have a high cost for proliferating states in terms of tangible cost (violation of the NPT agreement and defection from the norm of non-proliferation) and intangible cost (financial and political cost of the program), the likelihood that a potential conflict escalation might interrupt their efforts is too high, and so it is optimal for a state to act less hostile in order to avoid potential conflict.

In order to fully understand the behavior of states with nuclear weapons development programs, the present study implemented a major case study analysis of North Korea. In the North Korean case, a historical narrative was used to pinpoint North Korea's hostile and cooperative behavior before and after it established its nuclear weapons development program. The results in the North Korean case provided mixed support for the theoretical argument made in the dissertation, and instead of answering questions posed in Chapter 2, it brought to light additional questions about the behavior of states as they attempt to proliferate. Taken together, North Korea's hostile and cooperative behavior varied immensely as its nuclear status changed, and its behavior was dependent on the security problem on the Korean peninsula. In terms of hostile behavior, North Korea's hostility level began to increase steadily in 1957; then, between 1959 and 1993, North Korea displayed a fixed hostility levels in its dyadic relationship. However, in 1993, North

Korea's hostility level spikes, due in part to the nuclear crisis of 1993-1994, during which tensions over North Korea's nuclear production were at an all-time high. Assuming that North Korea had established its nuclear weapons in 1980 (Central Intelligence Agency, 9 July 1982), its level of hostility was fixed during this period and there was no evidence of a reduction in its hostile behavior. Rather, North Korea's behavior became more hostile in the 1990s and eventually the state was at its highest level of hostility in 1999, due in part to North Korea's provocation of South Korea along the DMZ, hostility directed towards it by South Korea, as well as the annual war exercises between the United States and South Korea.

Turning to cooperation, North Korea's cooperative behavior tended to fluctuate over time, unlike its hostile behavior, which saw periods of fixed patterns and fluctuations. Between 1955 and 1973, North Korea's cooperative behavior was at its all-time low, due in part to the geopolitical situation on the Korean peninsula and Cold War politics. Beginning in the early 1970s, North Korea's cooperative behavior begins to spike upwards, due in part to the onset of the inter-Korean dialogue. The historical narrative in Chapter 6 shows that North Korea was more cooperative and that this cooperation tended to decline when a crisis occurred between North Korea and its adversaries because it tended to engage more in the international community during and after the crisis.

Three comments are necessary about these conclusions. First, hostile and cooperative behaviors are interdependent, and so for a better understanding of state behavior as nuclear status changes, these of elements should be studied jointly. Second and perhaps more importantly, the 1993-1994 nuclear crisis brings up the issue of causality and whether North Korea's nuclear status has led to more hostility and less cooperation (the breakdown of

inter-Korean dialogue and North Korea's withdrawal from the NPT), or whether it is more hostility that led North Korea to the change its nuclear status. Third, North Korea's nuclear program has led to a greater sense of security and confidence, and so it was more willing to negotiate as well as open lines of contact and communication with the United States and South Korea. This was clearly evident with the Agreed Framework negotiations in 1994 and Joint Nuclear Denuclearization in 1992. Therefore, this situation explains North Korea's behavior towards cooperation.

The North Korean case study identified the relationship between the establishment of a nuclear weapons development program and state behavior.[92] To conclude, a brief discussion and analysis of Iran's hostile and cooperative behavior during its change of nuclear status is undertaken.[93] This brief discussion will provide a good test of external validity, in that the results found in Chapter 5 can be generalized to Iran. The following section will discuss Iran's hostile and cooperative behavior.

6.2 Understanding Iran's hostile and cooperative behavior:

Iran's nuclear weapons development program can best be understood in two parts: from 1974 to 1978 under the Shah and from 1984 to 2010 under the Khomeini. In the 1970s, Shah Mohamed Reza Pahlavi signed several agreements with West Germany, France, and the United States to purchase and build nuclear reactors strictly for the purpose of producing energy. Like North Korea, Iran received initial support from the United States

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[92] This includes the establishment as well as advancement in nuclear production.

[93] Iran's nuclear status is interesting since it had a reversal of its nuclear position. In 1974, Iran's nuclear status moved from not having a program to having one, but in 1978 it reverted back to not having a nuclear program. A detailed discussion of Iran's nuclear decision is undertaken in Chapter 1.

and France for its nuclear research program to be used for peaceful means; however, in 1974, the Shah's nuclear policy shifted towards developing weapons. In June 1974, the Shahs stated that Iran would have nuclear weapons "without a doubt and sooner than one would think" (as cited by Cordesman & Al-Rodhan, 2006: p. 22). In 1975, the Shah asserted that Iran had "no intention of acquiring nuclear weapons but if small states began building them, then Iran might have to reconsider its policy" (as cited by Cordesman & Al-Rodhan, p. 22). Though the Shah had stated that Iran had no intention of developing nuclear weapons, the United States moved to negotiate and sign the 1978 US-Iran Nuclear Treaty in order to restrict Iran's ability to develop nuclear weapons (Fiore, 2011). Following the 1979 Revolution, Iran's nuclear ambitions were stopped by the Khomeini. However, in 1984, evidence showed that the Khomeini had revived Iran's nuclear program for the purpose of establishing weapons, after years of opposing nuclear technology (Cordesman & Al-Rodhan, 2006; Cirincione, Wolfsthal & Rajkumar, 2005). It should be noted that national security concerns were a factor leading to the re-establishment of Iran's nuclear program. According to Levi (2011), Iran had been decisively pursuing nuclear weapons as a possible deterrent for invasion. In 1987 and 1990, Iran signed agreements with Pakistan and China, respectively, to establish long-term cooperation in nuclear research and development (Cirincione et al., 2005). Many experts had long suspected that Iran was carrying out a clandestine weapons development program since the mid-1980s, and was using its nuclear program for energy as a cover (Spector, 2007; Bruno, 2010).[94] Thus, the United States actively sought to limit Iran's program development by pressuring China, Russia, and other suppliers of nuclear technology not to establish cooperation agreements

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[94] The program was discovered in 1991.

with Iran. Additionally, like North Korea, Iran also received assistance from AQ Khan as early as the mid-1980s where it was revealed in 2004 that AQ Khan had assisted Iran in developing uranium enrichment capabilities as well as nuclear weapons design. However, Iran's nuclear program did not achieve significant breakthroughs until 1989 for two reasons. First, the death of Ruhollah Khomeini allowed for the rise of his successor, Ali Khomeini, who had a more favorable view towards nuclear weapons. Second, the Iran-Iraq War ended, ceasing that financial burden on Iran. Thus, since 1989, Iran moved to rebuild its Busheher nuclear reactor with the assistance of Russia, who also provided Iran with fuel. In addition, an Iranian opposition group in mid-2002 revealed that "Iran had pursued a clandestine program to enable it to produce nuclear weapon material, a program that had not been declared to the IAEA as required by the NPT" for the past 18 years (Spector, 2007). Despite becoming party to the NPT in 1970, Iran has consistently violated the non-proliferation agreement by developing a clandestine nuclear program. According to Shire and Albright (2006), "Iran's main NPT and safeguards violations relate to undeclared activity dating from the mid-1980s into 2003" (p. 1). In violation of its commitment to the NPT and Safeguard agreements, Iran carried out the following activities: importing uranium from China in 1991, converting uranium, enriching uranium, hiding nuclear facility sites used for uranium enrichment (Tehran Nuclear Research Center, Kalaye Electric Company Workshop, and Lashkar Ad'ad) from IAEA inspections, and enriching laser isotopes and conducting plutonium experiments at these undisclosed sites.

The following section will offer a brief discussion of Iran's hostile and cooperative behavior during its changes of nuclear status, and perhaps more importantly, compare the results found to the North Korean case in Chapter 5. The study will test the following

propositions about Iran's behavior as it moved to establish a nuclear weapons development

program in 1974 and 1984:

Proposition 1: Iran becomes less hostile when it moves from not having a   nuclear weapons development program to having one.

Proposition 2: Iran becomes more cooperative when it moves from not having a nuclear weapons development program to having one.[95]

Next the study will discuss Iran's hostile behavior in order to test proposition 1. Figure

6.1 presents Iran's hostility trends between 1964 and 2001.

Figure 6.1: Iran's hostility trends
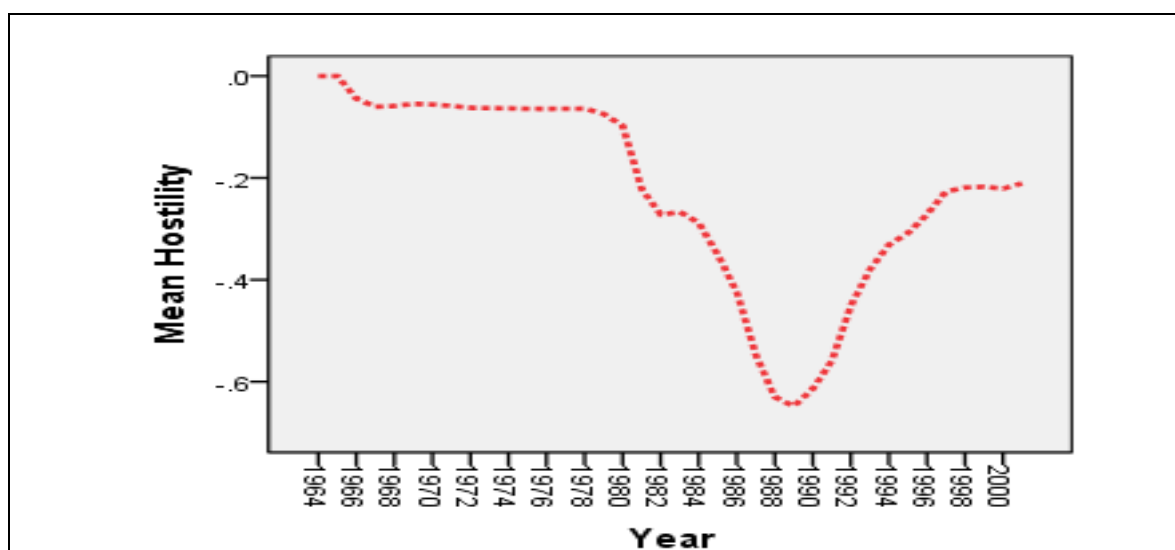
Notes:
(1) The red dashed line in the x-axis is the mean score for Iran's   hostility. The hostility score ranges from -1 to 0, where -1 indicates the highest level of hostility in   a dyad and 0 indicates neutrality. (2) For hostile behavior, it measures the level of hostility in militarized disputes   between states attempting to develop nuclear weapons and other states. On the other hand, cooperative behavior encompasses diplomatic representation/exchange, joint-IGO membership, and formal agreements between states attempting to develop nuclear weapons and other states. Therefore, hostility can increase in terms of   militarize disputes, but also cooperation can also increase as states participate in IGOs or form agreements. For example, in the Iran-Iraq dyad, despite becoming very hostile during the 1980s Iran-Iraq war, they continued to cooperate in

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[95] The logic behind these propositions is found in Chapters 2 and 6.

OPEC. Second, for the purpose of the study a decrease in cooperation means nonparticipation and indifference in formal agreements or IGOs by states attempting to develop nuclear weapons in given dyads. It should be noted that a decrease in cooperation does not indicate more violence by states attempting to develop nuclear weapons. Third, a decrease in hostility does not mean states attempting to develop nuclear weapons become more cooperative.

1964 - 1978: Iran's Program under the Shah

This section will examine Iran's hostile behavior between 1964 and 1978. During the Shah's regime, the study assumes that Iran did not have a nuclear weapons development program between 1964 and 1973, and that its nuclear status changed in 1974, where between 1974-1978, Iran had a nuclear weapons development program. A glance at figure 6.1 reveals that Iran's hostility between 1964 and 1969 increased slightly, as evident with the shift in the hostility score away from 0. This spike in hostility can be attributed to several factors, but mainly to the rise of the Ba'athist party to political power in Iraq.[96] The Ba'ath regime in Iraq adhered to the perception of Arab unity, which conflicted with Iran's ambitions of military supremacy in the Gulf (Karsh, 1990). For example, in July 1969, Iran attempted a coup against the Ba'ath regime in Iraq (Halliday, 1979). Additionally, territorial disputes over the Shatt-al-Arab waterway in the Gulf have contributed to various clashes between Iran and Iraq.[97] In 1959, the first *Shatt-al-Arab* crisis was initiated by the Shah's comment that the status quo regarding the *Shatt-al-Arab* waterway and the 1937 agreement

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[96] The Ba'athist party came into power on July 18, 1968 following a military coup.

[97] In 1937, an international agreement was established to deal with the Shatt-al-Arab dispute between Iran and Iraq. The 1937 agreement followed in line with previous Ottoman-Iran agreements about the waterway "that the shatt was wholly Iraqi territory except for a length of three miles opposite Abadan, where the frontier was to run along the *thalweg* (the line of greatest depth) of the river" (Brecher, 1997, p. 301).

are both "intolerable."[98] During this crisis, border clashes between Iran and Iraq occurred, and in response to Iraqi violation of its territory, Iran placed its military on high alert (Brecher, 301-302). The two conflicting countries clashed again over the *Shatt-al-Arab* waterway on April 15, 1969, when Iraq demanded that Iranian ships lower their flags when passing the waterway. In addition, Iraq stated that if its demands were not met, it would use force and prevent ships from using the river if they were heading to an Iranian port. In response to Iraqi demands, Iran declared the 1937 agreement to be null and void. This led to increased hostility between the two states; for example, Iran put its navy on high alert and fighter jets escorted its ships using the waterway.[99]

Between 1974 and 1978, Iran's hostility score was fixed and no major fluctuations in hostility occurred. Thus, during the first phase of Iran's nuclear weapons development program under the Shah, its level of hostility did not exhibit any increases or decreases. Iran's level of hostility during its first phase of nuclear development was similar to North Korea's hostile behavior from the 1960s until the early 1990s. Again, like North Korea, Iran's hostile behavior between 1974 and 1978 did not support the proposition 1 prediction that Iran's hostile behavior would decrease when it had a nuclear weapons development program. Nevertheless, since the "smoking gun" test for causal inference was applied in the analysis, proposition 1 is not eliminated but instead is weakened in regards to the first nuclear weapons development program attempt by Iran.

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[98] The first *Shatt-al-Arab* crisis started on November 28, 1959 and ended January 4, 1960.
[99] In 1975, an agreement was signed between Iran and Iraq that recognized that the Shatt-al-Arab waterway as a common border between the two nations.

1979-2010: Iran's nuclear program under the Khomeini

This section will analyze Iran's second phase of nuclear development. Figure 6.1 shows that between 1978 and 1984 (Iran did not have a nuclear program), Iran's hostility level increased significantly, with 1984 marked as the highest level of hostility for this time period.[100] This spike in hostility is evidently due to two factors: first, the 1979 Islamic Revolution and the resulting conflicting relationship between the United States and Iran; and second, the Iran-Iraq War.[101]

Turning to Iran's second attempt at developing a nuclear weapons program, from 1984 onward, Tehran showed a drastic increase in its hostile behavior from previous years. Much of Iran's hostility was towards Iraq and the United States, and to a lesser extent Afghanistan. Examining the period between 1984 and 1989, the spike in Iran's hostility can be attributed to the Islamic revolution and the Iran-Iraq territorial dispute over the *Shatt-al-Arab* waterway.[102] A notable crisis was the onset of the Iran-Iraq War in 1980, which lasted for eight years. On September 17, 1980, Iraq states that the 1975 agreement between Iran and Iraq, where they both agreed that the waterway is a common border, was now considered void by Iraq. Instead, Iraq claimed complete sovereignty over the waterway, referring to the 1937 agreement (Abdulghani, 1984). This incident led to major military confrontations between Iran and Iraq, during which Iran undertook powerful counterattacks against Iraq.

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[100] Between 1978 and 1984, Iran is coded as not having a nuclear weapons development program, which was due to the change in policy by the Ayatollah Khomeini. Refer to Chapter 1 for a more detailed discussion of Iran's nuclear foreign policy.

[101] When Iran was under the Shah, US-Iran relations were not conflictual like the post-1979 revolution period.

[102] For the 1984 - 1990 time period, Iran's average hostility score was -.487 and its highest hostility score for that period is -.984. The hostility scores are based on the Crescenzi and Enterline (2001) *Dynamic Interstate Interaction* model discussed in Chapter 3.

Despite having periods of stalemate during the war, there were several notable crises, such as the 1984 Basra-Kharg Island crisis and the 1987 Mecca Pilgrimage crisis. First, the Basra-Kharg Island crisis involved Iraq, Iran, Kuwait, and Saudi Arabia. On February 21, 1984, Iran launched several military attacks against Iraq. In response, Iraq launched a series of airstrikes against Iranian oil installations on Kharg Island with the goal of forcing Iran to agree to end the war (Wilson Center, 1982). The crisis was widened when Kuwait became involved in the conflict on May 13, 1984 after two of its oil tankers were damaged near Bahrain. Following these attacks, Kuwait "accused Iran of the hostile acts" (Brecher, p. 308). Later, Saudi Arabia became involved in the crisis due to the "tanker war," where its oil tankers were attacked by Iraqi and Iranian aircrafts. Second, the Mecca Pilgrimage crisis involved Iran and Saudi Arabia from July 31 to October 1987. During the 1987 annual pilgrimage to Mecca, Iranian demonstrators clashed with Saudi security guards, resulting in the guards firing at the Iranian pilgrims. This situation led to increased tension between Saudi Arabia and Iran, and eventually international intervention was required to put an end to this crisis.

Thus, during the 1984-1989 period, Iran displayed higher levels of hostility in its dyadic relationships, especially more than in its previous nuclear development phase (1974-1978). In the mid-late 1980s, Iran's nuclear program was moving forward with the assistance of Russia and China as well as AQ Khan. The 1984-1990 period failed to support proposition 1, which predicted that Iran's hostility would decrease when it had a nuclear weapons development program; instead, the opposite occurred. Proposition 1 was thus rejected, as evident from the above narrative that shows an increase in Iranian hostile behavior. Comparing this outcome to the findings in Chapter 5, Iran's hostile behavior

mirrored that of North Korea.[103]

A look at figure 6.1 indicates that in the 1990s, Iran's hostile behavior was declining gradually, as evident with the upward move of the red curve. However, it should be noted that despite being less hostile, Iran's hostile behavior does not reach previous lows or 0 (neutrality). The drop in hostility is attributed to the end of the Iran-Iraq war in 1988. Despite the end of the war, Iran and Iraq continued to experience various episodes of hostile interaction over the years; however, the conflicts for this period were based on Iran's opposition to the *Mujaheeden-i-khalg* group in Northern Iraq (Brecher, 1997).   For example, in 1993, Iran fired several rockets into Northern Iraq for the purpose of weakening the Kurds in that area (Dispute Narrative, 1993-2001, CoW Project). In addition, in the mid-1990s, a slight increase in Iran's hostility is evident; this is due to its increased attacks on Kurdish bases in Northern Iraq as well as various clashes with Afghanistan. Iranian forces in 1994 violated Afghanistan's sovereignty by crossing into its border as well as shelling Afghan forces (Dispute Narrative, 1993-2001, CoW Project). It should be noted that Iran was cooperating with some ethnic factions in Afghanistan, such as Tajiks, Uzbeks, and Hazaras, which will be discussed elsewhere in the chapter. Additionally, Iran was also responsible for the 1994 bombing of the Argentina Israelite Mutual Association in Buenos Aires. In 2006, Argentina "accused the Iranian authorities of directing Hezbollah to carry out the attack" (BBC News, 2006)

Thus, in testing proposition 1 for the 1990-1999 timeframe, it could be argued that mixed support was found since Iran's hostile behavior decreased during this time period.

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[103] Again, it should be noted that nuclear development in the case of Iran is the product of the hostility as adversaries object to Iran's nuclear ambition.

Thus, in terms of the 1990s, proposition 1 was supported since a decline in Iran's hostility levels was evident. The United States staunchly opposed Iran's nuclear ambitions, particularly after the 1979 Islamic Revolution, and so it took aggressive measures in order to prevent Argentina, China, and Russia from providing Iran with nuclear technology. In 2007, Mohammad Javad Zarif, the former ambassador to the United Nations, stated that "[t]o avoid the [U.S.-led] restrictions and impediments," Zarif writes, "Iran refrained for disclosing the details of its programs" (as cited by Bruno, 2010). Additionally, Iran continued to insist that its nuclear program was for electricity production and not weapons. Thus, since Iran sought to be discreet about its nuclear program in order to avoid preemptive strikes from the United States or Israel, this could explain its decline in hostility.

Next the study examined Iran's behavior between 2000 and 2010.[104] During this period Iran did not engage in as much military interaction as it had done previously in the 1980s. Rather, Iran supported various militias and terrorist organization abroad. For example, in 2002, a ship en route to Palestine was seized by Israel, which contained rockets, antitank missiles, and plastic explosives from Iran. Additionally, Iran supported Hezbollah in Lebanon, but has not engaged directly in the Hezbollah-Israel 2006 war. In 2003 and 2004, on several occasions Iran attacked Kurdish forces in Northern Iraq as well as fortified its border with Iraq. On March 22, 2003, Iran threatened to use military force in order to prevent any further violations by the United States, and this was response to two US missiles landing accidentally on Iranian territory (Dispute Narrative, 2002-2010, CoW Project). In addition, in 2008 and 2009, Iran clashed with Afghani forces, and perhaps most

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[104] It should be noted that figure 6.1 only presents data up to 2001 because the score relied on the CoW Project. Thus, in order to examine Iran's behavior past 2001, the study examined historical documents for the period of 2002-2010.

importantly, Iran supported the Northern Alliance fighting against the Taliban government in Afghanistan.[105] The latter part will be discussed in the cooperation section of the analysis because it explains Iran's cooperative behavior.
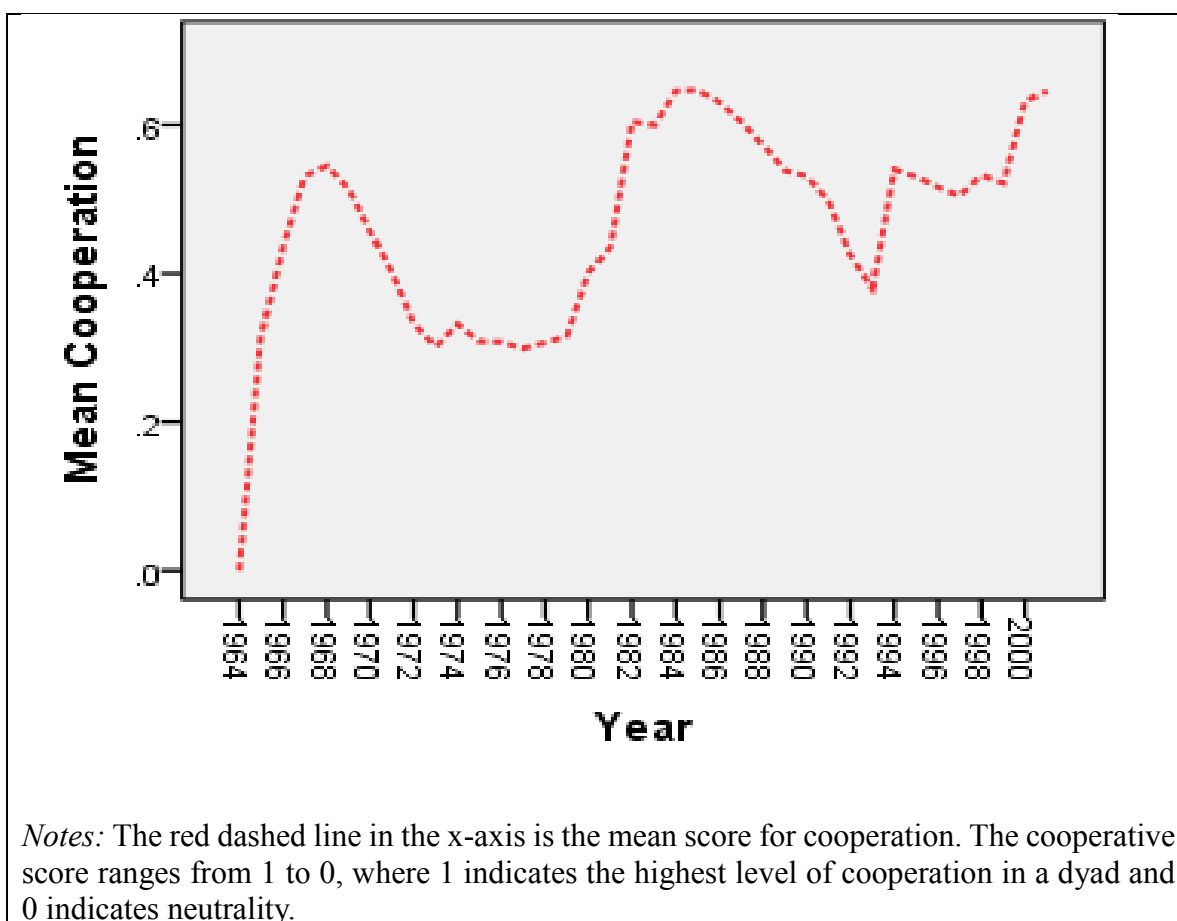
This brief discussion shows that Iran's hostile behavior did not increase nor decrease significantly as it advanced in its nuclear program. Despite the 2000 Iran Non-Proliferation Act, which "allowed the United States to sanction individuals and organizations providing material aid to Iran's nuclear program" (Nikou, 2014: p. 3), Iran and Russia signed a nuclear and military cooperation agreement in 2001. Following the Iranian-Russian agreement, Iran began enriching uranium, and by 2010, Iran had "produced 20% enriched uranium, up from 3.5%, in a move that marked a major increase in its capabilities" (Nikou, 2014: p. 9). No support was found for proposition 1 during the time period of 2000-2010, since Iran did not display a decrease in hostile behavior as it advanced in its nuclear program. Overall, Iran's hostile behavior mirrored the case study presented in Chapter 5 about the hostile behavior of North Korea. However, it could be argued that Iran's hostility levels vary for other reasons, such as its rivalry with the United States and Israel, and that nuclear preparations themselves may stem from rising hostilities. In the case of Iran, the Iran-Iraq War and the hostility of the United States towards the post-1979 regime have driven Iran's policy toward nuclearization.

Turning to Iran's cooperative behavior, the study attempts to test proposition 2 regarding whether Iran's cooperative behavior increased when it established and

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[105] The Northern Alliance (1996-2001) was established in 1996 in response to the Taliban regime takeover of Kabul (Rashid, 1999). The alliance was made up non-Pushtuns minorities, such as Tajik, Uzbek, and Hazaras, to fight against the Taliban regime in Afghanistan. Additionally, the Northern Alliance received extensive aid from Russia, Iran, and Tajikistan.

maintained a nuclear weapons development program.[106] For the purpose of this study, cooperative behavior includes the following: participation in IGOs, bilateral and multilateral agreements, and diplomatic representations as well as exchanges. This section will analyze Iran's cooperative behavior in two areas: first, Iran's participation and engagement in various IGOs and formal agreements with other states[107]; and second, Iran's nuclear diplomatic approach. Figure 6.2 presents Iran's cooperative trends between 1964 and 2001. For the time period between 2002 and 2010, the study analyzed Iran's diplomatic history in the NPT.

Figure 6.2: Iran's cooperative trends

Notes: The red dashed line in the x-axis is the mean score for cooperation. The cooperative score ranges from 1 to 0, where 1 indicates the highest level of cooperation in a dyad and 0 indicates neutrality.

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[106] A more detailed discussion of proposition 2 is found in Chapter 5.
[107] This section only examines up to 2001 because of data limitation.

Since 1964, Iran's cooperative behavior has increased significantly though not steadily, especially with a peak in 1968. This increase in cooperative behavior might be attributed to Iran joining several organizations, including Organization of the Petroleum Exporting Countries [OPEC, hereafter]. Following 1968, particularly between 1974 and 1978, Iran's cooperative behavior began to decrease and became more fixed. During Iran's first period of having a nuclear weapons development program, its cooperative behavior did not exhibit an increase from its previous years. Thus, proposition 2, which theorized that cooperative behavior would increase when a second-generation state has a nuclear weapons development program, was not supported by the narrative above.

Following the 1979 Islamic Revolution, Iran's cooperative behavior increased significantly[108]; in 1984, Iran reached the highest level of cooperative behavior in dyadic relationships. This shift in cooperative behavior can be attributed to increased economic, diplomatic, and military relations with other states. For example, after the 1979 Islamic Revolution, Iranian-Syrian relations improved significantly as both states established a strong military alliance and diplomatic cooperation.[109] It should be noted Iran's increased cooperation levels was in part an offshoot of its increasing hostility levels, particularly during the Iran-Iraq war in the 1980s. This was clearly evident with Syria supporting Iran in 1980 during the Iran-Iraq war. Despite tensions between Iran and Turkey after 1979, Iranian-Turkish economic ties expanded, and perhaps most importantly, Turkey continued its economic ties with Iran during the Iran-Iraq war (Larrabee and Nader, 2013).

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[108] Most notably in the Iran-Egypt and Iran-Russia dyads.
[109] The Iranian-Syrian alliance continues to baffle many because Iran, a theocracy, is strongly allied with Syria, a secular state.

Following the 1979 Islamic Revolution, the Ayatollah Khomeini had put an end to Iran's nuclear program under the Shah; however, in 1984, due to fear of a US military attack, Iran turned towards nuclear proliferation (Cordersman & Al-Rodhan, 2006). Turning to figure 6.2, Iran's cooperative behavior can best be explained within two different periods: 1984-1990 and 1991-2001. First, Iran's cooperative behavior increases in 1984 and continues to increase until 1987. Subsequently, Iran's cooperative behavior begins to decrease between 1988 and 1990. Several factors can explain these changes. First, Iran and Iraq continued to have diplomatic relations and to "cooperate" in OPEC in the 1980s. Second, between 1984 and 1990, Iran signed several nuclear cooperation agreements with China and Russia. In the early 1990s, for example, Iran and Russia signed an agreement, which established the joint research organization termed *Persepolis*. The research organization was intended to provide Iran with technical expertise and information; Russia also agreed to assist in building the Bushehr reactor (Friedland, 2006).

Furthermore, between 1991 and 2002 Iran's cooperation fluctuated as evident by figure 6.2. Due to pressure and threats of sanctions from the United States, both Russia and China scaled down their nuclear cooperation with Iran, which can be attributed to the gradual decline in Iran's cooperation score in the mid-1990s. On the other hand, the Iranian-Saudi rapprochement in 1999 can explain Iran's increased cooperative behavior. In 1999, Iran and Saudi Arabia engaged in several talks and agreements about oil production, maintaining stable oil prices as well as managing Iraq (Kohl, 2002). The talks and agreements between Iran and Saudi Arabia occurred even when distrust persisted over the Sunni-Shi's divide. Throughout 1999 and 2000, Iran and Saudi Arabia worked jointly in the OPEC to establish an agreement about oil production quotas. Iran's increased cooperative behavior can also

be attributed to improved relations with Turkey in 1995 and onward. As an example, Iran and Turkey established several bilateral economic ties dealing with the import and export of oil and gas.[110] Figure 6.3 illustrates the increased trade between Iran and Turkey.

Figure 6.3: Trade between Iran and Turkey (millions in US dollars)
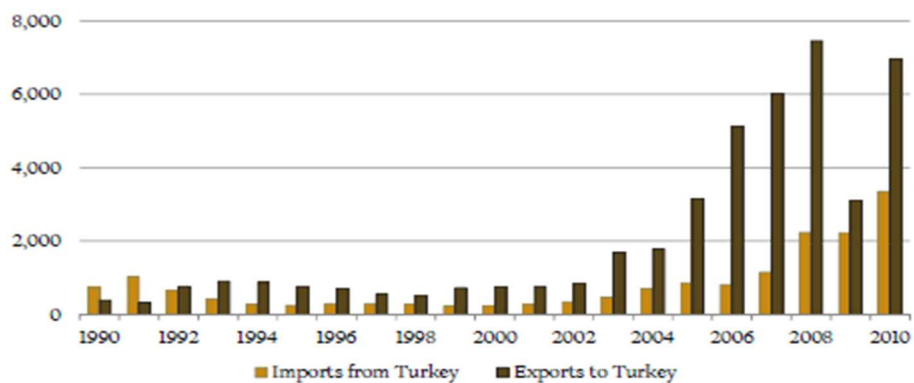
Source: Habibi, 2012, p. 4.

Between 1974 and 1978, Iran's cooperative behavior was fixed with no major spikes in either direction; also during this time period, advancements in Iran's nascent nuclear program were limited, with no significant breakthroughs. Thus, no support was found for proposition 2, which posited that Iran's cooperative behavior would increase during this time period.

In addition, between 1984 and 1990, Iran's cooperative behavior increased with minor fluctuations, which supported proposition 2 that its cooperative behavior would increase when it had a nuclear weapons development program. The results mirrored the ones found
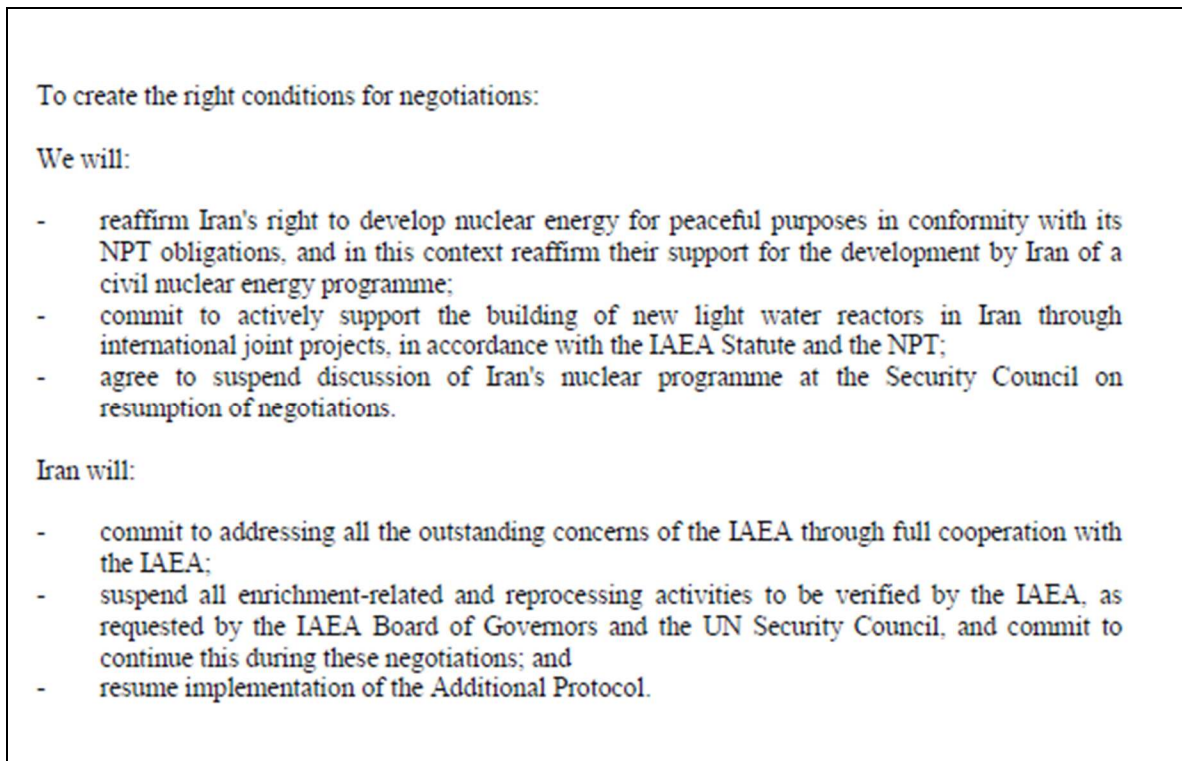
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[110] Turkey's economy is heavily dependent on Iran's export of oil and gas. In 1996, Iran and Turkey signed a $20 billion agreement for the sale of natural gas (Habibi, 2012).

for North Korea, where both states had fluctuations in their cooperative behavior as they attempted to establish nuclear weapons. It should be noted that around this time period, Iran was making progress with its nuclear weapons development, particularly with enriching uranium. On the other hand, between 1991 and 2001, Iran's cooperative behavior fluctuated, with a steep drop in its cooperative behavior between 1993 and 1994. Additionally, in the 1980s and early 1990s, Iran negotiated and signed various trade agreements and nuclear cooperation agreements with Argentina; however, due to pressure from the United States and the 1994 bombing of the Jewish Center, Argentina suspended its cooperation with Iran. Thus, this steep drop in Iran's cooperation level can be attributed to breakthroughs in its program and the American response to its nuclear program. On the other hand, in the late 1990s and until 2001, Iran's cooperative behavior increased, which could be due to its nuclear program. For example, IAEA inspections and the various nuclear cooperative agreements Iran signed with Russia and China could explain the rise in Iran's cooperative behavior during this period. Thus, in the 1991-2001 time period, Iran's level of cooperation provided mixed support for proposition 2 because there were both increases and decreases in its cooperative behavior.

The final section will discuss and analyze proposition 2 with respect to Iran's nuclear diplomacy in the 2000s. On August 2003, the IAEA discovered that for nearly two decades, Iran had failed to disclose its nuclear activities and was in noncompliance with its NPT and IAEA Safeguard obligations. Thus, in order to avoid sanctions by the United Nations and the United States, Iran began to negotiate with Britain, France, and Germany. At the end of the negotiations, Iran agreed to temporarily freeze its uranium enrichment as well as fully cooperate with the IAEA. Additionally, Iran signed a Protocol agreement with the IAEA to

permit more intrusive inspections by the IAEA. In defiance of the 2003 Protocol, Iran continued with its nuclear activities by producing centrifuge components as well as undertaking small-scale conversion experiments (Spector, 2007). Again in order to avoid sanctions, Iran signed the Paris Agreement in 2004 with Britain, France, and Germany. The agreement required Iran to continue with its temporary suspension, and additionally, Iran was required to negotiate in good faith about its nuclear program. In response to Iran's continued noncompliance with the NPT, IAEA Safeguards, 2003 Protocol Agreement, and 2004 Paris Agreement, on June 1, 2006, the permanent members of the United Nations Security Council proposed a comprehensive agreement to Iran. Figure 6.4 presents an excerpt from the agreement endorsed by the Security Council.

Figure 6.4 Excerpt from the UN's Security Council Proposed Agreement to Iran

To create the right conditions for negotiations:

We will:

- reaffirm Iran's right to develop nuclear energy for peaceful purposes in conformity with its NPT obligations, and in this context reaffirm their support for the development by Iran of a civil nuclear energy programme;
- commit to actively support the building of new light water reactors in Iran through international joint projects, in accordance with the IAEA Statute and the NPT;
- agree to suspend discussion of Iran's nuclear programme at the Security Council on resumption of negotiations.

Iran will:

- commit to addressing all the outstanding concerns of the IAEA through full cooperation with the IAEA;
- suspend all enrichment-related and reprocessing activities to be verified by the IAEA, as requested by the IAEA Board of Governors and the UN Security Council, and commit to continue this during these negotiations; and
- resume implementation of the Additional Protocol.

Source: Elements of a proposal to Iran, S202/06

On July 31, 2006, Iran rejected the proposed comprehensive agreement by the Security

Council, and so Iran continued its noncompliance with the NPT and IAEA Safeguards Agreements. On August 27, 2007, the IAEA and Iran developed a "work plan," which sought to address the international community's concerns about Iran's nuclear activities. According to Crail (2007):

> [the] majority of the work plan outlines a phased process for Iran to provide clarifications on a set of outstanding issues previously identified by the IAEA. These outstanding questions relate to a number of clandestine nuclear activities which Iran failed to declare before the IAEA discovered them in 2003, as well as weapons-related projects the United States has accused Iran of carrying out (p. 1).

By 2008, the IAEA's "work plan" failed to make the needed progress because Iran continued not providing the necessary information to the IAEA about the military component of its nuclear program. The Obama administration sought to improve American-Iranian relations, and so it proposed the Fuel Swap Agreement on October 2009 with Iran. The 2009 agreement outlined that "Iran would receive a special form of enriched uranium fuel for a research reactor that produces medical isotopes, if it shipped the majority of Iran's low enriched uranium (LEU) to a neutral third-country" (Christy & Zarate, 2014: p. 6). In 2009, Iran tentatively accepted the agreement, but later Iran refused to accept the agreement and eventually the agreement broke down. Finally, in 2010, both Turkey and Brazil attempted to restart a watered-down Fuel Swap Agreement initially proposed by the United States, but again Iran failed to cooperate.

For the time period of 2002-2010, the above brief narrative provides mixed support for proposition 2, which predicted that Iran's cooperative behavior would increase due to its nuclear weapons development program. During this particular time period, Iran had advanced significantly in its program in terms of enriching uranium. In theory, it could be argued that Iran's cooperative behavior increased as it engaged with the international

community in various negotiations, talks, and agreements. However, in practice, Iran was noncompliant with the NPT, IAEA Safeguards, and the various agreements signed during this time period, and so it could be argued here that Iran was displaying noncooperative behavior but simply acting to avoid additional sanctions. The case of Iran requires additional research, particularly about the relationship between its cooperative behavior and nuclear weapons development program.

6.3 Future Research

The study overall has yielded several results about the behavior of states as their nuclear status changes over time. In terms of hostile behavior, the study found that nuclear procurement decreased proliferating states level of hostility. It should be noted that reverse causation may be in effect with hostility leading to nuclear programs, this is clearly argued with the case of North Korea and Iran. On the other hand, the study found that states with nuclear weapons development programs tended to increase proliferating states cooperative behavior. Again, as discussed in great detail in Chapters 4 through 6, this increase in cooperative behavior to a certain extent is due to the nature of nuclear proliferation, where the international community responds to this proliferation attempt by increasing IAEA inspections, negotiations, and proposed agreements. This was clearly evident in the case of North Korea and Iran in Chapters 5 and 6, respectively.

A glance at the literature shows a lack of research about states with nuclear weapons development programs before they achieve nuclear weapons capabilities. An examination of state nuclear status is imperative since the timeframe of second-generation proliferating states to acquire nuclear weapons is much lengthier than their counterparts. Two clear

examples of this are North Korea and Iran. In that light, the behavior of states with nuclear weapons development programs that have not achieved nuclear weapons capabilities is understudied and requires attention in the literature.
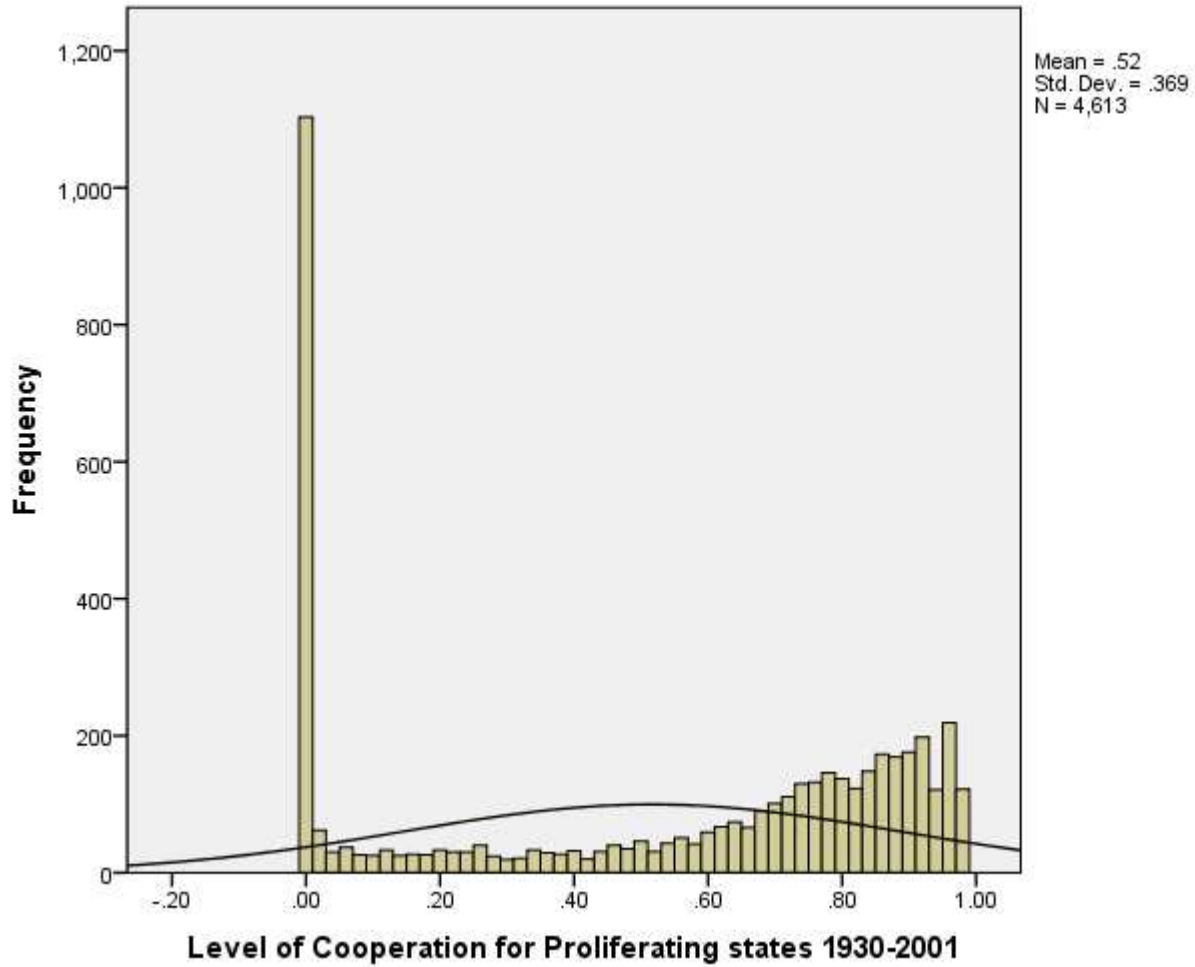
APPENDIX A

Figure A3.1: Histograms for hostility dependent variable
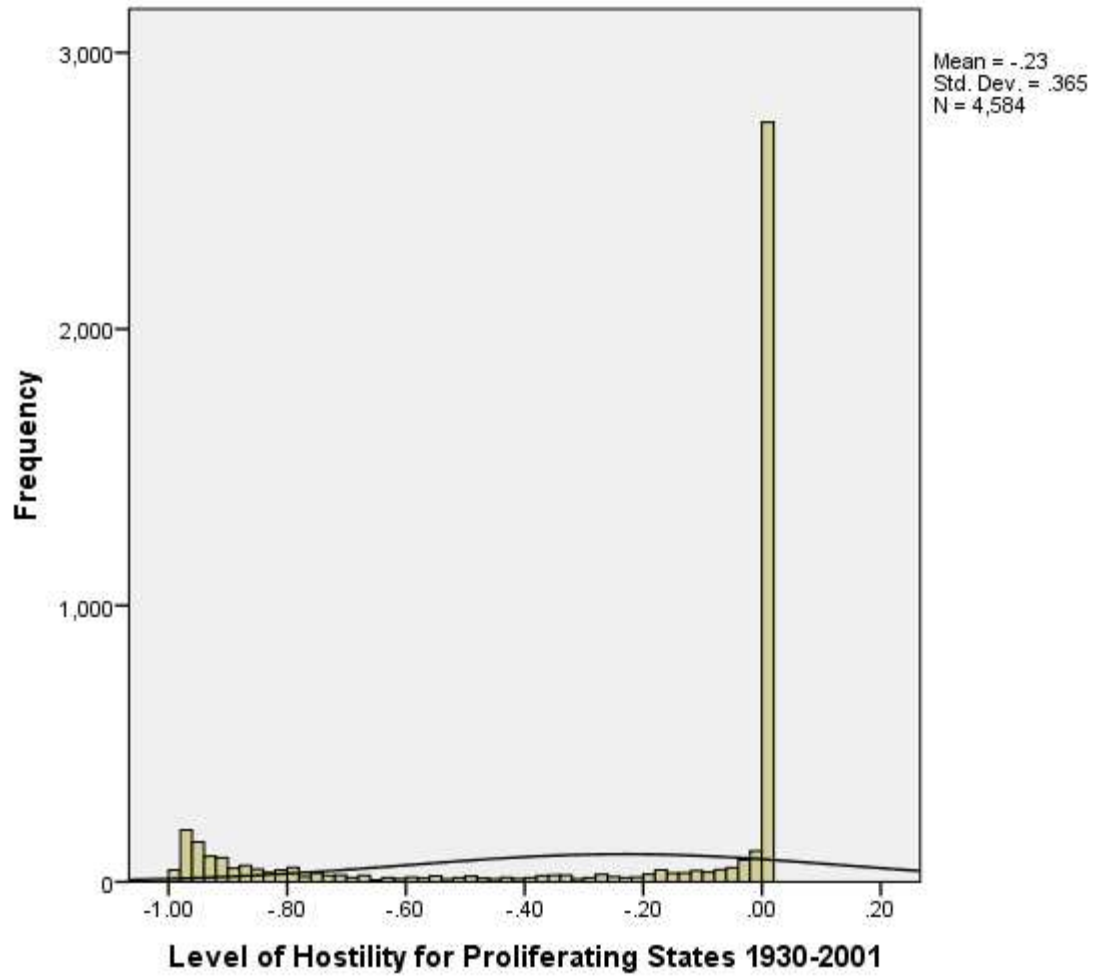
APPENDIX A

Figure A3.2: Histograms for cooperation dependent variable

Level of Cooperation for Proliferating states 1930-2001

APPENDIX A

Section A3.1: Dynamic Interstate Interaction (2001) Discussion:

The Crescenzi and Enterline (2001) model of *Dynamic Interstate Interaction* captures the role played by historical interstate interactions in informing about the patterns of state behavior. The dynamic model captures state relationships through the repeated occurrence of events (either cooperative or conflictual). Two core concepts are at the heart of the *Dynamic Interstate Interaction* model: growth and decay functions.

The growth function represents the new information with each occurrence of an event between two states (either a cooperative or hostile interaction). Decay refers to an absence of events between two states, thereby leading to a lack of new information. An absence of events in terms of militarized interstate dispute refers to a lack of crisis within a dyad, and on the other hand, an absence of events in terms of cooperation refers to a lack of joint-IGO membership, alliance agreement, and diplomatic representation within a dyad.

The growth and decay of information about the behavior of a proliferating state in a dyad is affected by several factors. First, increased interaction between a proliferating state and another state in a dyad offers more information about the hostile and cooperative behavior of the former state. This interaction is the growth of information about state behavior. For example, the frequent militarized interstate disputes between the United States and the Soviet Union during the Cold War increased the amount of information about the behavior of the United States and the Soviet Union, and on the other hand, the post-Cold War era is an example of decreased information about either state's behavior since militarized interstate disputes between them has decreased in frequency. On the other hand, infrequent interaction between a proliferating state and another state in a dyad offers limited

to no information about the hostile and cooperative behavior of the former state (decay of information). In terms of hostile behavior, frequent militarized interstate disputes between a proliferating state and another state in a dyad offers information about the behavior of the proliferating state. The same could be said about frequent cooperation between a proliferating state and another state in a dyad. Second, the time between each interaction (hostile or cooperative) in a given dyad influences the growth and decay of information about proliferating states behavior. In that light, if two events occur but are separated by a 35-year difference, then the two events are considered independent of each other. On the other hand, if the time between two events is much smaller, for example a few years or months, then this influences the growth of information about the behavior of a proliferating state in a given dyad.

The *Dynamic Interstate Interaction* model is formalized as follows Crescenzi and Enterline (2001):

$$IIS_t = \left(e^{-\alpha \left(\frac{Event.Temporal.Distance_t}{Event.History+1} \right)} \right) i_{(t-1)} - \beta_1 \left(\frac{Degree.of.Conflict_t}{Conflict.Temporal.Distance_t} \right)$$

$$+ \beta_2 \left(\frac{Degree.of.Cooperation_t}{Cooperation.Temporal.Distance_t} \right) \qquad [1]$$

$$0 \le \alpha$$

The subscript *i* is the interstate interaction level for a given dyad, which is lagged by 1 year. The first part of the equation is the decay element of the model, where the rate of decay is

determined by the amount of time that has lapsed since the last interaction (cooperative or conflictual) in the dyad. It is important to note that greater interaction in the dyad will lead to a decrease in the decay function of the model. The second part of the equation is the conflictual element of the model, which captures the level of hostility in the dyad interaction. Finally, the third part of the equation is the cooperative element of the model, which captures the degree of cooperation in the dyad interaction. It is important to note that the conflictual and cooperative parts of the equation are weighted by the severity of the interaction and the amount of time since the last interaction has occurred in the dyad. The last two parts of the equation [β_1 and β_2] represent the information that informs about states pattern of behavior in the international system. In equation [1] the interstate interaction level is unbounded and so the values range from -to +. In order to have a more intuitive range, equation [1] is transformed, where the interstate interaction value is bound from -1 to +1 (Crescenzi and Enterline, 2001). A value of -1 indicates the strongest interstate level of interstate hostility and a value of +1 indicates the strongest interstate level of cooperation. Also, a value of 0 indicates neutrality in the dyad. In summary, frequent interactions between states, either hostile or cooperative, will generate greater information about the patterns of behavior for states with nuclear weapons development programs and nuclear weapons in the dyad. The *Interstate Interaction* model will represent the dependent variable for the dissertation and will be operationalized in the data section below.

APPENDIX A

Table A3.1: List of Control Group Countries

Countries
Italy
Canada
Poland
Egypt
Malaysia
Australia
Sweden
Bangladesh
Lebanon
Syria
Germany
Japan
Spain
Turkey
Singapore
Thailand
Macedonia
Sir Lanka
Taiwan

APPENDIX A

Table A3.2: Jo and Gartzke's Composite Index of Latent Nuclear Weapons Production Capability

Composite Index Includes the following:	
Potential factors to developing weapons:	***Indicators***
Whether a state has potential nuclear explosive materials to produce nuclear weapons.	Has access to uranium deposits or produced uranium
Whether a state has metallurgical capability to process excavated uranium ores.	Production of crude steel or aluminum
Whether a state has chemical capabilities to make nuclear munitions.	Production of nitric or sulfuric acid
Whether a state has the capability to make explosive materials for nuclear munitions.	Production of non-organic fertilizer
Whether a state has explosive and electronic capability.	Produces or assembles motors and produces television or radios
Whether a state has nuclear engineering capability.	Nuclear reactor more than 3 years old
Whether a state has the capabilities to produce electricity enough to run nuclear weapon development programs.	Has 200 megawatt electricity production capacity or produces at least electricity equivalent to 50 thousand metric tons of oil.

Source: Jo and Gartzke (2006) code book for data set

APPENDIX B

Table A4.1: Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
Nuclear Status	4760	0	1	.51	.500
Hostility	4584	.00	.99	.231	.365
Cooperation	4613	.00	.98	.516	.369
Security Problem	4760	0	1	.15	.356
Security Commitment	4760	0	1	.23	.420
Contiguity (Land/Water)	4752	0	1	.43	.495
Contiguity Less 150 miles	4752	0	1	.22	.414
Major Power Status	4752	0	1	.41	.492
Regional S-Score	4477	-.98	1.00	.35	.511
Global S-Score	4477	-.61	1.00	.54	.375
Democratic Peace Effect (Weak-Link)	4553	.0	10.0	1.8	2.438
Ln Distance Capital	4752	3.78	9.37	7.28	1.04496
Relative Capability Ratio	4490	-5.63	7.86	1.61	1.74
Valid N (listwise)	4265				

APPENDIX B
Table A4.2: Correlation Matrix

	NS	SC	SP	Cont. Land/ Water	Cont Less 150 miles	MPS	Reg. S score	Glob. S score	DPE	Coop	Hos	RCR	DC
NS	.												
SC	.040	.											
SP	.003	-.006	.										
Cont. Land/ Water	-.003	-.069	.266	.									
Cont. Less 150 miles	.009	-.143	.296	.601	.								
MPS	-.019	.288	-.072	-.288	-.322	.							
Reg. S Score	.057	-.320	.043	.412	.370	-.467	.						
Glob S Score	.099	-.378	.018	.395	.387	-.566	.943	.					
DPE	.005	-.067	-.088	-.113	.055	.091	.062	-.068	.				
Coop.	.425	-.205	.055	.093	.131	-.335	.205	.307	.023	.			
Host.	.203	.068	.523	.255	.244	.064	-.041	-.083	.032	.044	.		
RCR	-.028	.073	-.154	-.010	-.099	.223	-.062	-.137	.171	-.172	-.079	.	
DC	-.007	.263	-.329	-.611	-.477	.373	-.467	-.477	-.013	-.130	-.221	.038	.

Note: NS = Nuclear Status; SC = Security Commitment; SP = Security Problem; Cont. Land/Water = Contiguity Land/Water; Cont.Less 150 miles = Contiguity Less 150 miles; MPS = Major Power Status; Reg. S-Score = Regional S-Score; Glob. S-Score = Global S-Score; DEP = Democratic Peace Effect; Coop. = Cooperation Host. = Hostility RCR = Relative Capabilities Ratio; DC = Ln Distance Capital
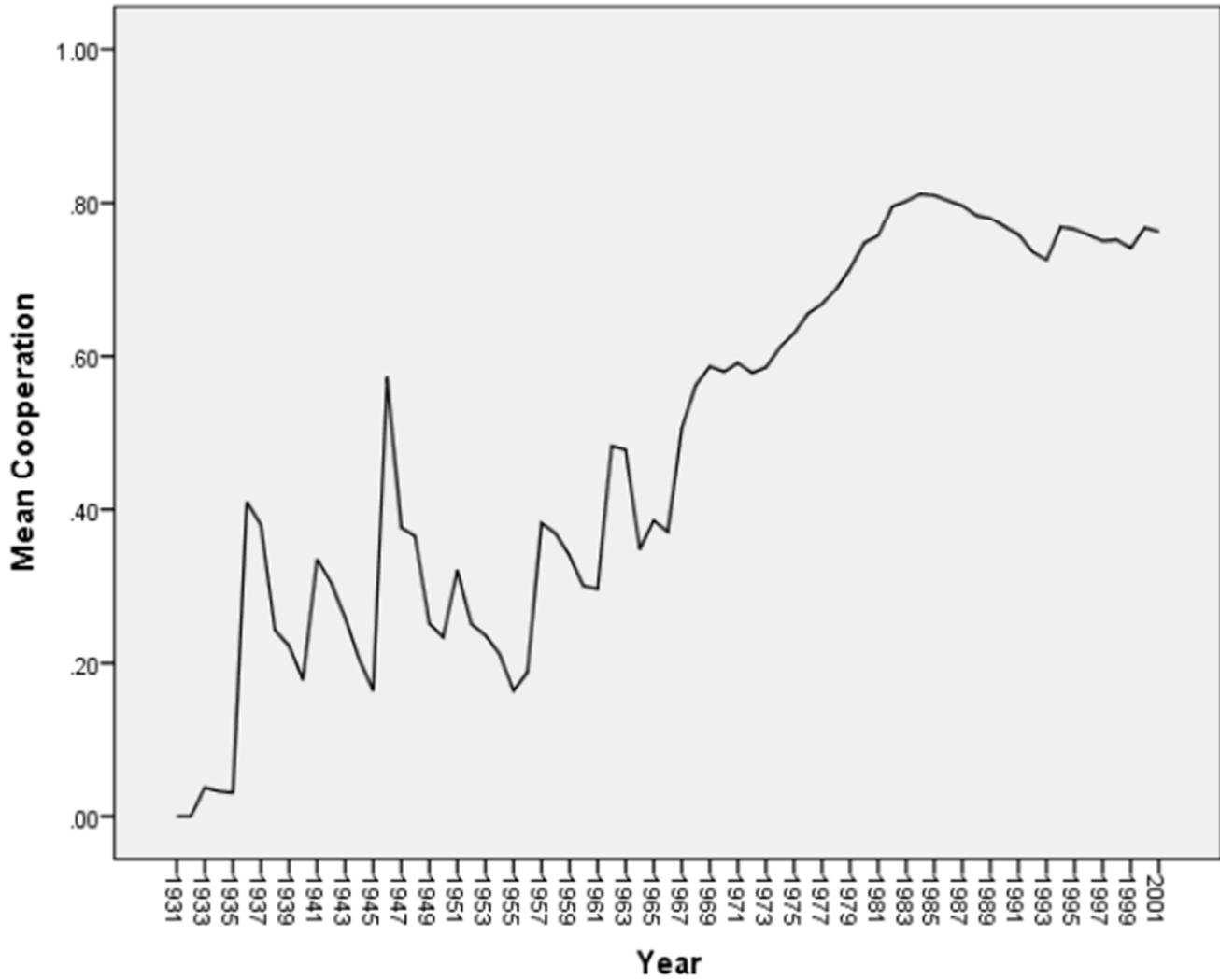
APPENDIX B

Figure A4.1: Hostility trends for states with nuclear weapons development program
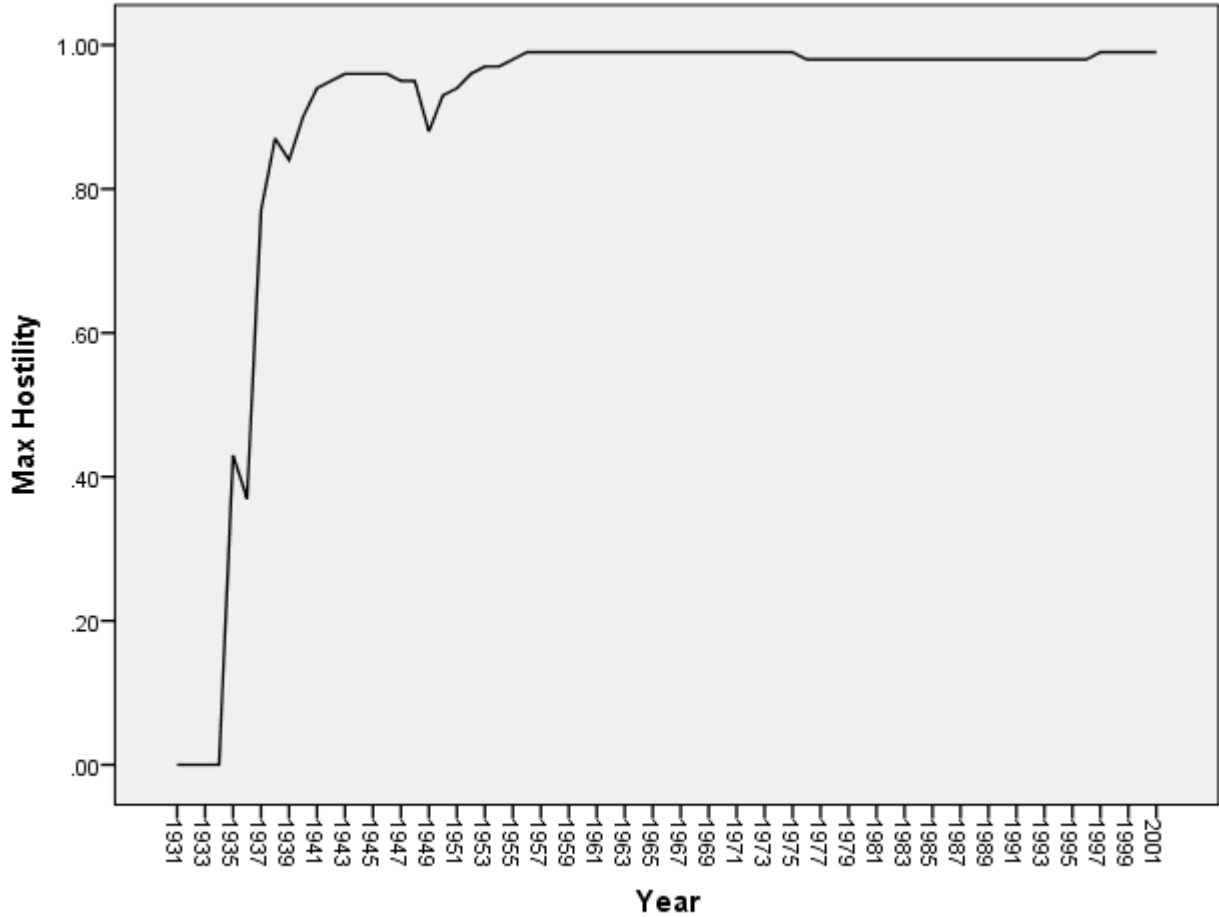
Note: Hostility score ranges between .000 (neutral relationship) - .998 (highest hostile relationship)
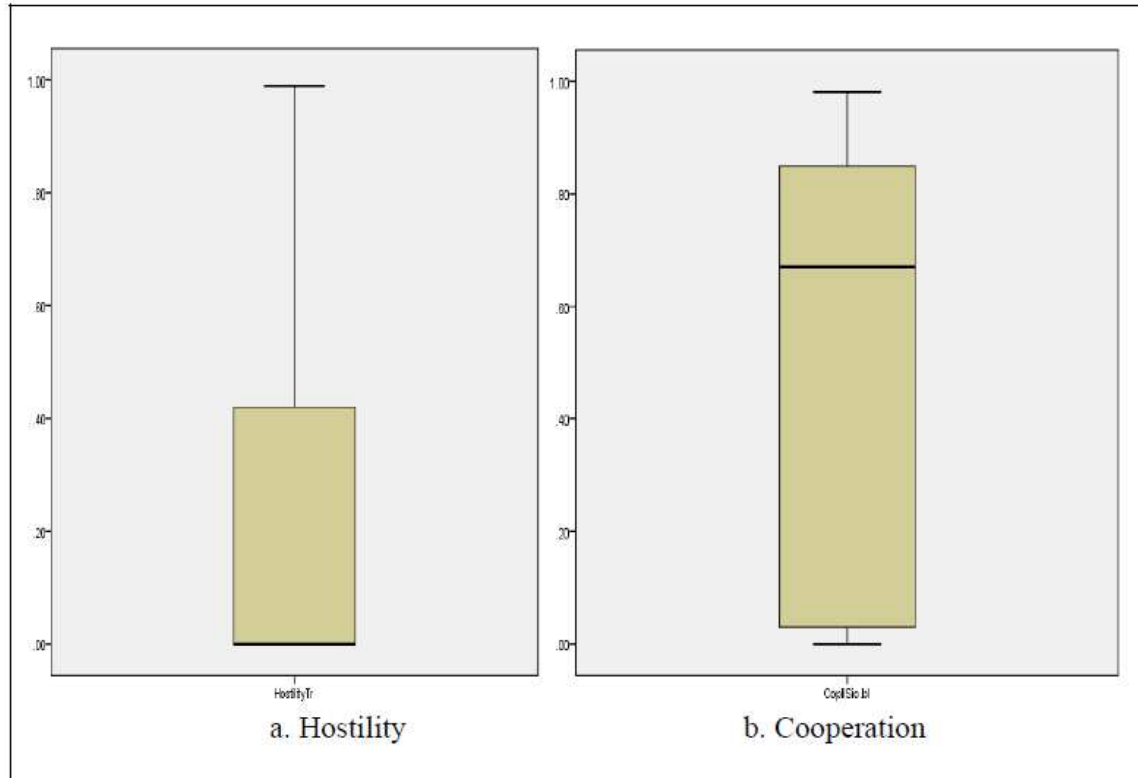
APPENDIX B

Figure A4.2: Cooperation trends for states with nuclear weapons development programs

Note: Cooperation score ranges between .000 (neutral relationship) - .980 (highest cooperative relationship)

APPENDIX B

Figure A4.3: Boxplot for hostility and cooperation

a. Hostility

b. Cooperation

Table A4.3: Goodness of fit for Model 1

Test for Hostility	Value	Degree of Freedom	Value/Degree of Freedom
Deviance	5100.616	4225	1.207
Scaled Deviance	3500.125	4225	
Pearson Chi-Square	5547.737	4225	1.313
Scaled Pearson Chi-Square	3806.947	4225	
Log Likelihood	-3149.647		
Akaike's Information Criterion (AIC)	6325.294		
Finite Sample Corrected AIC (AICC)	6325.380		
Bayesian Information Criterion (BIC)	6407.865		
Consistent AIC (CAIC)	6420.865		

Note: These are the results for the linear additive regression (model 1) in Chapter 4 table 4.1 for hostile behavior.

APPENDIX B

Table A4.4: Goodness of fit for model 2

Test for Hostility	Value	Degree of Freedom	Value/Degree of Freedom
Deviance	5100.616	4225	1.207
Scaled Deviance	3500.125	4225	
Pearson Chi-Square	5547.737	4225	1.313
Scaled Pearson Chi-Square	3806.947	4225	
Log Likelihood	-3149.647		
Akaike's Information Criterion (AIC)	6325.294		
Finite Sample Corrected AIC (AICC)	6325.380		
Bayesian Information Criterion (BIC)	6407.865		
Consistent AIC (CAIC)	6420.865		

Note: nuclear status and security problem interaction regression estimates (model 2) in Chapter 4 table 4.1 for hostile behavior.

APPENDIX B

Table A4.5: Goodness of fit for Model 3

Test for Hostility	Value	Degree of Freedom	Value/Degree of Freedom
Deviance	5070.669	4224	1.200
Scaled Deviance	3493.928	4224	
Pearson Chi-Square	5578.683	4224	1.321
Scaled Pearson Chi-Square	3843.974	4224	
Log Likelihood	-3139.351		
Akaike's Information Criterion (AIC)	6306.702		
Finite Sample Corrected AIC (AICC)	6306.801		
Bayesian Information Criterion (BIC)	6395.624		
Consistent AIC (CAIC)	6409.624		

Note: nuclear status and security commitment interaction regression estimates (model 3) in Chapter 4 table 4.1 for hostile behavior.

APPENDIX B

Table A4.6: Goodness of fit for Model 4

Test for Cooperation	Value	Degree of Freedom	Value/Degree of Freedom
Deviance	2914.432	4252	.685
Scaled Deviance	4298.037	4252	
Pearson Chi-Square	1460.442	4252	.343
Scaled Pearson Chi-Square	2153.777	4252	
Log Likelihood	-3564.731		
Akaike's Information Criterion (AIC)	7155.462		
Finite Sample Corrected AIC (AICC)	7155.547		
Bayesian Information Criterion (BIC)	7238.115		
Consistent AIC (CAIC)	7251.115		

Note: These are the results for the linear additive regression (model 4) in Chapter 4 table 4.2 for cooperative behavior.

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Table A4.7: Goodness of fit for Model 5

Test for Cooperation	Value	Degree of Freedom	Value/Degree of Freedom
Deviance	5035.833	4224	1.192
Scaled Deviance	3486.689	4224	
Pearson Chi-Square	6034.615	4224	1.429
Scaled Pearson Chi-Square	4178.222	4224	
Log Likelihood	-3127.320		
Akaike's Information Criterion (AIC)	6282.640		
Finite Sample Corrected AIC (AICC)	6282.740		
Bayesian Information Criterion (BIC)	6371.563		
Consistent AIC (CAIC)	6385.563		

Note: nuclear status and security problem interaction regression estimates (model 5) in Chapter 4 table 4.2 for cooperative behavior.

APPENDIX B

Table A4.8: Goodness of fit for Model 6

Test for Cooperation	Value	Degree of Freedom	Value/Degree of Freedom
Deviance	2878.299	4251	.677
Scaled Deviance	4286.841	4251	
Pearson Chi-Square	1486.979	4251	.350
Scaled Pearson Chi-Square	2214.655	4251	
Log Likelihood	-3537.956		
Akaike's Information Criterion (AIC)	7103.913		
Finite Sample Corrected AIC (AICC)	7104.011		
Bayesian Information Criterion (BIC)	7192.924		
Consistent AIC (CAIC)	7206.924		

Note: nuclear status and security commitment interaction regression estimates (model 6) in Chapter 4 table 4.2 for cooperative behavior.

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ABSTRACT

UNDERSTANDING THE BEHAVIOR OF STATES AS NUCLEAR STATUS CHANGES

by

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Can a state's nuclear status influence its behavior in dyadic relationships? The present study examines the role played by nuclear status on the proliferating state's level of hostility and cooperation towards other states in dyadic relationships. The study builds on the existing literature by looking at the behavior of states prior to becoming nuclear weapons states by strictly examining states with nuclear weapons development programs. This phase in the nuclear process is lacking in the current literature on nuclear weapons. Hostile behavior is measured based on the level of hostility in militarized disputes between states attempting to develop nuclear weapons and other states. Cooperative behavior encompasses diplomatic representation/exchange, joint-IGO membership, and formal agreements between states attempting to develop nuclear weapons and other states.

The dissertation contains six points of argument about the behavior of states as they move to establish nuclear weapons development programs. The first argument deals with nuclear status and hostility, where it argues that a change in nuclear status increases proliferating states level of hostility in dyadic relationships. In addition, the second argument deals with nuclear status and cooperation, where it argues that a change in nuclear

status decreases proliferating states level of cooperation. The next four points of argument examine the interaction effect between nuclear status, state behavior, security problem, and security commitment from a nuclear patron. In terms of security problem, the study argues that when nuclear status changes hostile behavior decreases a when security problem is present. On the other hand, the study argues that when nuclear status changes cooperative behavior increases a when security problem is present. Finally, in terms of security commitment, the study argues that a change in nuclear status is associated with an increase in the hostile behavior of proliferating states when they have a security commitment. With respect to cooperative behavior, the study argues that cooperation increases when proliferating states have a security commitment.

In attempting to test these arguments, the study applies a quantitative approach to 16 states with nuclear weapons developing program between 1930 and 2001. The study looked at state behavior before and after establishing a nuclear program for the purpose of developing weapons. In addition, recognizing the inherent limitation of quantitative analysis, the study also conducts one in-depth case study analysis and one minor case study by applying a process tracing approach, to North Korea and Iran, respectively. The results provided mixed support for the arguments made in the study, where the study found that hostile behavior decreased when nuclear status changes. Additionally, the study found that hostility decreased when security problem or security commitment were present. On the other hand, the study found that cooperation decreased when nuclear status changed. When testing the interaction effect, the study found that cooperation increased when proliferating states had a security commitment from a nuclear patron. The case study analysis of North Korea and Iran, further confirmed several of the findings found in the quantitative section

of the study.

AUTOBIOGRAPHICAL STATEMENT

Patty Zakaria-Nikolov is a PhD candidate in World Politics at Wayne State University. She received her Bachelor of Arts (Honors) in International Relations with a minor in Economics from the University of Windsor and a Master of Arts in Industrial Relations from Wayne State University. For the 2012-2013 academic year, she was a Visiting Assistant Professor at Dubrovnik International University, where she taught courses in international politics and international security. She has published in the International Political Science Review, Atlantic Community, European Perspective Journal, and Romanian Journal of European Affairs. Patty currently lives with her husband Stevcho Nikolov and daughter Sandra Nikolov in Toronto, Canada.