The Strategic Logic of Nuclear Proliferation

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September 29, 2013

Word count: 18,814

Prepared for presentation at the Princeton International Relations Faculty Colloquium on October 7, 2013.

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Abstract
When do states acquire nuclear weapons? Intuitively, security is the main motivation behind nuclear acquisition. Yet, existing security-based theories of proliferation cannot explain why some states with important security concerns nuclearize whereas others do not. This article offers a strategic theory that accounts for variation in the nuclear status of states with dire security threats. We focus not only on the security goals of the potential proliferator, but also on those of its enemies, and, when present, its allies. A state only acquires nuclear weapons when, besides having grave security threats, it possesses high relative power or a nuclear ally it deems prospectively unreliable. While relatively weak states without a nuclear ally lack the opportunity to nuclearize, those with a reliable nuclear ally lack the willingness to do so. We test our theory using original codings of enemies and allies for all historical instances of nuclear development and trace its logic in the Soviet, French, Pakistani, Swedish, South Korean, and Iraqi cases. We conclude with implications for U.S. counter-proliferation policy towards Iran.

Acknowledgments
The authors contributed equally to this article. We thank Nicholas Anderson, James Fearon, Frank Gavin, Christine Leah, Matthew Kocher, Carlo Patti, Scott Sagan, Bruce Russett, and workshop participants at George Washington University, Harvard University, McGill University, Stanford University, the University of Virginia, the University of São Paulo, as well as participants in the 2013 Princeton Conference on Theoretical and Quantitative International Relations, the 2013 International Studies Association Annual Meeting, and the 2013 SHAFR Summer Institute for their comments and suggestions; and Nicholas Anderson; Gabriel Botelho, Elisabeth Cheek, Connor Dezzani Huff, Alexander Ely, Matthew Kim, Bonny Lin, William Nomikos, Chad Peltier, Teodoro Soares, and David Tidmarsh for excellent research assistance. Alexandre Debs thanks CISAC at Stanford and the BCEP at UC-Berkeley for their hospitality.
1. Introduction

Since the outset of the nuclear era, proliferation has been an important concern for scholars of international relations. Intuitively, security considerations are the most important among the factors motivating states to acquire nuclear weapons. As Scott Sagan put it, most proliferation cases “are best explained by the security model.”

Yet, we do not possess a security-based theory capable of accounting for variation among states in their success in acquiring a nuclear arsenal. According to existing security-based arguments on proliferation, “security is the only necessary and sufficient cause of nuclear proliferation.” But while some states with grave security concerns have developed nuclear weapons, others have not. So although most scholars agree that security matters greatly as a driver of proliferation, we possess no systematic treatment of how the strategic environment shapes the spread of nuclear weapons.

Policymakers also worry deeply about proliferation. Against unfriendly states, Washington has often contemplated preventive counter-proliferation strikes. During the Cold War, high-ranking U.S. officials considered attacks against the Soviet and Chinese nuclear programs. After the Cold War, proliferation concerns led President Bill Clinton to the brink of war with North Korea in 1994, were central to President George W. Bush’s case for invading Iraq, and continue to press grave dilemmas on President Barack Obama concerning Iran. Washington has also vigorously tried to persuade its protégés not to nuclearize, threatening to withdraw its support and demanding inspections of their nuclear facilities. One of the main concerns surrounding Iran’s possible nuclearization is a regional proliferation cascade including Egypt, Saudi Arabia, and Turkey. Overall, avoiding the spread of nuclear weapons has been one of the key foreign-policy goals of the United States throughout the nuclear era.

Still, our understanding of the effectiveness of the tools applicable to friends and foes to deter proliferation is somewhat limited. We lack a clear view of the conditions that make the threat of a counter-proliferation strike against an enemy effective. While some states with powerful enemies (the Soviet Union in the late 1940s, China in the early 1960s, or Pakistan in 1990) nuclearized, others did not. Nor do we have an

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3 For the purposes of this paper, “counterproliferation” refers to the implicit or explicit threat of military action to prevent nuclear acquisition. This is different from “nonproliferation,” which refers to any measure designed to curtail proliferation without the threat of military attack. Likewise, “preventive war” includes a whole range of military actions, from surgical strikes against a limited target-set to full-scale war. For a literature review on preventive war, see: Jack S. Levy, “Preventive War and Democratic Politics,” International Studies Quarterly, Vol. 52, No. 1 (2008). For a review of preventive war debates in the context of proliferation, see: Francis J. Gavin and Mira Rapp-Hooper, “The Copenhagen Temptation: Rethinking Prevention and Proliferation in the Age of Deterrence Dominance,” presented at the annual meeting of the American Political Science Association, Seattle, September 2011.
understanding of when security commitments to allies stymie their nuclear ambitions. While some protégés of nuclear powers (France in 1960 or Pakistan in 1990) proliferated, others (South Korea or West Germany) have not.

This paper introduces a security-based theory that accounts for these different behaviors and the historical patterns of nuclear proliferation they produce. To explain why only some states with serious security concerns proliferate, we consider not only their security goals, but also those of the states that would be affected by their nuclear acquisition. The odds of proliferation, we contend, are largely determined by the strategic interaction between a state deciding whether to acquire nuclear weapons and its enemies. This interaction, in turn, is shaped by the potential proliferator’s relative power and whether it has a nuclear ally. The higher the potential proliferator’s relative power, the higher the likelihood that it will proliferate unimpeded whenever it deems the effect of nuclear weapons on its security to be worth the cost of pursuing them. Absent relative power, security guarantees extended by a nuclear ally also increase the likelihood that a state has the opportunity to nuclearize. Not all states with a nuclear ally proliferate, however. Should they expect this ally to continue to be a reliable guarantor of their security in the future, their willingness to pursue nuclear weapons would be low. Therefore, a weak state is likely to acquire nuclear weapons only when it possesses a nuclear ally whose future protection it deems unreliable.

After introducing our theory, we show how this argument highlights two hitherto underappreciated patterns of proliferation. First, only strong states or those with a nuclear ally have ever proliferated. There is no historical case of a relatively weak state without a nuclear ally committed to retaliating against a preventive strike -- such as contemporary Iran -- ever succeeding in nuclearizing. We should therefore be cautious about claims that nuclear weapons are the “weapon of the weak,” the “great equalizer” in international relations.\(^6\) No doubt, nuclear weapons would enable an otherwise weak nation to stand up to more powerful adversaries. So far, however, no weak unprotected nation has ever managed to obtain them.

Second, the spread of nuclear weapons decelerated after the end of the Cold War in 1989. Despite much concern about “nuclear cascades” and proliferation “tipping points,” only two states -- Pakistan and North Korea -- acquired nuclear weapons in the era of U.S. military power preponderance. U.S. allies face few if any significant security threats that nuclear weapons could placate and on which they do not trust Washington’s continued protection. U.S. enemies, lacking a nuclear patron, risk a preventive strike against their nuclear program.\(^8\) As long as U.S. unipolarity endures, therefore, we should expect the rate of


proliferation to remain low.9

The remainder of this article unfolds as follows. Section 2 reviews the literature. Section 3 introduces our theory. Section 4 tests our theory against all historical cases of nuclear development using original codings of enemies and allies. Section 5 traces our logic through six case studies: the Soviet Union, France, Pakistan, Sweden, South Korea, and Iraq. Finally, Section 6 presents policy implications. Appendix I includes coding rules and short summaries of all other nuclear development cases. Appendix II formalizes our theory and presents proofs of the formal results. [Both Appendices submitted as supplemental materials and be placed online upon publication.]

2. Existing Literature on Nuclear Proliferation

The scholarly literature on the causes of nuclear proliferation evolved in three waves. The first wave focused on security explanations, arguing that a state’s willingness to nuclearize results from its need to mitigate threats to its survival.10 The higher the threat level facing a country, the more it is likely to acquire nuclear weapons. Given the threat posed by nuclear weapons, this meant that proliferation might itself beget more proliferation, leading to predictions of nuclear “dominos” or a “strategic chain reaction.”11 Reviewing this literature in the mid-1990s, Sagan writes:

Although nuclear weapons could also be developed to serve either as deterrents against overwhelming conventional military threats or as coercive tools to compel changes in the status quo, the simple focus on states’ responses to emerging nuclear threats is the most common and most parsimonious explanation for nuclear weapons proliferation.12

Though security explanations continue to be considered intuitively appealing, their pessimistic predictions did not materialize. The number of nuclear states has remained relatively steady and “the pace of proliferation has been consistently slower than has been anticipated by most experts.”13 Today, only nine states possess nuclear weapons.

The perception that security arguments over-predicted the pace of proliferation led to a renewed focus on nuclear “forbearance” -- i.e., on why states forego nuclearization. Mitchell Reiss argued that when the security threats that prompt a nuclear program wane, so will the program itself, resulting in nuclear abandonment.14 T.V. Paul viewed nuclear forbearance as resulting from the negative security externalities

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14 See: Mitchell Reiss, Bridled Ambition: Why Countries Constrain their Nuclear Capabilities (Washington, D.C.:
of nuclear possession. For states not facing acute security threats, nuclear acquisition could worsen their security outlook, leading them to eschew their nuclear ambitions and even, in the case of South Africa, forfeit their nuclear arsenal.  

In addition to these refinements, the shortcomings of early security explanations led to a search for other “sources of the political demand for nuclear weapons,” resulting in a second wave of literature.  

Among these alternative sources, particular attention has been paid to the psychology of leaders, the political and economic preferences of ruling elites, the type of political regime, the role of non-proliferation norms, and the hurdles imposed by nuclear technology.  

More recently, a third wave of scholarship emerged, making use of quantitative methods and shifting the analytic focus from a state’s willingness to its opportunity to proliferate. This ‘supply-side’ literature emphasizes the role of powerful states in limiting access to nuclear technology and materials as key in determining the odds of proliferation. The higher a state’s power projection capability, the more likely it is to oppose attempts to assist others’ nuclearization efforts, undermining them.  

Today’s debate on the causes of proliferation is largely organized between demand- and supply-side explanations. Each of these perspectives contributes to our understanding of proliferation. Yet, none of


24 See: Kroenig, Exporting the Bomb.
them systematically captures the role of security concerns in driving the odds of nuclear acquisition.

Existing security explanations for proliferation remain unable to account for why some states acquire a nuclear deterrent while others do not. Reiss’s and Paul’s arguments represent important steps towards understanding a state’s security incentives not to nuclearize. Still, neither of these views is able to account for why states facing similar strategic outlooks -- such as France and West Germany in the 1950s -- make opposite nuclear decisions. Neither do they account for why some states -- e.g., North Korea and Iran -- decide to incur in heavy negative externalities in pursuit of the bomb while others -- e.g., Taiwan and Libya -- eventually give up their nuclear ambitions to avoid these externalities.

Non-security explanations for nuclear demand, although highlighting multiple factors that contribute to a state’s willingness to nuclearize, have prematurely abandoned the most important among them: security threats. Surely, the economic, political, psychological, or normative preferences of leaders and ruling elites are conditioned by the security environment states face. To understand their role in the proliferation process, we must determine the role of the security context in which they operate. The theory we lay out below gives this context its due importance, placing it at the center of the proliferation problem.

Supply-side explanations, in turn, correctly emphasize how nuclear acquisition requires not only willingness but also opportunity. Yet, they suffer from three shortcomings. First, their exclusive focus on restrictions to the supply of nuclear materials and technology ignores other tools states use to limit proliferation, including threats to withdraw support from an ally or use military force against an enemy. The efficacy of this policy toolkit must be evaluated in toto.

Furthermore, it is not clear why any supply-side efforts would slow down the rate of proliferation. A reduction in supply would only alter the rate of proliferation if demand for nuclear weapons were elastic. A small number of nuclear weapons, however, has a large effect on a state’s ability to guarantee its own survival. Therefore, few security-related goods should have a less elastic demand. Attempts to restrict nuclear supplies may thus lead only to an increase in the cost states have to pay for nuclearization.

Finally, supply-side theories cannot account for the slower pace of proliferation of the past two decades. By their own logic, as the Soviet Union lost much of its power-projection capability, it “became more willing to provide sensitive nuclear assistance.” Additionally, states such as Pakistan are suspected of supplying would-be nuclear powers with nuclear technology and materials.

More generally, extant theories of proliferation suffer from a common limitation: they focus either on a state’s willingness to acquire nuclear weapons (demand-side explanations) or on the motivations of other


See: Reiss, Bridled Ambition; Paul, Power versus Prudence.


Kroenig, “Exporting the Bomb,” p. 128. Kroenig notes that China’s rise may counter the effect of Russian decline, but this is theoretically indeterminate.

states to prevent it from having the opportunity to do so (supply-side explanations). To understand the role played by security concerns in proliferation, however, we need to look at both demand and supply, analyzing their net effect. The next section sets out to do so, laying out the strategic logic of nuclear proliferation.

3. A Strategic Theory of Nuclear Proliferation

This article introduces a new strategic theory of nuclear proliferation. We account for the spread of nuclear weapons by determining the net effect of the security environment on the likelihood of nuclear acquisition. While our theory is anchored in the “security model” of proliferation, we depart from existing security explanations for the spread of nuclear weapons by shifting the focus of analysis. Instead of looking at the consequences of nuclear acquisition for the subsequent security of the state, we focus on the incentives of the key actors in the run-up to acquisition. In our view, the odds of proliferation are shaped by the security environment that a state faces while developing nuclear weapons.

We define nuclear ‘development’ as the period during which the state is either exploring or pursuing nuclear weapons. Nuclear ‘exploration’ involves the “political authorization to explore the [nuclear] option” or “linking research to defense agencies that would oversee any potential weapons development,” Nuclear ‘pursuit’, in turn, involves “[a] political decision by cabinet-level officials, movement toward weaponization, or development of single-use, dedicated technology.”

This shift in analytic focus towards the period of nuclear development is justified by the historical observation that no state ever acquired nuclear weapons without developing them for a number of years. Since nuclear acquisition requires a costly investment of resources in science, technology, and industry that only yields a return after a significant period of time, proliferation can be deterred either by a credible threat of preventive war or by a credible security assurance of protection. Therefore, the security environment of the potential proliferator prior to the moment of nuclear acquisition must be factored into the decision to nuclearize, thereby conditioning the spread of nuclear weapons.

During the nuclear development period, our theory centers on the strategic interactions among three key actors: the ‘potential proliferator’ itself, its enemies, and, when present, its allies. A state’s security vis-à-vis its enemies may gain much from nuclear acquisition. Yet, by the same token, its enemies may stand to lose much as a result of its nuclear acquisition. Therefore, if a state may want to nuclearize, its enemies may want to thwart this effort. To do so, they may launch different counter-proliferation measures, including a preventive war. Similarly, the acquisition of nuclear weapons may improve a state’s autonomy vis-à-vis its allies. Yet this may lead its allies to try to stymie its nuclearization for fear of entrapment and regional instability. To do so, an ally may resort to different non-proliferation tools, including withdrawing

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11 Supply-side theorists also focus on the period of nuclear development. See: Kroenig, Exporting the Bomb; Fuhrmann, Atomic Assistance. We differ by broadening the analysis from nuclear assistance to the overall strategic setting.
its support for the would-be proliferator. To understand net effect of the security environment on nuclear acquisition we must synthesize the interaction of these competing forces. Our theory sets out to do so, determining the strategic conditions more likely to result in nuclear acquisition.

The key to understanding nuclear proliferation is to characterize the attractiveness of nuclear weapons for the potential proliferator, the credibility of an enemy’s threat of preventive war, and that of an ally’s guarantee of protection. The remainder of this section explains this logic, uncovering different pathways whereby the strategic environment leads a potential proliferator to nuclear acquisition or forbearance. Specifically, we lay out two causal pathways leading to nuclear acquisition and three different mechanisms producing nuclear forbearance. (Figure 2 below lays out these pathways. In Section 5 below, we illustrate each of them using case studies.)

These pathways are shaped by four independent variables: the cost of a nuclear program, the level of threat faced by a potential proliferator, its relative balance of power vis-à-vis its enemies, and the presence of reliable security guarantees by a nuclear ally. Our dependent variable is a country’s nuclear status, which can go from non-nuclear to nuclear either through a nuclear test or by otherwise becoming an acknowledged nuclear power. The causal mechanisms connecting the independent variables to a state’s nuclear status run through two intervening variables: the cost of a preventive war and the net effect of proliferation.

For the purposes of our theory, an ‘enemy’ is a state that constitutes an independent and direct security threat to a state’s survival. Two states are independent direct security threats if they may decide to engage in war against the would-be proliferator without the support of each other and if they have different security disputes with the potential proliferator. These are the states against which a nuclear deterrent would provide additional security. These are also the states most likely to consider a preventive attack against the potential proliferator during the nuclear development phase. (See Appendix I for our codings of enemies in each historical case of nuclear development.) Similarly, an ‘ally’ is a state that has supported the would-be proliferator in past international crises against its enemies, regardless of whether the two possess a defense pact. We restrict our attention to nuclear allies because these are the most effective deterrers of a preventive counter-proliferation attack. (See Appendix I for explicit coding rules of allies in cases of nuclear development.)

Nuclear acquisition improves the security of a state vis-à-vis its enemies and its autonomy vis-à-vis its allies. To prevent it, both enemies and allies may use a variety of tools. We focus on the most powerful tools at their disposal: a threat of preventive war launched by the enemy and a credible commitment of protection extended by the ally. The efficacy of softer counter- and non-proliferation measures depends on the credibility of threats to use military force against or in support of the potential proliferator.

The potential proliferator’s willingness to develop nuclear weapons depends on whether they would yield security benefits. We call the value of the material resources necessary to develop nuclear weapons the ‘cost of a nuclear program’, which is our first independent variable. Whether an investment in nuclear

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35 The role of efforts to limit the supply of nuclear technology and materials, central to supply-side theories of
weapons would pay off also depends on our second independent variable, the presence of an enemy posing a significant threat. When a high-level security threat is present, nuclearization mitigates it through a shift the balance of power. We call this shift the effect of proliferation.

Putting together these two independent variables, a state is willing to proliferate only when a high-level security threat makes the effect of proliferation greater than the cost of a nuclear program. A relatively benign security environment, by making the effect of proliferation smaller than the cost of a nuclear program, undermines a state’s willingness to proliferate, explaining why most states never attempted to develop nuclear weapons. Likewise, an improvement in the security environment during the nuclear development phase would undermine the potential proliferator’s willingness to nuclearize, leading it to abandon its nuclear program. (Such was, we show below, the case of Sweden.)

If the potential proliferator faces a high-level security threat and therefore expects the effect of proliferation to be greater than the cost of a nuclear program, it will be willing to nuclearize. But willingness is a necessary condition for nuclear acquisition, it is not sufficient. Nuclear acquisition could be thwarted by preventive action by the enemy (either an actual war or a credible threat of attack) or made redundant by credible allies security assurances.

As supply-side theorists have pointed out, a state may be willing to proliferate and yet it may not ultimately acquire nuclear weapons because it lacks the opportunity to do so. Whether this will be the case depends on the credibility of enemy threats of preventive attack. By striking preventively, an enemy can avoid an adverse shift in the balance of power. Yet a preventive war is costly in both blood and treasure. We label the value of the resources destroyed in a preventive war the ‘cost of preventive war’, our first intervening variable. Combining the cost of a preventive war with the effect of proliferation, we introduce the second intervening variable in our theory, the ‘net effect of proliferation’.

When the deterioration in the enemy’s security outlook that would follow from nuclearization is smaller than the cost of a nuclear program, the net effect of proliferation is negative. The potential proliferator’s nuclearization would be, from the perspective of its enemies, less disadvantageous than fighting a war to prevent it. In this case, the threat of preventive war is not credible and the potential proliferator has the opportunity to nuclearize unimpeded. As the net effect of proliferation increases, however, the threat of preventive war gains credibility, reducing the likelihood of proliferation. Some states internalize this threat, refraining from pursuing nuclear weapons. Others launch a covert nuclear program hoping to remain undetected, and may suffer a preventive strike. Either way, a state willing to nuclearize may lack the opportunity to do so because of the high net effect of proliferation.

proliferation, factors into our framework by conditioning the cost of a nuclear program. See: Kroenig, Exporting the Bomb; Fuhrmann, Atomic Assistance.

Jacques Hymans argues that technical and managerial incompetence thwarted the nuclear ambitions of several states by slowing down their programs. See: Hymans, Achieving Nuclear Ambitions. In our view, technical hurdles may affect proliferation in two ways. First, they increase the cost of nuclear proliferation, making it less likely that the state deems the investment productive. Second, by delaying nuclear acquisition, they may facilitate nuclear forbearance if the security environment improves during the nuclear development period.

See: Kroenig, Exporting the Bomb; Fuhrmann, Atomic Assistance.

Although both covert nuclearization and a preventive strike are theoretically possible, only the latter outcome has, to our knowledge, materialized historically.
Herein lies a key difference between our theory and existing security accounts of proliferation. Beyond a certain point, the likelihood of proliferation decreases as its net effect increases. Certainly, a state’s willingness to nuclearize increases with the net effect of proliferation. This logic led security explanations to predict that a worsened security environment would make a state more likely to proliferate -- e.g., in response to proliferation by an enemy.\(^{19}\) Crucially, however, an enemy’s incentive to strike preventively also increases with the net effect of proliferation. The greater the effect of proliferation on the enemy’s security, relative to the cost of striking preventively, the greater the enemy’s incentive to launch an attack. Since any potential proliferator must go through a relatively vulnerable period of nuclear development, the enemy has the advantage: it can launch an attack before the moment of nuclearization. Therefore, the enemy’s interest trumps that of the potential proliferator and the likelihood of nuclearization decreases.

Figure 1 below illustrates how the relationship between the effect of proliferation, the cost of a nuclear program, and the cost of preventive war influences the nuclear status of the potential proliferator. When the effect of proliferation is smaller than both these costs -- Zone 1 -- a state would have the opportunity to proliferate but is unwilling to do so. When the effect of proliferation is greater than both these costs -- Zone 3 -- a state would be willing to proliferate but does not have the opportunity to do so. It is only when the effect of proliferation is greater than the cost of a nuclear program but smaller than the cost of preventive war -- Zone 2 -- that a state has both the willingness and opportunity to proliferate, and proliferation is likely to occur.

![Diagram](image)

**Figure 1. Willingness and Opportunity Thresholds of Proliferation\(^{40}\)**

The next step in unpacking the causal logic in our theory is to look at what determines the net effect of proliferation. The key determinant of the net effect of proliferation for potential proliferators not protected by a nuclear ally is our third independent variable: the \textit{ex ante} balance of power between the potential proliferator and its enemies.

The \textit{first causal pathway to proliferation} is triggered when the balance of power favors the potential proliferator, making the net effect of proliferation low. Since the potential proliferator already enjoys high \textit{ex ante} relative power vis-à-vis its enemy, nuclearization would produce a relatively smaller benefit for its security and, conversely, the enemy would see a relatively smaller loss in its own security. Moreover, the


\(^{40}\) We depict the cost of a nuclear program as being smaller than the cost of preventive war, the most likely empirical situation. When the opposite is true, proliferation never occurs.
higher \textit{ex ante} relative power of the potential proliferator makes preventive war more costly. This lowers the credibility of threats of preventive war, making strong states more likely to proliferate unimpeded whenever they are willing to do so. Among states not protected by nuclear allies, then, the combination of a high-level security threat and high relative power constitute a sufficient condition for proliferation. (Such was, we show below, the case of the Soviet Union.)

When, on the contrary, the \textit{ex ante} balance of power favors the enemies of the potential proliferator, the net effect of proliferation high. Nuclear weapons would vastly improve the security outlook of the potential proliferator and worsen that of its enemies. At the same time, the potential proliferator’s \textit{ex ante} relative weakness makes preventive war relatively less costly. Consequently, preventive war is more likely to be a rational option against a relatively weak potential proliferator.\textsuperscript{41} This, in turn, boosts the credibility of threats of preventive war, making relatively weak states unprotected by a nuclear ally unlikely to nuclearize. (Such was, we show below, the case of Iraq.)

Nuclear acquisition among relatively weak states therefore depends on the second determinant of the net effect of proliferation: whether or not the potential proliferator possesses a reliable security guarantee from a (nuclear) ally, which is also the fourth and last independent variable in our theory. An ally willing to support the potential proliferator “replaces” high relative power by increasing the cost of preventive war, thereby lowering the net effect of proliferation. As such, the presence of an ally committed to the potential proliferator’s defense increases a state’s opportunity to proliferate. Yet, the presence of a nuclear ally does not impact only the net effect of proliferation. It may simultaneously reduce the potential proliferator’s willingness to acquire nuclear weapons. If the potential proliferator can rely on its ally, it need not acquire an independent nuclear deterrent.

These two countervailing dynamics may nullify the overall statistical effect of alliances on nuclear acquisition.\textsuperscript{42} Nevertheless, a nuclear ally has an important effect in shaping the odds of proliferation. To understand its effect, we must characterize the conditions that determine the relative strength of the two competing effects of an alliance: on the one hand, it lowers the net effect of proliferation, increasing a state’s opportunity to nuclearize; on the other, it lowers the effect of proliferation on the security of the potential proliferator, decreasing its willingness to proliferate. Under which conditions does each of these dynamics trump the other?

If the ally’s commitment to the potential proliferator’s security is entirely credible, the latter will have no willingness to nuclearize. A fully credible commitment by a nuclear ally reduces the effect of proliferation to the point at which it becomes lower than the cost of a nuclear program, removing the core incentive behind a state’s willingness to nuclearize. Since willingness is, as we saw, a necessary condition for nuclearization, proliferation will not occur.

Nuclear acquisition by a relatively weak state with a nuclear ally will therefore only happen if the ally’s commitment to support the potential proliferator is not entirely credible. Specifically, a state that possesses a nuclear ally credibly committed to the defense of its territory may entertain two types of doubt about the credibility of its ally’s overall commitment to its security. Either is sufficient to trigger the second causal pathway to proliferation.

\textsuperscript{41} See: Debs and Monteiro, “Known Unknowns.”

One possibility is that the potential proliferator trusts its ally’s commitment to ensuring its present survival but doubts its long-term reliability because the expected evolution of the security environment is likely to decrease the value of the alliance for its patron. If the potential proliferator possesses a nuclear ally committed to its present security but doubts the continuation of this protection, proliferation is likely to occur. (This was, we show below, the case of Pakistan.) At the same time, if the potential proliferator doubts the long-term reliability of its ally’s support, steps taken by the latter to reassure it of its continued commitment may result in nuclear forbearance. (Such was, we show below, the case of South Korea.)

The other possibility is that the potential proliferator trusts its ally’s commitment to its (present and future) survival but possesses broader security interests its ally is unwilling to guarantee. Whenever the pursuit of these broader security interests may trigger high-level threats to the potential proliferator that its ally is unwilling to placate, nuclear acquisition could help it pursue these goals by giving it the ability to placate such threats independently. (Such was, we show below, the case of France.) According to this logic, the wider the range of security goals of the potential proliferator that an ally does not protect, the higher the likelihood of nuclearization.

To summarize, nuclear proliferation is possible only in a limited number of strategic settings. Specifically, the potential proliferator must face a grave security threat combined with: (i) high ex ante relative power; (ii) doubts about the future protection of its territory by an ally; or (iii) doubts about the commitment of an ally to its broader security interests. Neither weak states without an ally nor those that possess an ally reliably willing and able to guarantee their broader security interests should be expected to proliferate. Figure 2 below summarizes the strategic logic of nuclear proliferation.

![Figure 2. The Strategic Logic of Nuclear Proliferation](image-url)

Our theory highlights how nuclear acquisition requires that a state overcome both willingness and opportunity thresholds. When a threat is sufficiently grave that the effect of nuclear acquisition on the
potential proliferator’s security is greater than the cost of a nuclear program, the willingness threshold to proliferation is overcome. Nuclear possession, however, might be made redundant by credible security assurances from an ally or significant improvements in the security environment during the period of nuclear development. Either of these would place the potential proliferator back below the willingness threshold and lead it to abandon its nuclear ambitions.

At the same time, whereas overcoming a willingness threshold is a necessary condition for nuclear acquisition, it is not sufficient. A state might be willing to proliferate and yet not have the opportunity to do so. When the effect of nuclear acquisition on the security of the potential proliferator’s enemies is greater than the cost of preventive war, acquisition will be thwarted by preventive action by the deterrer -- either an actual war or a credible threat -- placing the potential proliferator below the opportunity threshold. In order to overcome this threshold, a state must either possess high relative power or benefit from the protection of an ally, thereby raising the cost of preventive war. If the opportunity to proliferate is created by an allied security guarantee, however, a state will only be willing to pursue this opportunity if that guarantee is unlikely to last or cover all of the potential proliferator’s core security needs. In short, states protected by reliable nuclear allies do not have the willingness to proliferate. Weak states do not possess the opportunity.

For a formal statement of our theory using a game-theoretic model, see Appendix II [included in the supplemental materials].

4. Empirical Patterns of Nuclear Proliferation

This section tests our theory against the empirical record on proliferation. Our first hypothesis is that the presence of a significant security threat is a necessary condition for nuclear acquisition. Our second hypothesis is that, when such a threat is present, proliferation happens when a state is strong or possesses an ally that it deems prospectively unreliable.

To test our first hypothesis we identify the set of significant security threats against which potential proliferators might perceive the acquisition of nuclear weapons to bring a benefit. First we gauge a state’s interest in nuclear weapons by asking whether it reaches the stage of nuclear exploration. Exploration is a


44 For a definition of ‘exploration’ see page 6 above. We use Sagan’s canonical list to identify cases of nuclear exploration. See: Sagan, “The Causes of Nuclear Weapons Proliferation.”
low threshold, which does not presuppose a significant investment towards nuclear acquisition. Second, we identify, for each of these states, their independent and significant security threats: states that may engage in war against the potential proliferator independently of each other, possibly caring about different security issues. In sum, we say that a state has a significant security threat against which nuclear weapons might produce a positive effect only if we can identify at least one independent and significant security threat and it reaches the stage of nuclear exploration.

We can then test the first prediction of our theory, i.e., that nuclear acquisition occurs only when the state has a significant security threat. We find that this is indeed the case. More broadly, twenty-eight of the thirty-one recorded cases of nuclear development also involved a significant security threat. The three exceptions are Argentina, Brazil, and Romania. In our view, the fact that these countries did not possess a significant threat explains why their nuclear-weapons programs progressed slowly and ultimately did not come to fruition.

Having established empirically that a positive effect of proliferation is a necessary condition for states to have a willingness to nuclearize, we now turn to the effect of relative power and security alliances in conditioning the odds of nuclear acquisition among states that are willing to acquire nuclear weapons. We start by organizing all cases of nuclear development according to these two variables. To measure relative power, we follow quantitative studies in using the COW dataset, more specifically the military expenditure variable. To measure alliances, we construct our own coding. The quantitative literature typically favors formal treaties. Such a restrictive definition may miss important alliance dynamics that occur in the context of informal security pledges, however. For example, in 1957 Israel received private assurances from the United States, which refused to formalize them. Implicit U.S. support, along with Israel’s doubts about its reliability, were important dimensions of the strategic environment in the run-up to Israel’s nuclearization. To obviate such problems, we create a new index of alliances for all cases of nuclear development, approximating the expected behavior of nuclear powers by looking at their behavior during

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45 Our use of nuclear exploration to identify potential proliferators does not mean that we ‘select on the dependent variable,’ which is nuclear acquisition. In order to identify the effect of relative power and alliances, we need to be able to identify significant security threats, so that we can measure a state’s relative power vis-à-vis these threats. The inclusion in our analysis of states that did not explore the nuclear option would not change the ‘direction’ of the effect of relative power and alliances on the acquisition of nuclear weapons, though it could change the ‘magnitude’ of that effect.


47 We know of no literature identifying a security motivation behind Romania’s nuclear exploration. Although Argentina and Brazil are often portrayed as the security threat behind each other’s nuclear program, this perception is unjustified. The two cooperated extensively in their quest to master nuclear technology, which was aimed at ensuring national autonomy. (See case synopses in Appendix I.)

48 See footnote 36 above.


50 Singh and Way, “The Correlates of Nuclear Proliferation;” Jo and Gartzke, “Determinants of Nuclear Weapons Proliferation.”

past crises, using the ICB dataset.\textsuperscript{52} We also record whether the alliance is formal or not using the ATOP v3.0 alliance dataset.\textsuperscript{53} We include the nuclear allies of both the potential proliferator and its enemies. This decision is justified by the nature of nuclear weapons, which provide added security in worst-case scenarios. We focus on the three years leading up to nuclear acquisition or abandonment.\textsuperscript{54} (A detailed coding protocol plus synopses of all cases of nuclear development can be found in Appendix I.) Tables 1 and 2 below present our results.

<table>
<thead>
<tr>
<th>Relative Power</th>
<th>Nuclear Ally</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td></td>
<td>United States (1942-45)</td>
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</tr>
<tr>
<td></td>
<td>Algeria (1983-93)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Iran (1984-)</td>
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<td></td>
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<tr>
<td></td>
<td>Iraq (1972-91)</td>
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<td>Sweden (1954-69)</td>
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<td>Switzerland (1946-69)</td>
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<tr>
<td></td>
<td>Syria (2001-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
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<td>Yugoslavia (1954-61)</td>
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<td>Yugoslavia (1974-87)</td>
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<td></td>
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<tr>
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<td>Australia (1967-72)</td>
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<td>China (1955-64)</td>
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<td>India (1954-74)</td>
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<td>Iran (1974-78)</td>
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<td>Israel (1949-67)</td>
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<td>North Korea (1963-2006)</td>
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<td></td>
<td>Pakistan (1972-90)</td>
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<td>United Kingdom (1945-52)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>West Germany (1957-58)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Strategic Patterns of Nuclear Proliferation\textsuperscript{55}

\textsuperscript{52} See: Michael Brecher and Jonathan Wilkenfeld, \textit{A Study of Crisis} (Ann Arbor, MI: University of Michigan Press, 2000).
\textsuperscript{54} We do not consider earlier adversaries, such as West Germany as an enemy of French proliferation prior to 1955 or Iraq as an enemy of Iranian proliferation between 1984 and 2003.
\textsuperscript{55} Sources: Case list and program dates from: Sagan, “The Causes of Nuclear Weapons Proliferation.” We omit Brazil and Romania for lack of a clear security threat during their nuclear programs. For start dates of nuclear powers’ development phase, unavailable in Sagan, we use: Christopher Way, “Nuclear Proliferation Dates,” unpublished document, 2011, available at: http://falcon.arts.cornell.\textit{edu/crw12/}. Way’s case list incorporates two not included by Sagan: Argentina and Indonesia. We omit Argentina for lack of a clear security threat. We also do not include Indonesia in our analysis because, although it publicly announced its intention to acquire nuclear weapons between late 1964 and mid-1965, it did not appear to have considered any investments in nuclear technology. We calculate relative power based on the military expenditures component of the CINC index taken from the COW NMC v4.0 dataset. See: Singer, “Reconstructing the Correlates of War Dataset.” Specifically, we divide the military expenditures of each potential proliferator by those of its enemies (and the enemies’ nuclear allies) for the three years leading up to nuclear acquisition or abandonment of nuclear program. (The following are exceptions due to lack of
<table>
<thead>
<tr>
<th>Country</th>
<th>Period of Nuclear Development</th>
<th>Enemies</th>
<th>Nuclear Allies</th>
<th>Relative Power</th>
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</thead>
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<td>Libya+Morocco{US}</td>
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</tr>
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<td>Argentina</td>
<td>1968-90</td>
<td>---</td>
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<td>Indonesia+China[USSR]</td>
<td>[US]</td>
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</tr>
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<td>1967-72</td>
<td>China[USSR]</td>
<td>[US]</td>
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</tr>
<tr>
<td>Brazil</td>
<td>1953-90</td>
<td>---</td>
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<td>Taiwan+US</td>
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<td>1953-67</td>
<td>Israel{France+UK+US}</td>
<td>[USSR]</td>
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<td>France</td>
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<td>USSR</td>
<td>[UK+US]</td>
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<tr>
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<tr>
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<td>---</td>
<td>0.01</td>
</tr>
<tr>
<td>Syria</td>
<td>2001-</td>
<td>Israel+US</td>
<td>---</td>
<td>0.00</td>
</tr>
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<td>Taiwan</td>
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<td>[US]</td>
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</tr>
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<td>1987-88</td>
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<td>{US}</td>
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<td>---</td>
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<td>---</td>
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<td>Yugoslavia</td>
<td>1974-87</td>
<td>USSR</td>
<td>---</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**Table 2. Adversaries and Allies in Cases of Nuclear Exploration**

The first pattern we observe in the spread of nuclear weapons is that only two types of states have acquired them: strong states and weak states allied with a nuclear state they deem untrustworthy.

When the potential proliferator has no nuclear ally (left column of Table 1), the net effect of proliferation depends on the ex ante balance of power. When relative power favors the state exploring nuclear weapons (top-left cell of Table 1), the net effect of proliferation is low. In this case, the threat of a preventive strike data in the COW NMC v4.0 dataset: Data for Iran and Syria based on 2005-07, the latest available years. Data for North Korea based on 2001-03, the latest available years. Data for Angola 1977-78 and Libya 1993 not available, replaced by the average of the closest preceding and succeeding years for which data is available. We code a country as having “High” relative power when its military expenditures are greater than those of its enemies and their nuclear allies combined; and “Low” otherwise. For coding rules on enemies and allies as well as short vignettes describing how we implemented these rules in each case, see Appendix I. Bold underlined cases note nuclear acquisition.

Note: Allies noted as [Ally] if there is a formal defensive alliance and {Ally} if not. See also note on Table 1 on sources and coding decisions.
is not credible, letting the target proliferate undeterred. This dynamic describes nuclear acquisition by the United States and the Soviet Union.

When, on the contrary, the ex ante balance of power favors the potential proliferator’s enemies (bottom-left cell of Table 1), the net effect of proliferation is high. In this case, threats of preventive military action are credible, making proliferation unlikely. In fact, none of the eight states in this situation acquired nuclear weapons. Two -- Iraq and Syria -- launched a program hoping it would go undetected and suffered a preventive strike. Five others -- Algeria, Libya, Sweden, Switzerland, and Yugoslavia -- abandoned their nuclear programs due to changes in their strategic environment that made an investment in nuclear weapons no longer productive. Iran’s program is ongoing, so we discuss it in the conclusion.

Comparing the bottom-left to the bottom-right cells of Table 1, we assess the effect of security alliances on nuclear acquisition. When a state is relatively weak, the effects produced by a nuclear ally depend on the reliability of the latter’s security guarantees. States with a reliable nuclear ally, as we saw, are likely to drop their nuclear ambitions. Such was the case of Australia, Italy, South Korea, Taiwan, and West Germany, states to which the United States was strongly committed through public security assurances and, often, peacetime armed-forces and nuclear-weapons deployments. As we also saw, when the protégé fears future abandonment or possesses security interests its ally is not willing to protect, proliferation is likely. China, India, Israel, Pakistan, and South Africa all deemed their nuclear allies unreliable guarantors of their long-term survival. This led them to acquire nuclear weapons. France and the United Kingdom, for their part, nuclearized because, while they deemed U.S. commitment to their survival to be reliable, they also deemed the United States an unreliable guarantor of their overall “vital interests,” which they defined quite broadly. In sum, the historical record on nuclear acquisition dovetails well with our theory’s empirical implications.

Our theory can also account for a second important pattern: the decline in the rate of proliferation since the end of the Cold War. Whereas during the Cold War one new state entered the nuclear ranks every five years on average, since its end almost two-and-a-half decades ago only two states went nuclear: Pakistan in 1990 and North Korea in 2006. Moreover, the number of active nuclear programs decreased significantly in the post-Cold War, such that today only two states are suspected of pursuing nuclear weapons: Iran and Syria.

In our view, the end of the Cold War had two effects on proliferation. First, it ameliorated the security environment for U.S. allies and friendly states, thereby lowering the expected effect of nuclearization on their part. Argentina and Brazil, for instance, decided to end their nuclear programs in 1990. Since neither

57 In fact, so did their enemies. Egypt was about to target Israel’s nuclear facilities when, discovering this, Israel preempted it, starting the Six Day War. In at least two other instances enemies inquired whether the potential proliferator’s nuclear ally would oppose a preventive strike. In 1964, National Security Advisor McGeorge Bundy asked Soviet ambassador Dobrynin whether Moscow would countenance U.S. preventive action against China. See: Avery Goldstein, Deterrence and Security in the 21st Century: China, Britain, France and the Enduring Legacy of the Nuclear Revolution (Stanford, CA: Stanford University Press, 2000), p. 106. In the 1970s, it appears that Moscow may have asked for U.S. assistance in a preventive attack against South Africa’s nuclear program. See: David Albright, “South Africa and the Affordable Bomb,” The Bulletin of the Atomic Scientists, Vol. 50, No. 4 (1994), p. 42. Neither request was accepted.


59 Although it is unlikely that Syria has continued its nuclear exploration since the onset of its civil war in 2011, we prudently include its case.
country expected a direct attack from each other, the level of strategic threat they faced was not especially high. By further dampening it, the end of the Cold War undermined the willingness of both countries to proliferate. Likewise, South Africa, which had developed nuclear weapons to counter the threat of Communism, terminated its program shortly after the end of the Cold War, producing the only case of nuclear disarmament to date.\footnote{See case synopses for all three countries in Appendix I.}

Second, the end of the Cold War limited the potential costs of U.S.-launched preventive wars, boosting the credibility of U.S. threats of military action and decreasing the likelihood of nuclearization among non-U.S. allies. As we show below, the United States was able to impose crippling sanctions against Iraq that effectively terminated its nuclear-weapons program. After the U.S.-led invasion of Iraq in 2003, Libyan leader Muammar Qaddafi ended his nuclear program, confiding: “I will do whatever the Americans want, because I saw what happened in Iraq, and I was afraid.”\footnote{Cited in David D. Palkki and Shane Smith, “Contrasting Causal Mechanisms: Iraq and Libya,” in Sanctions, Statecraft, and Nuclear Proliferation, ed. Etel Solingen (Cambridge: Cambridge University Press, 2012), pp. 272-273.} Syria, for its part, has its nuclear reactor reportedly struck preventively by a U.S. ally, Israel, in 2007.\footnote{See: David Makovsky, “The Silent Strike: How Israel Bombed a Syrian Nuclear Installation and Kept it Secret,” \textit{The New Yorker}, September 17, 2012.}

Combined, these two effects account for why, despite claims to the contrary,\footnote{See: Jo and Gartzke, “Determinants of Nuclear Weapons Proliferation,” p. 187.} proliferation has slowed down with the emergence of U.S. power preponderance. More generally, they show the different paths to nuclear forbearance we laid out in the previous section at work. Changes in the security environment can affect the potential proliferator’s strategic calculus, undermining its willingness or opportunity to nuclearize, and ultimately leading states once perceived as proliferation risks to drop their nuclear ambitions.

5. Historical Cases

We now turn to six historical case studies to trace the strategic dimension of the proliferation process. Each of these cases exemplifies a different path to proliferation or forbearance. We first lay out three cases of nuclear acquisition. The Soviet Union illustrates our first causal pathway to proliferation: high threat and high \textit{ex ante} relative power. France and Pakistan show the second causal pathway to proliferation at work: high threat and prospectively unreliable security guarantees from a nuclear ally. We then turn to three cases of nuclear forbearance. Sweden illustrates how a state that initiates a nuclear program may ultimately abandon its willingness to nuclearize as a result of improvements in its threat environment. The South Korean case shows how a firm security commitment by a nuclear ally may also lead to nuclear abandonment despite a high level of threat. Finally, the case of Iraq highlights how a relatively weak state without a nuclear ally is unlikely to have the opportunity to proliferate.

5.1. U.S.S.R. (1945-49)

On August 29, 1949, the Soviet Union tested a nuclear device, ending the U.S. nuclear monopoly. Soviet nuclear proliferation exemplifies the first causal path to proliferation laid out in Figure 2. As a strong state facing a high-level security threat because of its security competition with the United States during the early Cold War, the Soviet Union had both the opportunity and the willingness necessary for nuclear acquisition.
The United States had known about the Soviet program since at least 1945 when, reacting to Hiroshima, Stalin mentioned it to the U.S. ambassador in Moscow.\(^64\) Stalin could afford his openness because of the tremendous costs a U.S. preventive strike would have, making it unlikely. In May 1949, analyzing the possibility of a covert U.S. attack on China -- a much weaker target -- Stalin wrote: “The material conditions for an attack, for unleashing war, do not exist. … America is less ready to attack than the U.S.S.R. to repulse an attack.”\(^65\) This assessment also accounts for U.S. acquiescence to Soviet proliferation. Truman understood -- as did Stalin -- that, compared with the effect of Soviet nuclearization, a preventive strike was too costly to make sense. Both Soviet and U.S. leaders understood that the while Soviet proliferation would be productive, its net effect would be low.

A U.S. strike would be costly because, to begin with, U.S. intelligence on Soviet nuclear facilities was poor, a problem compounded by Soviet secrecy about their location.\(^66\) This prevented the construction of a target-set that would enable a surgical strike.\(^67\) As a result, any preventive attack would have to target the entirety of the Soviet state.

Such a wide-ranging operation was beyond U.S. reach, however. During the early nuclear era, “the nation's stockpile [of nuclear weapons] and delivery capability were extremely limited. There were only two weapons…at the end of 1945, nine in July 1946, thirteen in July 1947, and fifty in July 1948. None of these weapons was assembled.”\(^68\) By the time the Soviets tested their nuclear device, the United States arsenal had fewer than 200 bombs.\(^69\) Combined with a shortage of nuclear-able bombers and crews trained to operate them,\(^70\) this left the United States unable to destroy the Soviet Union.\(^71\) In fact, U.S. "war plans

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\(^67\) Moreover, some see in the lack of accurate intelligence about Soviet progress the reason why Washington never launched an attack. (See: See: Bas and Coe, “Arms Diffusion and War.”) True, even by 1949 U.S. decisionmakers thought that a Soviet nuclear test was at least than five years away. (See: “CIA Intelligence Memorandum 225;” Holloway, *Stalin and the Bomb*, p. 220.) But this line of reasoning suffers from two shortcomings. First, U.S. decisionmakers knew that estimates of Soviet progress were “five percent information and ninety-five percent construction” (David Lilienthal, chairman of the Atomic Energy Commission in control of U.S. nuclear weapons, quoted in Michael S. Goodman, *Spying on the Nuclear Bear: Anglo-American Intelligence and the Soviet Bomb* (Stanford, CA: Stanford University Press, 2007), p. 28.) This led the military to prepare war plans as early as October 1945 and important voices in Washington to argue for a strike as early as January 1946. (See: Buhite and Hamel, “War for Peace,” p. 374.) Poor intelligence, then, did not necessarily lead to arguments in favor of attacking at a later moment. Second, and more importantly, this argument assumes that, had Washington correctly anticipated Soviet nuclearization, an attack would have happened. We believe that given, the its high costs, an attack would have been unlikely even if U.S. decisionmakers had been unanimous convinced of the imminent of Soviet nuclearization. Lack of accurate intelligence, in sum, cannot explain the absence of a strike.


consistently demanded more bombs than existed in the U.S. arsenals well into the 1950s. U.S. nuclear capabilities were insufficient to prevent Soviet nuclearization.

Any preventive strike would therefore necessarily entail a conventional invasion of the Soviet Union, which meant an extremely costly and potentially protracted fight. Additionally, without a quick victory in sight, this attack would invite massive Soviet retaliation. Given the quick post-World War II U.S. demobilization, the balance of conventional forces in Eurasia heavily favored the Soviets. A 1949 report on the consequences of a preventive attack on the Soviet Union therefore concluded that even if U.S. forces advanced as planned, “the capability of Soviet armed forces to advance rapidly into selected areas of Western Europe, the Middle East, and the Far East would not be seriously impaired.” In short, a preventive strike on the Soviet nuclear program was simply too costly to be a viable option and would bring about a geopolitical outcome the Soviets were unlikely to achieve even after their own nuclearization.

Taking stock, our argument can account for both the Soviet public decision to develop nuclear weapons and the U.S. decision not to attack it preventively. Seen through the lens of our strategic theory, the threat to Soviet survival posed by competition with a nuclear-armed United States induced Moscow’s willingness to nuclearize. Soviet opportunity to acquire nuclear weapons, for its part, derives from the extremely high cost of a U.S. preventive attack, which led Washington to countenance Moscow’s nuclear ambition.

5.2. France (1946-60)

France’s nuclearization illustrates the second causal pathway to proliferation laid out above in Figure 2. France was willing to acquire nuclear weapons because it possessed broader security interests that its nuclear ally, the United States, did not share and was therefore unwilling to guarantee. At the same time, France had the opportunity to proliferate because it benefited from U.S. protection of French territory while it developed nuclear weapons.

French nuclear exploration started in 1946 and culminated with the first test of a French nuclear weapon in 1960. Its quick progress in the 1950s is inextricably connected to French growing skepticism about the reliability of U.S. security guarantees. Specifically, French nuclearization was prompted by two developments during the 1950s.

No. 5 (1982), p. 29.
71 See: Rhodes, *Dark Sun*, p. 226.
73 The cost of preventing Soviet nuclearization by force was such that it raised moral concerns. After the Soviet test, President Truman himself justified not having launched a preventive strike by saying: “Such war is the weapon of dictators, not of free democratic countries like the United States.” (Harry S. Truman, “Radio and Television Report to the American People on the Situation in Korea, Sept. 1, 1950,” Public Papers of the Presidents, Harry S. Truman, 1945-1953.) Moral arguments, however, do not explain the absence of an attack, since they were also used by those who supported it. In fact, “preventive war thinking was surprisingly widespread in the early nuclear age.” (Marc Trachtenberg, “Preventive War and U.S. Foreign Policy,” *Security Studies*, Vol. 16, No. 1 (2007), pp. 4-5.)
First, in 1954 NATO adopted the New Look Policy of automatic massive atomic retaliation in response to a hypothetical Soviet invasion of Western Europe, decreasing the value of French conventional forces, and boosting the case made that only nuclearization would reestablish France to the major-power club. Then, in October 1957, Sputnik demonstrated the Soviets’ ability to target the U.S. mainland with a nuclear warhead, leading to a reevaluation of NATO nuclear strategy, “whereby a massive retaliation against Soviet cities thereafter would be seen only as a last resort option.” As de Gaulle would later put it to President Kennedy, this meant “the United States would use nuclear weapons only if its own territory was directly threatened.” France needed its own nuclear deterrent.

Second, the Indochina and Suez crises of 1954 and 1956 highlighted sharp divergence in global interests between Washington and Paris, making French leaders anxious about their strategic dependency on the United States and convincing Paris of the need for an independent nuclear capability.

In the spring of 1954, fighting to maintain French rule over Indochina, French troops landed at Dien Bien Phu. To counter a Viet Minh attack, they required American air support. President Eisenhower, however, declined support them, virtually guaranteeing a French defeat and exposing the inadequacy of alliances in protecting French global interests. French military leaders were convinced that tactical nuclear weapons might have avoided their demise at Dien Bien Phu. Furthermore, defeat in Indochina exemplified how the Soviet threat might manifest itself through sponsored independence movements rather than an assault on Western Europe. This made nuclear weapons necessary both to deter Soviet support to these movements and to secure the mainland if the French conventional military were forced to fight them overseas. Before the year was over, French Premier Mendès France made the key decision to advance towards building an atomic bomb.

Two years later, Washington again undermined Paris’s pursuit of its foreign-policy aims. In July 1956, Egyptian President Nasser nationalized the Suez Canal. In late October France and Britain launched an operation to support Israel in recapturing it. A week later, the Soviets threatened nuclear attack on all three. At this point, Washington threatened Moscow with retaliation against nuclear attacks on Britain or

77 For a dissenting view, see: Hymans, The Psychology of Nuclear Proliferation, p. 95.
82 See: Ibid., p. 32-33.
France while coercing its allies to end hostilities. Soon they capitulated to U.S. pressure. De Gaulle immediately concluded that “American nuclear power does not necessarily and immediately meet all the eventualities concerning France and Europe.” Premier Mollet directed his defense minister “to start at once on a clearly defined French nuclear program” and study “strategic questions and nuclear weapons.”

By 1958, with Washington publicly supporting national independence movements, the Fourth Republic disintegrated over violence in Algeria. France “found herself terribly alone.” Its possessions in North Africa, the Mediterranean, and the DOM-TOM were considered vital interests, integral to the “metaphysical survival” of the nation. Washington, however, considered that French overseas operations “seriously weakened the [NATO] alliance.” The United States therefore offered to protect only the French mainland from unprovoked attack, undermining French goals in Africa.

Against this strategic backdrop, Premier Gaillard authorized production of a nuclear explosive device. When de Gaulle took over in June 1958, the program was on track for a nuclear test in early 1960. Faced with a French request for nuclear assistance, Secretary Dulles refused it, invoking the potential for strategic instability generated by proliferation among its allies. In a June 30, 1958, meeting, Dulles added that Washington was committed to the defense of the “free world … on terms that would deny nuclear power where it might be subject to possible irresponsible use.” Resenting the implication, France withdrew from NATO’s military structure in 1959, and on February 13, 1960 France tested its first nuclear weapon.

Throughout its nuclear development period, France remained under the U.S. umbrella, avoiding the threat of preventive action from the Soviet Union. As politicians in both Paris and Moscow were aware, French nuclearization did not increase the overall threat faced by the Soviets. It merely complicated Moscow’s calculus when its actions impacted French interests not shared by Washington. Seen from Moscow, the effect of French nuclearization was relatively low. In contrast, a counter-proliferation attack on France would be extremely costly, risking a nuclear exchange between the superpowers. This low anticipated net

87 Quoted in Kohl, *French Nuclear Diplomacy*, p. 191. This quote further undermines Hymans’ argument about the high credibility of U.S. guarantees during France’s nuclear development. (See footnote 79 above.)
88 Reed and Danny B. Stillman, *The Nuclear Express*, p. 75.
89 Kohl, *French Nuclear Diplomacy*, p. 44.
93 See: Idem., p. 558.
95 See: Ibid., p. 357.
97 Ibid., pp. 65-66.
effect of French nuclearization helps explain Moscow’s accommodating posture towards French nuclear ambitions.  

In sum, France nuclearized to guarantee its ability to secure its own homeland while pursuing its interests abroad. An independent *force de frappe* boosted Paris’s ability to further its goals in at least three ways. First, it made clear to the Soviet Union that any threat of attack on the French homeland would be met with a nuclear retaliation. Second, it immunized Paris against nuclear coercion when pursuing its interests abroad. Finally, it freed up French conventional forces to pursue global goals while guaranteeing the mainland’s security. As de Gaulle put it, it was “the only effective way of ensuring [France’s] territorial integrity and political independence.”

5.3. Pakistan (1972-1990)

Like France, Pakistan illustrates the second causal pathway to proliferation laid out in Figure 2 above. Pakistan nuclearized because, faced with the threat posed by its powerful rival, India, it had profound doubts about the long-term reliability of its ally, the United States.

Pakistan’s foreign policy since its independence 1947 has been mainly aimed at deterring India, its stronger neighbor and adversary. To this end, Pakistan obtained security guarantees and conventional weapons from the United States, which in 1959 “undertook to preserve the ‘independence and integrity of Pakistan.’” Pakistani leaders at the time were convinced that the West “would provide Pakistan the security it needed against perceived Indian threats.”

To the Americans, Pakistan was seen as a bulwark against the spread of Communism while providing a convenient base for intelligence operations on the Soviet Union and China. U.S. support for Pakistan, however, seemed contingent on broader geostrategic developments. When China invaded India in October 1962, Washington quickly offered aid to Delhi, generating a “growing sense of uneasiness” in Islamabad. Moreover, the advent of reconnaissance satellites and ICBMs, reduced the importance of access to Pakistani territory for the United States.

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100 Quoted in Goldstein, *Deterrence and Security in the 21st Century*, p. 181. Some authors argue that France nuclearized in order to boost its prestige and status. (See: Heuser, *Nuclear Mentalities*, pp. 100-101.) In our view, Paris tied French status to specific strategic goals, the pursuit of which, in the absence of specific U.S. support and given the Soviet threat, required a nuclear arsenal. This explains why, unlike most other (presumably also status-seeking) countries, France nuclearized.

Apprehensions over the possible unreliability of American support materialized in the 1965 and 1971 Indo-Pakistani wars. The war of 1965 was fought over the control of Kashmir, which did not represent a core security interest for the United States. Washington remained neutral and after the conflict imposed a ban on arms transfers to both sides as “punishment for the war,” in practice delivering a more serious blow to Pakistan, which was reliant on U.S. military aid. Then, in 1971, while Pakistan was defeated by India, eventually losing control of East Pakistan (Bangladesh), Washington responded by sending an aircraft carrier to the Bay of Bengal, a move seen in Islamabad as largely symbolic.

Feeling abandoned by its ally, Pakistan decided to press forward with an independent nuclear-weapons program in January 1972. The Pakistani leader, Zulfikar Ali Bhutto, had earlier warned that Pakistan would get its own nuclear weapons in response to India’s nuclearization: “[e]ven if Pakistanis have to eat grass, we will make the bomb.” In May 1974, India successfully detonated a nuclear bomb, and Bhutto pledged that he would “never let Pakistan be a victim of nuclear blackmail.” In practice, this meant that Islamabad had to accelerate its nuclear program, incipient since the mid-1950s, and give it a decidedly military goal.

The difficulty was that a military program could be detected by the United States, which was likely to oppose it out of concern that Pakistani nuclear acquisition would augment the risks of conflict with India. In fact, U.S. pressure would soon be noticeable. When, in 1976, Islamabad concluded an accord with France aimed at purchasing a nuclear reprocessing plant, Washington got Paris to include safeguards aimed at ensuring that the plutonium would not be diverted to military purposes. By 1978, France was pressured by the United States to cancel the agreement. At the same time, the U.S. Congress approved legislation aimed at limiting the spread of nuclear weapons. Passed in June 1976, the Glenn-Symington Amendment prohibited military and economic aid to any country importing unsafeguarded nuclear materials, equipment, or technology. In 1978, Congress passed the Nuclear Nonproliferation Act, further limiting the transfer of peaceful nuclear technology even to allies. More directly, Washington suspended all military and economic aid to Pakistan after the 1977 coup that brought General Zia to power. At the same time, the Carter administration overrode the Nuclear Nonproliferation Act to allow for the shipment of nuclear fuel to India. U.S. support for Pakistani security goals seemed to be all but vanishing.

As it happened, Pakistan’s fortunes improved significantly with the December 1979 Soviet invasion of

110 Khan, Eating Grass, p. 118.
112 Armstrong and Trento, America and the Islamic Bomb, pp. 60, 77.
neighboring Afghanistan. In Washington, Pakistan was now seen as a “frontline state” that could help turn Afghanistan into a “Soviet Vietnam.”\textsuperscript{115} The United States quickly lifted economic sanctions aimed at Islamabad and resumed military aid.\textsuperscript{116}

Suspicious that U.S. support would last only for the duration of the Afghanistan conflict, Pakistan advanced rapidly with its nuclear-weapons program during the 1980s.\textsuperscript{117} This progress worried the U.S. Congress, but not the executive branch, which was more interested in protecting a key ally. In 1985, the Pressler Amendment came into effect, requiring the president to certify that a state did not have nuclear weapons in order to receive U.S. aid. Presidents Reagan and Bush complied and certified that Pakistan was non-nuclear until 1990. Yet, U.S. intelligence suspected as early as November 1986 that Pakistan was nuclear-capable.\textsuperscript{118} General Zia himself boasted in March 1987 that “Pakistan has the capability of building the Bomb.”\textsuperscript{119} In his 1989 testimony, President Reagan stayed close to the letter of the law while warning about future developments:

The statutory standard as legislated by Congress is whether Pakistan possesses a nuclear explosive device, not whether Pakistan is attempting to develop or has developed various relevant capabilities. … Congress should be aware that as Pakistan’s nuclear capabilities grow, and if evidence about its activities continues to accumulate, this process of annual certification … may be difficult or impossible to make with any degree of certainty.\textsuperscript{120}

Then, in late 1989, Soviet forces withdrew from Afghanistan as the Cold War came to a close with the fall of the Berlin Wall. As a result of these geostrategic developments, in 1990 President Bush refused to certify that Pakistan was non-nuclear, cutting all economic and military aid. For Islamabad, this was just the latest proof of the unreliability of U.S. security assurances. To meet the threat of a powerful enemy in India, Pakistan had pressed forward to acquire an independent nuclear capability while enjoying the support of the United States.

5.4. Sweden (1954-69)

The Swedish case exemplifies how an improvement in a state’s threat environment during the nuclear development phase may lead it to no longer be willing to proliferate, resulting in nuclear forbearance.

Early in the nuclear age, Sweden’s neutrality put it in a risky strategic situation. Since its airspace lied in the


\textsuperscript{116} Khan, \textit{Eating Grass}, p. 214.

\textsuperscript{117} See: \textit{ibid}, pp. 174-233.


flight path of both superpowers’ nuclear bombers, Sweden could easily be entrapped in a great-power conflict. To avert this possibility, Sweden initiated a secret nuclear program in 1946. In 1952, the Swedish military placed itself behind the nuclear effort. Between 1954 and 1962, the program had the support of Sweden’s political leadership, advancing steadily. By 1957, the Supreme Commander’s recommendations (OB57) supported the nuclear option. The Swedish Defense Research Agency (FOA) initiated construction of the Ågesta plutonium-producing reactor and expected to have the bomb by 1963-64.

In 1962, however, as the reactor came on line, the Swedish military became opposed to the nuclear option. The new Supreme Commander’s recommendations (OB62) argued for shifting defense priorities back to conventional forces. In 1963, Erlander informed U.S. Ambassador Parsons that, although Sweden “had the possibility of developing its own weapons rather quickly and quite easily,” it now supported a test-ban treaty and other proliferation-averting measures. In 1965, a Defense Ministry report concluded “[i]t is not in our country’s security interests to acquire nuclear weapons.” Funding for

125 See: Agrell, “The Bomb that Never Was,” p. 163. Note that this is despite restrictions imposed by the superpowers on supply of nuclear technology to Sweden. Faced with these restrictions, OB57 asserted that “with affordable human and financial effort we can produce atomic charges that can be adapted to domestically produced weapons carriers.” (ÖB-utredningarna 1957, Kontakt med Krigsmakten, p. 284.) Two years later, a new report concluded that, despite international controls, Sweden would be able to acquire nuclear weapons in “the later part of the 1960s.” (Sveriges Socialdemokratiska Arbetareparti, Neutralitet, Försvar, Atomvapen – rapport till Socialdemokratiska partistyrelsen (Stockholm: Tidens Förlag, 1959), p. 109.) Supply-side explanations, therefore, seem insufficient to account for Swedish nuclear forbearance.
128 See: Paul M. Cole, “Atomic Bombast: Nuclear Weapon Decision-Making in Sweden, 1946-72,” Washington Quarterly, Vol. 20, No. 2 (1997), p. 243. Stockholm’s position in favor of the non-proliferation regime led to arguments that Swedish nuclear forbearance is explained by “the international social environment surrounding nuclear nonproliferation,” which produced in Stockholm a strong commitment to international norms, a high level of trust in international treaties, and a desire not to harm NPT negotiations. (Rublee, Nonproliferation Norms, p. 180.) The evidence against such a normative argument is strong, however. A 1959 report by the Swedish ruling party at the time (SAP) asserts that “Sweden will not give up nuclear weapons due to ethical reasons, if other countries equip their forces with such weapons.” (Sveriges Socialdemokratiska Arbetareparti, Neutralitet, Försvar, Atomvapen, p. 110.) Furthermore, in 1965, the Swedish Ministry of Defense argued that if “nuclear weapons become a normal part of small nations’ armed forces, the question of Swedish nuclear weapons could come again at this time.” (Försvarsdepartementet, Säkerhetspolitik och Försvarsutgifter, pp. 73-74.) The NPT was important only in providing the SAP with a public cover to abandon its hitherto cherished nuclear program. (See: Agrell, “The Bomb that Never Was,” p. 169.) Tellingly, the dual-purpose Ågesta nuclear reactor, shut down in 1974, remains ready for reactivation within months. (See: Steve Coll, “Neutral Sweden Quietly Keeps Nuclear Option Open,” Washington Post, pp. I and A–42 (November 24, 1994.).)
the nuclear program was cut, leading to its extinction in 1969.  

Strategic considerations were key for Sweden’s nuclear pursuit and eventual abandonment. Whereas in the early Cold War a nuclear investment was expected to produce a large effect on Sweden’s security, by the 1960s that was no longer the case.

During the 1950s, the expansion of the superpowers’ nuclear arsenals and growing nuclear hand-offs to allies increased Swedish threat perception. OB57 stated that entrapment in a conflict between the two superpower blocs was Sweden’s greatest security risk, arguing that “[t]he enemy’s ability and means to implement an attack against us is strongly affected by whether our defense is backed by nuclear weapons.”

At the same time, the Swedish military knew that nuclear pursuit implied the risk of inviting a preventive strike. OB57 put this in no ambiguous terms: “in order to be certain that Sweden does not acquire nuclear weapons, an attacker might be tempted to use nuclear weapons against us without the risk of counteraction with the same weapon on our side.” In fact, Moscow made “implicit threats and warnings against a Swedish weapon.” The program therefore advanced secretly.

Yet the benefit provided by nuclearization started to decrease by the early 1960s. Progress in negotiations toward the Partial Test Ban Treaty (PTBT) of 1963 and reinvigorated discussions about the NPT suggested the overall probability of proliferation would go down. This meant that Sweden was only likely to be affected by nuclear conflict between the superpowers, which, in turn, was less likely given their new assured retaliation capability, soon to become mutually assured destruction (MAD). Furthermore, the Swedish defense establishment understood that an attack by a superpower would prompt the support of the other:

The Party considering an attack on Sweden with or without the use of nuclear weapons must … expect that nuclear weapons may be used against his operations even though Sweden does not have such weapons. … Sweden by and large is under the nuclear umbrella approximately in the same way that countries in our vicinity are, regardless which power bloc or great power sphere of interests they belong to.

Consequently, OB65 argued that Sweden should focus on conventional defenses.

Despite its neutrality, Sweden believed the Soviet Union to be its only plausible potential enemy. The suggestion that Sweden was ‘by and large’ under a nuclear umbrella (the U.S.’s) reflected Sweden’s efforts


Ibid., p. 290.

Ibid., p. 294. Furthermore, the military acknowledged that strategic nuclear weapons would invite preemptive strikes, supporting only tactical weapons. See: Ibid., 291-292.


Försvarsdepartementet, Säkerhetspolitik och Försvarsutgifter, p. 138.


to prepare for Western assistance. Swedish leaders hoped for Western assistance under the form of bombing against Soviet air-force and naval facilities plus the provision of supplies to Swedish forces based on the assumption that “lending such assistance was in the interests of the Western Powers themselves.” In fact, OB 54 explicitly recommended that Swedish strategy “focus on creating conditions to be supported, in war, by states in whose interests it would be to assist us,” identifying “Western strategic bombing” as the most likely form of support. Retrospectively, the extensive preparations Sweden made for receiving Western assistance were considered compatible with Swedish neutrality.

The United States, for its part, endorsed Swedish neutrality but was “fully intent on assisting Sweden.” While discouraging Stockholm from acquiring nuclear weapons, Washington believed it was in its own interest to help put Sweden “in the best possible position to resist Soviet pressure or aggression” even if that required that the United States “be prepared to come to the assistance of Sweden as part of a U.N. or NATO action.”

In sum, by the early 1960s, Swedish leaders concluded that an independent nuclear deterrent would not be useful. As the technical capability necessary for nuclearization came online, Sweden abandoned its nuclear program.

Our strategic approach highlights how the threat environment of the 1950s prompted Sweden’s willingness to attempt secret nuclearization. Facing a possible Soviet preventive strike and without a superpower ally, Stockholm proceeded prudently towards that goal. In the early 1960s, however, Sweden’s strategic outlook changed in ways that decreased the need for a nuclear deterrent. The likely limitation of nuclear conflict to the superpowers introduced by the NPT, the lower risk of superpower nuclear conflict as a consequence of MAD, and the increased likelihood of U.S. support in case of a Soviet attack all combined to make a Swedish nuclear investment no longer productive, ending Swedish willingness to nuclearize. Swedish nuclear forbearance is best understood using a strategic theory.

5.5. South Korea (1959-76)

The case of South Korea exemplifies how a state facing a significant security threat but pursuing limited foreign policy objectives may be persuaded by its nuclear ally to forego nuclear weapons.

Given the violence of the Korean War (1950-3) and the vulnerability of Seoul to North Korean attacks, South Korea could benefit from the acquisition of nuclear weapons. Its interest in nuclear weapons waxed and waned as a function of the perceived reliability of U.S. guarantees and aggressiveness of North Korea.

With its involvement in the Korean War of 1950-3, the United States displayed its interest in defending South Korea, and it has since played an important role in meeting South Korea’s security needs. As the

References:

138 Ibid., p. 34.
139 Ibid., p. 11.
140 See: Ibid., p. 35.
141 Ibid., p. 35.
142 Ibid., 13.
war ended, the two countries signed a Mutual Defense Treaty. In 1957, the United States further boosted its commitment to South Korea by deploying tactical nuclear weapons on the Korean peninsula. The United States also assisted South Korea in its exploration of nuclear energy, starting with a bilateral treaty in 1955 for the transfer of nuclear technology for peaceful purposes. In 1959, the Korea Atomic Energy Research Institute (KAERI) was founded to oversee all nuclear activities in the ROK, officially starting the country’s nuclear program.

Two developments worsened South Korea’s security outlook in the 1960s. The first was North Korea’s military buildup and frequent provocations. The second came in 1969 when newly-elected President Richard Nixon announced his Guam Doctrine, aimed at limiting U.S. military entanglement in Asia. Shortly thereafter, Washington pulled one third of its troops (around 20,000) out of South Korea, including all U.S. troops stationed on the demilitarized zone (DMZ) that divided the two Korean states. This shift in policy was meant to encourage U.S. allies to take greater control of their own security, yet, in Seoul, it also spurred greater interest in a military component to the nuclear program. President Park Chung-hee called for a “self-reliant national defense,” which included the development of a “super weapon.” In 1970, a military nuclear program controlled by the Agency for Defense Development was set in motion. President Park tasked the KAERI with acquiring reprocessing capabilities and created a covert Weapons Exploitation Committee, responsible for the procurement and production of nuclear weapons. During 1971 and 1972, Seoul reached agreements with France, Belgium, and Canada with the purpose of acquiring nuclear fuel, a laboratory, and a reprocessing facility. In February 1973 President Park signed the “Basic Plan for Developing Ballistic Missiles.”

Eventually, the United States became aware that its retrenchment had exacerbated fears of abandonment and heightened the risk of proliferation. In March 1975, U.S. Secretary of State Henry Kissinger explicitly

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147 See: Idem., p. 160.
151 Ibid., p. 384.
threatened to cut off all security ties with, and withdraw all U.S. forces from, South Korea if Seoul insisted in pursuing a nuclear weapon. This pressure led South Korea to ratify the NPT a month later, on April 23rd. Having done so, President Park proceeded to publicly tie the abandonment of his nuclear aspirations with the maintenance of a U.S. security guarantee. Speaking to Washington Post reporters on June 26, he said: “If South Korea were not provided with a U.S. nuclear umbrella, South Korea would do anything to protect its security, including the development of nuclear weapons.”

South Korea seemed intent on concentrating its efforts on the build-up of conventional forces. Yet developments in Washington renewed South Korean fears of abandonment. In early 1977, President Jimmy Carter came to power in Washington “determined to remove U.S. troops from South Korea and was highly critical of Park’s repressive domestic policies.” To this effect, Carter proposed to cut military aid to South Korea, withdraw American ground troops from the peninsula, and remove 1,000 tactical nuclear weapons from the country. As a result, President Park once again considered the nuclear option and a development of Korea’s missile capability. Carter’s announcement, made on March 9, 1977, to delay withdrawal plans until 1982, did not assuage Korean concerns.

Park’s assassination in October 1979, and the arrival in power of President Ronald Reagan, paved the way for a possible change in South Korea’s nuclear policy. In 1981, the Reagan Administration promised to restore and reaffirm Washington’s long-standing security commitment to South Korea if the country would terminate its nuclear ambitions in the military realm. President Chun Doo-hwan (1980-88) was persuaded to cancel the nuclear program altogether.

During the 1980s and 1990s, South Korea remained firmly under the U.S. security umbrella while diplomatic activity with North Korea increased, leading to improved relations. In December 1991, the two countries adopted the “Basic Agreement,” which included provisions for controlling military movements and exercises, the peaceful use of the DMZ, exchange of military information, and the phased reduction and eventual elimination of WMDs on the Korean peninsula. The following year, the “Joint Declaration of Denuclearization of the Korean Peninsula” committed both countries to not “manufacture or produce, deploy, store, or use nuclear weapons or to possess reprocessing and enrichment facilities.” Finally, the Agreed Framework of 1994, promised eased relations between North Korea and the United States, which were key to unlocking the situation on the peninsula.

159 See: Feldman and Bourseton, “Countries and Issues of Nuclear Strategic Concern – South Korea.”
163 See: Paul, Power versus Prudence, p. 121.
169 See: Ibid., p. 379.
170 Paul, Power versus Prudence, p. 123.
More recently, increased tensions with North Korea have raised concerns about the possibility that South Korea could resume its program. The Agreed Framework was abandoned in 2002 and North Korea performed three nuclear tests, in October 2006, May 2009, and February 2013. In response, the United States has reiterated its pledges to defend South Korea. Eleven days after the first of these tests, the term “extended nuclear deterrence” was, at the South’s request, for the first time added to the Joint Communiqué issued by South Korea and the United States at the end of Security Consultative Meetings. Given the limited aims of South Korean foreign policy, and the firm commitment of the United States to defend South Korea, it is unlikely that South Korea would develop its own nuclear weapons.

5.6. Iraq (1972-91)

The case of Iraq exemplifies how a weak state without a nuclear ally is unlikely to have the opportunity to nuclearize despite possessing the willingness to do so when it faces a significant external threat. Specifically, Iraq’s nuclear forbearance is the result of military action and diplomatic pressure by adversaries such as Iran, Israel, and the United States.

Since shortly after the overthrow of the monarchy and creation of the Iraqi republic in 1958, Iraq was a weak state without a nuclear ally. In March 1959, Iraq withdrew from the defensive Baghdad Pact of 1955, which included the United Kingdom as one of its signatories. It signed an ‘entente’ with the Soviet Union in April 1972, but this agreement fell short of a defensive pact (including only consultation and nonaggression clauses) and, in any case, was rescinded in September 1990 after the Iraqi invasion of Kuwait but before the end of the Iraqi nuclear program.

Facing two strong threats in Iran and Israel, Iraq perceived the effect of nuclear acquisition on its security to be large. By the same token, Iraq’s weakness made it vulnerable to the threat of preventive strikes. Iran attempted to destroy the Iraqi research in Osiraq in September 1980, and Israel successfully did so in June 1981. The Iraqi nuclear-weapons program then went underground and, following its invasion of Kuwait in August 1990, Iraq sped up efforts to acquire the bomb. This crash program was short-lived, however. In January 1991, the United States led a coalition to liberate Kuwait and launched an air campaign that ultimately crippled Iraq’s nuclear-weapons program. In the ensuing decade, the Iraqi program was halted by intrusive UN inspections and severe sanctions, backed by the threat of war and actual strikes in 1998, which led to the evacuation of inspectors. Uncertain about the development of the Iraqi nuclear-weapons program, the United States invaded Iraq in March 2003.

The Iraqi nuclear program started with civilian purposes in 1956, when the country took advantage of the U.S. Atoms for Peace initiative to create the Iraqi Atomic Energy Commission (IAEC). The program later acquired a military dimension in the early 1970s. By then, Iraq faced two major independent threats: Iran and Israel. Iran had declared war against Israel upon its creation in 1947, and participated in the Six-Day War of 1967. Both ended in defeat. Iran, for its part, had confronted Iraq in two border disputes,

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173 For a discussion of the role of uncertainty about WMD programs in Washington’s decision to invade Iraq, see: Debs and Monteiro, “Known Unknowns.”

in 1959-60 and 1969, and would later fight Iraq in a long and bloody war between 1980 and 1988. In 1981, Saddam Hussein explained the motivation for the Iraqi nuclear-weapons program: “We have to have this protection for the Iraqi citizen so that he will not be disappointed and held hostage by the scientific advancement taking place in Iran or in the Zionist entity. … Without such deterrence, … Iraq will remain threatened by the Zionist entity.”

Since Iraq was an NPT signatory, the IAEC leadership decided it had “to clandestinely develop the expertise and infrastructure needed to produce weapon-grade plutonium.” In 1976, Iraq secured a deal with France for the construction of two reactors, including Osiraq (Tammuz I). But Iraq’s efforts to acquire nuclear materials raised suspicion and eventually triggered an aggressive response by its enemies. In 1979, the French nuclear firm in charge of the reactor cores was attacked, delaying their delivery. Israel was suspected to be responsible for the attack. Then, in September 1980, two Iranian F-4s bombed Osiraq. The following June, an Israeli air strike successfully destroyed it.

The destruction of Osiraq was a serious blow to the Iraqi nuclear-weapons program. Nonetheless, it spurred Saddam Hussein’s nuclear ambitions, given that, in his words, Arabs “can have no security as long as Israel alone commands the nuclear threat.” The IAEC’s budget was increased twenty-five times and its body of nuclear scientists grew 17-fold.

Iraq’s progress towards nuclearization was halted after the 1990 invasion of Kuwait, which triggered a forceful U.S. response. As Washington denounced the invasion, Hussein launched a crash weaponization program. On January 16, 1991, the U.S.-led coalitions launched Operation Desert Storm and identified WMD as one of its main targets, with air strikes seriously crippling Hussein’s nuclear program, destroying two research reactors and nuclear fuel facilities.

After the war, UNSC Resolution 687 required Iraq to dismantle its nuclear-weapons program and implemented severe sanctions until it did so. UN inspectors were deployed to verify Iraq’s compliance.

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175 Hal Brands and David Palkki, “Why did Saddam want the Bomb?” Foreign Policy Research Institute, 2011.
183 See: Grant, “Osirak and Beyond,” p. 76; Wing and Simpson, Detect, Dismantle, and Disarm, pp. 13-4.
According to Scott Ritter, chief UN weapons inspector in Iraq between 1991 and 1998, the severity of the sanctions convinced Saddam to unilaterally destroy his program.\(^\text{184}\)

Clearly, sanctions hurt the Iraqi economy. For example, they lowered Iraqi imports by 86 percent between 1990 and 1996 (from $7.6 to $1 billion).\(^\text{185}\) In July 1995, Hussein threatened to end his cooperation with UNSCOM unless there was progress towards ending the sanctions.\(^\text{186}\) Three years later, in August 1998, Hussein expelled the inspectors, only to reverse himself in mid-November under the threat of U.S. air strikes. Upon reentering Iraq, inspectors found that Hussein was again impeding their work. On December 16, 1998, they were evacuated and U.S. strikes soon followed. Inspectors would not return to Iraq until November 2002, by which time they were deemed insufficient by the U.S. administration, which proceeded to invade the country the following March.\(^\text{187}\) After defeating Iraqi forces and deposing Hussein, U.S. forces were unable to find any functioning WMD programs or stockpiles. Ritter had been correct: Iraq had dismantled its nuclear program during the 1990s under international pressure.

In sum, as a weak state facing dire security threats without a nuclear ally, Iraq was willing to acquire nuclear weapons. This very position raised concerns among its enemies -- Iran, Israel, and, eventually, the United States -- making Iraq vulnerable to threats and actual preventive strikes, and ultimately dooming its nuclear ambitions by taking away Iraq’s opportunity to proliferate.

6. Conclusion

This article introduced a strategic theory of nuclear proliferation focusing on the interaction between a state, its enemies, and allies. Proliferation occurs only when countries face significant threats yet possess high ex ante relative power or a nuclear ally deemed prospectively unreliable. Proliferation by a relatively weak state with no nuclear allies has never occurred.

Today, Iran is at the center of U.S. proliferation concerns. As a relatively weak state without a nuclear ally, Iran is likely to consider an investment in nuclear weapons to yield important security benefits vis-à-vis Israel and the United States. An Iranian nuclear deterrent would guarantee the country’s survival and might boost its bargaining position on other issues, justifying the cost of a nuclear investment. Tehran is therefore likely willing to proliferate, arousing suspicion when it proclaims the peaceful nature of its nuclear program. Yet, at the same time, our theory makes clear why Iran may not have the opportunity to nuclearize. In order for Tehran to acquire nuclear weapons, its adversaries must estimate the effect of Iranian nuclearization on their security to be lower than the cost of a preventive counterproliferation strike. Otherwise, a preventive strike is a rational option and either Iran internalizes this threat and abandons its nuclear investment, or its program is likely to be targeted. It should therefore come as no surprise that both U.S. and Israeli leaders refuse to take the military option off the table. A credible threat of attack is a precondition for the success of other counterproliferation measures.

Given higher U.S. relative power, Iranian nuclearization would have a greater net effect vis-à-vis Israel.

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\(^\text{187}\) See: Debs and Monteiro, “Known Unknowns.”
This makes Israel the most likely source of a hypothetical preventive strike. In either case, however, whether Iranian obstinacy in the nuclear path will result in a preventive strike depends on policymakers’ calculations of the net effect of Iranian nuclearization. If Iranian nuclear weapons are considered merely a deterrent, the only problem they create for Iran’s adversaries is an increase in the cost of attempting to change the Iranian regime by force, a goal that is generally considered to be already too costly. If, on the contrary, Iranian nuclearization is judged to embolden the regime to pursue revisionist foreign-policy goals more aggressively, then preventive action would make sense even if costly.  

Although our theory is agnostic on how Iranian nuclearization might affect the behavior of Tehran’s regime, it does provide reasons to doubt the widespread fear that Iranian nuclearization will trigger a proliferation cascade in the Middle East involving Egypt, Iraq, Saudi Arabia, and Turkey. As the South Korean case demonstrates, none of these states are likely to pursue nuclear weapons as long as they continue to possess reliable U.S. security guarantees. (Although, as the Pakistani case demonstrates, in order to persuade its allies to drop their nuclear ambitions, Washington must place nonproliferation at the top of its agenda.) In the past, Washington has consistently succeeded in preventing clients from nuclearizing whenever it privileged nonproliferation efforts over other strategic goals. This success is, to a great extent, responsible for the historical absence of “reactive proliferation.”

Finally, our theory highlights incentives to manipulate the key variables in our model on the part of Iran, Israel, and the United States. By burying nuclear facilities underground and investing in retaliatory conventional capabilities and air defenses, Tehran has increased the costs of preventive military action, thereby lowering the net effect of proliferation and making it more likely. The United States and Israel, for their part, have attempted to find ways of hindering Iranian proliferation without necessitating a military strike. Iranian nuclear scientists have been targeted with assassination. Stuxnet, the computer virus that effectively sabotaged Iran’s uranium-enrichment efforts at Natanz in 2010, is widely believed to have been a cyber-attack launched by Western agents. The Obama Administration has reportedly turned these attacks into a systematic program. In sum, while Iran attempts to raise the costs of preventing its nuclearization, U.S. policymakers have been devising ways to drive this cost down. Whatever the outcome, this interaction underlines the strategic logic of nuclear proliferation.

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