

# International Security: Nuclear Proliferation

Wilfred Wan, United Nations University-Centre for Policy Research  
and Etel Solingen, Thomas T. and Elizabeth C. Tierney Chair in Peace Studies, School of Social Sciences,  
University of California, Irvine

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## Summary

Since the advent of the nuclear age, scholars have sought to provide rationales behind decisions to pursue, forgo, or relinquish nuclear weapons programs. Security, status, cost, technical capabilities, and domestic considerations have played central roles in explaining those choices. Classical neorealism was once the conventional wisdom, advancing that relative power and the logic of self-help in an anarchic world drove states to nuclear weapons. Yet, the analysis of nuclear proliferation has evolved in accordance with broader debates in international relations theory in recent decades, including the incorporation of neoliberal institutionalist, constructivist, and domestic political perspectives. The end of the Cold War and the upheaval of international order in particular marked a watershed for the literature, with scholars challenging the dominant paradigm by examining the effects of institutions, norms, and identities. Those approaches, however, under-theorized—if not omitted altogether—the role of domestic political drivers in choices to acquire or abstain from acquiring nuclear weapons.

Such drivers provide filters that can be invaluable in explaining whether, when, and how state actors are susceptible to considerations of relative power, international institutions, and norms. More recently, scholars have deployed more sophisticated theoretical frameworks and diverse methodologies. The road ahead requires greater analytical flexibility, harnessing the utility of classical perspectives while adding enough nuance to increase explanatory power, greater attentiveness to the complex interaction among variables, and improved specification and operationalization amenable to rigorous testing, all with an eye toward enhancing both historical accuracy and predictive capabilities.

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## Introduction

Since their advent in the 1940s, nuclear weapons have been labeled the absolute weapon, the most naked manifestation of military power in the world, or “the heart, the inner sanctum, of states’ security dilemmas” (Solingen, [2007](#), p. 263). The study of nuclear proliferation, defined for our purposes as the acquisition of a nuclear explosive device, has thus been—and remains—at the core of the study of international security. Yet it is only in the last couple of decades that scholarship on nuclear proliferation began taking its cues from broader debates in the international relations literature (for early studies, see Meyer, [1986](#); Solingen, [1994a](#), [1994b](#); Ogilvie-White, [1996](#); and Sagan, [1996](#); for a recent overview, see Wan & Solingen, [2015](#)). The collapse of the Soviet Union marked a watershed both for the discipline as a whole and the proliferation literature in particular. With the sudden end of the Cold War, the neorealist paradigm that had long dominated the discourse gave way to greater attention to international institutions, domestic politics, norms, and identities as drivers of security behavior. This new theoretical toolkit also began informing the

study of nuclear proliferation, replacing classical single-country historical accounts and policy-oriented studies typical of earlier times. The 21st century has witnessed the deployment of even more sophisticated theoretical frameworks and methodologies, leading to a thriving debate over the sources and effects of nuclear proliferation and the most productive ways to study them.

The chapter begins with an overview of the evolution of this literature, including different theories identified as causal drivers in state decisions to acquire—or abstain from acquiring— nuclear weapons. It examines next the methodologies upon which proliferation scholars have relied, assessing the contributions of each given the scarcity of relevant cases since the dawn of the nuclear age.<sup>1</sup> We also highlight the character of the non-state proliferation threat that emerged in the 21st century, including the relative inattention to the subject in the scholarly literature. Finally, we outline the current state of theoretical and methodological debates in the study of nuclear proliferation, reflecting general trends in the profession, along with outstanding challenges for gaining deeper insight into the study of nuclear proliferation.

## Theoretical Approaches

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### Power and Security

Traditional explanations for choices to acquire nuclear weapons draw upon the centrality of international power considerations in state decision-making. In classical realism, the actions of statesmen are determined “by what they regard as their national interests rather than by the allegiance to a common good” (Morgenthau, [1948](#), p. 433). For neorealists, it is the structure of the anarchical system—the absence of a central authority above sovereign states—that drives states pervaded by uncertainty and fear to “provide for their own security” (Waltz, [1988](#), p. 619; [1981](#)). Accordingly, the unrivaled power of nuclear weapons renders them the most effective tools to enhance state security in a self-help world. Stronger states would presumably develop nuclear capabilities while weaker states would lean on nuclear-armed allies to provide them with extended deterrence.

Nuclear weapons remain prominent in the military postures of states with nuclear stockpiles. For some, the emergence of Israel, India, Pakistan, and North Korea as (unofficially recognized) nuclear weapon states suggests that external security environments and “enduring rivalries” are key causal drivers of proliferation decisions (Paul, [2000](#)). Problematically for this approach, however, there are many anomalies that fail to support its predictions. The world has hardly borne witness to the extensive nuclear chains scholars and analysts predicted in the 1950s and 1960s. The “proliferation begets proliferation” hypothesis (“reactive proliferation”) has not led to the dramatic expansion of nuclear weapons’ states. Egypt, Jordan, South Korea, Taiwan, Vietnam, and Japan, among many others, abstained from acquiring nuclear weapons despite tense regional security dynamics, nuclear-armed neighbors, absence of extended nuclear deterrence guarantees in many cases, and varying polarity distributions during and after the Cold War (Solingen, [2007](#); Potter & Mukhatzhanova, [2008](#), [2010a](#), [2010b](#)). Relative power and security-based explanations simply cannot address the many empirical deviations from their predicted outcomes. As Betts ([2000](#)) pointed out, insecurity has not led most states to acquire nuclear weapons.

Neorealist approaches also reveal underlying conceptual limitations, including elastic and subjective definitions of threat, vulnerability, and of power itself; unclear thresholds that compel nuclearization; inconclusive, open-ended operational implications of relative power (power differentials), and concerns with whether the theory is falsifiable. The idea that the desire for power drives proliferation decisions only makes sense if military power was the sole form of power in international relations. Competing

conceptions of security further undermine any simple cause-and-effect implication for nuclear weapons. The shift in focus to security “threats”—both real and potential—in defensive realism (Walt, [1987](#)) reinforces the term’s subjectivity, and highlights the arbitrary threshold that would compel nuclear weapons’ acquisition. At a minimum, it calls attention to the role of domestic actors in defining such threats or setting such thresholds. Explanations centered on anarchy, relative power, and security threats thus remain under-determining, allowing for a variety of outcomes ranging from overt to ambiguous nuclearization and several non-nuclear alternatives.

In sum, states are not trapped in fixed and inexorable destinies defined by relative power. States have opted for different solutions—nuclear and non-nuclear—to comparable structural security predicaments. Self-help as an analytic category did not provide clear markers for likely behavior and have led to indeterminate predictions, invariably requiring additional information unrelated to power balances. Furthermore, the theory’s performance is deficient precisely in what should be its best arena of argumentation. If the ultimate strategic behavior (states’ nuclear choices) does not invariably stem from structural balance of power considerations, the theory is challenged in the most auspicious domain for corroborating its canons. A theory that cannot be easily confirmed even under the best circumstances suggests serious problems.

## **International Institutions**

The nuclear arena exhibits—counter-intuitively—one of the most prominent international security treaties. Since entering into force in 1970, the Nuclear Non-Proliferation Treaty (NPT) has come to encompass 190 states-parties—the vast majority of which have safeguards agreements in place with the International Atomic Energy Agency (IAEA). Those agreements are designed to detect any diversion of materials from peaceful nuclear activities to weapons usage. The IAEA Board of Governors and the UN Security Council stand as enforcement mechanisms of both those safeguards agreements and 1997’s voluntary Additional Protocol, which granted the agency complementary access for verification purposes and provided it a more complete account of a country’s nuclear program. The architecture surrounding the treaty has also developed in other ways over the years, with the emergence of a suppliers’ network (the Nuclear Suppliers Group and the Zangger Committee), the signing of the Comprehensive Test Ban Treaty, and the spread of nuclear-weapon-free zones across the entire southern hemisphere (Wan, [2013](#)).

The wide adherence to the non-proliferation regime (NPR henceforth, including the NPT, IAEA, and other instruments) aligns with a theoretical approach that challenges the bleak vision of international relations posited by neorealists. Neoliberal institutionalist scholars suggest that states can “mitigate the effects of anarchy, produce mutual gains, and avoid shared harm” (Jervis, [1999](#), p. 45). Institutionalized security cooperation represents a “categorical imperative” that can influence state motivations and “make it much easier to enforce nonproliferation” (Muller, [2008](#), pp. 73–74). Central to this is the notion that iterated games—expectation of repeated and continuous interactions among states—alter their strategic calculus. The “shadow of the future” (Axelrod & Keohane, [1985](#)) thus provides incentives for institutional arrangements that soften the rough edges of power politics and offer positive externalities, as demonstrated in the NPR. First, it perpetuates shared expectations about non-acquisition through explicit rules and guidelines. Second, it expands the knowledge base of nuclear programs of signatories through its vast information structure. Third, it exposes and punishes would-be proliferators with its detection and enforcement mechanisms. The overall impact mitigates (but does not completely eliminate) security dilemmas and reduces incentives for nuclear weapons’ acquisition.

Systematic evidence for all member states that the NPR has prevented further proliferation is not yet

available, but neither is there evidence to the contrary. Treatment of the NPT in the literature is often limited to a dichotomous variable centered only on membership, overlooking the complexities suggested by the regime's broad structure. Some indeed argue that state decisions to acquire or forgo nuclear weapons might be made despite treaty commitments (Guzman, [2008](#)). For instance, Iraq, Libya, and North Korea all developed clandestine weapons programs while being signatories. The South African case suggests that membership in and compliance with the NPT may be a symptom rather than a cause of nuclear decisions. After all, it acceded to the treaty in 1991, two years after dismantling its nuclear weapons program, and, once the Apartheid regime was superseded, South Africa could normalize its economic and political relations with the rest of the world. Another weakness is the fact that the NPR hardly represents an exemplar of effective global arrangements. The regime's persistence belies inconsistencies in non-compliance rulings, discord with the two-tier system of nuclear haves and have-nots, and accusations of pro-Western bias (Goldschmidt, [2009](#); Miller, [2012](#)).

None of this is to say that the NPR is a paper tiger. But at the end of the day we lack enough systematic data on all states affirming the actual role of the NPT in their nuclear decisions. States may have joined the NPT for a wide range of reasons (domestic interests, hegemonic coercion, fear of adversary's reaction, or other reasons) that were causally prior to assessing the merits of the NPT (Solingen, [2007](#)). This is the problem of "selection bias": the very conditions that may have led states to sign and ratify the NPT, even if not always directly observable, could also explain subsequent compliance better than the NPT itself. Enforcement has been easy for an overwhelming majority of states, which might be attributed to those prior decisions not to develop nuclear weapons rather than to fear of detection and punishment by the NPR. Another institutionalist perspective builds on seminal work by Schelling ([1976](#), [2000](#)) and Tannenwald ([2007](#)), who trace the non-use of nuclear weapons since 1945 to the internalization of the norm (taboo) that nuclear weapons are illegitimate and abhorrent. Rublee ([2009](#)) applied a similar insight, arguing that socialization into the NPT norms explains why states renounced nuclear weapons. But many states abandoned nuclear designs prior to the NPT, and there are numerous—and very significant—anomalies for this latter claim. The normative argument may thus be more persuasive in explaining Schelling and Tannenwald's puzzle of non-use of nuclear weapons than subsequent applications to non-acquisition. Indeed, acquisition obviates use, at least according to some canonical views on the effect of deterrence, injecting a more complex moral conundrum that has thus far hindered proposals for a Global (Nuclear) Zero. Furthermore, Japan itself, the only state to have suffered a nuclear attack (and hence a crucial case for this theory), does not seem to have been guided primarily by antinuclear norms. Japan had several government commissions exploring the nuclear option, inserted caveats in its NPT ratification, and relies—to this day—on extended nuclear deterrence guarantees from the United States, not precisely a confirmation of a nuclear taboo (Samuels, [1996](#); Solingen, [2010b](#)).

Institutionalist arguments can benefit from delving further into the decision-making process and the drivers of change in the NPR (Wan, [2013](#)). The broader literature on international treaties may offer insights on the NPR's differential impact across states, especially as it lacks strong and consistent enforcement and resembles "soft law" across many of its components (Chinkin, [1989](#); Guzman, [2008](#)). It is difficult to gauge the treaty's impact on state decision-making based on membership alone, given its near universality. More reflective of its strength at a given time is the number of safeguards agreements in place, or the emergence of consensus at NPT Review Conferences. Shifting from the dichotomous variable may help scholars distinguish the regime's institutional effects from its normative ones.

## Domestic Politics

A third branch of the non-proliferation literature focuses on domestic politics as an important driver of nuclear choices. Some work points to the role of “mythmakers” within the scientific- military-industrial complex in persuading decision-makers to acquire nuclear weapons (Lavoy, [1993](#), [2006](#)). The notion of a nuclear program as an example of “technological radiance” linked to national identity was highlighted by Hecht ([2009](#), p. 22) as a key element of rapid nuclear development in France in the post–World War II era, involving engineers, workers, even neighbors of reactor sites. Also drawing from the toolkit of social constructivism, Jasper ([2013](#)) suggests that Libyan leaders were driven by similar currents of pride and a corresponding desire for regional and global status; she then attributes the eventual failure of the nuclear pursuit to the lack of a comparable and coherent national framing and constituency required to sustain any such broad-based effort.

In a similar vein, Liberman ([2001](#)) attributes the initial development of South Africa’s latent nuclear weapons capability to a strong and opaque national Atomic Energy Board that had the prime minister’s ear. International ostracism against apartheid reduced the costs of nuclearization, and then–Defense Minister P. W. Botha developed a secret arsenal in the 1970s. Other work has focused on the role of bureaucracies. Sagan ([1996](#), p. 72) claimed that the longevity of the NPR has created “a well-placed elite in the foreign and defense ministries with considerable bureaucratic and personal interests in maintaining the regime.” This constitutive effect may be even greater on the technical side, in light of the extensive safeguards and export controls system that has emerged at the national level. That the non- proliferation regime might not only shape domestic debate but also redefine the very actors tasked with proliferation decision-making suggests a muddled boundary between the domestic and international arenas.

Others examine the individual psychology of state leaders, identifying “oppositional nationalists” as more inclined to acquire nuclear weapons (Hymans, [2006](#)). Yet this approach neglects the political context, which often neutralizes whatever inherent psychological proclivities one might be able to ascertain about leaders (if at all). Premiers Kishi, Yoshida, Sato, Nakasone, Koizumi, Abe, Fukuda, and others may have arguably been psychologically animated by the merits of a Japan equipped with nuclear weapons but did not (could not?) act on those proclivities (Solingen, [2010b](#)). Indeed, the confluence of a major neorealist-style trigger (North Korea’s repeated nuclear and missile tests) and a leader with arguably the strongest psychological proclivity (imbibed as Kishi’s grandson)—Abe Shinzo—has failed thus far to yield what both these theories—structural and psychological—would predict: Japan’s acquisition of nuclear weapons. Fuhrmann and Horowitz ([2015](#)) suggest an alternative motivation, according to which leaders who rebelled against the government prior to taking office are more likely to seek nuclear weapons, due partly to a greater trust deficit in their relations even with allies and a greater risk tolerance. But explanations centered on individual leaders entail a far greater level of volatility across the spectrum of nuclear behaviors than the empirical record supports, given turnover in state leadership. They also leave unanswered questions of sequence, as the incentives and costs of pursuing nuclear weapons are affected by the level of development already in place.

Individual decision-makers do not act in a political vacuum. Even autocratic ones lean on supportive domestic coalitions, as de Mesquita, Morrow, and Wu ([1993](#)) argued. Solingen ([1994a](#), [1994b](#), [2007](#)) identified the different incentives of two ideal-typical domestic coalitions vis-à-vis the global political economy, each endorsing a different model of political survival in power. Leaders favoring internationalizing models attract actual or potential beneficiaries of economic openness; leaders advancing inward-looking models logroll across constituencies adversely affected by openness. These models have implications for nuclear choices.

Internationalizers have incentives to avoid the political, economic, reputational, and other costs of

acquiring nuclear weapons. Such costs impair a domestic agenda favoring economic growth via integration in the global economy. By contrast, inward-looking models incur fewer costs and have greater incentives to exploit nuclear weapons as tools in nationalist platforms of political competition and survival in power. The empirical record for the post-1970 world time—with the inception of the NPR—provides strong support for the causal relationship between involvement in the world economy and nuclear abstinence. Yet the association between models of political survival and nuclear choices is neither deterministic nor inevitable. It is a tendency or likelihood suggesting that internationalizing models make the development of nuclear weapons less likely than inward-looking counterparts. Furthermore, the argument is bounded in three ways. First, resistance to the global economy may provide only near-necessary but not sufficient conditions for seeking nuclear weapons. Second, the extent to which other states in the regional context share a congruent orientation toward the global political economic order (either positive or negative) modifies domestic preferences on nuclear issues in each state. Thirdly, the argument is bounded by temporal sequences in nuclear weapons' acquisition. Abandoning nuclear weapons once they are acquired is not equivalent to abandoning a nuclear program that has not yet yielded such weapons. Prospect theory provides insights into why this might be the case: it is far more costly politically to eliminate existing nuclear weapons entirely than to reverse steps prior to their acquisition. When nuclearization precedes the inception of internationalizing models, subsequent denuclearization may be much harder. Overall, the argument is falsifiable: An internationalizing model may embrace nuclear weapons, and an inward-oriented one may abandon them.

A final set of arguments shifts attention from political will to technical opportunity. This distinction between motivation and capability in nuclear weapons acquisition was first explored systematically by Meyer (1986), who tested the proposition that technological momentum would inevitably transform latent capacity into active operation. More recent iterations of this supply-side approach argue similarly that the diffusion of nuclear technology lowers barriers to proliferation (Jo & Gartzke, 2007; Fuhrmann, 2009). Citing the cases of North Korea and India, Abraham (2010) posits that the ambivalence of nuclear power has at times inspired a prematurely harsh response from the international community—in the form of sanctions and denial of exports—that had the unintended consequence of reducing the costs of pursuing nuclear weapons. Thus, identifying both direct and indirect mechanisms, these scholars argue that the availability of technology serves as a prism through which external factors are considered. Yet, technological determinism exhibits significant anomalies as well: a substantial number of “most likely cases” (i.e., technologically fit) abstained from acquiring nuclear weapons, whereas some “least likely cases” pursued them (Solingen, 2007). Some consider “techno-centric” approaches to have been defined and driven by their quantitative methodologies (Hymans, 2012).

Scholars exploring domestic political factors can benefit from careful attention to the context under which individuals or coalitions operate. The global political, economic, and strategic context—“world-time”—may exacerbate or temper the weight of domestic political competition. The domestic institutional context—democracy vs. autocracy—can also alter coalitional dynamics and with it, receptivity to external pressures and inducements to abandon nuclear ambitions (Solingen, 2012).

## Methodological Approaches

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### Case Studies, Comparative Case Studies, and Regional Comparisons

Case studies and comparative case studies are common in the proliferation literature, including in many studies cited previously. Both types reveal trade-offs between theoretical parsimony, explanatory richness,

generalizability, and potential tensions between case detail and cross-case comparison (George & Bennett, 2004). Both have relied on states as aggregates, particular regimes, dominant models of political survival, and individuals as units of analysis. Case selection has been appropriately justified on methodological grounds sometimes, but not always. Some case and comparative studies selected on the dependent variable but others did not. Some qualitative work also suffers from conceptual ambiguity; under-specification of variables and causal mechanisms; lack of empirical fit; and limited efforts to generalize beyond chosen cases. Mono-causal case studies frequently fail to fully address competing hypotheses and to establish clear scope conditions under which their arguments are likely or unlikely to obtain.

Other work favors comparisons of entire regions, including several states within each. Given the relevant universe of cases of nuclear proliferation and abstention, some regions may account for a significant proportion of all cases, falling between small and large N studies.

Regions provide useful units of analysis as sub-systems that sometimes enable controls for similar strategic environments and sources of external insecurity while offering variation in alliance patterns, regime types, models of political survival, and norms. Tracing the contrasting trajectories of states in the Middle East and East Asia, respectively, Solingen (2007) finds several advantages of a research design cast at this level. Among them is the fact that those two regions account for the vast majority of relevant cases since 1970 that either acquired nuclear weapons or considered them but ultimately renounced them. That temporal choice also helps understand nuclear decisions while controlling for: a common international institutional order (the non-proliferation regime [henceforth NPR]); shared hierarchic and multipolar power distributions; comparable authoritarian rule, state-building challenges, and limited economic interdependence. With similar initial background conditions, those two regions subsequently diverged primarily with respect to their level of integration in the global economy, rendering the latter an important variable of interest. The states included also enable important opportunities—“most likely,” “least likely,” and “crucial” or “tough” cases— for corroborating or rejecting different theories.

The regional unit of analysis appears especially promising to the study of nuclear proliferation in light of the current geopolitical landscape. The post–Cold War period has been characterized by increasing interdependence within those sub-systems across economic, political, and sociocultural lines. Engaging in comparative analysis can allow scholars to consider the impact of attributes associated with the “new regionalism” on nuclear decision-making: this includes the presence of free trade and investment agreements, formal political organizations, and strong common identities, for starters. Greater harmonization of a region along these or other markers may serve to defuse threat perceptions and thus mitigate tendencies toward nuclearization even in the absence of a universal collective security arrangement. Regional comparisons thus can help to reflect how the evolving international order affects both regional and individual state policies. Despite these and other advantages, the regional unit of analysis (hosting many relevant states) remains a rare methodological choice, particularly in single-authored studies.

## **Large-N**

The 21st century has seen the emergence of a body of literature employing statistical techniques to identify the sources and effects of nuclear proliferation. These studies are typically not wedded to a particular theoretical framework but rather geared to test hypotheses derived from the theoretical literature examined above. For instance, they operationalize neorealist explanations centered on the external threat environment into explanatory variables such as the presence of enduring rivalries, security guarantees, and interstate disputes (Sasikumar & Way, 2009). In some cases their explicit concern is the perceived “mismatch between theoretical arguments, which tend to make probabilistic claims and envision multiple causal

variables, and ... case studies that implicitly apply deterministic standards based on an univariate logic of inference” (Singh & Way, [2004](#), p. 881).

There has been little consensus across large-N studies on the causal drivers of proliferation decisions. Some scholars examined the correlation between overall diffusion of nuclear technology and nuclear proliferation, moving beyond demand-side analyses toward supply-side variables that provide technological opportunities. Kroenig ([2009](#)) concludes the link applies only to the provision of sensitive nuclear assistance. Fuhrmann ([2009](#)) suggests a broader connection with all forms of civilian nuclear aid, which magnifies existing militarized disputes, though the latter is deemed a secondary factor. Kemp ([2014](#)) finds the effect of foreign assistance on proliferation to be overstated.

Singh and Way ([2004](#)), Jo and Gartzke ([2007](#)), and Bleek ([2010](#)) all find support for some association between external security environments and proliferation but differ on the conceptualization of security.<sup>2</sup> They also disagree regarding the weight of enduring rivalries, the likelihood of “reactive proliferation,” and the effect of security guarantees by existing nuclear powers, among others. Monteiro and Debs ([2014](#)) argue that existing security theories of proliferation are unable to explain why some states with grave security concerns have developed nuclear weapons whereas others have not. They thus advance an argument that looks at both demand and supply sides—the strategic interaction among the potential proliferator, its adversaries, and allies—which, in their view, is compatible with historical evidence. States are likely to acquire nuclear weapons, in their view, only under the following conditions: when the proliferator has high relative power and can deter a preventive strike; or when it has a great power ally that can deter a preventive strike but falls short in reliability; or when the great power ally has expansive foreign policy interests not covered under the alliance and allows its partner to proliferate as long as the risk of entrapment is low. As a neorealist theory, however, theirs retain concepts such as “level of security threat,” “relative power,” and estimates of “the likelihood of future conflict” that are open to subjective estimates and disagreements.

Quantitative studies also differ in their conceptualization of domestic, economic, and other variables. Singh and Way ([2004](#), pp. 876, 82) found that “the process of economy liberalization is associated with a reduced likelihood of exploring nuclear weapons” and that economic openness “has a statistically significant negative effect” on exploring, pursuing, or acquiring nuclear weapons. Fuhrmann and Li ([2008](#)) found that economic liberalization has a positive and statistically significant effect on nuclear-weapon-free zone treaty ratification; economically liberalizing states are especially willing to demonstrate that they are responsible, and willing to substitute the opportunity to pursue nuclear weapons for the opportunity to get wealthy. Bleek ([2010](#), p. 187), in contrast, finds “little support and some outright contradictory evidence” for that relationship. He does, however, acknowledge that how scholars operationalize their variables in large-N studies can impact their findings significantly. In revisiting the oft-studied relationship between regime type and nuclearization, Way and Weeks ([2014](#)) found that a further disaggregation of “non-democracies” resulted in a robust causal link overlooked by previous work: personalist regimes are more likely to pursue nuclear weapons than other authoritarian forms. However, at least five (of nine) nuclear weapons’ states are democratic and most personalist regimes have not acquired such weapons. Müller and Schmidt ([2010](#)) argue that nonproliferation norms act most strongly on democratic or democratizing states because they are more likely to abide by the rule of law.

Several quantitative studies over the last decade have shifted attention from the drivers of nuclear proliferation to the latter’s effects. This is not necessarily a new debate but one that has deep roots in Cold War debates over deterrence, compellence, and nuclear superiority largely among great powers. Sechser and Fuhrmann ([2013](#)) found nuclear weapons to be useful for deterrence but not compellence irrespective of the size of the nuclear arsenal, whereas Kroenig ([2013](#)) advances that quantitative nuclear superiority



provides significant advantages in an international crisis. For Narang (2014), the mere possession of nuclear weapons or secure-second strike capabilities does not necessarily deter conventional conflict, challenging the existential deterrence school.

Competing findings reveal some drawbacks of the large-N approach, most recently highlighted by Bell (2015). Relying on sophisticated statistical tests of the quantitative literature, he argues that quantitative studies fail to offer strong explanations for proliferation patterns and struggle to predict out-of-sample cases. Bell traces the apparent poor performance of certain variables in quantitative studies to the fact that models often neglect indirect causal pathways. These are far more difficult to capture; hence the studies have little to say about those drivers' actual causal strength. In addition, there are too many variables for the number of relevant cases. Reliance on different data sets and time frames (e.g., 1939–1992 vs. 1945–2000) exacerbates discrepancies. The availability of a data set often leads to reliance on proxy variables that stand as poor gauges for the concepts they aim to represent. For instance, steel production rate is often used as a measure of technical capacity to support a nuclear program; Nuclear Non-Proliferation Treaty (NPT) membership proportionality is sometimes used to measure the strength of the institution; economic data on trade openness has been used to capture what is at heart a political variable: whether dominant coalitions are “internationalizing” or “inward looking,” and so on. There is also wide discrepancy about what the appropriate “universe of cases” should be and serious concerns that the chosen “universe” exacerbates heterogeneity and decreases validity (Solingen & Malnight, 2016).

These studies also ignore temporal effects, treating states as monolithic entities with proliferation pathways implying a continuous, coherent process. Contextual elements difficult to capture and operationalize are summarily excluded in some cases, such as the role of the NPR (beyond membership), political-economy models (beyond trade ratios), or perceptions of status (beyond capacity). Variables that are included often suffer from problems of conceptual validity, measurement, and operationalization. Indeed different studies focus on different dependent variables (nuclear exploration, pursuit, acquisition). The scarcity of relevant cases contributes to the sensitivity of results to coding procedures, or to the inclusion or exclusion of particular borderline cases (Gavin, 2014). Montgomery and Sagan (2009) call for further disaggregation in supply-side studies, differentiating between the signing versus implementation of nuclear cooperation agreements on sensitive nuclear assistance.

## **Proliferation beyond the State**

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An overview of the proliferation literature would be remiss not to acknowledge the changes in the area of study itself that took place in the early 21st century. While concerns about nuclear terrorism were expressed from the advent of the atomic age, it was revelations about al-Qaeda's nuclear ambitions—and acquisition efforts—in the aftermath of the September 11th attacks that brought the scenario back to the forefront of the nuclear agenda. Fears about potential use of nuclear weapons by nonstate actors crystallized with the uncovering of the Abdul Qadeer Khan network in 2004. The so-called father of the Pakistani nuclear program admitted to selling weapons technology to Iran, North Korea, and Libya over previous decades. These events, alongside others, inspired wide-ranging action, with the Proliferation Security Initiative (2003), Security Council Resolution 1540 (2004), and the Nuclear Security Summit series (2010) each expressly addressing nonstate dimensions of the proliferation threat.

Yet, while some policymakers may now prioritize the role of nonstate actors in nuclear proliferation, academic coverage on the subject has lagged behind. This may reflect a perceived a-theoretical treatment of the topic, particularly in research focused on operation rather than motivation (Corera, 2006; Russell,

2006). Scholars largely discuss the threat in the context of emergent challenges to the NPR, engaging in risk assessment and prescribing counterproliferation methods (Braun & Chyba, 2004; Chestnut, 2007; Levi, 2009; Maerli, 2010). The select few who do dabble in a theoretical approach analyze the character of the network itself, examining geographic variables and drawing parallels to other illicit flows— including conventional arms and narcotics (Bourne, 2011; Hastings, 2012). Ultimately, this work subsumes the role of nonstate actors into existing frameworks, underlining their contributions to illicit procurement networks that in turn allow states to circumvent existing counterproliferation instruments. Whether the next wave of analyses will consider the nonstate proliferation threat on its own accord remains to be determined.

## Looking Back, Moving Forward

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The last two decades have witnessed the emergence of a far more developed body of literature on nuclear proliferation than was available in the early 1990s. As a result the field has left behind a rather narrow focus on geopolitics, moved beyond a single-minded focus on the state level of analysis, and made significant strides in further theorizing previously omitted sources of variance affecting nuclear choices. Recent debates on Iran, North Korea, and others devote growing attention to the strong association— causally and temporally— between decisions to embrace the global economy and decisions to abandon nuclear weapons. There is a much less single-handed focus on elusive balance of power considerations. Former South Korean president Kim Young-sam went as far as arguing that “the North Koreans think they can say whatever they want because no matter what they do, the Americans will never attack them” (Sang-Hun, 2015). Similarly, others might argue that concerns with the political and economic effects of sanctions have been far more critical for Iran’s Rouhani camp than have putative geostrategic advantages of nuclear weapons. The final fate of Iran’s nuclear program may hang less on the balance of power between elusive and ill-defined dyads than on the balance between those who seek to deepen the course of economic openness and those who oppose it (Esfandiari, 2015).

While this review reveals a thriving literature indeed, proliferation studies also mirror the broader field of international security (and political science more generally) in what is sometimes deficient conceptualization, theoretical indeterminacy, contested findings, and sub-optimal methodological choices. All these portend significant challenges for a future agenda, including the need to transcend vague notions of power, threat, security, and vulnerability; to move beyond a simplified dichotomy in institutionalist (NPR) studies that privileges membership over other sources of compliance; and to avoid discussion of actors (states, individuals, coalitional models) that mute attention to the domestic political landscapes and institutions within which those actors operate. All theoretical formulations can benefit from improvements: they must be cast in falsifiable terms, with greater precision, and aim at better specification of threshold conditions. They must provide clearly defined and testable propositions a priori; avoid circularity and ex-post-facto rationalizations; stipulate the kind of evidence that would question or corroborate their expectations; and tighten rules and procedures for (quantitative or qualitative) data gathering and analysis.

Nor has increased methodological diversity brought greater substantive consensus. Both qualitative and quantitative studies struggle with problems of temporality. Choices for or against nuclear weapons are fluid and change over time (Levite, 2002). Endogeneity is rampant and the dominant direction of causal effects often unclear. For instance, supply-side analyses acknowledge both capability and motivation as determinants of proliferation yet overlook how these factors might interact. Jo and Gartzke (2007, p. 187) acknowledge that “a willingness to proliferate may lead to investments in nuclear infrastructure that in turn increase nuclear opportunity over a long time span,” but those factors are entirely omitted from their conceptual framework. Further, the nuclear black market suggests that a motivated state can overcome issues of capability and (legal) access (Braun & Chyba, 2004). Another fundamental challenge for research

on nuclear proliferation are secrecy issues, which scholars have sought to address through freedom-of-information-act requests, personal interviews, and new archival discoveries, particularly by nuclear historians.

Extensive disagreements across methodologies remain on whether the existence of nuclear allies or security guarantees account for decisions to proliferate or abstain and whether U.S. coercion or persuasion were involved in specific cases (Solingen, [1994b](#), [2007](#); Knopf, [2012](#); Monteiro & Debs, [2014](#)); and about much more. Bell ([2015](#)) concludes that weak correlations between proliferation and many variables in extant quantitative studies offer no proof whatsoever that those variables do not in fact cause or prevent proliferation. In other words, the absence of evidence is not evidence of absence, as is sometimes argued in court. Most of these shortcomings can afflict qualitative studies as well. When designed and operationalized appropriately, quantitative analysis might be useful for specifying the relative weight of variables. This is not a unique virtue of quantitative studies, however. Rigorous qualitative work can advance falsifiable arguments; assess them against competing claims; be rooted in systematic evidence; and have an advantage for discovering, dissecting, and assessing causal pathways.

Both qualitative and quantitative studies vary in their degree of investment in—and can benefit from—developing strong theoretical foundations. Qualitative studies should improve the criteria for case selection, seeking crucial cases and least likely conditions that force the empirical analysis to overcome difficult conditions for passing the test (Van Evera, [1997](#); Eckstein, [1975](#)). Cases that feature a reversal of course in either direction seem especially fruitful analytically because the various periods of fluctuation enhance the number of observations and offer the opportunity to gauge variation over time. Nuclear outcomes are better conceptualized not as finite and final but as malleable and operating on a continuum. Entrenchment in particular approaches risks losing the forest for the trees. The resurgence of technological determinism, for instant, perpetuates an artificial conceptual divide between demand-side and supply-side analyses. That case study and large-N methodologies are often confined to each of these categories only exacerbates the problem.<sup>3</sup> Quantitative work relying on a limited number of proxy variables risks reducing demand-side arguments to the status of strawmen. Qualitative work advancing mono-causal arguments can incur similar risks.

In search for parsimony, many studies shy away from coming to terms with the complexity of nuclear (and other political) decisions and with interaction effects among causal drivers.

Considerations of power, institutions, and domestic politics do not operate in a vacuum. A given “critical juncture” may turn one or the other more relevant than would otherwise be the case in another context. Both empirical accuracy and predictive capabilities can be enhanced by analysis of nuclear behavior that is attentive to complexity, contingency, and historical context. As Philip Tetlock’s ([2005](#)) masterful treatise on expert political judgment and prediction suggests, parsimony can be the enemy of accuracy, a substantial liability in real- world forecasting.

Monteiro and Debs ([2014](#)), for instance, advance that expected security costs and benefits of nuclear acquisition are, in their view, sufficient to explain a country’s nuclear path. Yet they also acknowledge that a more complete analysis of proliferation would benefit from incorporating other approaches, although they don’t act on their own recommendation. All the same, they rightly suggest that work on the role of political economy preferences should incorporate security concerns. Some work along these lines already does that, acknowledging explicitly that “security predicaments and existential vulnerabilities are certainly not figments of neorealist imagination,” while also cautioning that “concerns with existential security are never perfunctory reflections of structural considerations ... but rather the product of domestic filters that convert such considerations into different policies;” and that domestic political survival models are “filters through

which security is defined” offering “a better handle on the operational implications of security predicaments” (Solingen, [2007](#), pp. 4, 6, 26, 53, 72, 259, 285).

As reiterated in Sil and Katzenstein’s ([2010](#), p. 82) volume on analytic eclecticism, those filters do not invalidate the role of other factors but rather “condition and modify the values and relative weight of other variables.” The effort was to avoid mono-causal straitjackets and capture a more complex political reality that enables the weaving together of diverse strands drawn from a variety of theoretical principles. The previous omission of models of political survival from the theoretical repertoire on nuclear choices, for instance, allowed an overestimation of the effect of other variables. The inclusion of these models provides scope conditions for—and improves our understanding of—the relative importance of power, norms, and other considerations.

All in all, notwithstanding the tough challenges ahead, a promising research agenda attentive to complex systemic effects, reputation, domestic veto-points, dynamics of the global economy, and models of regime survival seems to be replacing analytically impoverished, policy-deficient, grossly inaccurate forecasts, and stale accounts of why states seek to acquire nuclear weapons.

## References

Abraham, I. (2010). ‘Who’s next?’ Nuclear ambivalence and the contradictions of non-proliferation policy. *Economic and Political Weekly*, 45(43), 48–56.

Axelrod, R., & Keohane, R. O. (1985). Achieving cooperation under anarchy: Strategies and institutions. *World Politics*, 38(1), 226–254.

Bell, M. S. (2015). Examining explanations for nuclear proliferation. *International Studies Quarterly*, 60(3), 520–529.

Betts, R. K. (1980). Incentives for nuclear weapons. In J. A. Yager (Ed.), *Nonproliferation and U.S. foreign policy* (pp. 85–175). Washington, DC: Brookings Institution.

Betts, R. K. (2000). Universal deterrence or conceptual collapse? Liberal pessimism and utopian realism. In V. A. Utgoff (Ed.), *The coming crisis: Nuclear proliferation, U.S. interests, and world order* (pp. 51–86). Cambridge, MA: MIT Press.

Bleek, P. C. (2010). Why do states proliferate? Quantitative analysis of the exploration, pursuit, and acquisition of nuclear weapons. In W. C. Potter & G. Mukhatzhanova (Eds.), *Forecasting nuclear proliferation in the 21st century: The role of theory* (Vol. 1) (pp. 159–192). Stanford, CA: Stanford University Press.

Bourne, M. (2011). [Controlling the shadow trade](http://dx.doi.org/10.1080/13523260.2011.556863) <<http://dx.doi.org/10.1080/13523260.2011.556863>>. *Contemporary Security Policy*, 32(1), 215–240.

Braun, C., & Chyba, C. (2004). Proliferation rings: New challenges to the nuclear nonproliferation regime. *International Security*, 29(2), 5–49.

Chestnut, S. (2007). [Illicit activity and proliferation: North Korean smuggling networks](http://dx.doi.org/10.1080/13523260.2007.1489888) <<http://dx.doi.org/10.1080/13523260.2007.1489888>>.

[dx.doi.org/10.1162/isec.2007.32.1.80](https://doi.org/10.1162/isec.2007.32.1.80)>. *International Security*, 32(1), 80–111.

Chinkin, C. M. (1989). The challenge of soft law: Development and change in international law. *International and Comparative Law Quarterly*, 38(4), 850–866.

Corera, G. (2006). *Shopping for bombs: Nuclear proliferation, global insecurity, and the rise and fall of the A.Q. Khan Network*. New York: Oxford University Press.

de Mesquita, B. B., Morrow, J. D., & Wu, S. S. G. (1993). Forecasting the risks of nuclear proliferation: Taiwan as an illustration of the method. *Security Studies*, 2(3–4), 311–331.

Eckstein, H. (1975). Case study and theory in political science. In F. J. Greenstein and N. W. Polsby (Eds.), *Handbook of Political Science* (pp. 79–137). Reading: Addison-Wesley.

Esfandiari, H. (2015, October 29). [How a conflicted Iran undercuts its own regional ambitions](http://blogs.wsj.com/washwire/2015/10/29/how-a-conflicted-iran-undercuts-its-own-regional-ambitions/) <<http://blogs.wsj.com/washwire/2015/10/29/how-a-conflicted-iran-undercuts-its-own-regional-ambitions/>>. Wall Street Journal.

Fuhrmann, M. (2009). Spreading temptation: Proliferation and peaceful nuclear cooperation agreements. *International Security*, 34(1), 7–41.

Fuhrmann, M., & Horowitz, M. C. (2015). When leaders matter: Rebel experience and nuclear proliferation. *Journal of Politics*, 77(1), 72–87.

Fuhrmann, M., & Li, X. 2008. *Legalizing nuclear abandonment: The determinants of nuclear weapon free zone treaty ratification*. Cambridge, MA: Harvard Kennedy School.

Fuhrmann, M., & Kreps, S. E. (2010). [Targeting nuclear programs in war and peace: A quantitative empirical analysis, 1941–2000](http://dx.doi.org/10.1177/0022002710371671) <<http://dx.doi.org/10.1177/0022002710371671>>. *Journal of Conflict Resolution*, 54(6), 831–859.

Gavin, F. J. (2014). [What we talk about when we talk about nuclear weapons: A review essay](http://issforum.org/ISSF/PDF/ISSF-Forum-2.pdf) <<http://issforum.org/ISSF/PDF/ISSF-Forum-2.pdf>> (pp. 11–36). H-Diplo/ISSF Forum.

George, A. L., & Bennett, A. (2004). *Case studies and theory development in the social sciences*. Cambridge, MA: MIT Press.

Goldschmidt, P. (2009). Exposing nuclear non-compliance. *Survival*, 51(1), 143–164.

Guzman, A. T. (2008). *How international law works: A rational choice theory*. Oxford: Oxford University Press.

Hastings, J. V. (2012). [The geography of nuclear proliferation networks](http://dx.doi.org/10.1080/10736700.2012.734190) <<http://dx.doi.org/10.1080/10736700.2012.734190>>. *Nonproliferation Review*, 19(3), 429–450.

Hecht, G. (2009). *The radiance of France: Nuclear power and national identity after World War II*. Cambridge, MA: MIT Press.

- Hymans, J. E. C. (2006). *The psychology of nuclear proliferation: Identity, emotions and foreign policy*. New York: Cambridge University Press.
- Hymans, J. E. C. (2012). *Achieving nuclear ambitions: Scientists, politicians, and proliferation*. New York: Cambridge University Press.
- Jasper, U. (2013). *The politics of nuclear non-proliferation: A pragmatist framework for analysis*. London: Routledge.
- Jervis, R. (1999). Realism, neoliberalism, and cooperation: Understanding the debate. *International Security*, 24(1), 42–63.
- Jo, D. J., & Gartzke, E. (2007). [Determinants of nuclear weapons proliferation <http://dx.doi.org/10.1177/0022002706296158>](http://dx.doi.org/10.1177/0022002706296158). *Journal of Conflict Resolution*, 51(1), 167–194.
- Kemp, R. S. (2014). [The nonproliferation emperor has no clothes <http://dx.doi.org/10.1162/ISEC\\_a\\_00159>](http://dx.doi.org/10.1162/ISEC_a_00159). *International Security*, 38(4), 39–78.
- Knopf, J. (Ed.). (2012). *Security assurances and nuclear nonproliferation*. Stanford, CA: Stanford University Press.
- Kroenig, M. (2009). Importing the bomb: Sensitive nuclear assistance and nuclear proliferation. *Journal of Conflict Resolution*, 53(2), 161–180.
- Kroenig, M. (2013). [Nuclear superiority and the balance of resolve: Explaining nuclear crisis outcomes <http://dx.doi.org/10.1017/S0020818312000367>](http://dx.doi.org/10.1017/S0020818312000367). *International Organization*, 67(01), 141–171.
- Lavoy, P. R. (1993). Nuclear myths and the causes of nuclear proliferation. *Security Studies*, 2(3-4), 192–212.
- Lavoy, P. R. (2006). Nuclear proliferation over the next decade: Causes, warning signs, and policy responses. *Nonproliferation Review*, 13(3), 433–454.
- Levi, M. A. (2009). *On nuclear terrorism*. Cambridge, MA: Harvard University Press.
- Levite, A. (2002). Never say never again: Nuclear reversal revisited. *International Security*, 27(3), 59–88.
- Liberman, P. (2001). The rise and fall of the South African bomb. *International Security*, 26(2), 45–86.
- Maerli, M. B. (2010). The threat of nuclear terrorism. In O. Njolstad (Ed.), *Nuclear proliferation and international order: Challenges to the Non-Proliferation Treaty* (pp. 108–126). New York: Routledge.
- Mahoney, J., & Goertz, G. (2004). [The possibility principle: Choosing negative cases in comparative research <http://dx.doi.org/10.1017/S0003055404041401>](http://dx.doi.org/10.1017/S0003055404041401). *American Political Science Review*, 98(04), 653–669.
- Meyer, S. M. (1986). *The dynamics of nuclear proliferation*. Chicago, IL: University of Chicago Press.

- Miller, S. E. (2012). [Nuclear collisions: Discord, reform & the nuclear nonproliferation regime](http://belfercenter.ksg.harvard.edu/publication/21875/nuclear_collisions.html) <[http://belfercenter.ksg.harvard.edu/publication/21875/nuclear\\_collisions.html](http://belfercenter.ksg.harvard.edu/publication/21875/nuclear_collisions.html)> (pp. 1–42). Cambridge, MA: American Academy of Arts & Sciences.
- Monteiro, N. P., & Debs, A. (2014). The strategic logic of nuclear proliferation. *International Security*, 39(2), 7–51.
- Montgomery, A. H., & Sagan, S. D. (2009). The perils of predicting proliferation. *Journal of Conflict Resolution*, 53(2), 302–328.
- Morgenthau, H. (1948). *Politics among nations*. New York: Knopf.
- Muller, H. (2008). The future of nuclear weapons in an interdependent world. *Washington Quarterly*, 31(2), 63–75.
- Müller, H., & Schmidt, A. (2010). The little-known story of deproliferation: Why states give up nuclear weapons activities. In W. C. Potter & G. Mukhatzhanova (Eds.), *Forecasting nuclear proliferation in the 21st century: The role of theory* (Vol. 1) (pp. 124–158). Stanford, CA: Stanford University Press.
- Narang, V. (2014). *Nuclear strategy in the modern era: Regional powers and international conflict: Regional powers and international conflict*. Princeton, NJ: Princeton University Press.
- Nye, J. S., Jr. (1990). Soft power. *Foreign Policy*, 80, 153–171.
- Ogilvie-White, T. (1996). Is there a theory of nuclear proliferation? An analysis of the contemporary debate. *Nonproliferation Review*, 4(1), 43–60.
- Paul, T. V. (2000). *Power versus prudence: Why nations forgo nuclear weapons*. Montreal, QC: McGill Queens University Press.
- Potter, W. C., & Mukhatzhanova, G. (2008). Divining nuclear intentions: A review essay. *International Security*, 33(1), 139–169.
- Potter, W. C., & Mukhatzhanova, G. (Eds.). (2010a). *Forecasting nuclear proliferation in the 21st century: The role of theory* (Vol. 1). Stanford, CA: Stanford University Press.
- Potter, W. C., & Mukhatzhanova, G. (Eds.). (2010b). *Forecasting nuclear proliferation in the 21st century: A comparative perspective* (Vol. 2). Stanford, CA: Stanford University Press.
- Ragin, C. C. (2004). Turning the tables: How case-oriented research challenges variable-oriented research. In H. E. Brady & D. Collier (Eds.), *Rethinking social inquiry: Diverse tools, shared standards* (pp. 123–138). New York: Rowman & Littlefield.

- Rublee, M. R. (2009). *Nonproliferation norms: Why states choose nuclear restraint*. Athens, GA: University of Georgia Press.
- Russell, J. A. (2006). Peering into the abyss: Non-state actors and the 2016 proliferation environment. *Nonproliferation Review*, 13(2), 645–657.
- Sagan, S. D. (1996). Why do states build nuclear weapons? Three models in search of a bomb. *International Security*, 21(3), 54–86.
- Samuels, R. J. (1996). “Rich nation, strong army”: National security and the technological transformation of Japan. Ithaca, NY: Cornell University Press.
- Sang-Hun, C. (2015, November 21). [Kim Young-sam, South Korean president who opposed military, dies at 87 <http://www.nytimes.com/2015/11/22/world/asia/kim-young-sam-former-president-of-south-korea-dies-at-87.html?ref=world>](http://www.nytimes.com/2015/11/22/world/asia/kim-young-sam-former-president-of-south-korea-dies-at-87.html?ref=world). New York Times.
- Sasikumar, K. & Way, C. (2009). Testing theories of proliferation in South Asia. In S. D. Sagan (Ed.), *Inside nuclear South Asia* (pp. 66–105). Stanford, CA: Stanford University Press.
- Schelling, T. (2000). A half-century without nuclear war. *Key Reporter*, 65(3), 3–5.
- Schelling, T. C. (1976). [Who will have the bomb? <http://dx.doi.org/10.2307/2538578>](http://dx.doi.org/10.2307/2538578) *International Security*, 1(1), 77–91.
- Sechser, T. S., & Fuhrmann, M. (2013). [Crisis bargaining and nuclear blackmail <http://dx.doi.org/10.1017/S0020818312000392>](http://dx.doi.org/10.1017/S0020818312000392). *International Organization*, 67(01), 173–195.
- Sil, R., & Katzenstein, P. J. (2010). *Beyond paradigms: Analytic eclecticism in the study of world politics*. New York: Palgrave Macmillan.
- Singh, S., & Way, C. R. (2004). The correlates of nuclear proliferation: A quantitative test. *Journal of Conflict Resolution*, 48(6), 859–885.
- Solingen, E. (1994a). The domestic sources of regional regimes: The evolution of nuclear ambiguity in the Middle East. *International Studies Quarterly*, 38(2), 305–337.
- Solingen, E. (1994b). The political economy of nuclear restraint. *International Security*, 19(2), 126–169.
- Solingen, E. (2007). *Nuclear logics: Contrasting paths in East Asia and the Middle East*. Princeton, NJ: Princeton University Press.
- Solingen, E. (2010a). Domestic models of political survival: Why some do and others don’t (proliferate). In W. C. Potter & G. Mukhatzhanova (Eds.), *Forecasting nuclear proliferation in the 21st century: The role of theory* (Vol. 1) (pp. 38–57). Stanford, CA: Stanford University Press.
- Solingen, E. (2010b). The perils of prediction: Japan’s once and future nuclear status. In W. C. Potter and G. Mukhatzhanova (Eds.), *Forecasting nuclear proliferation in the 21st century: A comparative perspective*



(Vol. 2) (pp. 131–158). Stanford, CA: Stanford University Press.

Solingen, E. (2012). Of dominoes and firewalls: The domestic, regional, and global politics of international diffusion. *International Studies Quarterly*, 56(4), 631–644.

Solingen, E., & Malnight, J. (2016, February 10). [More noise than signal in proliferation studies?](http://www.isanet.org/Publications/ISQ/Posts/ID/5013/More-Noise-than-Signal-in-Proliferation-Studies%20International%20Studies%20Quarterly%20Blog) <<http://www.isanet.org/Publications/ISQ/Posts/ID/5013/More-Noise-than-Signal-in-Proliferation-Studies%20International%20Studies%20Quarterly%20Blog>> International Studies Quarterly Blog post.

Tannenwald, N. (2007). *The nuclear taboo: The United States and the non-use of nuclear weapons since 1945*. New York: Cambridge University Press.

Tetlock, P. (2005). *Expert political judgment: How good is it? How can we know?* Princeton, NJ: Princeton University Press.

Van Evera, S. (1997). *Guide to methods for students of political science*. Ithaca, NY: Cornell University Press.

Walt, S. M. (1987). *The origins of alliance*. Ithaca, NY: Cornell University Press.

Waltz, K. N. (1981). The spread of nuclear weapons: More may be better. *Adelphi Papers* 171. London: International Institute for Strategic Studies.

Waltz, K. N. (1988). The origins of war in neorealist theory. *Journal of Interdisciplinary History*, 18(4), 615–628.

Wan, W. (2013). *Institutional change and the nuclear non-proliferation regime* (Doctoral dissertation). University of California, Irvine.

Wan, W., & Solingen, E. (2015). [Why do states pursue nuclear weapons \(or not\)](http://onlinelibrary.wiley.com/doi/10.1002/9781118900772.etrds0386/abstract) <<http://onlinelibrary.wiley.com/doi/10.1002/9781118900772.etrds0386/abstract>>. In R. A. Scott & S. M. Kosslyn (Eds.), *Emerging Trends in the Social and Behavioral Sciences*. John Wiley & Sons.

Way, C., & Weeks, J. L. P. (2014). [Making it personal: Regime type and nuclear proliferation](http://dx.doi.org/10.1111/ajps.12080) <<http://dx.doi.org/10.1111/ajps.12080>>. *American Journal of Political Science*, 58(3), 705–719.

## Notes

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Relevant cases are defined as those that demonstrate enough similarities to warrant comparison; they therefore include not only cases of proliferation but also those in which the outcome of interest is possible (Mahoney & Goertz, 2004; Ragin, 2004).

On preventive attacks against nuclear facilities, see Fuhrmann and Kreps (2010).

Some quantitative studies complement statistical analysis with case-studies, including, inter alia, Kroenig (2009) and Monteiro and Debs (2014).

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