1

Do Nuclear Agreements Work?

On September 25, 2009, President Barack Obama issued the following warning to Iran at a G20 summit in Pittsburgh, Pennsylvania:

Iran must comply with UN Security Council resolutions and make clear it is willing to meet its responsibilities as a member of the community of nations. We have offered Iran a clear path toward greater international integration if it lives up to its obligations, and that offer stands. But the Iranian government must now demonstrate through deeds its peaceful intentions or be held accountable to international standards and international law.[1]

For years, Western powers had extended such olive branches to Iran, offering various enticements if Tehran ended its (assumed) nuclear-weapons program. Almost six years later, Obama's plan finally came to fruition. On July 14, 2015, Iran and an international coalition led by the United States completed the Joint Comprehensive Plan of Action (JCPOA). Known colloquially as the "Iran Deal," the JCPOA mandated that Iran reduce its uranium stockpiles, divest portions of its nuclear infrastructure, and welcome back weapons inspectors. In return, the United States lifted economic sanctions and took the first step toward integrating Iran back into that community of nations.

Although the JCPOA may have dominated recent news cycles, it is not unique in its intention. The United States has attempted to reach similar agreements with North Korea. In early 2012, Washington and Pyongyang reached a food-for-nukes agreement, which called for the

[1] Obama 2009.

North to end its nuclear-weapons program and suspend long-range missile tests in exchange for millions of pounds of food. That plan fell through. So too did the 1994 "Agreed Framework," which would have traded energy concessions for similar divestments. Since then, North Korea has stubbornly continued testing nuclear weapons and fired missiles under the auspices of its fledgling space program.

There are reasons to be pessimistic about these types of agreements in general. Both sides appear to face commitment problems. The United States would only want to offer its opponents concessions if they end their respective nuclear programs in return. However, these states could take those concessions, continue constructing nuclear weapons, magnify their military power, and extract yet *more* concessions. If Washington worries they will adopt such a strategy, it might never give the concessions necessary to induce them to end their programs. Meanwhile, without a nuclear deterrent at the ready, potential proliferators must worry that the United States' policy concessions are temporary. Thus, even if settlements exist that leave both sides better off, credible commitment problems may lead to proliferation anyway.

Despite these important concerns, there is cause for cautious optimism about the potential success of nuclear deals. Similar conciliatory strategies involving other states have lasted over the long-term. Egypt's turbulent early relationship with Israel led Cairo to explore proliferation beginning in the 1960s. However, Egypt lost most of the incentive to acquire nuclear weapons when the parties signed the Camp David Accords, which returned the Sinai Peninsula to Egypt (Einhorn 2004 48–51). Anwar Sadat formalized Egypt's commitment by ratifying the Nuclear Non-Proliferation Treaty in 1981. Although Egypt continued pursuing nuclear technology (Solingen 2007, 230–231), he and successor Hosni Mubarak never made a serious attempt to proliferate thereafter. Indeed, any nuclear experimentation would have put US foreign direct aid – tied to good relations with Israel per the Accords – in jeopardy (Arena and Pechenkina, 2016). Proliferation could have provided Egypt with benefits, but the net gain could not have exceeded the value of the deal that Egypt had already obtained.

Egypt is not the only historical case of nuclear forbearance. The end of the Cold War presented the United States a large-scale nuclear conundrum. Although the nuclear stockpiles in Belarus, Kazakhstan, and Ukraine remained under Moscow's control (Miller 1993, 71–74), each of these countries had the technological proficiency to proliferate. Negotiations between the United States and the successor states led to

the Lisbon Protocol. Belarus, Kazakhstan, and Ukraine became parties to the Nuclear Non-Proliferation Treaty. Contingent on the terms, the United States offered assistance with civilian nuclear-energy projects, provided substantial aid at a time of financial crisis, and issued security assurances.[2]

The United States even offered concessions to its own Cold War allies. At various points, Japan, South Korea, and Australia explored a nuclear deterrent. The United States publicly extended its commitment to those countries in each case. Rather than risk destroying their good relationships with Washington, each backed down.

Of course, negotiations do not always lead to nonproliferation. Ten countries have proliferated; nine still maintain nuclear arsenals.[3] What separates Egypt, Belarus, and South Korea from the Soviet Union, Pakistan, and North Korea? Why do negotiations sometimes succeed? Why do they sometimes fail?

In the wake of the Iran Deal, this may be the most important question today regarding nuclear politics. Proponents of the Iran Deal envision it as a framework for future negotiations. That being the case, it is critical that policymakers understand what features of the agreement drive compliance. Meanwhile, critics of the deal suggest it is only a matter of time until Iran violates it. If so, it is crucial to identify the agreement's shortcomings and rectify them if possible. And if these deals are hopeless, then policymakers need alternatives to curtail future nuclear proliferation.

The possibility that deals may actually succeed has a broader implication for the nuclear politics literature. Fewer than five percent of countries possess nuclear weapons. A common research question is why more states have not yet developed a bomb. This project can answer that. If bargaining works, then the shortage of nuclear countries has a simple explanation. Rather than build weapons, potential proliferators prefer taking buyouts instead, and their opponents are happy to offer those concessions.

Unfortunately, we do not yet have a full understanding of whether states can bargain over the bomb and how they do that. This book fills that void.

[2] Foreign aid to recipients not allied to the donor is somewhat common. See Uzonyi and Rider 2017.

[3] South Africa held deliverable nuclear weapons from 1982 to 1990 but eventually acceded to the Nuclear Non-Proliferation Treaty due to a combination of structural change to the international system and internal political strife (Albright 1994). See Gartzke and Kroenig (2009) for a list of nuclear powers and when they entered the club.

TABLE 1.1. *Some Successful and Unsuccessful Nonproliferation Agreements*

States	Deal	Year
Soviet Union	US Concessions	1945–1948
Worldwide	Atoms for Peace	1953
Worldwide	IAEA Technical Cooperation	1957
Worldwide	Non-Proliferation Treaty	1968
Australia	US Guarantees	1970
Japan	US Guarantees	1970–1976
Pakistan	US Guarantees	1972–1998
South Korea	US Guarantees	1976–1981
Taiwan	US Guarantees	1977–1978
Egypt	Camp David Accords	1992
Argentina/Brazil	Guadalajara Accord	1991
Soviet Successors	Lisbon Protocol	1992
North Korea	Agreed Framework	1994
Iran	Tehran Declaration	2003
Libya	Libyan Disarmament	2003
North Korea	Six-Party Talks	2003–2007
North Korea	Leap Day Agreement	2012
Iran	JCPOA	2015

1.1 THE CENTRAL ARGUMENT

The main subject of this book is nonproliferation agreements, which I define as any transfer from one country to another with the intent to make the latter less likely to acquire nuclear weapons. Table 1.1 includes a list of salient agreements, some successful and others less so.[4] The definition is broad and the examples cast a wide net, but both are intentional decisions. The core model demonstrates that mutually preferable transfers exist between would-be proliferators and their rivals. Furthermore, the model demonstrates that *any* transfer has that effect. Nuclear-specific agreements, like the Joint Comprehensive Plan of Action, qualify. But so do broader agreements that do not seem to have a direct connection to nuclear weapons, like the Camp David Accords and American inducements to the Soviet Union following World War II. Regardless of whether nuclear weapons are in the headlines, these agreements intend to reduce tensions between states in discord, which reduces the value of a nuclear arsenal.

[4] See Bas and Coe 2017 for a similar list.

However, the possibility of such agreements does not guarantee feasibility. States may be misinformed about each other's capabilities or cannot credibly commit to such agreements. The presence of these bargaining frictions determines whether a state pursues nuclear weapons. In five words, proliferation is a bargaining problem.

Understanding nuclear proliferation is a two-step process. First, this book shows that there exist concessions-for-weapons agreements, or *butter-for-bombs* settlements, that leave the parties with no incentive to build nuclear weapons or declare war. The book then describes the circumstances under which opponents refuse to offer such settlements or potential proliferators reject them, perhaps leading to the construction of nuclear weapons or preventive action.

More specifically, this book presents a proliferation inefficiency puzzle. When nuclear weapons are too expensive or the rival's threat to launch a preventive strike is credible, reaching nonproliferation settlements is straightforward. Outside these cases, proliferation may seem inevitable, as the potential proliferator's temptation to build might prove too strong. However, such intuition fails to empathize with the potential proliferator's incentives. Nuclear weapons are exceedingly expensive. The costs start with building nuclear infrastructure to create weapons-grade material. Then the state must construct the physical weapons and the corresponding delivery systems. And once completed, the proliferator must maintain the weapons and delivery systems over time, which can be the most burdensome part of all. As a result, perhaps it is not surprising that Schwartz (1998) estimates that American expenses related to nuclear weapons totaled $8.9 *trillion* from 1940 to 1996 (in 2016 dollars).

Nuclear weapons must provide some sort of benefits for potential proliferators to bother with the whole operation. That being the case, why can't rival states concede most of those benefits up front and avoid the nuclear outcome? Under such terms, potential proliferators benefit by achieving the majority of their goals without having to pay a dollar; opponents benefit from not sacrificing the entire policy in dispute and avoiding the spread of nuclear weapons. It therefore appears that the inefficiency of proliferation incentivizes *both* states to reach an agreement.[5]

The main theoretical section of this book proves the credibility of butter-for-bombs settlements. Under these agreements, the rival state makes immediate concessions to the potential proliferator. The potential

[5] This argument is similar to war's inefficiency puzzle (Fearon 1995), except applied to costly weapons construction instead of war.

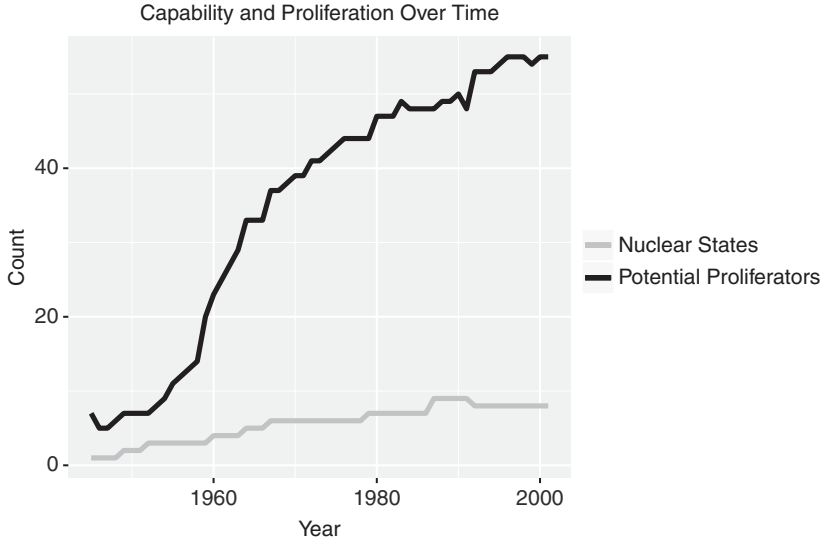

FIGURE 1.1. Nuclear Capacity and Weapons over Time

proliferator accepts the concessions and never builds. Surprisingly, nuclearizing would yield further concessions for the potential proliferator. However, the additional concessions do not compensate for the cost of proliferation. In turn, the potential proliferator has no incentive to break the deal.

This has an important implication for the nonproliferation regime. By some accounts, the Nuclear Non-Proliferation Treaty is one of the most successful international organizations ever created.[6] Only four countries have never signed (India, Israel, Pakistan, and South Sudan) and only one (North Korea) has ever withdrawn. The model shows that concessions from rival states cause potential proliferators to abide by the treaty; absent those concessions, many more states would leave the NPT and develop a nuclear deterrent. This helps explain the discrepancy between the number of nuclear-capable states and the number of nuclear-weapons states seen in Figure 1.1.[7]

Going deeper, Figure 1.1 shows the universe of cases that this study addresses. Note that these are *states*, not nonproliferation agreements.

[6] See Sagan 1996; Dai 2007; Rublee 2009. Mearsheimer 1993 provides an opposing viewpoint.
[7] Figure adapted from Smith and Spaniel 2018.

This is for two reasons. First, explaining both the successes and failures requires cases where deals were successful, deals that failed, and deals that never even materialized.[8] These agreements span over time and may be adjusted according to shocks to relations, so it is important to consider them in their broader context. Second, despite the temptation to focus on agreements that are explicitly nuclear (e.g., the Iran Deal), the Camp David Accords case suggests that any sort of concession made to an adversary could override a state's need for nuclear weapons. Table 1.2 gives a comprehensive list of these nuclear-competent states with the year they first obtained a proficiency higher than North Korea's in 2001 and the year they first obtained that proficiency. Countries in bold have pursued nuclear weapons according to Bleek's (2010) data.

Figure 1.1 also suggests a bigger puzzle. Although most of these states opt not to proliferate, some do. Insofar as negotiations can reduce a state's desire to proliferate, these are the cases of bargaining failures. The task then is to explain these instances of proliferation within the context of the inefficiency puzzle. Why do potential proliferators nuclearize when nonproliferation settlements exist that improve both parties' welfare?

This book provides three causal mechanisms. First, commitment problems preclude a deal when the potential proliferator expects to lose the ability to develop nuclear weapons in the future. Opponents would like to promise concessions over the long term to convince the potential proliferator to forgo nuclear weapons. However, because the threat to proliferate drives those concessions, the potential proliferator knows it will lose the deal once nuclear weapons are no longer an option.[9] In turn, this dynamic forces the potential proliferator to invest while it can to coerce concessions in the long run.

Second, incomplete information leads potential proliferators to challenge rivals in the absence of a butter-for-bombs offer. Weak rival states have incentive to act tough and make no concessions, relying on the threat of a preventive strike to induce the potential proliferator to yield. Thus, the potential proliferator may develop nuclear weapons to test the rival's credibility. Stable butter-for-bombs agreements still exist here.

[8] Studies often overlook the cases where states never reached explicit nuclear negotiations, which means the conclusions are only useful for understanding how to solve a problem once it has started. Instead, I parse the cases at countries with nuclear capacity. This is similar to the empirical strategy in Bas and Coe 2017.

[9] Note that the potential proliferator does *not* face a commitment problem here. As later chapters will show, it is willing to accept concessions, even if it could freely proliferate after receiving a bribe.

TABLE 1.2. *List of Nuclear-Proficient Countries and the Year They Achieved Proficiency*

Country	Year	Country	Year
Germany	1939	Finland	1964
United States	1939	Portugal	1964
United Kingdom	1941	Turkey	1964
Soviet Union/Russia	1943	Bulgaria	1967
Canada	1944	Colombia	1967
Japan	1944	Greece	1967
France	1945	Venezuela	1967
Sweden	1948	Netherlands	1969
India	1949	Thailand	1969
Yugoslavia/Serbia	1953	Mexico	1970
Norway	1954	**Iran**	1972
China	1955	**Pakistan**	1972
Israel	1955	**South Africa**	1974
Australia	1956	**Iraq**	1975
Switzerland	1957	Chile	1976
Belgium	1958	Indonesia	1980
Brazil	1959	Peru	1980
Czechoslovakia	1959	Philippines	1980
East Germany	1959	Algeria	1983
Romania	1959	**North Korea**	1983
West Germany	1959	Bangladesh	1988
Argentina	1960	Belarus	1992
Poland	1960	Kazakhstan	1992
Spain	1960	Ukraine	1992
Hungary	1961	Lithuania	1992
Italy	1961	Slovenia	1992
Austria	1962	Czech Republic	1993
South Korea	1962	Uzbekistan	1995
Egypt	1963	Slovakia	1996
Taiwan	1963	**Syria**	2000
Denmark	1964		

However, because weak rivals have incentive to bluff, the potential proliferator sometimes challenges the status quo.

Third, imperfect information has mixed effects. If the rival cannot monitor the potential proliferator's decision to build, the potential proliferator faces great temptation to defect from a deal. When the cost of proliferation is high, the opponent prefers overpaying the potential proliferator to ensure compliance. In contrast, when the cost of proliferation is low, the required overpayment becomes too large.

Instead, the opponent sometimes launches preventive war to quash the nuclear option. Both parties are worse off in the second case. Consequently, potential proliferators benefit from voluntarily *increasing* their costs of nuclear weapons, whether through divestment, inspection regimes, or domestic constraints.

1.2 ALTERNATIVE EXPLANATIONS AND WHY THEY ARE INSUFFICIENT

My theory draws on previous state-level explanations for proliferation. The model confirms many existing necessary conditions for nuclear development. However, it also shows that some conditions the literature currently believes are sufficient fall short. In sum, conventional wisdom (Sagan 1996, 57–61; Debs and Monteiro 2017) holds that the following assumptions explain proliferation behavior:

1. Nuclear weapons increase a state's coercive power.
2. There is a zero-sum point of contention between a state and a rival.
3. The costs of proliferation are smaller than the coercive power gained by proliferating.
4. Preventive war is not a viable option.

The first two components form the backbone of most security-based explanations for proliferation. If nuclear weapons do not increase coercive power, then they are merely a radiation threat to their possessors. Fortunately, a long literature dating back to Schelling (1960, 187–204) suggests that states are more likely to back down on an issue when facing a nuclear-armed opponent. More recent empirical evidence indicates that nuclear-weapons states prevail more often in conflict (Beardsley and Asal 2009). And even critics who argue that nuclear weapons provide little to no compellent power still believe in their deterrent power (Sechser and Fuhrmann 2013, 177–178).[10]

Likewise, if a state is not involved in a coercive bargaining relationship today and does not expect to be at a later date, then there is no reason to invest in nuclear weapons. This is the "demand side" of nuclear proliferation. States with protracted disputes or enduring rivalries participate in proliferation behaviors (Singh and Way 2004; Jo and Gartzke 2007). Thayer (1995, 486) goes further, concluding that "security is the only necessary and sufficient cause of nuclear proliferation." Alternatively,

[10] I further explore the coercive power of nuclear weapons in the next chapter.

proliferation is just another form of "internal balancing" against external threats (Lavoy 1993, 196).

Recent research has paired the traditional security explanations with practical and political barriers. These form the cost component. Indeed, "supply side" theories recognize the high price of nuclear weapons and see technological hurdles as major determinants of nonproliferation. Countries with lower levels of nuclear proficiency are less likely to pursue nuclear weapons (Jo and Gartzke 2007; Smith and Spaniel 2018), especially if no status quo nuclear power offers assistance (Kroenig 2009a; Kroenig 2009b; Kroenig 2010; Fuhrmann 2008; Fuhrmann 2009). Low-proficiency countries can overcome their technological barriers, but they still will not do so when the ultimate bang is not worth the buck.

Domestic political explanations for proliferation fit into a broader conceptualization of the cost of nuclear weapons. Pure technical capability must be paired with competent program management, which takes some countries out of the proliferation equation (Hymans 2012; Braut-Hegghammer 2016). Leaders who care little about international economic integration are more willing to bear the opportunity costs of nuclear weapons than outward-looking regimes (Solingen 2007). Likewise, countries with normative aversions to nuclear weapons have a higher perceived cost of proliferation (Tannenwald 1999; Rublee 2009). In contrast, leaders with oppositionalist psychological profiles take threats more seriously and therefore internalize the costs of proliferation at lower values (Hymans 2006). If a state falls on the wrong side of each of these issues, they may find the price of nuclear weapons too large relative to the benefits and therefore decide against proliferation.

The final component delves deeper into strategic interactions in the shadow of nuclear weapons. For the proliferation process to run its course, the developing state must have some minimal ability to defend itself. Otherwise, recognizing the disadvantageous shift in power to come, the opponent would launch preventive war. Internalizing the threat, the potential proliferator passes on nuclear weapons (Debs and Monteiro 2014). Combining these components together, Debs and Monteiro (2017, 66) thus state that "high relative power is, together with a high level of threat, sufficient to cause proliferation."

I incorporate all of these components in my main model. However, the model demonstrates that these assumptions are *not* sufficient to explain proliferation. To be explicit, suppose a country faces an intense, zero-sum security issue, as the traditional, realist theories of proliferation require. Imagine that country is technologically proficient and can