The Logic of Latent Nuclear Deterrence

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Abstract

Nuclear deterrence is central to international relations theory and practice. Most people assume that countries must possess nuclear weapons in order to reap deterrence benefits from their nuclear programs. This article shows, however, that latent nuclear powers – nonnuclear states that possess the capacity to make weapons – can deter aggression, despite their lack of assembled warheads. Latent nuclear deterrence works because states that possess the technology needed to produce bombs can threaten to initiate or accelerate nuclear weapons programs if they are attacked. A fixed effects regression analysis that includes 170 countries from 1946 to 2010, using data compiled by the author on the global spread of sensitive nuclear technology, provides evidence consistent with three of the theory's testable predictions. First, switching from non-latency to latency reduces the probability of being targeted in a violent military dispute in a given year by 3.32 percentage points. Second, having nuclear latency does not deter less serious, nonviolent disputes. Third, the development of non-sensitive nuclear technology that does not provide states with latent nuclear capacity is not associated with a lower likelihood of being attacked. A qualitative analysis of Iran's nuclear activities from 2002 to 2015 illustrate these statistical findings. This evidence has lessons for the debate about nuclear disarmament: most scholars and policymakers are skeptical that the prospect of nuclear rearmament in a disarmed world could deter serious international disputes, but the case for latent nuclear deterrence is stronger than critics would lead us to believe.

Much ink has been spilled on the subject of nuclear deterrence.[1] Most scholarship assumes, at least implicitly, that nuclear technology has little value for deterrence unless countries can immediately retaliate with nuclear weapons. In this view, a nuclear arsenal provides an effective deterrent because it can swiftly destroy an opponent's dearest possessions, such as cities. Without providing the capacity to launch a nuclear strike, nuclear technology cannot deter military conflict and may actually invite it by providing adversaries with incentives to launch preventive wars.

The conventional view of nuclear deterrence may understate the strategic benefits of nuclear technology. Nuclear weapons are indeed valuable deterrents, but the mere capacity to produce a nuclear bomb could limit military aggression as well. Countries with nuclear latency – nonnuclear states that have developed the capacity to make weapons – might be able to deter attacks even though they are incapable of immediate nuclear retaliation. How is nuclear deterrence without bombs possible?

States with dual-use nuclear technology possess the potential foundation for a nuclear weapons program. When states build sensitive nuclear plants they send a warning to others: "we have come this far and we can go further, if necessary." The development of nuclear latency, then, resembles a shot across the bow. If a latent nuclear power perceives that its interests are threatened, it might begin a nuclear weapons program or accelerate an existing one. The prospect of fomenting nuclear proliferation may induce caution among the latent state's potential adversaries, leading to less military conflict. I call this means of influence *latent nuclear deterrence*.

Some practitioners appear to embrace the notion that nuclear latency bolsters deterrence. In 2011, Shigeru Ishiba, a former Japanese defense minister, put it this way: "I don't think Japan needs to possess nuclear weapons, but it's important to maintain our commercial reactors because it would allow us to produce a nuclear warhead in a short amount of time." Having nuclear latency, he added, serves as "a tacit nuclear deterrent."[2] Pakistani officials, particularly those in the Army, also hold an "enduring belief" that the country's latent nuclear capacity deterred military conflict in the 1980s – before it assembled a warhead or carried out a nuclear test.[3]

Does latent nuclear deterrence work? If so, under what conditions? We know surprisingly little about the efficacy of deterrence without bombs. This is unfortunate given the practical significance of this issue. More than 30 states – three times as many as built nuclear weapons – have developed sensitive dual-use nuclear technology over the last 70 years. There are

[1] See, for example, Brodie (1959), Kahn (1960), Schelling (1966), Miller (1984), Jervis (1989), Powell (1990), Gartzke & Jo (2009), Sagan & Waltz (2012), Narang (2009, 2014), and Bell & Miller (2015).

[2] Quoted in Dawson (2011). See also Hoey (2016, 485).

[3] Fair (2014, 223).

indications that this number could increase: Saudi Arabia and other Arab countries have publicly asserted that they will develop latent nuclear capabilities, though it remains to be seen whether that objective will materialize.[4] Moreover, as this article will make clear, latent nuclear capacity carries implications for the study of nuclear proliferation and military deterrence in scholarship.

This article unpacks the logic of latent nuclear deterrence. It revisits the fundamentals of deterrence theory to identify the basic requirements for success, and then evaluates whether having nuclear latency helps states meet those requirements. The theory holds that latent nuclear deterrence is more effective than other research would lead us to believe. In this paper, I test three of the theory's empirical predictions using existing data on military conflict and the newly-released Nuclear Latency (NL) dataset, which contains information on sensitive nuclear technology – specifically uranium enrichment and plutonium reprocessing (ENR) activities – in all countries from 1939 to 2012.[5] The analysis produces evidence consistent with latent nuclear deterrence theory. First, developing nuclear latency lowers the likelihood that a state will be targeted in violent military disputes. Second, latent nuclear capabilities do not appear to deter less serious, nonviolent conflicts. Third, nuclear programs do not significantly bolster deterrence when countries engage in non-sensitive activities but fail to achieve a state of nuclear latency.

There are good reasons to expect that nuclear weapons also bolster deterrence. How do latent nuclear forces compare to nuclear arsenals? Some evidence suggests that nuclear latency is less beneficial for deterring military disputes than nuclear weapons. However, there is considerable uncertainty about this relationship. We cannot rule out the possibility, based on my analysis, that latent nuclear forces are superior to nuclear arsenals.

In his 1984 book *The Abolition*, the disarmament advocate Jonathan Schell popularized the concept of weaponless deterrence.[6] Schell desired a world in which nuclear powers dismantled their warheads but retained the capacity to reconstitute their arsenals. In the event of war, countries such as the United States could quickly rearm, putting themselves in a position to retaliate with nuclear strikes. Weaponless deterrence, then, works just like traditional nuclear deterrence except that there is a short delay between the aggressor's military provocation and the defender's ability to carry out a nuclear response. Subsequent work characterized this form of deterrence as a system of "virtual nuclear arsenals (VNAs)."[7]

However, most international relations scholars and nuclear strategists are skeptical that

[4]Sanger (2015).

[5]Fuhrmann & Tkach (2015).

[6]Schell (1984).

[7]Mazarr (1995), Mazarr (1997b), Holdren (1997), Perkovich & Acton (2009), and Drell & Goodby (2009).

latent nuclear deterrence can work.[8] As Kenneth Waltz put it, "a latent nuclear force is at best a shaky deterrent."[9] Colin Gray calls the idea of a latent deterrent "appallingly poor." "The idea of virtual nuclear arsenals," he writes, "is such a bad one that even many among the Western opinion leaders who routinely will endorse propositions for policy that staple together disarmament, anti-nuclear action, and clever-sounding theory are unlikely to be seduced."[10] For these scholars, the delay between an attack and punishment renders latent nuclear forces feeble.[11] There is little hope, based on this view, for latent nuclear deterrence to work as well as deterrence with operationally deployed arsenals.

My findings suggest that weaponless deterrence is more viable than critics suggest. Historically, based on my analysis, developing latent nuclear capacity resulted in countries being targeted in violent disputes at a lower rate. Proponents of VNAs actually understate the deterrence benefits of nuclear latency. These scholars focus on one particular type of nuclear latency: a situation in which a former a nuclear power could reconstitute an arsenal and quickly deliver retaliatory strike. Throughout the nuclear age, however, very few countries could do this. Even Japan, a prototypical latent nuclear power, would probably take six months to produce a bomb following a political decision, possibly longer. Others that carried out sensitive nuclear activities – including Spain, Sweden, and Taiwan – were likely one or more years from being able to carry out a nuclear attack at the height of their efforts. VNA advocates do not seriously consider that these countries may have benefited from having a latent nuclear capacity because their focus is on rapid nuclear rearmament by former nuclear powers. My analysis shows that far less advanced nuclear programs can help countries deter military disputes, at least under certain conditions.

At the same time, there is some truth to the critical view of VNAs. The conditions for successful latent nuclear deterrence may not always hold. One can point to cases – the 1965 Indo-Pakistani War, for instance – where it failed. Critics go too far when they characterize latent nuclear forces as "at best ... shaky," but there are clear limits to deterring military conflict with nuclear latency. If one's goal is to make violent conflict impossible, they are likely to find latent nuclear forces wanting. Moreover, when it comes to reducing the risk of violent conflict, a latent nuclear deterrent is better than nothing but it might not be as beneficial as possessing a nuclear arsenal. The evidence on this front is mixed, though, and the difference between arsenals and latency for deterrence is smaller than what VNA skeptics would expect.

[8]See, for example, Waltz (1997), Roberts (1997), Cohen & Pilat (1998), Payne (1998), Gray (1999), and Ford (2011).

[9]Waltz (1997, 155).

[10]Gray (1999, 117).

[11]Critics also reject VNAs on the grounds that pursuing nuclear disarmament is impractical and would produce instability because there would be strong incentives to surreptitiously rearm.

Nuclear latency has long been suspected of heightening global and regional insecurity. In particular, scholars and practitioners draw a connection between dual-use nuclear technology and preventive war. One state's development of dual-use nuclear technology, the argument goes, causes a rival to fear that the developer intends to build bombs, leading the rival to take military action before it is too late.[12] Israel's attacks against nuclear plants in Iraq (1981) and Syria (2007), as well as the contemporary crisis over Iran's nuclear program, appear to support this line of thinking. The theory and evidence presented here, however, show that latent nuclear capacity deters – not provokes – violent military disputes more often than not. Nuclear programs can indeed lead to war but the conditions under which they are likely to do so are rarer than most studies acknowledge.

This study's findings may help explain an enduring puzzle about nuclear proliferation: why have just 10 countries built nuclear weapons, despite the fact that many more have the technical wherewithal to proliferate? This study points to one partial explanation: by developing a latent nuclear capability, states can reap some benefits – including a perk that is normally associated with a nuclear arsenal – while skirting the costs of full-blown proliferation. In the eyes of countries with nuclear latency, then, nuclear forces may be seen as unnecessary. If their security environment deteriorates unexpectedly, latent nuclear powers can obtain bombs quicker than if they had to start from scratch. Short of that, these countries can use the threat to go nuclear to ward off military challenges. This may explain the behavior of countries such as Iran. It is impossible to know Tehran's true motives, but it would not be surprising if Iran was content to possess a latent nuclear capability, based on my analysis.

All of this suggests that we should reconsider what it means to be a nuclear power. In a 1976 essay, the future Nobel laureate Thomas Schelling wrote, "Until recently, having or not having nuclear weapons appeared to be, and was treated as, a question of yes or no. From now on it will make more sense to describe a country's nuclear-weapon status not with a yes or a no but with a time schedule."[13] However, over the ensuing four decades, most literature on nuclear deterrence continued to define nuclear status narrowly, based on states that had assembled (or, like Israel, were widely believed to have assembled) nuclear warheads. This led scholars to downplay or overlook the deterrent effects of nuclear latency. A broader conception of nuclear capability would allow us to more fully appreciate the scope of nuclear deterrence in world politics. Powerful countries armed with nuclear arsenals are undoubtedly important for deterrence in today's international environment. At the same time, in their own way, nonnuclear states that possess sensitive dual-use technology are nuclear powers, too. Like the traditional nuclear weapons states, these countries can reap deterrence benefits

[12]See, for example, Fuhrmann & Kreps (2010), Debs & Monteiro (2014), and Whitlark (2017).
[13]Schelling (1976, 79).

from their possession of nuclear technology.

This paper proceeds by defining nuclear latency and latent nuclear deterrence in greater detail and discussing global trends. It then discusses the minimum requirements for deterrence success, considers whether nuclear latency offers the potential to deter military disputes, and identifies testable prediction from the theory. To illustrate latent nuclear deterrence theory, I then discuss the strategic effects of Iran's nuclear program over the last 15 years. The subsequent sections describe the dataset and variables used to test the hypothesis, present the results from a fixed effects regression analysis designed to isolate the relationship between latent nuclear capacity and the instigation of military disputes, and highlight several key latent nuclear deterrence failures. The penultimate section summarizes what we learn from this study, and the final section comments on the lessons for nuclear disarmament.

Conceptualizing Nuclear Latency and Latent Nuclear Deterrence

Nuclear latency generally refers to having the capacity to build nuclear weapons without possessing an arsenal. There are three main requirements for building a nuclear bomb: (1) obtaining fissile material (weapons grade highly enriched uranium or plutonium), (2) weaponizing this material, and (3) mating the weapon to a delivery system. The first step is widely seen as the most difficult. I therefore measure nuclear latency based on the possession of sensitive nuclear technology that can produce fissile material.[14] I classify nonnuclear weapon states that actively employ ENR technology as *latent nuclear states*.

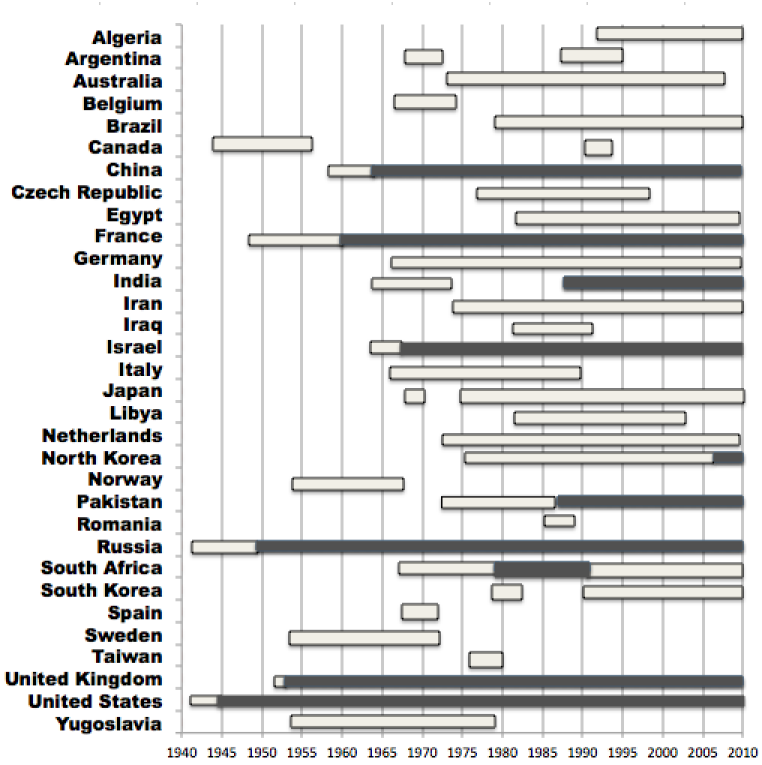
My conception of nuclear latency differs from VNAs in that there is a much longer time needed to assemble deliverable weapons. The VNA advocate Michael Mazarr states, "VNAs would attempt to create a cushion measured in days or weeks [before nuclear weapons could be used]."[15] Nuclear latency, by contrast, is characterized by a cushion of months or years.

There is heterogeneity in the speed with which latent nuclear powers could proliferate. Some countries developed only R&D-scale ENR programs that may produce small amounts of fissile material but not enough for even a single warhead (Sweden and Yugoslavia). Others have larger-scale programs that could make enough fissile material for many bombs (the

[14]This approach is consistent with arguments made by Sagan (2010) and Fuhrmann & Tkach (2015). For other conceptions of nuclear latency, see Meyer (1984), Jo & Gartzke (2007), and Spaniel & Smith (2016).

[15]Mazarr (1997a, 15). Mazarr suggests that a longer lead time could be introduced once VNAs were in place.

Figure 1. *Countries with nuclear latency and nuclear weapons, 1940-2010.*



Note: light shading = nuclear latency; dark shading = nuclear arsenal.

Netherlands and Japan). Both groups could likely build nuclear weapons quicker than non-latent states, but the latter could do so faster than the former. I will exploit this variation in the analysis presented later to assess whether the speed with which a state could build nuclear weapons affects the value of nuclear technology for deterrence. It turns out that this distinction does not matter for deterrence as much as one might think.

Figure 1 illustrates global trends in nuclear latency. It shows the countries that developed latent nuclear capacity from 1940 to 2012 as well as the years that they had ENR facilities or laboratories in operation, based on the NL dataset.[16] As the figure shows, 32 countries achieved some form of nuclear latency during this period. Any state that builds a nuclear arsenal must first spend time as a latent nuclear power. However, just 10 of these countries – less than 33 percent – went on to proliferate.

Deterrence works, in part, by imposing costs on countries that commit aggression. Nuclear weapons help deter conflict because aggressors face the possibility of suffering devastating nuclear retaliatory attacks. There are ways to impose costs on instigators, however, that do not involve immediate physical destruction. Many countries – including the United

[16]Fuhrmann & Tkach (2015).

States – are threatened by the spread of nuclear weapons.[17] The prospect of fomenting nuclear proliferation could be enough to dissuade adversaries from attacking even if there was no possibility of retaliatory nuclear use.[18] Latent nuclear deterrence, therefore, does not depend on carrying out a delayed nuclear strike.[19]

Imagine that State A has a grievance with State B, who is a latent nuclear power. State A considers attacking State B to resolve the dispute in its favor, and State A believes that it could prevail militarily within two weeks. State B is months or years away from a deliverable warhead, so it could not launch a quick nuclear strike in retaliation. However, by developing latent nuclear capacity, State B has signaled that it could utilize dual-use nuclear technology for military purposes in the future. Attacking State B might heighten its sense of insecurity, increasing the likelihood that it pushes harder to build nuclear bombs. This response could "hurt" State A even if it never incurs physical destruction as a result of State B's efforts. State A might therefore think twice before attacking State B.

In latent nuclear deterrence, the defender's threat can be explicit but it is often implicit. Explicit threats are rare because raising the specter of nuclear proliferation can be politically and diplomatically costly. They are also unnecessary to achieve deterrence with nuclear latency. The development of ENR technology sends a signal that does not necessarily need to be communicated verbally by a country's leaders.

Moreover, latent nuclear deterrence does not have to be a deliberate strategy on the part of the defender. The nuclear proliferation literature distinguishes between latency and hedging.[20] Nuclear hedging implies that a state has latency *and* a deliberate desire to shorten the time needed to build nuclear bombs, recognizing that the security environment might quickly deteriorate in the future. Latency, by contrast, is about capabilities only – not intentions. My focus is strictly on nuclear latency. States may experience deterrence gains from having nuclear latency even if they developed this capacity for economic or prestige-related reasons, not strategic ones. In my view, however, only three countries shown in Figure 1 – Belgium, Czechoslovakia, and the Netherlands – developed nuclear latency exclusively for non-military reasons. The other 29 states sought or maintained nuclear latency at least

[17]This is partially because they worry about future nuclear use, but also for other reasons that will be articulated later.

[18]Previous studies have raised this possibility but the logic has not been fully fleshed out. See Paul (2000, 59), Levite (2002), Fuhrmann & Tkach (2015), and Mehta & Whitlark (2017).

[19]Delayed nuclear retaliation can bolster deterrence. My argument is simply that threats to proliferate can deter as well. The arguments and evidence presented later in the paper show that latent nuclear powers can deter military conflict well before they have the capacity to launch retaliatory nuclear strikes.

[20]For a recent study that identifies the strategies that states may adopt when pursuing nuclear weapons, including hedging and latency, see Narang (2017).

partially to fulfill strategic or military goals.[21]

The logical foundations of latent nuclear deterrence remain underdeveloped.[22] In the following pages, I develop a theory of latent nuclear deterrence. To do so, I identify the basic requirements for successful deterrence and then consider whether nuclear latency helps states better meet them.

Requirements for Successful Deterrence

When states practice deterrence, they attempt to alter their opponent's beliefs about the net benefits of an attack relative to the current status quo.[23] Defenders, in other words, strive to make the status quo relatively more attractive to potential challengers, usually by making a change in policy seem less desirable. Successful deterrence depends on four basic conditions. Meeting these requirements does not guarantee that deterrence will work.[24] The absence of these conditions, however, will doom deterrence to failure.

First, a defender must have the capability to deny benefits (*deterrence by denial*) or impose costs on potential aggressors (*deterrence by punishment*).[25] Without the capacity to do at least one of these things, deterrence will be unsuccessful. Consider a hypothetical example. Bashar al Assad may hope to deter greater U.S. involvement in Syria's civil war by threatening to launch missile attacks against U.S. cities. The targeting of American cities with missiles would surely be costly for Washington. However, because Syria does not possess missiles capable of hitting the U.S. homeland, the threat would be dismissed out of hand.

Second, there must be a non-zero probability that the defender would carry out its threat. A defender's threat cannot influence a challenger's behavior if there is *no* chance that the defender would implement it – regardless of how much punishment the defender could, in

[21]See Muller & Schmidt (2010, 157-158). As shown in the online appendix, excluding the cases where military aims were seemingly nonexistent produces similar results. This is admittedly a crude exercise since it is exceedingly difficult to discern a country's nuclear intentions. Even a country's own leaders may not have a clear sense of why they are seeking nuclear latency.

[22]Most thinking about latent nuclear deterrence has occurred in the context of the debate about VNAs. Even in this literature, however, the mechanisms through which latency deters conflict remain underdeveloped. Michael Mazarr acknowledged this point in a 1997 essay: "the concept [of a VNA] remains at such a rudimentary stage of analytical development," he argued, "that no final case for it can yet be made." See Mazarr (1997b, 369). Although this statement was written 20 years ago, I believe that it is still true today.

[23]Snyder (1961, 13).

[24]For a discussion of relevant factors that shape deterrence outcomes, see George & Smoke (1974) and Huth (1999).

[25]Zagare & Kilgour (2000, 290) call this the only condition that is "absolutely necessary" for deterrence success.

theory, inflict on the challenger. A threat to use nuclear weapons, for instance, will not influence the challenger's behavior if it is incredible, even though a nuclear attack would be catastrophically costly were it to occur.

Whether the defender's threat is sufficient to dissuade an attack depends, in part, on the costs of attacking discounted by the probability that those costs will be imposed. Thus, low likelihood threats may deter if the potential costs are exceedingly high. To illustrate, it is plausible that the United States would be deterred from invading North Korea even if there was just a ten percent chance that Pyongyang would retaliate with nuclear weapons. On the other hand, relatively modest costs may not dissuade an aggressor from attacking even if they are nearly certain to materialize. A U.S. adversary's threat to recall its ambassador from Washington in the event of an American attack may be credible, but the costs of this action are small, so the threat is unlikely to meaningful influence U.S. behavior.

A third requirement is implicit in deterrence theory, but is rarely made explicit.[26] A challenger must believe that it will *not* pay the costs associated with an attack if it maintains the status quo. Behind every threat is a promise. As Schelling put it, "To say, 'One more step and I shoot,' can be a deterrent threat only if accompanied by the implicit assurance, 'And if you stop I won't.'"[27] If the target of this threat believes that he or she will be shot regardless of whether or not they take another step, there is little reason to heed the gunman's warning. This applies to international politics, too. If a state will carry out a threatened action – for example, seizing territory held by its rival – regardless of whether the rival attacks, the state's threat will not change the rival's calculus.

The defender's ability to credibly impose costs or deny benefits, however, is just one side of the deterrence coin. The challenger's expected benefits of attacking are equally important when it comes to explaining deterrence outcomes. A fourth requirement of deterrence is that the challenger's expected costs of fighting do not exceed the expected benefits. In cases where the issues at stake are critical, a challenger might attack even if doing so is costly. For example, the United States knew that attacking North Vietnam would be costly but it nonetheless intervened in the 1960s, partially because it was determined to contain the spread of communism.[28]

Why Latent Nuclear Deterrence Works

It is hard to see how nuclear latency could be helpful for military denial. Having a latent nuclear capability could, however, allow states to punish their opponents more effectively.

[26]For a recent exception, see Kydd & McManus (2017).

[27]Schelling (1966, 74).

[28]On President Johnson's assessment of the costs of fighting in Vietnam, see Downes (2009).

Based on the logic of deterrence, a minimum of four things must be true in order for nuclear latency to deter aggression via punishment: (1) nuclearization by the defender must impose costs on the attacker; (2) a defender's threat to advance the nuclear program must be seen as credible; (3) the challenger must not believe that the defender is racing to build nuclear weapons; and (4) the challenger must not be highly resolved to fight. These conditions will often – but not always – hold, leading to successful latent nuclear deterrence.

Nuclear Proliferation is Usually Undesirable

Military counterattacks naturally impose costs on challengers to some degree. But when the threatened action is to pursue a military capability that may not be immediately used (or ever used), as in latent nuclear deterrence, the costs of aggression for the challenger may be less obvious. Whether a defender's threat to advance its nuclear program is costly depends on the challenger's opposition to nuclear proliferation. For this threat to impose costs, the defender's acquisition of nuclear forces must be undesirable for the challenger. There is not consensus in scholarship about the degree to which nuclear proliferation is consequential, but there are a range of conceivable costs that one state's pursuit of nuclear weapons could impose on others.

Nuclear proliferation may constrain the foreign policy behavior of non-proliferating states. Having a nuclear arsenal is widely seen as an effective deterrent, since threatening a country's vital national interests could provoke a devastating response.[29] The spread of nuclear weapons might therefore limit a state's freedom of action militarily. For example, the United States might find it desirable to depose North Korean leader Kim Jong Un at some point in the future but the country's possession of a nuclear arsenal would make implementing this policy exceedingly risky. Washington can still threaten Pyongyang to some degree but U.S. leaders must tow a fine line, as jeopardizing the regime's vital national interests could provoke a catastrophic response. By contrast, when an adversary does not possess nuclear weapons, the United States has more freedom of action when considering invasions, foreign imposed regime changes, or other offensive military operations, as the cases of Iraq (2003) and Libya (2011) illustrate. Deterrence may be positive from the standpoint of peace and stability, but countries generally desire flexibility – not rigidity – when it comes to addressing foreign policy challenges. Nuclear proliferation may take options off the table that countries would otherwise find attractive.

The spread of nuclear weapons might also increase the vulnerability of other countries. Nuclear powers may be emboldened to take greater foreign policy risks once they obtain an

[29]Many scholars have made this point. Classic discussions include Waltz (1981) and Jervis (1989).

arsenal.[30] In particular, states armed with nuclear arsenals may instigate military confrontations at a higher rate. For example, some have argued that Pakistan became more assertive in its interactions with India – Islamabad provoked the 1999 Kargil War and supported insurgent groups – after testing nuclear weapons in 1998.[31] In situations where nuclear proliferation has emboldening effects, nonnuclear states might face more military challenges than they otherwise would or be forced to make costly concessions. There is scant evidence that nuclear weapons are useful for coercion – as opposed to deterrence – but policymakers nonetheless routinely worry about nuclear blackmail.[32] As one illustration, John F. Kennedy thought that China's acquisition of nuclear weapons was likely to be, as one of his advisers put it, "the most significant and worst event of the 1960s" partially because it might weaken U.S. influence in the region.[33] Nuclear proliferation makes states susceptible to catastrophic attacks even if the nuclear power is a peace-loving and responsible nation. As long as nuclear weapons exist there is always the possibility, however small it may be, that they could be used as a result of accidents, unauthorized launches, or false alarms.[34]

The spread of nuclear weapons may generate collateral effects as well. A case of nuclear proliferation triggers other events, and those events – rather than the initial instance of bomb production – could impose costs on a country. Arms races provide a relevant example. One state's acquisition of nuclear weapons may cause others to follow suit. China's development of nuclear weapons, for example, may have encouraged Indian proliferation, which in turn led to a Pakistani bomb. In today's nuclear landscape, some analysts fear that an Iranian bomb would cause Arab countries such as Saudi Arabia to proliferate, too. This kind of "chain reaction" is notable because it means that the effects of nuclear proliferation can be farther-reaching than it initially seems. Pakistan was not directly threatened by China's 1964 nuclear test; the constraining or vulnerability-inducing effects were minimal because a military confrontation between these two countries was rather unlikely. This event was nonetheless consequential for Islamabad since it may have propelled India's nuclear ambitions. The possibility of collateral consequences helps explain why countries might oppose nuclear proliferation even when the proliferator is an ally.[35]

Strategic considerations aside, nuclear proliferation could be costly for normative reasons. Many countries are deeply invested in nonproliferation because they view nuclear weapons as a threat to international peace and stability, even if they are not vulnerable to a nuclear

[30] See Bell (2015) for a detailed discussion of emboldenment in the context of nuclear proliferation.
[31] Kapur (2007).
[32] For a comprehensive discussion of nuclear coercion, see Sechser & Fuhrmann (2017).
[33] The quotation is from Walt Rostow and is quoted in Burr & Richelson (2000/2001, 61).
[34] Sagan (1993) provides a classic discussion of this issue.
[35] For example, Israel's development of nuclear weapons in the 1960s may not have directly threatened the United States but Washington was hardly enthusiastic about an Israeli bomb.

attack. Indeed, some of the most vocal proponents of nonproliferation are relatively weak states who are unlikely to suffer the kinds of costs described above – for example, Ireland, Mexico, and New Zealand. These countries share a deep normative commitment to reducing the risk of nuclear war. Nuclear proliferation is costly for these states because it could weaken the global nonproliferation regime, which is backed by the Nonproliferation Treaty (NPT), and undermine efforts to reduce the role of nuclear weapons in world politics.

Challengers may discount the costs of attacking to some degree. In latent nuclear deterrence, the challenger will not pay an immediate price for its actions. There will instead be a delay between the infraction (the attack) and the punishment (the target's acquisition of nuclear weapons). This may cut against the efficacy of nuclear latency deterrence. Criminologists point to the importance of celerity, or the immediacy of punishment, for successful deterrence.[36] Some have argued that punishment is less likely to deter crime when there is a long delay in the imposition of a sanction.[37] In the context of nuclear latency deterrence, it is therefore possible that the challenger's costs of attacking may be somewhat reduced, even in cases where a state is threatened by nuclear proliferation.[38]

Although most scholars and policymakers believe that nuclear proliferation is undesirable, some have argued that the limited spread of nuclear weapons bolsters international stability by raising the costs of war.[39] If countries place a high value on stability – even if it deters their own freedom of action – and if nuclear proliferation does in fact lower the risk of war, the net benefits of another state's acquisition of a nuclear arsenal could be positive. In that case, a threat to "go nuclear" will not deter military conflict, since the challenger would welcome the threatened outcome.

There is cross-national variation in the perceived costs (or benefits) of nuclear proliferation. The United States, for instance, generally seems more threatened by the horizontal spread of nuclear weapons than Pakistan. Thus, the price that the challenger would pay if the defender implements a threat in latent nuclear deterrence may vary to some degree. At the same time, threats to go nuclear will usually impose costs on the challenger in situations where military conflict is possible. Bolivia does not seemed too concerned about the prospect of an Iranian bomb, but Bolivia is also exceedingly unlikely to attack Iran. The absence of a proliferation threat in this case, then, is unlikely to produce a deterrence failure. If it is conceivable that a country would attack a latent nuclear power, like in the India-Pakistan dyad, the target's acquisition of a nuclear arsenal will almost always be undesirable for the challenger.

[36]See, for example, Nagin & Pogarsky (2001).

[37]For an alternative view that celerity is irrelevant for general deterrence, see Gibbs (1975).

[38]The costs of "breakout" may also be reduced to some degree if the challenger believes that it has additional opportunities to stop the target's acquisition of nuclear forces.

[39]Waltz (1981).

Post-Attack Threats to Proliferate Are Often Credible

The ability to impose costs is necessary but insufficient to deter military conflict. The defender's threat to advance its nuclear program following an attack must also be credible. Seemingly unbelievable threats to go nuclear may become more (or less) credible following an attack. It is therefore important to consider how military attacks shape the perceived credibility of nuclear latency deterrence. Credibility is primarily a function of two things: the defender's capability and the costs of implementing the threat for the defender relative to the benefits.

Latent Nuclear Powers Have the Capability to Proliferate

The challenger must believe that the defender has the capacity to advance its nuclear program – and potentially obtain an arsenal in the future – if it is attacked. If a country is seen as scientifically incompetent or lacks the underlying technological basis for a bomb program, its threat to go nuclear may be dismissed. As discussed previously, however, states with nuclear latency have already demonstrated an ability to overcome technological barriers to proliferation. A threat to go nuclear by a state with a latent nuclear capability, therefore, is generally more believable than a similar threat made by a state that lacks nuclear infrastructure.

There is a special case where an attack might make the defender's threat less credible based on a capacity-based logic: if an attack destroys critical nuclear infrastructure to the point where the probability of proliferation is expected to be lower following an attack than it is in the status quo. For this to be true, the challenger must have confidence that it can locate and fully destroy all of the relevant infrastructure and knowledge in latent nuclear states. This is a tall order.[40] Countries can hide critical infrastructure, making it difficult for an adversary to carry out a successful preventive strike.[41] This is one reason that the United States refrained from attacking Chinese nuclear plants in the early 1960s, although it seriously considered this option. A formerly top secret assessment prepared by Robert Johnson of the State Department's Policy Planning Council in April 1964 is worth quoting:

> It is doubtful whether, even with completion of initial photographic coverage of the mainland, we will have anything like complete assurance that we will have identified all significant nuclear installations. Thus, even 'successful' action may not necessarily prevent the ChiComs [Chinese Communists] from detonating a nuclear device in the next few years. If an attack should be made, some installations are missed and

[40] On the challenges of carrying out successful attacks against nuclear programs, see Kreps & Fuhrmann (2011).

[41] Narang (2017, 130).

> Communist China subsequently demonstrates that it is continuing to produce nuclear weapons, what is likely to be the reaction to the half-finished U.S. effort?

This problem is particularly acute for latent nuclear powers, because they typically have extensive programs with many critical plants. By contrast, the attacker will generally have greater confidence that it could erode the target's nuclear capacity by striking when there is a single chokepoint, as might be the case for pre-latent countries. It is notable that the two peacetime raids against nuclear sites – Israel's attacks against Iraq and Syria – could be seen as successful from a strictly supply-side perspective by targeting just one plant.

The Net Benefits of Implementing the Threat Are Positive

Threats are often dismissed when they would be too costly for the threatening state to implement relative to the issues at stake. It is exceedingly difficult to use nuclear weapons for coercive purposes, for instance, because a nuclear power would likely suffer tremendous political and military backlash for launching a nuclear strike.[42] Unless a state is defending a vital interest, such as preserving its territorial integrity, these costs will often be too great to bear.

A defender may pay costs by advancing its nuclear program. To be sure, because nuclear proliferation is undesirable for many states, the international community typically responds negatively if a state appears to move towards a nuclear arsenal. Proliferators may therefore suffer political, economic, or diplomatic blowback as a result of nuclearization. It is not obvious, however, that these costs will render threats to go nuclear incredible. Three considerations combine to make post-attack proliferation threats from latent nuclear powers believable, despite the costs of carrying them out.

The Costs of Nuclearization Can Be Extreme But Are Often Modest States may be willing to wage war to delay nuclear proliferation, as the 2003 Iraq War illustrates. Other cases suggest, however, that proliferators pay a relatively modest price for seeking nuclear weapons. South Africa's nuclearization was by no means costless, but it seemed to shoulder the international blowback from building an arsenal with relative ease. The same could be said of Israel. Moreover, the Indian experience reveals that proliferators may ultimately be accepted as de facto nuclear powers, even if they suffer significant economic and diplomatic fallout in the short to medium term. The costs of nuclearization are hardly trivial, but they will rarely be large enough to make threats to go nuclear *obviously* incredible, except in a case where a state has nothing to gain from possessing a nuclear arsenal.[43]

[42] Sechser & Fuhrmann (2017).

[43] We may only observe proliferation in cases where the expected costs are relatively low; when the costs are very high (and therefore most likely to be observed), states are unlikely to seek an

Attacks Raise the Latent Nuclear Power's Benefits of Possessing a Nuclear Arsenal The possible gains from nuclearization provide a second reason why threats to go nuclear may be credible. The benefits of possessing nuclear weapons are still debated in scholarship.[44] There is general consensus, however, that countries with nuclear arsenals are unlikely to suffer large-scale attacks against their homelands. If a potential proliferator fears a future military attack, it may be willing to push forward regardless of the consequences. It is hard to imagine U.S. beliefs about the costs of nuclearization holding back the Manhattan Project, for instance.

An attack may provide incentives to proliferate in cases where such incentives did not previously exist. Few (if any) policymakers today worry about a Dutch nuclear weapons program, despite the Netherlands' possession of a latent nuclear capability. Although it may strain credulity to suggest that the Netherlands might proliferate at this moment, this concern would appear more legitimate if the country was suddenly targeted in military disputes that threatened its national security. Indeed, history shows that states often launch nuclear weapons programs shortly after they are targeted in serious military disputes: Mao Zedong was determined to build an arsenal after being pushed around by the United States during the 1954-55 crisis in the Taiwan Strait; Indian prime minister Lal Bahadur Shastri acquiesced, albeit reluctantly, to a nuclear explosives project following the 1962 border war with China; Pakistani leader Zulfikar Ali Bhutto followed through on his earlier promise build nuclear forces, even if the Pakistani people had to "eat grass," after suffering a defeat at the hands of India in the 1971 Bangladesh War; South Korea's nuclear weapons program followed numerous military provocations from North Korea, including an assassination attempt against President Park Chung Hee; Saddam Hussein redoubled his efforts to obtain an Iraqi bomb following Israel's bombing of the Osiraq reactor in 1981; and Iran's campaign to build nuclear forces traces its roots to the end of the Iran-Iraq War during the 1980s.

Potential challengers seem to recognize the connection between the instigation of military disputes and nuclear proliferation. States frequently refrain from threatening other countries in situations where they might be tempted to do so, since they do not want to cause nuclear proliferation. Threats to use nuclear weapons are rare, in part, because states worry that making them will induce the targets to seek nuclear arms.[45] This applies to conventional threats as well. U.S. officials concluded during the crisis over the Falkland Islands, for instance, that a humiliating British defeat of Argentina could produce an Argentine bomb. As a May 28, 1982 memorandum from the National Security Council Staff to Robert McFarlane,

arsenal. We therefore cannot draw reliable inferences about the costs of nuclearization based only on cases in which states actually proliferated. For a similar point in the context of audience costs, see Schultz (2001).

[44]See, for example, Jervis (1989), Beardsley & Asal (2009), and Sechser & Fuhrmann (2017).

[45]Sagan (2004) and Sechser & Fuhrmann (2017).

who was then President Ronald Reagan's deputy national security adviser, put it: "A nuclear weapons capability would be virtually guaranteed, as both Brazil and Argentina would seek ultimate security in nuclear arsenals."[46]

Conflict severity plays a critical role in this logic. An attack will make a proliferation threat more credible only if it threatens the defender's core national security interests. However, many episodes of military conflict involve issues that are important but not critical to the defender. In January 2006, for instance, Russian military planes briefly violated Japanese airspace. This troubled Japan to some degree – it scrambled its own fighters in response – but it would be hard to argue that this event produced a threat sufficient to raise the probability of Japanese proliferation.[47] The (implicit) threat to go nuclear therefore lacks credibility in this episode and others like it, so there is little reason to expect that nuclear latency would deter this kind of military encounter.

This discussion suggests that the benefits of carrying out a threat to nuclearize may exceed the costs in at least some situations. It is important to remember, however, that nuclear latency may deter conflict as long as there is a non-zero probability that a defender would implement its threat to go nuclear. Even if the challenger has doubts about the believability of the defender's threat, then, it may still refrain from instigating disputes. At the same time, assuming the costs for the challenger are held constant, the likelihood that latency will deter declines as threats are seen as less credible.

Developing Nuclear Latency is a Costly Signal

I argued previously that nuclear latency makes threats to go nuclear more credible because it provides the technological capacity to proliferate. Developing ENR plants may also signal resolve, since doing so is costly. Building fissile material production facilities requires substantial time and resources. Moreover, pursuing this technology can be costly politically. For decades, the United States has applied significant pressure on any state that has sought nuclear latency, including close allies like South Korea. Given these costs, potential challengers might perceive that states with nuclear latency are at least open to flirting with the bomb.[48] By using nuclear latency to signal resolve, states may be able to make threats to go nuclear credible even if carrying out a threat to go nuclear might seem irrational.

One might question, for example, whether Turkey would go nuclear because of the costs that policy might entail and the lack of an overwhelming strategic imperative to possess an

[46]Foreign Relations of the United States, 1981-88, Volume XIII, Conflict in the South Atlantic, 1981-1984, Document 309.

[47]This is case number 4,475 in the Correlates of War's Militarized Interstate Dispute (MID) dataset. See Palmer *et al.* (2015).

[48]However, as discussed elsewhere in this article, nuclear latency deterrence can work even if states do not develop ENR technology explicitly for proliferation-related reasons.

independent arsenal. Yet, if Turkey developed sensitive nuclear technology, others' assessments of the probability of a Turkish bomb may increase. Even if the government publicly justified this policy on commercial grounds, it may be interpreted by many as a move to keep Ankara's nuclear options open. By developing nuclear latency, then, Turkey might be able to turn an (implicit) threat of questionable credibility into one that is taken seriously – especially if a major attack were to occur.

Unambiguous Nuclear Sprinting is Rare

Reassurance is an important component of successful latent nuclear deterrence.[49] One recent study points to the critical role that promises play when states bargain with nuclear latency: Tristan Volpe argues that latency-based compellence is difficult because states must simultaneously promise to refrain from building nuclear weapons if their demands are met, as well as threaten to go nuclear if the target refuses to give in.[50] A similar logic applies to deterrence with nuclear latency.

Deterrence may fail if a country believes that a latent nuclear power is racing to proliferate as quickly as possible and that it will succeed imminently. In that case, the challenger might as well attack, since it can do no harm from the standpoint of nonproliferation by instigating a dispute. If proliferation is not seen as certain and near-immediate, however, threats to go nuclear may deter since there is a possibility that an attack could lead to an increase in the likelihood of proliferation. Latent nuclear deterrence can work, therefore, even if proliferation is seen as more likely than not – as long the challenger has some doubt about the inevitability of that outcome. A country's expected costs of doing nothing increase as the probability of proliferation by an adversary rises. Yet as long as an attack increases this probability relative to the status quo and the threat posed by proliferation is constant, the expected costs of using force will be greater than the expected costs of not attacking.

Latent nuclear deterrence theory expects nuclear sprinting to occur infrequently. Countries with nuclear latency should recognize that racing to build nuclear weapons may invite a military attack. As long as states create ambiguity about their nuclear intentions, however, they may be able deter serious military confrontations. Because keeping bomb-making capabilities latent allows countries to extract strategic benefits while skirting the costs of full blown proliferation, it is an optimal policy for many states.[51] Indeed, sprinting is rare. Only

[49]Schelling (1966).

[50]Volpe (2017).

[51]This is consistent with William Spaniel's argument that promises to remain nonnuclear may be credible because countries benefit politically from having the capacity to build nuclear weapons. See Spaniel (2015, 839).

six countries have raced to obtain nuclear weapons as quickly as possible.[52] This includes the first five countries to build bombs: the United States, the Soviet Union, the United Kingdom, France, and China. Since the early 1960s, only one country has pursued a sprinting strategy – India – and this happened in the period after it carried out a so-called "peaceful" nuclear test. Mad dashes towards the bomb can undermine latent nuclear deterrence in theory but they are unlikely to do so in practice.

The Lack of Resolve to Fight

Latent nuclear deterrence will likely fail if the challenger's expected benefits from fighting exceed the costs. Although the costs resulting from nuclear proliferation are significant, they may not be substantial enough to discourage attacks from highly resolved challengers. This is especially true since the nonproliferation-related consequences of an attack may be discounted, since they are not imposed immediately. In cases where the challenger has revisionist aims, therefore, nuclear latency deterrence failures may occur. To cite an extreme example, it is hard to imagine that Poland's hypothetical possession of nuclear latency in 1939 would have deterred Nazi Germany's invasion of the country. It may not take a Hitler-like level of revisionism to produce nuclear latency deterrence failures; more modest expected gains from fighting may be sufficient to produce this outcome. Pakistan, for instance, frequently instigated disputes against India even though doing so risked accelerating Indian nuclear proliferation. Pakistan certainly found the possibility of an Indian bomb threatening, but it was also determined to change the territorial status quo in Kashmir.

There is some good news for states hoping to reap deterrence benefits from having nuclear latency: the stakes for the challenger are usually not vital. In deterrence, the challenger must fight over something that it does not currently possess. Unless they are highly revisionist, challengers will rarely view a change in the status quo – for example, obtaining it piece of territory that it does not currently control – as essential for its national security. Consider a scenario that concerned deterrence theorists and policymakers in the West during the Cold War: a possible Soviet invasion of western Europe. The Soviet Union may have wanted to wrest territory away from NATO, but this was hardly critical for Moscow. By contrast, the stakes for the defender can be tremendous. Losing territory to the Soviet Union would have been a serious blow the United States and its allies. In the context of deterrence, the stakes will usually be higher for the defender, and this provides the defender with a key bargaining advantage.[53]

[52]Narang (2017). The "sprinting" language comes from the study referenced here.
[53]See Jervis (1989) and Sechser & Fuhrmann (2017).

Testable Predictions

It is conceivable that states with nuclear latency can credibly threaten to impose costs on challengers by advancing their nuclear programs. However, according to latent nuclear deterrence theory, a few key conditions must be satisfied for this claim to be sustained. If these conditions hold, developing nuclear latency should reduce a country's vulnerability to military conflict. The absence of one or more of these conditions, however, would erode the deterrence benefits of nuclear latency.

1. **The challenger opposes the target's acquisition of a nuclear arsenal**. Moving closer to an arsenal is the principal means through which the defender can "hurt" the challenger. If the challenger is indifferent about the defender's acquisition of nuclear weapons – or if it sees such an outcome as beneficial – latent nuclear deterrence will undoubtedly fail.

2. **The target has the technological capacity to build nuclear weapons, and this capacity could survive an attack**. Challengers may perceive post-dispute proliferation threats as non-credible if they doubt the target's technological capabilities. Moreover, if an attack erodes the challenger's capacity to make bombs, the expected pre-attack probability of proliferation may be higher than the likelihood of proliferation afterwards. In that case, the challenger might be better off attacking.

3. **The military dispute increases the target's demand for nuclear weapons**. Latent nuclear deterrence works best when disputes threaten the defender's core national security interests. For non-serious confrontations, post-dispute threats to go nuclear may lack credibility.

4. **The challenger does not believe that the target is racing to build nuclear weapons**. If this is the case, challengers may expect that they can attack without contributing to an outcome that will immediately happen anyways.

5. **The challenger is not highly resolved to fight**. Nuclear latency may not deter military conflict if the challenger is determined to instigate disputes for reasons unrelated to nonproliferation, since its expected benefits from attacking might exceed the costs.

Latent nuclear deterrence generates several predictions. However, some of these predictions are difficult to test empirically. In cases where the above conditions rarely fail, there is inadequate variation to conduct a reliable test. The theory expects, for example, that the deterrent value of nuclear latency should increase as the challenger becomes more

threatened by the target's acquisition of nuclear bombs. Yet military disputes – especially serious attacks – are exceedingly rare when the perceived proliferation threat is low. Low perceived costs of nuclear acquisition, therefore, rarely account for latent nuclear deterrence failures. Another problem with testing some of the theory's predictions is that it is difficult to measure key concepts, such as resolve. In this paper, I focus on three of the theory's most central empirical predictions that can be reliably tested.

The severity of a military dispute likely influences the efficacy of latent nuclear deterrence. Nuclear latency should deter violent military disputes because they are more likely to heighten the target's sense of insecurity (condition 3). By contrast, nonviolent disputes can occur with greater frequency in the shadow of nuclear latency since challengers will be more likely to perceive post-attack proliferation as non-credible. Once states develop latent nuclear capacity, the other conditions (1-2 and 4-5) should be true more often than not. In general, then, nuclear latency should lower a country's vulnerability to violent conflict but attacks may still be possible. The effects of nuclear latency on nonviolent are more ambiguous, given that they might leave condition 3 unsatisfied. This leads to two testable predictions:

Prediction 1. *Developing nuclear latency reduces the likelihood that a country will be targeted in violent military disputes, on average.*

Prediction 2. *Developing nuclear latency may not reduce the likelihood that a country will be targeted in nonviolent military disputes, on average.*

Technological capacity (condition 2) stems mostly from an enrichment or reprocessing program, according to the theory. States that have separated plutonium or enriched uranium have demonstrated an ability to overcome a critical technological barrier. Moreover, work on enrichment and reprocessing sends a signal to adversaries about a state's willingness to go nuclear that is likely absent in the case of less sensitive nuclear activities. The theory predicts, then, that latent nuclear powers have a unique ability to make proliferation threats credible following an attack. If this is correct, states with more rudimentary nuclear programs should not necessarily derive deterrent benefits from their nuclear programs, even in the case of violent disputes. This generates a third testable prediction:

Prediction 3. *Developing non-sensitive nuclear technology without an enrichment or reprocessing program does not reduce a country's vulnerability to violent conflict, on average.*

I will ultimately test these predictions using statistical analysis. Before turning to the quantitative tests, however, it is useful to further probe the plausibility of the argument. To do so, I examine the deterrence benefits that Iran derived from its nuclear program in the

21st century.

The Iranian Nuclear Crisis, 2002-2015

Iran's sensitive nuclear activities date back to the late-1960s, when it carried out reprocessing activities at the Tehran Nuclear Research Center. More recently, Iran developed an advanced uranium enrichment capability. In April 2006, after Iran enriched uranium to a level sufficient to fuel a nuclear power plant, President Mahmoud Ahmadinejad proclaimed that Iran had "joined the club of nuclear countries."[54] Iran's enrichment capacity triggered an international crisis and raised the possibility of an American attack against the country's nuclear infrastructure. Despite a period of sustained tension, there was not a serious military confrontation. The crisis over Iran's nuclear program subsided (at least temporarily) with a diplomatic settlement in 2015.

Washington was threatened by the possibility of an Iranian bomb. To be sure, there was bipartisan consensus in the United States that Iran's acquisition of nuclear weapons could produce a number of undesirable effects: limiting U.S. freedom of action in the Middle East, encouraging Tehran to adopt a more assertive foreign policy, triggering a regional arms race, and generally raising the risk that nuclear weapons would be used in war. One might instinctively expect that these fears would prompt U.S. military action against Iran. However, as expected by latent nuclear deterrence theory, the United States exercised military restraint.

Washington did so in part because it feared that attacking Iran would foment nuclear proliferation. A U.S. military strike would have exacerbated Tehran's insecurity, thereby heightening its need for a nuclear deterrent. An attack may also have induced Iran to withdraw from the NPT or refuse to have its facilities inspected by the International Atomic Energy Agency, which would lower the barriers to proliferation.[55]

An attack may have nonetheless occurred if Washington believed that it could lower the probability of an Iranian bomb by destroying critical infrastructure. Some advocates of the military option argued that this was the case.[56] However, it was far from obvious that preventive strikes could have degraded Iran's nuclear capacity to a degree that was acceptable to U.S. policymakers. The U.S. military certainly had the capacity to destroy the sites about which it knew, including those that might have been buried underground. Yet there was still a possibility that critical technology or materials existed in secret locations.[57] Unlike

[54]Robert Tait and Ewen MacAskill, "Iran declares: we are in the nuclear club," *The Guardian*, 11 April 2006.

[55]Broad (2012).

[56]See, for example, Kroenig (2012).

[57]One lesson from the 1991 Persian Gulf War is that locating and targeting nuclear infrastructure

the 1981 Israeli raid against Iraq's nuclear reactor – when destroying a single facility could substantially curtail the program – multiple sites would need to be located and destroyed in order for a raid against Iran to be operationally successful. In the best case scenario, a U.S. attack could have set Iran's nuclear program back by a few years. However, because Iran was already a latent nuclear power, it could rebuild sensitive plants with relative ease. Given that an attack would also increase Iran's appetite for a nuclear arsenal, the net effect of using military force would be to increase the likelihood of an Iranian bomb, especially in the medium to long term.

U.S. officials, including those at the highest levels, accepted this assessment. A secret study carried out during the presidency of George W. Bush reportedly concluded that bombing Iran would be counterproductive. As then Central Intelligence Agency director Michael Hayden put it, Bush's advisers believed that striking the Iranians "would drive them to do what we were trying to prevent."[58] This view persisted during the Barack Obama administration. According to Colin Kahl, who served as deputy assistant to the U.S. president and national security to the vice president from 2014 to 2017, "Obama regularly talked about a military strike buying a few years but motivating Iran to go all the way to deter a future attack." Kahl added that "while Obama was willing to use force as a last resort if Iran made a mad dash for the bomb, he strongly believed that only a diplomatic solution – not a military one – offered an enduring solution to the proliferation challenge posed by Iran."[59] Officials outside of the United States held this view as well. For example, Carl Bildt and Erkki Tuomioja, the foreign ministers of Sweden and Finland, wrote in 2012, "It is difficult to see a single action more likely to drive Iran into taking the final decision to acquire nuclear weapons than an attack on the country. And once such a decision was made, it would only be a matter of time before a nuclear-armed Iran became a reality [because Iran was already a latent nuclear power]."[60]

American perceptions of Iran's intentions played an important role in deterring an attack. Most officials in Washington believed that Iran's nuclear future was uncertain. There was general consensus that Tehran wanted to maintain the *capacity* to build nuclear bombs, but little evidence that it was racing to proliferate as quickly as possible. As an oft-cited 2007 National Intelligence Estimate put it, "We judge with high confidence that in fall 2003, Tehran halted its nuclear weapons program; we also assess with moderate-to-high confidence that Tehran at a minimum is keeping open the option to develop nuclear weapons." Obama's

is more difficult than commonly assumed. Key Iraqi nuclear sites survived the war, despite an intensive bombing campaign against all known bomb-related facilities. See Kreps & Fuhrmann (2011).

[58]Quoted in Broad (2012).

[59]E-mail correspondence with the author, 18 September 2017 and 30 January 2018.

[60]Bildt & Tuomioja (2012).

view, as summarized previously, underscores that things might have played out differently if Washington believed that Iran was sprinting towards the bomb. Actions such as withdrawing from the NPT, expelling international inspectors, or diverting large quantities of nuclear material from civilian plants may have produced a latent nuclear deterrence failure, if those moves caused the United States to believe that nuclear proliferation would be immediate and inevitable in the absence of military intervention. That U.S. officials saw an Iranian bomb as possible but not inevitable in the absence of conflict bolstered latent nuclear deterrence.

This case highlights the importance of conflict severity in latent nuclear deterrence. The Iranian nuclear crisis was not completely conflict-free. In fact, Iran and the United States experienced militarized disputes during the crisis. In January 2005, for instance, U.S. planes violated Iranian airspace, apparently to collect intelligence on the country's nuclear activities. U.S. forces also conducted military operations in the Persian Gulf in March 2007 and, the next month, sent planes over Iranian territory at low altitudes as signals of resolve. These kinds of disputes are possible, according to latent nuclear deterrence theory, because post-conflict threats to build nuclear weapons may lack credibility. The United States likely calculated that Iran would not race to obtain a nuclear arsenal just because of American displays of force, since these actions did not pose a large enough threat to Tehran. Thus, Iran's development of nuclear latency may have invited low-level disputes but it did not trigger a large-scale attack.

Although the possibility of inducing an Iranian bomb deterred the United States from attacking Tehran, it did not halt U.S. nonproliferation efforts. Washington instituted harsh economic sanctions against Iran, applied serious diplomatic pressure, and even engaged in covert actions to halt Iran's progress such as the Stuxnet cyberattack against the Natanz enrichment plant. Latent nuclear deterrence theory does not expect that states will accept an adversary's nuclear capabilities without a fight, just that they should refrain from launching serious military attacks that heighten the latent state's insecurity and lower the barriers to proliferation.

In sum, this case satisfies the key conditions for latent nuclear deterrence theory. First, the United States opposed Iran's acquisition of nuclear weapons. Second, Iran's enrichment program demonstrated the technological wherewithal to proliferate. U.S. officials did not appear to be confident that a military attack would reliably erode Iran's capacity, especially not in the medium to long term. Third, Washington recognized that an attack would harden Tehran's resolve to seek nuclear weapons, thereby facilitating the very thing that U.S. policy-makers were trying to stop. Fourth, American leaders did not believe that Iran was hellbent on building nuclear bombs. The perceived flexibility in Iran's nuclear intentions weakened arguments for preventive strikes. Fifth, the United States did not have salient reasons to fight that were unrelated to Iran's nuclear program. Had Iran hardened American resolve

to use military force – for example, by attacking Israel or seizing disputed territory from its Arab rivals – the benefits of fighting may have exceeded the costs.

Dataset and Variables

I assemble a dataset that contains information on 170 countries from 1946 to 2010. The unit of observation in this dataset is the country-year, meaning that each country appears one time for each year that it existed during the period of study.[61]

I identify whether a state was targeted in a military dispute during a given year, based on the Correlates of War's (COW) Militarized Interstate Dispute (MID) dataset.[62] To test predictions 1 and 2, I distinguish between violent and nonviolent conflict. The variable VIOLENT MILITARY DISPUTE indicates whether a country suffered at least one fatality during a military dispute in which it was the target. NONVIOLENT MILITARY DISPUTE, by contrast, measures disputes in which the target does not suffer any fatalities.[63]

I use the previously-described NL dataset to measure whether states are latent nuclear powers in a given year.[64] The variable NUCLEAR LATENCY indicates whether a state had active ENR-related activities. I consider an ENR program to be active if at least one of three things occur on a state's soil: (1) experiments designed to enrich uranium or produce small amounts of plutonium; (2) the operation of a pilot scale ENR plant; or (3) the operation of a commercial facility. As noted previously, states with ENR programs vary in their capacity to produce nuclear bombs. In the empirical analysis below, I will assess whether states with lab-based activities only (STAGE ONE NUCLEAR LATENCY) derive fewer deterrence benefits than states with pilot or commercial plants in operation (STAGE TWO NUCLEAR LATENCY).

Testing prediction 3 requires data on non-sensitive nuclear activities. The variable NON-SENSITIVE NUCLEAR ACTIVITIES indicates whether a state operates at least one research reactor in a given year in the absence of nuclear latency or a nuclear arsenal. This measure identifies states that possess some nuclear infrastructure but lack the capacity to produce fissile material for bombs.

If states became latent nuclear powers at random, like a treatment in a prescription

[61]This analysis does not account for potential challengers, only whether a state is targeted in a dispute in a given year. However, the online appendix shows the results when I employ a dyadic setup that pairs targets with potential challengers. The findings are similar in terms of statistical significance. The coefficient on the nuclear latency variable decreases in size due to a dramatic increase in the number of observations, from about 8,000 to more than one million.

[62]I use a new version of this dataset produced by Gibler *et al.* (2017) that introduces a number of corrections to version 4.01 (Palmer *et al.* 2015).

[63]This does not mean that the dispute is violence-free since the initiator may suffer casualties.

[64]Fuhrmann & Tkach (2015).

drug trial, we could simply compare the conflict rates for latent and non-latent states. But nuclear latency arises due to strategic decisions made on the part of governments – not because of random chance. The conflict rates for latent and non-latent states, therefore, are not directly comparable. There are two concerns related to the non-random assignment of nuclear technology that must be addressed.

First, the countries that ultimately acquire nuclear latency might have a high pre-existing risk of conflict. Deterrence, then, may already be "hard" when nuclear latency emerges. An apparent positive relationship between military conflict and nuclear latency, in this view, might emerge because the same factors that give rise to latency also make conflict more likely – not because latent nuclear deterrence does not work. This concern is not merely theoretical: one notices from Figure 1 that many current or former latent nuclear powers, ranging from Iraq to North Korea, operate in dangerous neighborhoods.

Second, nuclear latency might emerge in situations where states are unlikely to experience future conflict. Latent nuclear powers, based on this line of thinking, would be unlikely to suffer an attack even if they refrained from developing dual-use nuclear technology. This possibility might come to mind when thinking about a latent nuclear power such as Belgium or the Netherlands.

To address these possibilities, we must control for confounding factors – that is, variables that cause both nuclear latency development and conflict. I include several potential confounders in the dataset. Including these variables in the statistical models that will be estimated below reduces the likelihood that the findings will be an artifact of the process through which latent nuclear capabilities emerge.

- **Nuclear arsenal.** By definition, existing nuclear powers cannot possess nuclear latency. Nuclear arsenals are also widely believed to reduce the risk of major international disputes.[65] Nuclear weapons, then, may make the conflict risk for countries without nuclear latency appear lower than it actually is. NUCLEAR ARSENAL is coded 1 if a state possesses nuclear weapons and 0 if not.[66]

- **Prior military conflict.** Countries that have experienced disputes in the recent past may have a greater demand for dual-use nuclear capabilities. Security threats could encourage states to keep their options open by developing nuclear latency, even if they do not push states towards a full-blown bomb program.[67] At the same time, states that have experienced conflict in previous years are more likely to fight in the present. Thus, as prior research on nuclear deterrence has shown, neglecting to account for

[65] See, for example, Jervis (1989).
[66] This is based on data from Sechser & Fuhrmann (2017).
[67] Levite (2002).

conflict history can lead to misleading conclusions.[68] The variable CONFLICT HISTORY represents the number of years over the previous decade that a state was targeted in at least one violent military dispute, based on the MID dataset. In addition, I include the number of years that pass without a country experiencing a dispute (PEACE YEARS), along with its square (PEACE YEARS SQUARED) and cube (PEACE YEARS CUBED).[69]

- **Superpower rivalry.** One might argue that conflict with a superpower is especially important in this context. Superpower rivals are likely to be dissatisfied with the status quo, making them more likely to seek nuclear latency as part of hedging strategy. In addition, these countries may be targeted in disputes at a higher rate than non-superpower rivals, in part, because their revisionist policies may provoke others.[70] The variable SUPERPOWER RIVAL is coded 1 if a state is a country experienced one or more violent military disputes with the United States or the Soviet Union during the previous 20 years.

- **Superpower alliance**. Having a formal defense pact in place reduces the likelihood that a state will be targeted in a military dispute, especially if the patron is armed with nuclear weapons.[71] Because states that benefit from nuclear umbrellas may generally feel more secure than those without nuclear protection, they may see less of a need for dual-use nuclear capabilities. Thus, the conflict rates for non-latency states may be artificially suppressed by the fact that these states operate in relatively secure environments. SUPERPOWER ALLY is a dichotomous variable that is coded 1 if a state has a defense pact with the United States or the Soviet Union, and 0 otherwise.[72]

- **Capabilities**. There are technological hurdles that must be overcome to achieve a state of nuclear latency. Although the case of North Korea suggests that any state may be able to overcome these challenges with enough time and resources, in general, states with greater capabilities should have an easier time developing and/or operating sensitive dual-use nuclear plants. More capable states may also be at a greater risk of experiencing conflict, because they are likely to be more active in world politics. I address the confounding effects of state capacity with the variable CAPABILITIES, which is drawn from the COW Composite Index of National Capabilities (CINC) dataset.[73]

[68] Bell & Miller (2015).

[69] Carter & Signorino (2010).

[70] This could also happen because superpowers can use military force with greater ease.

[71] Leeds (2003), Johnson & Leeds (2011), and Fuhrmann & Sechser (2014).

[72] This measure is based on the Alliance Treaty Obligations and Provisions (ATOP) dataset. See Leeds *et al.* (2002).

[73] Singer *et al.* (1972). I take the natural log of this measure to address its skewed distribution.

- **Democracy**. Powerful enforcers of the nonproliferation, such as the United States, regime might not "allow" some states to obtain sensitive nuclear technology, because they believe that the security risks are too high. One factor that influences others' threat perceptions is the nuclear developer's regime type.[74] Enforcers may believe that non-democracies in possession of nuclear latency represents a particularly strong threat to the status quo, and work hard to ensure that those states are unable to obtain sensitive plants. To the extent that democracies are seen as more pacific, challengers may also be less likely to target them in military disputes. The variable REGIME TYPE represents the widely employed 21-point indicator of a state's regime type from the Polity IV project.[75]

- **Domestic instability**. If states experience domestic unrest, they may place less of a priority on developing nuclear technology. These states are also more vulnerable to international conflict.[76] The variable CIVIL WAR indicates whether a state experienced a civil war at any point in the previous five years.

Controlling for these variables brings us closer to identifying the true relationship between nuclear latency and conflict. However, there is another problem: some confounding factors cannot easily be incorporated into a statistical model because they are unobservable or difficult to measure. The existence of such factors threatens my ability to identify how nuclear latency affects military conflict. For example, a country's identity in world politics may shape the development of latency and the likelihood of military conflict. Japan provides a useful illustration. The country's experiences in World War II – particularly the fact that nuclear weapons were used against it for the first and only time in combat – shaped Japanese identity after 1945. It seems likely that Japan's power-World War II identity influenced its nuclear policy *and* the extent to which Tokyo was targeted in military disputes. Failing to account for a country's identity could produce misleading results. The problem, however, is that state identity is difficult to measure in a systematic way.

To account for unmeasured differences among countries, I use country fixed effects in the regression analysis below. Doing so controls for country-specific factors that do not change over time, such as culture, identity, or geography. The resulting analysis will be based on within-country variation only; any variation that exists across countries will be soaked up by the country fixed effects. The results will therefore tell us how the probability of military conflict changes when a state transitions from non-latency to latency, or vice-versa.

A related issues is that each year is unique in world politics. Unmeasured year-to-year differences that influence the likelihood of countries developing nuclear latency and

[74]Fuhrmann & Kreps (2010).
[75]Marshall *et al.* (2009).
[76]Gleditsch *et al.* (2008).

experiencing military conflict also pose a barrier to inference. The geopolitical landscape began to shift dramatically in 1989, for instance, following the fall of the Berlin Wall and the anti-Communist revolutions in Eastern Europe. If these events affected latency and conflict in that year, failing to account for them could lead us astray. To control for differences over time that might confound the relationship of interest, some of which might be unobservable, I also employ yearly fixed effects.

My research design has some key limitations. Most notably, there might be time-variant, country-specific variables that cause international conflict and the development of latent nuclear capacity. If such factors exist, the results reported below will be wrong (meaning that the reported coefficients and confidence intervals would be off, even if the statistical inferences were still correct.) However, the design of this study brings us closer to identifying the true relationship between nuclear latency and international conflict. It is an improvement over previous empirical models when it comes to our ability to identify a causal relationship.[77] Short of randomly assigning nuclear latency to some states and not others and then comparing the frequency with which they were attacked, which should never be attempted, controlling for observable confounders and including country/year fixed effects is about the best that we can do.

Findings

I use linear probability models (LPMs) that are estimated with ordinary least squares (OLS) to test the theory's predictions. The LPM has two major advantages over logit, an approach that is frequently employed when the outcome of interest is dichotomous.[78] First, the LPM allows me to include all country-year observations for which I have complete data in the analysis. When fixed effects are included, by contrast, logit will drop all countries (or years) that experience no variation on the dependent variable. States that are not targeted in a single violent dispute from 1946 to 2010, then, are excluded from the analysis.[79] Second, the LPM allows me to easily compute marginal effects, which provide a clear indication of how important each independent variable is in shaping the likelihood of conflict.[80] While

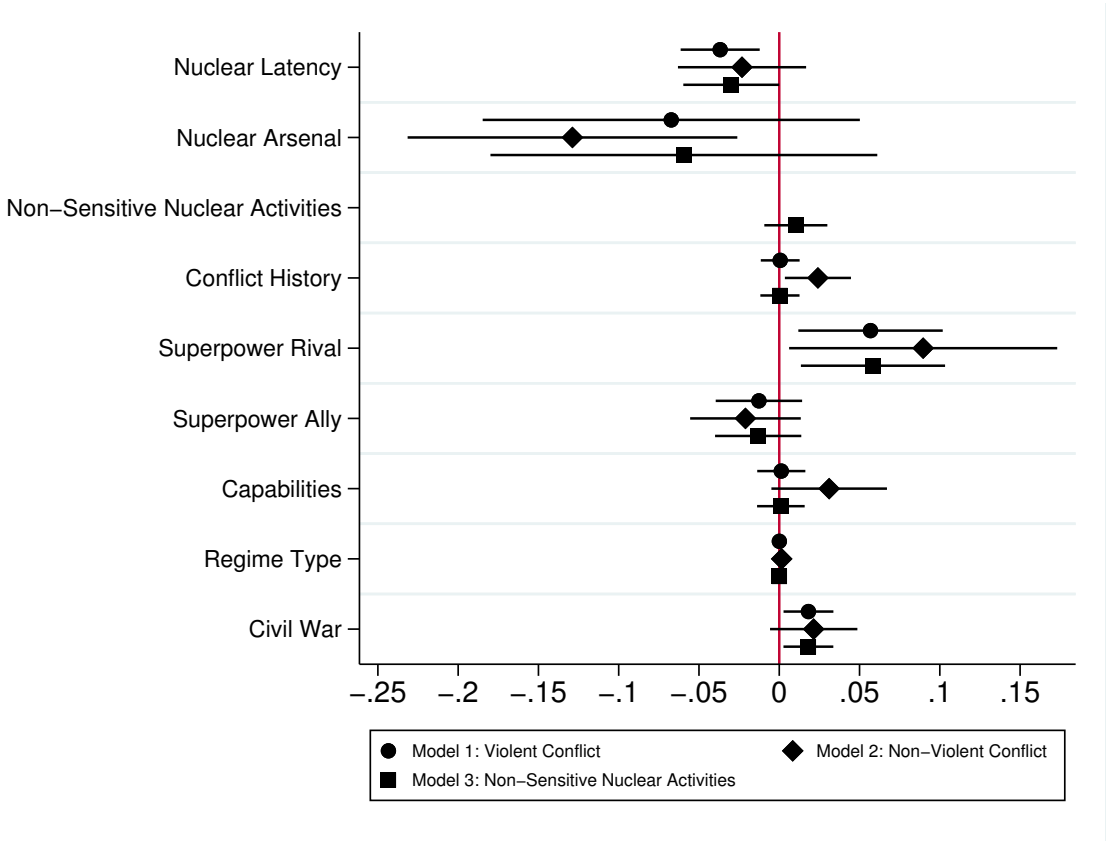
[77] Fuhrmann & Tkach (2015).

[78] There are two logit approaches that we might consider: standard logit with country and year fixed effects added (FELOGIT) or Chamberlain's conditional logit (CLOGIT). See Beck (2015).

[79] Japan, for instance, was not attacked in a violent dispute at any point during the period of study, according to the MID dataset, so logit drops all Japanese country-year observations. This is problematic since Japan, and other countries like it, may be conflict-free in part because they possess nuclear latency.

[80] The only way to interpret findings from a CLOGIT model is through odds ratios, which are informative but far less intuitive. See Karaca-Mandic *et al.* (2012, 267). We could, however, calculate marginal effects using FELOGIT (Beck 2015).

Figure 2. *Fixed effects regression analysis of military conflict.*



Notes: N = 8,427; circles represent coefficients and lines represent 95% confidence intervals; country/year fixed effects, controls for time dependence, and constant not reported.

these advantages lead me to prefer the LPM, the online appendix shows that the results are similar when I use two different logit approaches instead.

Figure 2 shows the findings from the fixed effects regression analysis.[81] The circles in this chart represent the estimated coefficients on each independent variable, while the lines depict the 95 percent confidence intervals. We can interpret the coefficients as the difference in the probability of violent conflict that results from a one-unit increase in the independent variable, while all other factors are held constant.

The results are consistent with prediction 1. When a country switches from non-latency to latency, the annual probability of being targeted in a new violent military dispute declines

[81]Given the nature of the dataset, the model errors for different years within the same country may be correlated. If unaddressed, the standard errors will be artificially deflated, making it easier to reject the null hypothesis (Cameron & Miller 2015). I therefore cluster the standard errors by country.

by 3.32 percentage points (Model 1).[82] The probability that a country will be targeted in a violent dispute after it develops nuclear latency is nearly zero, according to my analysis, compared to more than 3 percent without latency. Countries can therefore make it extremely unlikely that they experience an attack during a given year by developing nuclear latency. Even without nuclear latency, though, violent conflict in a single year is unlikely – though the probability may be higher than many countries would like. The 95 percent confidence interval around the coefficient ranges from -0.0576 to -0.00875. Thus, if we were to repeat this study over-and-over using hypothetically different samples, 95 percent of the time the marginal effect would be between -5.76 and -0.875 percentage points.

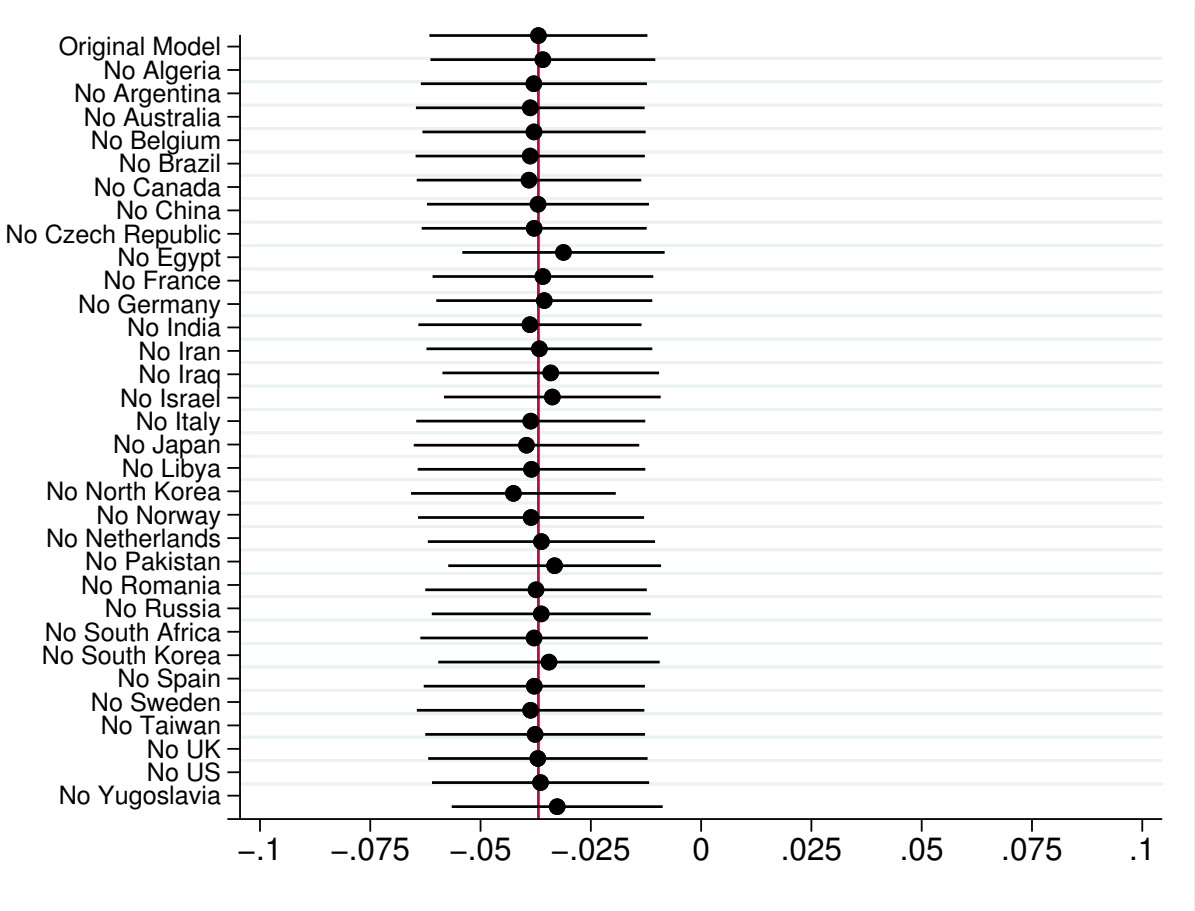
How fragile is the evidence in favor of latent nuclear deterrence theory? Do the patterns change with minor modifications to the analysis? If so, to what degree? These questions are especially important for this study because it focuses on two rare events: violent conflict and nuclear latency. It is therefore possible that the reported patterns could be driven by a small number of cases, possibly a single country. To address this possibility, I carry out some sensitivity analysis. I re-run Model 1 while individually excluding all 32 states that developed latent nuclear capacity. This analysis gives us a sense of how much the relationship between nuclear latency and violent conflict changes when I exclude individual countries from the analysis. Figure 3 displays the results of the sensitivity analysis. The vertical line in the chart allows readers to compare the original results with those that emerge upon the exclusion of each state. The coefficients on NUCLEAR LATENCY move when I re-run the analysis with each state is removed, but these changes are small: they range from a minimum -0.0332 to a maximum -0.0312. In no case does the 95 percent confidence interval include zero. The core finding, therefore, is robust to the exclusion of any single country.

Egypt seems to have done better than any other country when it comes to latent nuclear deterrence, since the coefficient moves furthest to the right of the vertical line when it is excluded from the analysis. An earlier study points to Egyptian President Hosni Mubarak as providing "a near-explicit endorsement" of latent nuclear deterrence in 1998: "If the time comes when we need nuclear weapons," Mubarak said, "then we will not hesitate. I say if we have to, because this is the last thing we think about. We do not think now of joining the nuclear club."[83] Although Egypt's ENR activities were done on a small scale – it was years away from producing a deliverable warhead, even at the height of its program – the signal sent by its development of sensitive dual-use technology appears to have bolstered deterrence. It is important to reiterate, however, that the result remains strongly significant even with Egypt excluded ($p = 0.008$).

[82] It is important to remember that these results are based on *annual* reductions in the probability of conflict. Having latent nuclear capacity can have larger cumulative effects on the reduction of conflict, say over a 10 or 20 year period.

[83] Levite (2002, 72).

Figure 3. *Sensitivity analysis.*



The evidence is also consistent with predictions 2 and 3. First, the results are more ambiguous when we shift from vilent to nonviolent disputes. In the model of nonviolent conflict (Model 2), the coefficient on NUCLEAR LATENCY is negative but the 95 percent confidence interval includes zero [-0.0631, 0.0167]. We cannot rule out the possibility, therefore, that the relationship between latency and nonviolent conflict is positive. Moreover, the coefficient decreases in size by 63 percent in Model 2, suggesting that the effect of nuclear latency is weaker for nonviolent conflict than for violent disputes.

Second, non-sensitive nuclear activities appear to have scant deterrence benefits. The coefficient on NON-SENSITIVE NUCLEAR ACTIVITIES is positive and the 95 percent confidence interval includes zero. This lends support to the notion that enrichment and reprocessing programs provide unique benefits because they reveal information about a state's technological capabilities and resolve that other aspects of a nuclear program do not.

What happens when we account for varying degrees of nuclear latency? Is an advanced state of nuclear latency better for deterrence than latent nuclear capabilities based on lab-scale activities only? To address this issue, I utilize the disaggregated measures of latent nuclear capacity described earlier – STAGE ONE NUCLEAR LATENCY and STAGE TWO NUCLEAR LATENCY. I also create a variable (NO NUCLEAR LATENCY) indicating whether a country is non-latent; these states lack even a laboratory-based ENR program. I substitute the variables STAGE TWO NUCLEAR LATENCY and NO NUCLEAR LATENCY for NUCLEAR LATENCY and re-estimate Model 1. In this analysis, the variable STAGE ONE NUCLEAR LATENCY serves as the reference category, meaning that the reported coefficients tell us how advanced latent nuclear capacity and non-latency compare to laboratory-based ENR programs. The results (not shown) indicate that there is not a statistically significant difference between STAGE ONE NUCLEAR LATENCY and STAGE TWO NUCLEAR LATENCY when it comes to the likelihood of military conflict. According to these findings, advanced latent capabilities are probably not better for deterrence – and might be worse – than a relatively rudimentary state of nuclear latency.

If the deterrent value of nuclear latency stemmed only from a state's ability to launch a delayed nuclear strike in retaliation, we would have expected to find clearer evidence that countries are targeted at a lower rate when they could arm quicker following an attack. That this is not the case reinforces the mechanism at the heart of the theory. Latent nuclear deterrence works by raising the probability of nuclear proliferation, not just exposing the attacker to a delayed retaliatory nuclear strike. If the target eventually obtains a nuclear arsenal, of course, the aggressor may be susceptible to future nuclear attacks – but not necessarily in retaliation for its initial provocation.[84]

[84]The dispute that catalyzed the target's nuclear program would likely be over before it obtained a deliverable warhead.

We can also compare the deterrent effects of nuclear latency with having a nuclear arsenal. The estimated coefficients on NUCLEAR ARSENAL reported in Figure 2 are larger than those on NUCLEAR LATENCY: switching from non-latency to the possession of nuclear warheads lowers a state's annual probability of violent dispute instigation by 6.73 percentage points [95 percent confidence interval: -0.184, 0.0502], based on the results from Model 1. In the case of nonviolent conflict (Model 2) developing a nuclear arsenal lowers the probability of conflict even more – by 12.88 percentage points [95 percent confidence interval: -0.231, -0.0261].

However, this information does not allow us to make a direct comparison between nuclear weapons and latent nuclear capacity. Further analysis, shown in the online appendix, indicates that switching from nuclear latency to a nuclear arsenal reduces the probability of violent dispute initiation by 3.04 percentage points. The 95 percent confidence interval ranges from -14.76 to 8.67 percentage points. If we were to repeat this analysis, therefore, we could find that nuclear arsenals are *much* better than latent nuclear capacity at deterring violent conflict, but the results could also lead us to the opposite conclusion. Yet, the difference between latency and weapons is statistically significant in the case of nonviolent conflict [95 percent confidence interval: -0.210, -0.00169]. There is some evidence, therefore, that nuclear weapons are superior to latent nuclear capabilities when it comes to military deterrence. At the same time, we cannot rule out the possibility that latency is better – perhaps much better – at deterring violent conflict than an arsenal. Part of the reason there is significant uncertainty about this relationship is that only 10 countries have built nuclear weapons. Our inferences about nuclear arsenals, including how they compare with nuclear latency, rest on a small number of cases. Circumspection is therefore warranted when interpreting these results.

To sum up, the statistical evidence supports three key predictions from latent nuclear deterrence theory. Switching from non-latency to latency reduces the likelihood that a state will be targeted in a violent interstate dispute. Yet developing nuclear latency does not reliably deter nonviolent disputes, and non-sensitive nuclear activities do not offer countries deterrence benefits. Interestingly, advanced latent nuclear capabilities do not appear to be better for deterrence than rudimentary ones, suggesting that even nascent ENR programs can be an effective "shot across the bow." Although I cannot draw definitive conclusions about the relationship between nuclear arsenals and nuclear latency for deterrence, at the very least, the difference between the two is smaller than the conventional wisdom would lead us to believe.

Table 1. *Latent nuclear deterrence failures.*

Target	Challenger	Dispute Year(s)	Description
China	India	1961-63	Sino-Indian War.
India	Pakistan	1964-66	Indo-Pakistani War.
India	Pakistan	1965	Clashes along ceasefire line.
India	Pakistan	1971	Bangladesh War.
India	Pakistan	1972	Fighting in Kashmir.
Iran	Iraq	1979-88	Iran-Iraq War.
Iran	United States	1987-88	US ships destroy oil platforms.
Iran	Iraq	1989	Ceasefire violation.
Iran	Armenia	1994	Armenian forces down Iranian aircraft.
Israel	Syria	1966-67	Six Day War.
North Korea	South Korea	1975	Attack on North Korean vessels.
North Korea	South Korea & USA	1983	Attack on North Korean vessels.
North Korea	Japan	2001	Attack on North Korean vessels.
Pakistan	India	1986-87	Fighting on Siachen Glacier.
South Korea	North Korea	1979-80	Various naval skirmishes.
South Korea	North Korea	2001-04	Naval and land-border clashes.
West Germany	Czechoslovakia	1986	Border clash.

Latent Nuclear Deterrence Failures

The statistical findings are based on average effects; they do not imply that states with nuclear latency are *never* targeted in disputes. Latent nuclear powers have been vulnerable to aggression historically. There are 17 instances in which states with latent nuclear capabilities were targeted in violent military disputes from 1946 to 2010. Table 1 lists these cases. These conflicts make clear that there are limits to the value of nuclear latency for deterrence. The conditions that emerge from latent nuclear deterrence theory – including those that were not directly tested in the quantitative analyses – can at least partially account for these failures.

The target's nuclear program directly contributed to conflict in at least one case: the Six Day War.[85] Israel's Arab rivals may have believed that they could take out critical nuclear infrastructure, thereby lowering the post-attack probably of proliferation (condition 2), and/or that an Israeli bomb was inevitable (condition 4). In May 1967, Egypt deployed troops on the Sinai peninsula and carried out reconnaissance flights over Dimona, Israel's most critical nuclear site. Egypt appears to have been on the cusp of attacking Dimona, but Egyptian leader Gamal Abdel Nasser called off the raid hours before it was set to

[85]India's nuclear program may have contributed to the onset of the 1965 war with Pakistan. George Perkovich (1999, 108) writes that this could "constitute the first case of nuclear proliferation in one country (India) prompting an adversary to undertake military action to 'beat' the anticipated effects of nuclear deterrence." However, as Perkovich acknowledges, there is little direct evidence to support this. Future research may, however, uncover previously underappreciated nuclear dimensions.

occur.[86] Following Egypt's mobilization, on June 5, Israel launched preemptive attacks against Egyptian forces. Although this case is a failure of latent nuclear deterrence, it supports one aspect of the theory. Israel was on the fence about its nuclear future in 1966-67 – weaponization was by no means guaranteed. As Avner Cohen put it, "[Israeli Prime Minister Levi] Eshkol [was] reluctant to take the nuclear plunge, but he was apparently leaning to keep the option open yet not necessarily to go beyond it."[87] The prime minister, in other words, seemed to favor a latent nuclear capability – not a nuclear arsenal. The May 1967 crisis changed this. As a result of the emerging threat, Israel swiftly assembled nuclear warheads and likely had at least a few rudimentary weapons in its arsenal prior to carrying out the preemptive strikes. Egypt's actions therefore helped foment nuclear proliferation (condition 3). Latent nuclear deterrence theory holds that Egypt should have anticipated this and therefore exercised restraint. War ensued in this case, perhaps because some of the theory's conditions failed to hold.

In a few of these cases, one could argue that the attack did not significantly increase the target's demand for nuclear weapons (condition 3). The 1986 incident involving West Germany and Czechoslovakia, in which a West German man was accidentally killed by Czech border guards, almost certainly had no effect on Bonn's nuclear ambitions.[88] It also seems unlikely that the Armenian shoot-down of an Iranian aircraft in 1994 catalyzed Iran's nuclear program. These cases reveal that even violent military confrontations may not be sufficient to make post-attack threats to proliferate credible.

The challenger's benefits of fighting appear to be especially significant for explaining when latent nuclear deterrence fails. Recall that the costs of attacking a latent nuclear power are significant but not extreme, and there is a delay between the action (an attack) and the threatened punishment (nuclear proliferation by the target). When challengers are highly resolved to fight for reasons unrelated to nonproliferation, therefore, the benefits may exceed the costs (condition 5). Several of these deterrence failures feature revisionist challengers that cared deeply about overturning the status quo: Pakistan's dispute with India over Kashmir, the Iran-Iraq War, and North Korea's actions towards South Korea.

Potential targets can increase the challenger's resolve to fight by taking aggressive actions. These actions may not technically cause a country to be classified as the initiator of a violent dispute but nonetheless put pressure on the "challenger" to act. Take, for instance, the violent disputes that South Korea initiated against North Korea. South Korea may have technically fired first in these episodes but North Korea arguably forced Seoul's hand by

[86](Ginor & Remez 2007) and Cohen (2007).

[87]Cohen (2007).

[88]It is questionable whether this case should be classified as producing fatalities, based on the MID coding rules, because the West German victim was a civilian (though he was a former military officer).

launching incursions into the South's territorial waters, among other provocations. The 1990-91 Persian Gulf War also illustrates this point, although it does not appear on this list because Iraq is classified as the initiator, not the target. After invading Kuwait, Iraq failed to deter the U.S.-backed effort to expel its forces, despite its latent nuclear capability. The lesson for latent nuclear powers is clear: having nuclear latency may not help you if you take actions that disrupt global or regional peace and stability, since doing so will increase others' resolve to fight.

What Have We Learned?

Nuclear deterrence has been central to international relations theory and practice for more than 70 years. Many studies consider the role that nuclear weapons play in limiting (or encouraging) international conflict. This article viewed nuclear deterrence through an alternative lens. It analyzed whether nonnuclear countries in possession of sensitive dual-use technology can deter military disputes. These states cannot launch retaliatory nuclear strikes, so they have been written off by most scholarship on nuclear deterrence. However, latent nuclear powers may be able to dissuade others from attacking by threatening to build nuclear weapons if they experience insecurity.

Prior studies have raised the possibility that nuclear latency may bolster deterrence, but the logical foundations of this claim remain underdeveloped. This paper presented a deductive theory of latent nuclear deterrence. For deterrence to work, the defender must have the capacity to impose costs on the challenger following an attack, the threat to impose costs must be credible, and the likelihood of those costs materializing cannot be higher (or the same) in the status quo relative to after an attack. One the basis of these basic requirements, having nuclear latency can help countries deter military disputes. Successful latent nuclear deterrence depends on five conditions: (1) the challenger must have preferences for nonproliferation; (2) the challenger must believe that the target has the technological capacity to proliferate in the future, even after an attack; (3) a dispute needs to increase the target's demand for nuclear weapons; (4) the challenger cannot believe that the latent nuclear power is racing to build nuclear weapons as quickly as possible; and (5) the challenger must not be highly resolved to change the status quo.

I identified and tested three predictions from latent nuclear deterrence theory using quantitative data on violent military conflict and information on the global development of sensitive nuclear technology – specifically, uranium enrichment and plutonium reprocessing plants, which provide states with the ability to make fissile material for bombs. The evidence from a fixed effects regression analysis supported the theory. First, switching from non-latency to latency lowers the annual probability of violent dispute initiation. Second, developing nu-

clear latency does not reliably reduce a state's vulnerability to nonviolent disputes, though states may derive some deterrence benefits in this context. Third, non-sensitive nuclear activities do not deter violent conflict. The analysis also showed that nuclear weapons may bolster deterrence, but there is considerable uncertainty about this conclusion. Based on my analysis, we cannot conclude with confidence that nuclear arsenals are better at deterring violent conflict than nuclear latency.

Latent nuclear powers are not invulnerable to violent aggression. I identified several cases where a state suffered an attack despite its development of latent nuclear capacity. These cases show that war is still possible in the shadow of nuclear latency. For some, this may suggest that latent nuclear deterrence is a risky strategy. It is important to remember that nuclear weapons states have been attacked, too. Wars such as the 1982 Falklands War and the 1999 Kargil War, and smaller-scale conflicts such as the 1968 USS *Pueblo* affair, clearly show that states armed with nuclear weapons are not invincible. Latent nuclear deterrence has not worked perfectly, but neither has deterrence with nuclear arsenals.

This evidence carries implications for how we think about nuclear deterrence. Most scholarship assumes that nuclear deterrence works by raising the possibility of immediate, devastating counterattacks. Based on this view, states must possess deliverable nuclear warheads in order to deter military conflict. Most people call the countries that have this capability today – there are nine of them – *nuclear powers*. This article tells a different story. The mere capacity to build nuclear bombs at some point in the future can also dissuade countries from launching military attacks. It may be fruitful, therefore, to broaden our conception of a nuclear power. Countries such as Brazil, Iran, and Japan cannot launch an immediate nuclear counterattack today. They can nonetheless shape the international environment with greater ease because of their nuclear programs. In this sense, their possession of nuclear technology makes them powerful – at least under certain conditions.

This study's findings help us better understand trends in nuclear politics. Since the beginning of the atomic age, many countries have sought to obtain sensitive nuclear technologies. For some of these states, including the United States and the Soviet Union, nuclear latency was simply a stop along the way to obtaining a nuclear arsenal. But this analysis points to another reason for countries being interested in latent nuclear capacity: the mere capability to build nuclear weapons can benefit countries strategically. If history is any indication, it would not be surprising if states continue to pursue enrichment and reprocessing technologies in the coming decades. Few countries have built nuclear weapons, especially relative to the number of states that could have done so. At least some states may have refrained from proliferating, in part, because they can reap benefits from their nuclear programs without incurring the costs associated with weaponization. In the event of a crisis, latent states would be well positioned to push ahead with weapons production. Having nuclear latency,

then, is analogous to having your cake and eating it too. Iran's nuclear behavior over the last fifteen years is consistent with this line of thinking, though the full story here may not yet be told.

Lessons for Nuclear Disarmament

For as long as nuclear weapons have existed, people have considered whether they should (or could) be eliminated. In June 1946, 10 months after the nuclear attacks on Hiroshima and Nagasaki, the United States introduced the Baruch Plan. This plan called for the United States to dismantle its nuclear arsenal after the creation of an international body to manage and inspect any site that could make material for bombs. The Baruch Plan was never implemented, but this did not stop scholars and government officials from thinking about nuclear disarmament. Even as the Cold War continued, Ronald Reagan and Mikhail Gorbachev discussed scrapping their nuclear forces during a historic October 1986 summit in Reykjavik, Iceland.

Over the last decade, calls for the eventual elimination of nuclear weapons have received growing attention. In 2007, four former U.S. senior officials – Henry Kissinger, Sam Nunn, William Perry, and George Schultz – wrote a widely discussed op-ed in the *Wall Street Journal* that advocated for a nuclear weapons-free world. Shortly thereafter, during one of his first major speeches as president, Barack Obama echoed this vision: "I state clearly and with conviction America's commitment to seek the peace and security of a world without nuclear weapons." Momentum on this front appears to continue, as the United Nations adopted a treaty in June 2017 that bans all nuclear bombs. Recent events – especially North Korea's development of long-range missiles that could hit the United States – may make the idea of nuclear disarmament seem like a misguided pipedream. There nonetheless remains a segment of the population, globally and in the United States, that continues to advocate for the elimination of nuclear weapons.

Nuclear weapons cannot be totally uninvented because the knowledge required to make them would still exist, even in a disarmed world. If today's nuclear states dismantled their warheads, we would live in a world with nine additional latent nuclear powers. This would not be a purely nuclear-free world. The formerly nuclear-armed countries could reassemble bombs quickly in the event of a crisis – quicker than any other state could do so today, with the possible exception of South Africa. VNAs would replace nuclear forces that were "locked and loaded." What does my analysis tell us about the desirability of such a world? No single study can provide a definitive answer, but this analysis produces four relevant insights for the disarmament debate.

First, that latent nuclear powers have been able to lower their risk of being attacked

in the past suggests that they could continue to do so in the future. However, this study analyzed the deterrent effects of nuclear latency in a world where some countries possessed nuclear arms. In a VNA-backed system, by contrast, no country would have intact nuclear warheads ready for immediate launch. Even non-targets of aggression would be incapable of immediate nuclear retaliation.[89] Although these two worlds are different, the findings give us reason to believe that latent nuclear deterrence could work in a hypothetical world without nuclear weapons. At the very least, the evidence in favor of latent nuclear deterrence is stronger than the dominant view in scholarship would lead us to believe.

Second, latent nuclear capacity is not like having an impenetrable force field around a country's territory. Successful latent nuclear deterrence depends on some key conditions. These conditions have generally held in the past but wars have still occurred once states obtained nuclear latency. There is little reason to expect, based on logic or history, that VNAs would make future armed conflict impossible. Moreover, the future of latent nuclear deterrence could look worse than the past, if the conditions for success become more difficult to satisfy. Weakening state preferences for nonproliferation, a reduction in the survivability of latent nuclear forces, measures that make post-attack threats to go nuclear less credible, or an increase in the number of revisionist states would erode the deterrence benefits of nuclear latency to some degree.

Third, VNA proponents may understate the deterrence benefits of nuclear latency. They assume that latent nuclear deterrence works like deterrence with weapons except for a short time lag between the initial attack and the nuclear response. In this view, only highly advanced latent states can deter military disputes. I show, however, that states can deter violent conflict even when they are months or years away from a deliverable nuclear warhead. Threats to initiate or accelerate a nuclear weapons program following an attack can impose costs on challengers – even if nuclear forces are never used in combat. It is telling that states with laboratory-based ENR programs seem to do about as good as, and possibly better than, countries that have pilot and commercial facilities in place. This opens up the possibility of much longer lag times in a world with VNAs.

Fourth, it is not clear that nuclear arsenals are dramatically better for deterrence than nuclear latency. There is some evidence that nuclear weapons reduce military conflict to a greater degree than latent nuclear capacity. Based on the analysis, however, we cannot rule out the possibility that latency is superior to an arsenal, especially when it comes to violent disputes. There is considerable uncertainty about the consequences of shifting from nuclear latency to a nuclear arsenal, and this makes it difficult to draw definitive conclusions.

[89]The United States, in theory, could have swiftly launched nuclear strikes against Iraq following Saddam Hussein's invasion of Kuwait in August 1990. This kind of response would not be possible in a world with latent nuclear powers only.

VNA skeptics sometimes imply that latent nuclear deterrence has little chance of working and deterrence with nuclear weapons cannot fail.[90] If nothing else, the evidence does not support this stark conclusion. The deterrence hit that would result from a shift to a system of VNAs, it seems, might be smaller than critics fear. The context may determine which kind of deterrence works better. In some situations nuclear latency may deter more effectively than a nuclear arsenal, while weapons may be more desirable in other circumstances. For instance, a nuclear arsenal capable of carrying out an immediate retaliatory attack may be preferable when facing a highly revisionist challenger that is hellbent on carrying out a full-scale invasion or decapitation strike.

None of this implies that policymakers should (or should not) embrace a world without nuclear weapons. Whether countries should keep or eliminate their arsenals is a complex issue, and a comprehensive assessment is beyond the scope of this article. The arguments and evidence presented here show, however, that the case for latent nuclear deterrence is stronger than most people acknowledge. Instead of dismissing latent nuclear deterrence out of hand, as critics sometimes do, we should devote more intellectual firepower to understanding the strengths and limitations of nuclear deterrence in a disarmed world.

[90] See especially Waltz (1997).

References

Beardsley, Kyle, & Asal, Victor. 2009. Winning with the Bomb. *Journal of Conflict Resolution*, **53**(2), 278–301.

Beck, Nathaniel. 2015. Estimating Group Data Models with Binary Dependent Variables and Fixed Effects: What is the Problem? *Paper presented at the Annual Meeting of the Society for Political Methodology, University of Rochester.*

Bell, Mark, & Miller, Nicholas. 2015. Questioning the Effect of Nuclear Weapons on Conflict. *Journal of Conflict Resolution*, **59**(1), 74–92.

Bell, Mark S. 2015. Beyond Emboldenment: How Acquiring Nuclear Weapons Can Change Foreign Policy. *International Security*, **40**(1), 87–119.

Bildt, Carl, & Tuomioja, Erkki. 2012. The Only Option on Iran. *New York Times*, **March 20**.

Broad, William. 2012. How to Help Iran Build a Bomb. *New York Times*, **September 28**.

Brodie, Bernard. 1959. *Strategy in the Missile Age.* Princeton: Princeton University Press.

Burr, William, & Richelson, Jeffrey T. 2000/2001. Whether to 'Strangle the Baby in the Cradle': The United States and the Chinese Nuclear Program, 1960-64. *International Security*, **25**(3), 54–99.

Cameron, A. Colin, & Miller, Douglas L. 2015. A Practitioner's Guide to Cluster-Robust Inference. *Journal of Human Resources*, **50**(2), 317–372.

Carter, David, & Signorino, Curtis S. 2010. Back to the Future: Modeling Time Dependence in Binary Data. *Political Analysis*, **18**(3), 271–92.

Cohen, Avner. 2007. Crossing the Threshold: The Untold Nuclear Dimension of the 1967 Arab-Israeli War and Its Contemporary Lessons. *Arms Control Today*, **37**(5), 12–16.

Cohen, Avner, & Pilat, Joseph. 1998. Assessing Virtual Nuclear Arsenals. *Survival*, **40**(1), 129–144.

Dawson, Chester. 2011. In Japan, Provocative Case for Staying Nuclear; Some Say Bombs' Potential as Deterrent Argues for Keeping Power Plants Online. *Wall Street Journal*, October 27.

Debs, Alexandre, & Monteiro, Nuno. 2014. Known Unknowns: Power Shifts, Uncertainty, and War. *International Organization*, **68**(1), 7–52.

Downes, Alexander B. 2009. How Smart and Tough are Democracies? *International Security*, **33**(4), 9–51.

Drell, Sidney D., & Goodby, James E. 2009. *A World Without Nuclear Weapons: End-State Issues.* Stanford, CA: Hoover Institution Press.

Fair, C. Christine. 2014. *Fighting to the End: The Pakistan ArmyâĂŹs Way of War.* Oxford: Oxford University Press.

Ford, Christopher A. 2011. Nuclear Weapons Reconstitution and Its Discontents: Challenges of 'Weaponless Deterrence'. *In:* Schultz, George P., Drell, Sidney D., & Goodby, James E. (eds), *Deterrence: Its Past and Future.* Stanford, CA: Hoover Institution Press.

Fuhrmann, Matthew, & Kreps, Sarah. 2010. Targeting Nuclear Programs in War and Peace: A Quantitative Empirical Analysis, 1941-2000. *Journal of Conflict Resolution*, **54**(6), 831–59.

Fuhrmann, Matthew, & Sechser, Todd S. 2014. Signaling Alliance Commitments: Hand-Tying and Sunk Costs in Extended Nuclear Deterrence. *American Journal of Political Science.*

Fuhrmann, Matthew, & Tkach, Benjamin. 2015. Almost Nuclear: Introducing the Nuclear Latency Dataset. *Conflict Management and Peace Science*, **32**(4), 443–461.

Gartzke, Erik, & Jo, Dong-Joon. 2009. Bargaining, Nuclear Proliferation, and Interstate Disputes. *Journal of Conflict Resolution*, **53**(2), 209–233.

George, Alexander L., & Smoke, Richard. 1974. *Deterrence in American Foreign Policy: Theory and Practice*. New York: Columbia University Press.

Gibbs, Jack P. 1975. *Crime, Punishment, and Deterrence*. Amsterdam: Elsevier.

Gibler, Douglas M., Miller, Steven V., & Little, Erin K. 2017. An Analysis of the Militarized Interstate Dispute (MID) Dataset, 1816-2001. *International Studies Quarterly*, **60**(4), 719–730.

Ginor, Isabella, & Remez, Gideon. 2007. *Foxbats over Dimona: The Soviets' Nuclear Gamble in the Six-Day War*. New Haven, CT: Yale University Press.

Gleditsch, Kristian, Salehyan, Idean, & Schultz, Kenneth. 2008. Fighting at Home, Fighting Abroad: How Civil Wars Lead to International Disputes. *Journal of Conflict Resolution*, **52**(4), 479–506.

Gray, Colin S. 1999. *The Second Nuclear Age*. Boulder, CO: Lynne Rienner.

Hoey, Fintan. 2016. Japan and Extended Nuclear Deterrence: Security and Non-proliferation. *Journal of Strategic Studies*, **39**(4), 484–501.

Holdren, John P. 1997. *The Future of U.S. Nuclear Weapons Policy*. Washington, D.C.: National Academies of Sciences.

Huth, Paul K. 1999. Deterrence and International Conflict: Empirical Findings and Theoretical Debates. *Annual Review of Political Science*, **2**, 25–48.

Jervis, Robert. 1989. *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon*. Ithaca, N.Y.: Cornell University Press.

Jo, Dong-Joon, & Gartzke, Erik. 2007. Determinants of Nuclear Weapons Proliferation. *Journal of Conflict Resolution*, **51**(1), 167–94.

Johnson, Jesse C., & Leeds, Brett Ashley. 2011. Defense Pacts: A Prescription for Peace? *Foreign Policy Analysis*, **7**(1), 45–65.

Kahn, Herman. 1960. *On Thermonuclear War*. Princeton: Princeton University Press.

Kapur, S. Paul. 2007. *Dangerous Deterrent: Nuclear Weapons Proliferation and Conflict in South Asia*. Palo Alto, Calif.: Stanford University Press.

Karaca-Mandic, Pinar, Norton, Edward C., & Dowd, Bryan. 2012. Interaction Terms in Nonlinear Models. *Health Services Research*, **47**(1), 255–274.

Kreps, Sarah E., & Fuhrmann, Matthew. 2011. Attacking the Atom: Does Bombing Nuclear Facilities Affect Proliferation. *Journal of Strategic Studies*, **34**(2), 161–187.

Kroenig, Matthew. 2012. Time to Attack Iran: Why a Strike is the Least Bad Option. *Foreign Affairs*, **91**(1), 76–86.

Kydd, Andrew H., & McManus, Roseanne W. 2017. Threats and Assurances in Crisis Bargaining. *Journal of Conflict Resolution*, **61**(2), 325–348.

Leeds, Brett Ashley. 2003. Do Alliances Deter Aggression? The Influence of Military Alliances on the Initiation of Militarized Interstate Disputes. *American Journal of Political Science*, **47**(3), 427–439.

Leeds, Brett Ashley, Ritter, Jeffrey M., Mitchell, Sara McLaughlin, & Long, Andrew G. 2002. Alliance Treaty Obligations and Provisions, 1815-1944. *International Interactions*, **28**(3), 237–260.

Levite, Ariel. 2002. Never Say Never Again: Nuclear Reversal Revisited. *International Security*, **27**(3), 59–88.

Marshall, Monty G., Gurr, Ted Robert, & Jaggers, Keith. 2009. *Polity IV Project: Political Regime Characteristics and Transitions, 1800-2009.*

Mazarr, Michael J. 1995. Virtual Nuclear Arsenals. *Survival*, **37**(3), 7–26.

Mazarr, Michael J. 1997a. The Notion of Virtual Arsenals. *Pages 3–32 of:* Mazarr, Michael J. (ed), *Nuclear Weapons in a Transformed World.* New York: St. Martin's Press.

Mazarr, Michael J. 1997b. Virtual Nuclear Arsenals: A Second Look. *In:* Mazarr, Michael J. (ed), *Nuclear Weapons in a Transformed World.* New York: St. Martin's Press.

Mehta, Rupal, & Whitlark, Rachel. 2017. Assessing the Benefits and Burdens of Nuclear Latency. **Working manuscript**.

Meyer, Stephen. 1984. *The Dynamics of Nuclear Proliferation.* Chicago: University of Chicago Press.

Miller, Steven E. 1984. *Strategy and Nuclear Deterrence.* Princeton, NJ: Princeton University Press.

Muller, Harald, & Schmidt, Andreas. 2010. The Little-Known Story of Deproliferation: Why States Give Up Nuclear Weapons Activities. *Pages 124–158 of:* Potter, William C., & Mukhatzhanova, Gaukhar (eds), *Forecasting Nuclear Proliferation in the 21st Century: The Role of Theory.* Stanford, CA: Stanford University Press.

Nagin, Daniel S., & Pogarsky, Greg. 2001. Integrating Celerity, Impulsivity, and Extralegal Sanction Threats Into a Model of General Deterrence: Theory and Evidence. *Criminology*, **39**(4), 865–892.

Narang, Vipin. 2009. Posturing for Peace: Pakistan's Nuclear Postures and South Asian Stability. *International Security*, **34**(3), 38–78.

Narang, Vipin. 2014. *Nuclear Strategy in the Modern Era: Regional Power Nuclear Postures and International Conflict.* Princeton, NJ: Princeton University Press.

Narang, Vipin. 2017. Strategies of Nuclear Proliferation: How States Pursue the Bomb. *International Security*, **41**(3), 110–150.

Palmer, Glenn, D'Orazio, Vito, Kenwick, Michael, & Lane, Matthew. 2015. The MID4 Dataset, 2002-2010: Procedures, Coding Rules, and Description. *Conflict Management and Peace Science*, **32**(2), 222–242.

Paul, T.V. 2000. *Power versus Prudence: Why Nations Forgo Nuclear Weapons.* Montreal: McGill-Queens University Press.

Payne, Keith B. 1998. The Case Against Nuclear Abolition and for Nuclear Deterrence. *Comparative Strategy*, **17**(1), 3–43.

Perkovich, George. 1999. *India's Nuclear Bomb: The Impact on Global Proliferation.* Berkeley: University of California Press.

Perkovich, George, & Acton, James M. 2009. *Abolishing Nuclear Weapons: A Debate.* Washington, D.C.: Carnegie Endowment for International Peace.

Powell, Robert. 1990. *Nuclear Deterrence Theory: The Search for Credibility.* New York: Cambridge University Press.

Roberts, Brad. 1997. VNAs and the Contemporary Latent Weapon State. *Pages 263–288 of:* Mazarr, Michael J. (ed), *Nuclear Weapons in a Transformed World.* New York: St. Martin's Press.

Sagan, Scott D. 1993. *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons.* Princeton: Princeton University Press.

Sagan, Scott D. 2004. Realist Perspectives on Ethical Norms and Weapons of Mass Destruction.

Pages 73–95 of: Hashmi, Sohail H. (ed), *Ethics and Weapons of Mass Destruction: Religious and Secular Perspectives*. New York: Cambridge University Press.

Sagan, Scott D. 2010. Nuclear Latency and Nuclear Proliferation. *Pages 80–101 of:* Potter, William C., & Mukhatzhanova, Gaukhar (eds), *Forecasting Nuclear Proliferation in the 21st Century: The Role of Theory*. Stanford, CA: Stanford University Press.

Sagan, Scott D., & Waltz, Kenneth N. 2012. *The Spread of Nuclear weapons: An Enduring Debate*. New York: W.W. Norton.

Sanger, David E. 2015. Saudi Arabia Promises to Match Iran in Nuclear Capability. *New York Times*.

Schell, Jonathan. 1984. *The Abolition*. New York: Knopf.

Schelling, Thomas C. 1966. *Arms and Influence*. New Haven: Yale University Press.

Schelling, Thomas C. 1976. Who Will Have the Bomb? *International Security*, **1**(1), 77–91.

Schultz, Kenneth A. 2001. Looking for Audience Costs. *Journal of Conflict Resolution*, **45**(1), 32–60.

Sechser, Todd S., & Fuhrmann, Matthew. 2017. *Nuclear Weapons and Coercive Diplomacy*. Cambridge: Cambridge University Press.

Singer, J. David, Bremer, Stuart A., & Stuckey, John. 1972. Capability Distribution, Uncertainty, and Major Power War. *Pages 19–48 of:* Russett, Bruce M. (ed), *Peace, War, and Numbers*. Beverly Hills, Calif.: Sage.

Snyder, Glenn H. 1961. *Deterrence and Defense: Toward a Theory of National Security*. Princeton: Princeton University Press.

Spaniel, William. 2015. Arms Negotiations, War Exhaustion, and the Credibility of Preventive War. *International Interactions*, **41**(5), 832–856.

Spaniel, William, & Smith, Bradley C. 2016. Introducing Nu-CLEAR: A Latent Variable Approach to Measuring Nuclear Capability. *Typescript, University of Pittsburgh and University of Rochester*.

Volpe, Tristan. 2017. Atomic Leverage: Compellence with Nuclear Latency. *Security Studies*, **26**(3), 517–544.

Waltz, Kenneth N. 1981. *The Spread of Nuclear Weapons: More May Be Better* (Adelphi Paper No. 171). London: International Institute for Strategic Studies.

Waltz, Kenneth N. 1997. Thoughts about Virtual Nuclear Arsenals. *The Washington Quarterly*, **20**(3), 153–161.

Whitlark, Rachel. 2017. Nuclear Beliefs: A Leader-Focused Theory of Counter-Proliferation. *Security Studies*, **forthcoming**.

Zagare, Frank C., & Kilgour, D. Marc. 2000. *Perfect Deterrence*. New York: Cambridge University Press.