

Nuclear Proliferation and Non-Proliferation

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Introduction

The basic puzzle facing the study of nuclear proliferation is why we observe such a wide and persistent gap between the large number of nuclear weapons-capable states, now generally estimated to be around 50, and the small number of actual nuclear weapons states – eight or nine, depending on how one counts North Korea. This stability has endured despite multiple and major shocks to the non-proliferation norm. Figure 1 (from Hymans 2006) presents the basic picture. Note that the top line represents states that are estimated to have the basic indigenous technical capacity to launch a successful nuclear weapons drive. The line would be much higher if one assumed an active black market in nuclear materials.

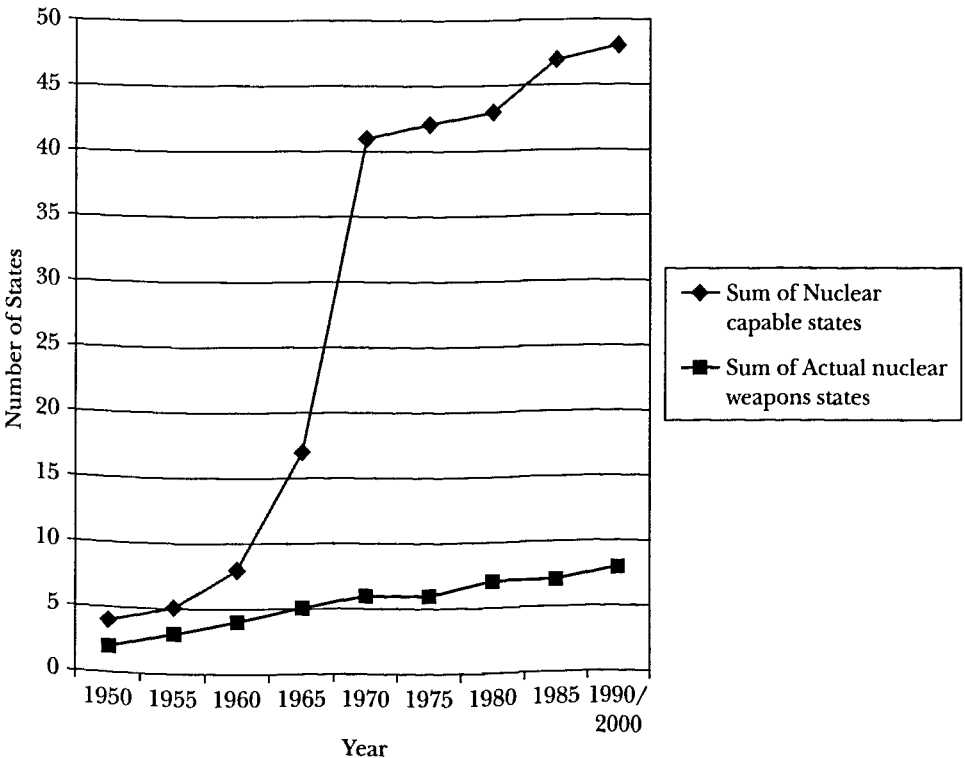


Figure 1 Potential vs. Actual Nuclear Proliferation

The slow pace of proliferation has been a major surprise for IR scholars and policy makers alike (Mueller 1998). Why have many states with the technical wherewithal to acquire the so-called “absolute weapon” been so slow to do so? In addition, what explains the determination of the few states that have gone against the general non-proliferation tide? And under what conditions can we expect the general pattern of abstention to reverse or continue? These are the fundamental questions being tackled in this field. Of course, the field tackles other questions as well, including: proliferation’s potential consequences for strategic stability (Lavoy 1995; Sagan and Waltz 1995; Lavoy, Sagan, and Wirtz, 2000); what policy tools may be most useful for promoting non-proliferation (Sokolski 2001; Busch and Joyner 2009); and the possibility of nuclear terrorism (Stern 1999; Allison 2005; Mueller 2006). Without denying the importance of such matters, this essay focuses on the evolution of thinking about the basic proliferation puzzle.

It was not easy for the proliferation field to home in on the basic proliferation puzzle. There were four principal reasons for this: (1) its strong predilection, due to its dominant policy orientation, for focusing on predicting the future rather than on explaining the past; (2) its standard realist bias, which led to disbelief that proliferation could long remain rare; (3) its vaguely defined typical dependent variable of “going nuclear,” which allowed analysts to see what they wanted to see; and (4) the secrecy with which many states conduct their nuclear affairs, which also gave analysts great freedom of interpretation. Since the mid-1990s the literature has made major strides toward surmounting these problems, but old habits die hard.

The first section of this essay focuses closely on a handful of early works that represented crucial conceptual breakthroughs in the struggle toward a proper descriptive inference of the dynamics of proliferation: Epstein (1976), Meyer (1984), and Frankel (1991). Although not necessarily the most cited contributions to the proliferation literature even in their own day, they are nonetheless milestones in the history of proliferation studies, harbingers of important turns in the basic assumptions and descriptive inferences made by most of the scholars and many of the analysts working in the area. (See Potter 2003 for a review of greater breadth.)

The second section of the essay shifts to more contemporary political science work on the by now widely acknowledged central proliferation puzzle of the small number of nuclear weapons states. In particular, it reviews attempts by each of the major IR paradigms to tackle this puzzle: realism (Paul 2000), psychological constructivism (Hymans 2006), neoliberal institutionalism (Dai 2007), liberalism (Solingen 2007), and sociological constructivism (Ruble 2009). The essay focuses on these books as strong representatives of each of the major IR paradigms, but it must be added that many other works have made valuable contributions as well. Having conducted this *tour d’horizon*, the essay concludes that there are signs of an emerging scholarly consensus on five fundamental points: (1) that proliferation has been historically rare, (2) that we cannot take the demand for nuclear weapons for granted, (3 and 4) that domestic politics and identity considerations play a crucial role in shaping proliferation choices, and (5) that theory-guided, in-depth comparative case studies are the most appropriate means of advancing the state of our knowledge at this time.

Early Milestones in the Study of Proliferation

William Epstein’s The Last Chance (1976): The Unbearable Lightness of the NPT

Concern about proliferation began rising steeply after France and then China joined the nuclear “club” in the 1960s (Beaton and Maddox 1962; Quester 1973). But it was only with the Indian “peaceful nuclear explosive” test of 1974 that a real sense of

potential worldwide crisis emerged, and, with it, a critical mass of serious writing on the issue. Epstein (1976) was one of the most original contributions to the post-1974 proliferation literature (for an appreciation, see Potter 2005; other notable works from the period include Wohlstetter et al. 1979; Goldschmidt 1980; Kegley 1980; Quester 1981; Dunn 1982; Poneman 1982; Potter 1982; and Spector 1984). Epstein's first sentence set the tone: "For the first time in a quarter of a century of working with the problems of the arms race and arms control, I am beginning to get scared" (p. xiii). The superpower arms race was bad enough, Epstein wrote, but India's test threatened to open up a catastrophic series of mini-nuclear arms races the world over. The rise of nuclear terrorism also was plainly foreseeable. However, Epstein contended, all was not lost. The NPT represented a good basis for non-proliferation efforts to take hold, and it was still alive – barely. The superpowers had essentially neglected the treaty ever since its signing in 1968; but if they were to reinvest themselves in it, the world might still have one "last chance" to save itself from nuclear bedlam.

According to Epstein, the NPT was negotiated within the following broad parameters. There were three points on which essentially all states agreed: first, the spread of nuclear weapons – both "horizontally" to new countries, and "vertically" among the existing nuclear weapons states (NWS) – was a bad thing; second, the spread of civilian uses of nuclear energy was a good thing; and third, it was devilishly difficult to separate civilian and military uses of the atom. In addition, there were two more points on which at least most states could agree: first, codifying the existence of two different classes of states was extremely problematic under international law, but second, realistically the members of the "nuclear club" were unlikely to give up their weapons anytime soon. These basic parameters provided enough room for a broad, multilateral agreement on how to tackle the proliferation issue.

At its heart, Epstein wrote, the NPT was an exchange of promises: on the one hand, a promise by the non-nuclear weapons states (NNWS) not to acquire nuclear arms, and on the other hand, a promise by the NWS to minimize the negative security, political, and economic consequences of that nuclear abstention. Thus, while Article II forbade NNWS from getting the bomb, in Article VI the NWS promised to work toward nuclear and general disarmament. Moreover, while Article III commanded the NNWS to accept technical safeguards against proliferation instituted by the International Atomic Energy Agency (IAEA), Article IV commanded the NWS to assist NNWS's legitimate desires to acquire civilian nuclear technology and materials. Indeed, Article IV protected the right of the NNWS to conduct scientific research on any subject in the nuclear field – even sensitive, "dual-use" research on the nuclear fuel cycle. Only "peaceful nuclear explosions" (PNEs) for engineering and mining purposes were deemed off limits for NNWS to dabble in, but in Article V the NWS even agreed to conduct PNEs on behalf of NNWS who expressed an interest. Finally, there were two escape clauses: Article X allowed any state to unilaterally withdraw from the treaty on just three months' notice, and it also limited the treaty to 25 years in duration, unless a majority of NPT parties voted at that time to extend it.

Epstein argued that because the NNWS were generally satisfied by this bargain, they agreed to join the treaty in relatively large numbers. Already by the time of the first NPT Review Conference in 1975, the treaty boasted 96 signatories, including West Germany, the state whose non-proliferation commitment the two superpowers had been most anxious to lock in. But Epstein also argued that since the negotiation of the treaty, the NWS had not lived up to their side of the bargain. Their provision of aid and technical assistance for civilian nuclear energy in developing countries was "pitifully small" (p. 166); they quickly took off the table any notion of actually conducting a PNE on behalf of a NNWS; the security guarantees they were willing to extend to non-allied NNWS were paper-thin; and, worst of all, soon after the NPT was signed the superpower arms race truly kicked into high gear. In short, quoting

one of the American negotiators, the NWS treated the NPT as “one of the greatest con games of modern times” (p. 118). The NNWS’s only consolation was that the NWS (along with the advanced NNWS like West Germany and Switzerland) were still too interested in promoting the commercial possibilities of nuclear power to impose an onerous system of export controls, technical safeguards, and international inspections on their customers. This was cause for even more lamentation by Epstein, as paradoxically, having first provided the NNWS substantial motive for breaking out of the NPT, the NWS were also proving more than willing to sell them the means to do so. Such was the international context of India’s 1974 test, the spark that could ignite a global proliferation wildfire.

With the benefit of hindsight, we now know that the Indian test did not ignite a proliferation wildfire. Why not? Some authors have argued that the major states responded to the Indian test just enough to head off a proliferation catastrophe. While they still failed to provide the NNWS with the carrots promised in the NPT, at least their newly formed “nuclear suppliers’ club” did start wielding real sticks (Davis 1993; Paul 1996; Sokolski 2001). For instance, in 1978 the US started to demand adherence to country-wide (“full-scope”) safeguards in exchange for provisioning NNWS reactors with highly enriched uranium fuel, and it convinced fellow nuclear suppliers to abandon sales of fuel reprocessing facilities to Pakistan, South Korea, and Taiwan.

Clearly, the 1970s did witness some supply-side non-proliferation successes. But on the other hand, some nuclear suppliers strenuously resisted abandoning prized clients; for instance, West Germany was willing to endure the worst turn in its relations with the US since 1945 to follow through on providing a complete nuclear fuel cycle to non-NPT member Brazil. And even as formal rules tightened over the late 1970s and 1980s, there was still much nuclear exporting even to states that were actively seeking the bomb, such as Iraq and Pakistan. The persistence of this trade reflected not only commercial interests on the part of individual companies, but also a willful negligence on the part of numerous Western states (Langewiesche 2007). Thus, traditional supply-side explanations for the slow pace of proliferation after 1974 seem at best incomplete.

Epstein himself actually did not place the emphasis on the supply-side issue. Rather, his principal claim was that the NWS’s continuing failure to deal with the real *political* gripes of the NNWS would inexorably lead to the regime’s breakdown. As he put it, “The credibility and viability of such a system of safeguards depends on the moral climate and on the strength of the entire non-proliferation regime” (p. 153). It was impossible to completely prevent cheating; what was necessary was to remove the incentives to cheat. The lack of respect the NWS showed for their NPT commitments hardly removed those incentives; indeed, “the developing NNWS, on the whole, felt that *they* had been cheated” (p. 230, emphasis added).

In subsequent years the NNWS did not stop feeling cheated, yet the general pattern of nuclear abstinence remained. Indeed, as Stephen M. Meyer showed, nuclear abstinence was even more widespread than people like Epstein believed.

*Stephen M. Meyer’s The Dynamics of
Nuclear Proliferation (1984): The Primacy Of Politics*

Meyer (1984) was the first sustained effort to apply modern political science analysis to the subject of proliferation. As he wrote in the preface, “The objective of this book is to take one step back – ignoring the policy disputes – and undertake a rigorous and systematic examination of the assumptions and contending hypotheses that constitute contemporary thinking on nuclear proliferation” (p. xiv). The result was a giant leap forward, although the non-academic policy analysts who still dominated the field generally did not recognize the full import of Meyer’s contribution.

Meyer's argument began with some careful distinctions between possible dependent variables in the proliferation field. He argued (p. 5) that we should analytically separate four such variables: (1) the development of a latent nuclear weapons capacity, whether this happened on purpose or as an unintended byproduct of other choices; (2) the conscious "capability decision" to generate a certain level of nuclear weapons capacity; (3) the "proliferation decision" to try to get a functional nuclear arsenal; (4) the actual acquisition of a functional arsenal. He further argued that variable (3) generally represented the most important bottleneck on proliferation.

To explain proliferation decisions, Meyer developed an explicit test of "technological imperative" hypotheses versus "motivational" hypotheses. "Technological imperative" hypotheses, which underlay the single-minded post-1974 efforts to tighten the supply-side controls on proliferation, contend that "governments 'decide' to go nuclear because the technology is available, thereby making the technical/financial costs manageable and the opportunity irresistible" (p. 9). By contrast, "motivational" hypotheses counter that "nuclear weapons do not generate spontaneously from stockpiles of fissile material" (p. 6). To go nuclear requires making a tough political *decision*; and that decision will reflect the top leadership's assessment of its likely costs and benefits. What is more, there is no reason to suppose *a priori*, as "technological imperative" analyses do, that the benefits of nuclear armament outweigh the costs.

Meyer's empirical test of the "technological imperative" hypotheses was groundbreaking. Previous work on proliferation had focused largely on "near-nuclear" states like Germany, Israel, or India, whose advanced nuclear infrastructures placed them on the cusp of a nuclear weapons arsenal if they desired one. But Meyer pointed out that such analyses unfairly tipped the scales in favor of "technological imperative" hypotheses, because many states developed their nuclear infrastructures precisely in order to have that nuclear weapons capability. Instead, Meyer tested the "technological imperative" hypothesis using a new model of "latent capacity" to build the bomb within six years or less, *which did not rely primarily on estimating a state's present level of nuclear technology*. Rather, Meyer's "latent capacity" model placed most emphasis on broad indicators of scientific and industrial accomplishment – things that *could* be placed at the service of a nuclear program, *if* the state so chose (see Table 1). Meyer's solution to the endogeneity problem that had dogged the literature up to that point is now the standard starting point for analyses of proliferation capacity.

Not surprisingly, Meyer's broader approach to the technical capacity question added several new states to the list of potential proliferants, and it also generally advanced

Table 1 Meyer's nuclear latent capacity indicators

Previous national mining activity
Indigenous uranium deposits
Metallurgists
Steel
Construction work force
Cement
Chemical engineers
Nitric acid
Electricity production capacity
Nuclear engineers, physicists, chemists
Nuclear graphite production capacity
Electronics specialists
Explosives specialists

the dates upon which states were estimated to have attained that capacity. Thus, according to Meyer's calculations, by 1963, the year of President Kennedy's ominous warning that 15 to 25 nuclear weapons states could emerge within the next 10 to 12 years, actually 18 states had already achieved the ability to build the bomb within six! The "technological imperative" camp might be frightened by this news, but Meyer argued that it paradoxically should make us more sanguine about the likelihood of a proliferation wildfire. For if so many states had been capable of going nuclear for such a long time, and yet so few had done so, the proper conclusion to draw was that the "technological imperative" was no imperative at all.

Meyer's careful study of the relationship between technology and proliferation thus pointed to the primacy of politics, or, as he called it, the "motivational hypothesis." The question then became, what specific factors might produce motivations for or against going nuclear? Few had attempted to think the question through systematically. Meyer combed the existing case study literature to produce a list of general factors that should be either "motive" or "dissuasive" for most states when confronting the question of whether or not to get the bomb. He came up with a long list of potential independent variables (see Table 2).

Meyer's list has two particularly interesting features, which are particularly striking in light of the fact that he wrote his book at a time of overwhelming neorealist dominance in the IR field. First, Meyer found no clear theoretical valence for the hard-core "realist" variables that are still the most commonly cited reasons for proliferation. Actual or latent nuclear threats or overwhelming conventional threats might give states reason to respond with a nuclear drive of their own, or they might give states reason to lie low. Moreover, the existence of a nuclear ally might calm states down about needing to deter others themselves, or it might cause states to feel the need to get the bomb to escape sinking into the status of a semi-independent protectorate. For Meyer, neorealist variables were theoretically indeterminate. The second interesting feature of this list is that most of the variables Meyer listed as theoretically clear motive factors for proliferation – regional and great power status or pretensions, pariah status, and the need to save face after loss in war – relate more to what we would today term constructivist, "identity" variables than they do to the materialist calculus still favored by most analysts. Meyer did not make as much of this fact as he could have.

Table 2 Meyer's nuclear predictor variables

<i>Variable</i>	<i>Type</i>
Threatening nuclear arsenal	Both?
Threatening latent nuclear capacity	Both?
Overwhelming conventional threat	Both?
Nuclear ally	Both?
Domestic turmoil	Motive
Intolerable defense expenditure burden	Motive
National self-image (regional or global status or pretensions, or desire to recover self-esteem after loss of a war)	Motive
Pariah status	Motive
Regional nuclear proliferation	Motive
Legal treaties in force	Dissuasive
Peaceful reputation	Dissuasive
Possible nuclear preemption	Dissuasive
Risk of unauthorized seizure	Dissuasive

Source: Adapted from Meyer (1984:74, Table 8)

Meyer's empirical testing suggested the importance of all of the hypothesized motivational factors. From the perspective of 2009, however, it must be said that the book's statistical methodology leaves much to be desired. In recent years, other quantitative analysts with vastly enhanced computing power at their disposal have done analyses similar in spirit to Meyer's. For instance, Jo and Gartzke (2007) largely seconded Meyer's conclusions. But Singh and Way (2004) found overwhelming support for the variable of "enduring rivalries," which neither Meyer nor Jo and Gartzke had tested, as the key motive factor. These very sophisticated quantitative analyses are a clear step beyond Meyer's initial forays. But the differences in their results reflect a more basic problem for quantitative attacks on this question: the lack of a reliable data set on which to base worldwide statistical tests. For instance, Jo and Gartzke do not code Libya as ever having had a nuclear weapons program, whereas Singh and Way code it as having had one consistently since 1970, and Meyer codes it as definitely having had one only from 1970–5. The disagreements over the Libya case reflect a more general uncertainty about the historical record. Indeed, the coded start or end dates of *most* country programs are different across the data sets (Montgomery 2006). In light of this confusion about the basic historical facts, it may be premature to attempt large-N analyses of the proliferation phenomenon (Müller and Schmidt 2008).

Meyer's clear identification of the basic proliferation puzzle was an essential contribution to the field. The next step for the literature might logically have been to dig deeper into the question of motivations to go nuclear, in order to develop a genuine explanatory theory of nuclear proliferation (Ogilvie-White 1996). But before that could happen, there was a theoretically sophisticated assault on the relevance of the basic proliferation puzzle that Meyer had identified.

*Benjamin Frankel (ed.) Opaque Nuclear Proliferation (1991):
More Proliferation than Meets the Eye?*

Contrary to Meyer's generally positive story of general proliferation restraint, Frankel (1991) painted a much darker picture. It argued that the Israeli case of "opaque proliferation" was *ideal-typical* of an ongoing second generation of nuclear proliferation, whose magnitude was being sorely underestimated due to its opacity. The implication was that, like Hegel's Owl of Minerva, scholars of proliferation had arrived at the basic puzzle of why there were so few nuclear weapons states at the very moment that the historical pattern was ceasing to replicate itself.

The lead piece in the volume, by Cohen and Frankel (1991), argued that opaque proliferation was a response to the NPT's success in delegitimizing nuclear weapons desires. Quite surprisingly given their neorealist moorings, they accepted that the non-proliferation norm existed, and that it was powerful. But, they argued, it would be overly optimistic to think that states' *recognition* of the norm meant real *respect* for it. As Cohen and Frankel wrote, "This does not mean that nations have lost interest in the acquisition of nuclear weapons, but rather that nations cannot voice this interest *publicly* in the international arena" (p. 16). The norm had simply pushed nuclear weapons activities underground. (Cohen and Frankel did not specify exactly when or how the international non-proliferation norm had become entrenched, and therefore it is difficult to evaluate whether the norm caused Israeli nuclear opacity, the center of their empirical concerns. The book's chapters specifically focusing on Israel actually largely dropped this international norms hypothesis in favor of an explanation focusing on Israeli domestic political culture and US diplomatic pressure.)

The most notable implication of the logic of "opaque proliferation" was the demise of the testing of nuclear explosive devices as "a clear-cut and visible criterion for recognizing when and how the nuclear threshold had been crossed" (p. 18). In

addition to the rule of “no tests,” Cohen and Frankel argued that opaque proliferation also involved denial of possession, no direct threats, no military doctrine, no military deployment, no open debate, and organizational insulation (pp. 21–2). In short, opaque proliferation was proliferation that dared not speak its name.

Cohen and Frankel argued that this *behavioral* change had important *epistemological* implications. The international community thought it “knew” that thanks to the NPT, proliferation was under control: there were the 5 NWS on the one hand, and 175+ NNWS on the other. But in fact, this “knowledge” was based on who had or hadn’t tested; yet, in the new world of opaque proliferation, testing was an unnecessary luxury that most proliferants would simply bypass. True, there were still not many “opaque” cases – Israel, Pakistan, India, South Africa, and perhaps a handful of even more secret programs – but, Frankel argued, this was *because* of the superpower nuclear arms race, not despite it as NPT advocates believed (p. 6). Now that the superpower arms race was over, a new era of horizontal proliferation was beginning. In this new era, while not directly challenging the NPT, states would simply submerge it in a sea of new *de facto* nuclear arsenals.

The opaque proliferation idea wormed its way into US policy after the shocking 1991 discovery of Iraq’s gigantic and formerly unknown effort to enrich uranium. In response to the Iraq revelations Washington did not merely devote more resources to proliferation intelligence and diplomacy; it also changed its methodology of proliferation assessment. Traditional proliferation assessment had used inductive techniques like visual identification to judge the progress of nuclear weapons efforts. But over the course of the 1990s, the intelligence community gradually developed a “capabilities-based” approach. The “capabilities-based” approach, evident in extreme form in the influential Rumsfeld Commission report on ballistic missile threats (Rumsfeld et al. 1998), took for granted that proliferation would remain opaque; therefore, to compensate for this, it extrapolated estimates of states’ progress toward strategic weapons from Meyer-type latent capacities. The result of this methodological shift was a “technological imperative” hypothesis on steroids. Worse yet, “capabilities-based” assessments were unfalsifiable – or at least, unfalsifiable until after a country had been invaded and occupied.

Washington’s deadly mistakes notwithstanding, the opaque proliferation concept could still be a valid one. To evaluate this, we need to answer the following question: is the Israeli experience indeed the ideal-type of a much broader category of cases, or is it in fact still an outlier? Actually the past 15 years have witnessed Cohen and Frankel’s other signal cases of opacity falling by the wayside. Almost as soon as their book was published, South Africa destroyed its nuclear devices and went openly non-nuclear. A few years later, both India and Pakistan tested bombs and declared their nuclear weapons status. Meanwhile, some of the other suspected cases of “opaque proliferation,” such as Libya and Iraq, turned out to have simply failed to reach the finish line; while others, such as Argentina, turned out never to have made the crucial “proliferation decision” in the first place (Hymans 2006). Moreover, after the breakdown of the US–DPRK Agreed Framework North Korea used precisely the opposite strategy, loudly proclaiming its nuclear capability several years *before* it finally conducted a first test in 2006, whose paltry results hardly justified official US claims that the country had become a nuclear power already in the early 1990s (Sigal 1998). In sum, although we cannot say for sure what various states may be doing behind the back of the IAEA, it would seem that Israel’s path to the bomb remains a *sui generis* one, a point increasingly recognized even by Cohen himself (see Cohen 2008). Thus the NPT’s traditional bright-line distinction between NWS and NNWS appears still relevant to today’s world (Kier and Mercer 1996).

With Cohen and Frankel’s challenge blunted, Meyer’s fundamental puzzle of the gap between the nuclear-capable and the nuclear-armed returns to the fore. And

not surprisingly, over the past decade a number of works have taken up Meyer's question.

Recent Studies of Nuclear Proliferation: Bringing the Demand Side Back In

It was Scott Sagan who did the most to launch a new debate on why some states decide to go nuclear, while others do not. His now classic article (Sagan 1996/7; see also Sagan 2000) outlined three basic "models" of proliferation intentions that could be discerned from a close reading of the idiographic case study literature. Sagan's "security model" followed the typical "defensive realist" point of view that nuclear proliferation occurs in response to significant external threats; his "domestic politics" model saw proliferation as a political payoff to powerful domestic electoral or bureaucratic constituencies; and his "norms model" explained it as the product of a state's quest for acceptance as a "legitimate, modern" member of international society. Sagan's article was a halfway house: beyond the old-style literature's lists of potentially motive or dissuasive variables, but not yet a genuine theory of proliferation with clear micro-foundations linking cause to effect and with multiple, testable hypotheses. Still, Sagan (in addition to other sophisticated efforts such as Reiss 1988, Davis and Frankel 1993, Flank 1993, Lavoy 1993, and Solingen 1994) had pointed the way forward, and other scholars took up the challenge and strove to build and test genuine theories of proliferation.

The new literature on proliferation reflects the diversity of theoretical paradigms available to scholars working in IR today. By now we have strong examples of realist, neoliberal institutionalist, liberal, psychological-constructivist, and sociological-constructivist theories of proliferation to choose from. While these works diverge on many points, actually in many respects they dovetail quite nicely together. This section of the essay summarizes and critiques recent contributions from each of the five paradigms, in chronological order: Paul (2000), Hymans (2006), Dai (2007), Solingen (2007), and Rublee (2009).

The Realist Take: T.V. Paul, Power Versus Prudence (2000)

Breaking with standard realist perspectives on proliferation (e.g. Waltz in Sagan and Waltz 1995; Gray 1999), Paul (2000) depicts the question of going nuclear as a great dilemma for states. On the one hand, Paul accepts the standard realist point of view that acquisition of nuclear weapons provides a state with more military and political power; but on the other hand, he points out that it also threatens to destabilize relations with the state's neighbors (pp. 14–16). Therefore, Paul contends that the cardinal realist value of prudence actually generally commands nuclear abstinence. However, some states can be expected not to act "prudently" (pp. 22–4): (1) great powers or aspiring great powers, for such states simply cannot forfeit the chance to own a weapon with such a fundamental impact on the structure of international polarity; and (2) non-great powers engaged in "enduring rivalries" and not protected by a superpower guarantee or by the knowledge that their enemy is incapable of going nuclear, because such states cannot assume that any nuclear restraint they show will be reciprocated. Having developed these hypotheses on proliferation choices, Paul then tests them on a wide range of fourteen historical cases of both nuclear and non-nuclear weapons states, with cases selected to ensure variation on their placement within the international power structure and the Cold War alliance system. He claims that the test overwhelmingly confirms the model.

Paul's work represents a major step forward for realist approaches to proliferation. Some of its most important contributions are: first, the frank acknowledgment that

proliferation has been rare, and that this is a puzzle with which realism needs to come to grips; second, the refusal to fall back on the typical realist defense that although proliferation has been rare in the past, it is about to explode tomorrow; and third, the clear exposition of why, even within the confines of realist theory, going nuclear may be a very unattractive option for most states. Although the book's explanation of *non*-proliferation thus has considerable punch, its explanation of why some states actually do decide to acquire the bomb could be further developed.

First, Paul emphasizes the importance of "enduring rivalries" in sparking proliferation drives. But the mechanisms via which "enduring rivals" turn into nuclear rivals are not precisely specified. Although "enduring rivalries" often exhibit high tendencies toward conflict spirals, it is not clear why such tendencies would also extend to the nuclear level. Indeed, from a "prudential realist" perspective, the fact that such rivals *know* that their relationship has this tendency might be expected to make them *even more prudent* than normal states before launching a nuclear program. In short, although "enduring rivalry" probably does contribute to proliferation intentions, recognizing this fact should point us away from realism, not toward it.

Second, Paul's expectation that "states with intense aspirations to become great powers" will seek the bomb strains his realist framework to the breaking point. This exception to the rule of prudence does not emerge out of the logic of a well-specified theory, but rather seems tacked on to explain some of the unexplained variance. Moreover, Paul neither explains nor measures these "intense aspirations." Therefore, although in his book Paul applies this exception only to the case of India, one wonders why many other states that have apparently chosen not to go nuclear, including today's Brazil or even South Korea, could not be categorized similarly.

In sum, Paul's "prudential realism" is a good start for understanding why many states have abstained from going nuclear, and the variables he points to as causing exceptions to the general rule of prudence seem plausible. A fully developed theory of proliferation, however, would have to genuinely integrate Paul's basic rule of prudence with the empirical exceptions he notes to that rule. And because of the complex sources of the "enduring rivalry" and "great power aspiration" variables in domestic as well as international political dynamics, it seems hard to imagine that such a theoretical integration could be carried out while remaining within the confines of realism.

*The Psychological-Constructivist Take: Jacques E.C. Hymans,
The Psychology of Nuclear Proliferation (2006)*

Hymans (2006) begins with the contention that the decision to go nuclear is even harder to make than Paul (2000) suggests. It is, he writes, a leap in the dark, a revolutionary decision with consequences that are wildly uncertain (pp. 10–11). It is the tremendous uncertainty about what might follow from the creation of a new nuclear arsenal, Hymans contends, that explains the general historical pattern of nuclear restraint. Moreover, the existence of such a high level of uncertainty undermines the standard notion that the choice to go nuclear even could be made on the basis of a typical cost–benefit calculation. Instead, to understand the decision to go nuclear, we must look beyond typical international, or even domestic, structural variables, to the identity-driven perceptions and emotions that guide leaders to make a choice in the absence of more solid indicators. In short, Hymans offers a psychological constructivist (Lebow 2008) approach to the proliferation puzzle.

In particular, Hymans argues that leaders who hold a "national identity conception" of "oppositional nationalism" – i.e., who define their nation as being both naturally at odds with, and naturally equal (if not superior) to, a particular external "key comparison other" – have a strong emotional tendency to decide to go for an actual

operational nuclear arsenal. By contrast, leaders holding other types of national identity conception will tend to shy away from taking that ultimate step, preferring instead to engage in some level of nuclear hedging (pp. 12–13). Hymans argues that oppositional nationalists' opposition-induced fear and nationalism-induced pride combine to produce a very strong tendency to reach for the bomb. Therefore, the arrival in power of such a leader is almost sufficient to spark a clear proliferation decision, assuming that the state is engaged in reasonably intense interactions with the key comparison other, has at least some measure of experience in the nuclear field, and has placed centralized control of its nuclear establishment into the hands of the top leader (p. 36). Moreover, once the nuclear choice has been made, powerful bureaucratic and psychological forces come into play to make it very hard for the state to turn back on that original commitment (pp. 44–5).

Hymans tests his theory against four country cases: France, Australia, Argentina, and India. The first step in the test is a qualitative and quantitative measurement of the national identity conceptions of dozens of top leaders from the four country cases. On the basis of these measurements, Hymans offers a set of hypotheses on these leaders' likely nuclear preferences. He then tests these hypotheses with detailed process tracing using primary-source documentation. The case studies sometimes demonstrate the inadequacy of received historical wisdom about these states' basic nuclear trajectories. For instance, the book's analysis of Argentina utilizes archival materials to show that, contrary to popular belief, that state never had a nuclear weapons program. Hymans claims that all four cases highlight the importance of different individual leaders' conceptions of the national identity. When oppositional nationalist leaders came to power, they hastened to seek nuclear weapons; by contrast, leaders holding other national identity conceptions avoided making that decision. The importance of the individual level of analysis is underscored by the radically different positions on nuclear armament that were held by different political elites, sometimes even from within the same political party, at a given point in time.

Hymans's book has some clear limitations. First, it takes state leaders' identities as given and therefore does not tackle the important further questions of how people become oppositional nationalists in the first place, and why they may rise to power at certain moments in history. The decision to bracket these questions may be legitimate from the perspective of theory-testing – after all, there is no “independent variable” in social science that cannot also be viewed as a “dependent variable” if one so chooses – but nonetheless it seems to short-circuit consideration of some of the deeper forces that may be at play here. (A valiant effort to seek out those deeper forces in the Indian case is Abraham 1998; see also Abraham 2006.)

Second and more problematically, although Hymans (following Meyer 1984) may be right to focus on the leader's “proliferation decision” as the key proliferation bottleneck, it surely is not the only bottleneck. Indeed, it is an established historical fact that not all states have seen such decisions through to the end. Moreover, in his discussion of the Australian case for instance, Hymans admits that in some cases non-proliferation attitudes and commitments may become entrenched in state institutions, making the mere arrival in power of a new leader insufficient to turn policy around. Clearly, more analysis is needed not only of proliferation decisions themselves, but also of the institutional settings with which leaders must deal (Lieberman 2001; Walsh 2001; Hymans 2008).

The Neoliberal Institutional Take: Xinyuan Dai, International Institutions and National Policies (2007)

It is quite surprising that the renowned NPT regime has not been subjected to close scrutiny by the neoliberal institutionalist literature that has become so dominant in

the IR field over the last two decades. Dai (2007) makes a small step toward filling that gap, although in her work the NPT is introduced only as a shadow case to contrast with the weaker international institutions whose success is explored much more fully (see also Mistry 2003).

Dai begins her analysis with the assumption that the NPT, like many treaties, is a response to a "Prisoner's Dilemma" (PD)-type situation (p. 19). In the PD, while neither party wants to defect – meaning, here, to go nuclear – each fears that the other may well do so, and in that case it would have to defect as well. The well-known solution to this dilemma is an institution that permits each side to have confidence that the other is not defecting. However, as Dai notes, such an institution is only as good as its system for monitoring compliance; yet the neoliberal institutionalist literature has strangely shown little curiosity about how such monitoring is actually done (pp. 20–3). Dai's book tries to answer this question.

Dai's general answer to this question focuses, first, on states' basic level of interest in ensuring compliance by their peers; and second, on their desire to do so in a cost-effective manner (pp. 38–42). For the case of non-proliferation, she contends that states view potential proliferation as a top concern and therefore want high-quality information on it; moreover, given the secrecy that enshrouds the issue they know they are unlikely to get the information they seek from a low-cost, decentralized process. Therefore, in this case they have built a very strong, centralized information system centered on the IAEA safeguards and inspections process. This system, Dai implies, has reassured states sufficiently of others' intentions to be willing to keep their own nuclear powder dry (pp. 50–3).

Dai's book is a model of clarity and precision, and the brief application of her model to the non-proliferation monitoring system has a great deal of plausibility. At least in the post-Cold War era there have been considerable efforts to strengthen the IAEA safeguards and inspections regime. Indeed, in light of the Bush administration's disregard for international institutions, the IAEA's steady progress since the late 1990s is remarkable. But, at the same time, the non-proliferation regime is actually not an ideal-typical case of a centralized monitoring system. In fact, the environmental and peace movements have also played a crucial role in providing information on dangerous nuclear activities, particularly in Western countries but also in many developing countries, notably those that do business with Western nuclear companies (Kitschelt 1986). The IAEA has often found itself following up on leads developed by such "low-cost monitors," in Dai's parlance. Thus, rather than the pure case of monitoring by IGOs that Dai portrays it as, the non-proliferation regime would instead appear to be yet one more mixed case of monitoring by both IGOs and NGOs, not unlike the other regimes to which Dai devotes the bulk of her text.

Dai's assessment of this mixed sort of monitoring system is very optimistic; her book strongly emphasizes "the power of weak international institutions" (p. 100). But her optimism can be questioned. Dai shares with most neoliberal institutionalists the basic assumption that more information availability automatically translates into more regime credibility. Yet what is important for regime credibility is actually not simply the raw amount of information available, but rather states' confidence that the information is accurate and complete. Thus, by bringing to light facts missed by the centralized monitoring system, NGOs can actually undermine the overall credibility of the non-proliferation regime. Indeed, undermining that credibility is often the NGOs' explicit purpose, since their ultimate goal in many cases is to demonstrate that the centralized monitoring system cannot be counted on, and therefore that the only solution to proliferation is to curtail the use of nuclear power altogether. So, these "low-cost" monitors, far from being complementary to the centralized monitoring system, may actually exact a very heavy price on the regime. And indeed, in spite of the vastly increased resources that states have poured into the centralized monitoring system

since the early 1990s, due to the activities of such groups as well as the advent of globalized proliferation networks and the widespread acceptance of the Cohen–Frankel “opaque proliferation” concept, international confidence in the non-proliferation regime today is at an all-time low (Montgomery 2005).

One might retort that states nevertheless appear to have retained confidence in the NPT regime, because after all, they have not abandoned it. But this pattern of continued adhesion may in fact simply reveal the inadequacy of the most basic assumption upon which Dai rests her analysis: that the proliferation “game” is a PD in the first place. This point returns us to the domestic level, for nuclear choices inevitably reflect how particular state elites understand the value of the bomb.

The Liberal Take: Etel Solingen, Nuclear Logics (2007)

Solingen (2007) offers a liberal, i.e. domestic politics-driven, theory of proliferation and non-proliferation. The book, an elaboration of the argument originally made in Solingen (1994), has been rewarded with the prestigious Woodrow Wilson prize of the American Political Science Association. Solingen’s “political survival” model focuses on how ruling coalitions inside states have, since the institutionalization of the NPT regime, pursued their material self-interest via what she terms policies of “nuclearization” or “denuclearization.” Solingen argues, “Inward-looking models [of economic development] approximate necessary if not sufficient conditions for nuclear weapons programs. Internationalizing models are not necessary but likely to be sufficient for denuclearization except under two circumstances: (a) when neighboring inward-looking regimes seek nuclear weapons (or other WMD); and (b) when nuclear weapons were acquired prior to the inception of internationalizing models” (p. 46). Solingen also notes the possibility of “compromise coalitions” between inward-oriented and internationalizing forces, which try to have it both ways, outwardly respecting NPT commitments while building up their potential for a nuclear breakout that only some coalition members truly want (pp. 43–4).

The bulk of Solingen’s book contains nine thoroughly researched country case studies from two regions, East Asia and the Middle East. The case studies strongly undermine the notion that proliferation (or non-proliferation) is the product of unitary, rational states pursuing objective national interests. Rather, they show that different groups within states can actually have very different opinions on the value of “nuclearization.” The case studies also clearly demonstrate that when deciding where they stand on the question of nuclear weapons, political actors consider a much wider array of values than simply the state’s international security and power position. Along these lines, Solingen argues that although alliance relationships with the US may have solidified key East Asian states’ nuclear abstention, the fact of alliance should be seen as endogenous to their other political choices. In other words, East Asian states such as Japan did not stand down from nuclear weapons ambitions because the US placated them with a credible nuclear guarantee, as most accounts suggest; rather, they actively sought that guarantee because they wanted to avoid an indigenous nuclear weapons program that would be terribly damaging to their broader political interests (pp. 79–81). This is a fine example of intellectual judo.

There is much to praise in Solingen’s work, but also room for improvement. First, more attention could have been given to the conceptualization, operationalization, and measurement of the book’s key dependent variables. In a footnote, “nuclearization” is defined as “movement *toward* nuclear weapons acquisition, even if it does not result in actual acquisition” (p. 301, n. 1). This definition is a start, but it is rather general, for instance not clearly distinguishing, as Meyer (1984) did, between the two types of movement “toward” the bomb – political and technological. Reflecting this definitional ambiguity, in Solingen’s book the relative weight assigned to these two

types of indicators appears to vary from chapter to chapter. Meanwhile, “denuclearization” is defined simply as “renunciation,” without further elaboration (p. 301, n. 1). The word “renunciation” suggests a very strong, indeed irreversible commitment to remaining non-nuclear, but elsewhere in the book “denuclearization” seems to be simply the decision not to get nuclear weapons for the time being. It is certainly true that operationalization and measurement are very difficult issues in the study of proliferation, and it would be impossible to resolve them to everyone’s satisfaction (see also Levite 2002/03). Nevertheless, without more precision on these issues it is difficult to determine whether or not the empirical record actually confirms Solingen’s theory as strongly as she contends.

Second, Solingen makes rather modest claims about the power of her basic theoretical model for explaining movement in the direction of “nuclearization.” The asymmetrical nature of the book’s theoretical contribution can be seen in the title of the theory chapter: “Alternative Logics on Denuclearization.” In that chapter, as noted above, the presence of an inward-oriented coalition in power is merely said to be one “necessary” condition for nuclearization (p. 46); though we are not provided with a clear list of the additional conditions that are required to fully explain nuclearization, the case study chapters imply that they may be numerous. The implication that inward-oriented coalitions may, depending on other variables, adopt a wide variety of nuclear postures ranging from denuclearization to nuclearization starkly contrasts with the book’s seemingly much stronger claim about the causal link between internationalizing coalitions and denuclearization. There is absolutely nothing wrong with such theoretical modesty; indeed, one of the real strengths of Solingen’s work is how carefully she points out her own theory’s limits. But of course the field as a whole needs to overcome those limits.

Third, Solingen does not problematize the relationship between import-substitution industrialization and nationalism. Therefore, she tends to take the fact that nationalist sentiments in countries like North Korea led to “nuclearization” as further indication of the fundamental impact of inward-looking economic models on states’ nuclear choices. But actually nationalism and inward economic orientations are clearly separable analytically. And this leads to the question: what if they were also separated empirically? Would it turn out that tendencies toward “nuclearization” and “denuclearization” more strongly followed the pull of economic interests, or the tug of identity? Indeed, in some historical periods internationalizing economic models have gone hand in glove with nationalism (Greenfeld 2001). The case of late-1990s India, in which a strongly nationalist *and* economically internationalizing coalition chose to risk its economic and political survival for an overt, sustained nuclear breakout, suggests that when push comes to shove, nationalist urges may at least sometimes get the better of material self-interest. Solingen properly acknowledges that the Indian case demonstrates her theory’s “refutability” (p. 348 n. 40). But in fact the 1998 Indian decision may well be more than a mere anomaly to be brushed off in a footnote. Given the reality of globalization, it has been hard to be anything but an economic internationalizer in recent years – Solingen suggests that even Kim Jong Il may be one (pp. 133–8) – yet we know that despite this trend, nationalism and “nuclearization” are still very much with us. We must therefore follow Max Weber (1958) and attempt to identify the fundamental ideas that give rise to perceptions of material interests.

The Sociological-Constructivist Take: Maria Rost Rublee, Nonproliferation Norms (2009)

Rublee (2009) begins her work with the by now classic question of the proliferation field: “Why have so many states abstained from nuclear weapons, while a few continue to pursue them against all odds?” (p. 1). She finds her answer in the sociological

constructivist literature on identity and norms complemented with social psychology, as exemplified by the work of Johnston (2001; 2008). In particular, Rublee contends that “the international social environment, supported by first an emergent and then a full-fledged nuclear nonproliferation regime, has helped to provide that systemic impetus toward nuclear nonproliferation [...]. Over time, nuclear proliferation became more costly – economically, technically, and diplomatically – whereas nuclear nonproliferation became more rewarding” (p. 202). Rublee emphasizes that the “cost–benefit” calculation that she claims states make about the bomb is not a strictly material one, but includes a wide variety of nonmaterial considerations as well (p. 28). For instance, in line with much sociological constructivism, she places great emphasis on most states’ desire for recognition as normal states, whereas “those outside the NPT are also outside the international community” (p. 51).

Rublee tests her rigorously derived hypotheses against competing theories with in-depth historical case studies of Japan and Egypt, and briefer looks at Germany, Sweden, and Libya. Unlike some of the other books considered here, Rublee’s is quite winningly modest about the power of her theory. She does not claim that the international non-proliferation norm by itself caused any state to choose nuclear forbearance, but rather that in most cases the norm *interacted* with other variables to produce this outcome (p. 202). For instance, in the case of Japan, Rublee argues that the international norm reinforced a pre-existing domestic revulsion from nuclear weapons born of Hiroshima, and that the continuing strength of the Japanese public’s nuclear allergy was important because it kept the ruling conservative elites from allowing themselves to grow unsatisfied with the nuclear umbrella provided by the US. In other words, Rublee’s argument in the Japanese case rests on a combination of domestic identity politics, the international social environment, and alliance politics. Rublee makes similarly nuanced arguments in the other cases she studies. This is fine historical scholarship.

On the other hand, Rublee’s claims for the effects of the NPT are so modest that one starts to wonder whether it might be right to characterize the regime as simply an *extra* layer of protection against the possibility of proliferation. Indeed, in four of her five cases, the fundamental decision to abstain from nuclear weapons was taken before the creation of the NPT. This fact pushes Rublee’s argument into some difficult contortions. For instance, on Egypt Rublee writes, “One potential explanation for Nasser’s reluctance to pursue a nuclear weapons program seriously after 1960 is the influence of the international norm against non-proliferation. At first glance this may seem implausible, given that the NPT was not open for signature until 1968 and did not come into force until 1970. But closer analysis shows otherwise” (p. 114). Rublee’s “closer analysis” is that Egypt saw international disarmament negotiations at the UN as a means of exercising leadership of the Arab cause against Israel. But such diplomatic posturing is hardly incompatible with the continuation of a secret nuclear weapons drive. The main reasons for Egyptian non-proliferation are thus to be sought elsewhere (perhaps in Walsh 2001).

Second, Rublee’s attempt to highlight the impact on states’ nuclear choices of not just the NPT but also the broader “non-proliferation norm” highlights the need for much more rigorous measurement. Rublee devotes only four pages to assessing the existence and strength of the overall international non-proliferation norm, which she sees as part of a broader normative revulsion against nuclear weapons dating at least from 1945 (pp. 35–9). Yet a serious assessment of the overall strength of the norm is particularly important in the case of proliferation, for as Sagan (1996/7) emphasized in his discussion of the “norms model,” in addition to the non-proliferation norm there is also a *proliferation* norm – an implicit injunction that states seeking great power status need to get the bomb. This ambiguous normative environment is reinforced by the frankly discriminatory character of the NPT, which Epstein (1976) and

many subsequent authors have argued may doom the regime to failure. Rublee greatly understates these structural problems (p. 39).

Indeed, due to what Abraham (2006) calls the “ambivalence of nuclear histories,” standard IR constructivist hypotheses are much less readily applicable to the case of non-proliferation than they are to, say, the proliferation of conventional weapon systems or the abolition of slavery. From another angle, however, the unique normative features of the proliferation issue present an opportunity for the further development of the sociological-constructivist research program in the discipline.

Toward the Future of Proliferation Studies: An Emerging Consensus?

The state of the proliferation literature is strong today. In the past decade or so, the topic has come to the forefront of the IR debate, and the result has been a great deal of productive scholarship from all of the major paradigms in the literature. The different authors reviewed here of course have many disagreements – for instance, over the proper weight to assign to individual, domestic political, or international systemic variables. However, one can also perceive the faint outlines of a consensus on the dynamics of nuclear proliferation up to this point in history. In particular, there are five points on which most recent works converge.

The first point of agreement is that proliferation has historically been a rare phenomenon, and moreover that this is not a fluke or an aberration but rather a battle-tested empirical reality that needs to be explained. Despite acknowledging that opaque proliferation can happen, the overwhelming majority of academic analyses today accept the basic fact that non-proliferation has been the norm. This is one of the most important contributions that the literature can make to the often hysterical proliferation debate that is taking place in the policy world.

The second point of agreement is that while the supply side of the proliferation equation is undoubtedly important (Montgomery 2005; Gartzke and Kroenig 2009), the most significant bottleneck has consistently been on the demand side. To explain why the bomb has proven less attractive to states than people like President Kennedy once feared, Paul and Dai primarily stress states’ anticipation of a proliferation domino effect; Solingen primarily stresses their desire to advance their economic interests in a globalized world; Rublee primarily stresses the international normative delegitimation of the pursuit of nuclear weapons; and Hymans stresses the paralyzing degree of uncertainty that is produced by all of these potential downsides and by the potential upsides as well. While the literature’s disagreements over what disincentives are more important need to be resolved, all the authors agree on the basic fact that to go nuclear is potentially extremely costly for states.

The third point of agreement is that the analysis of states’ nuclear choices cannot bypass the domestic level of analysis. Domestic factors are of course central to the work of Solingen and Hymans, but the other strands in the literature are generally not antagonistic to this point of view. For instance, Dai’s overall theoretical framework demonstrates a strong commitment to analyzing the interaction between international institutions and domestic-level variables, so reconsidering the NPT along those lines could be a “friendly amendment” to her book.

The fourth point of agreement is the close connection that most of the authors see between national identity and the desire for nuclear weapons. Hymans’s “oppositional nationalist” leaders, Rublee’s “social” states, Paul’s “enduring rivals” and “great power aspirants,” and even Solingen’s “inward-oriented coalitions” are all doing more than simply developing a military response to a material security threat. They are reaching for a powerful symbol whose meaning goes far beyond its likely practical consequences.

The fifth point of agreement is that the way forward for the proliferation literature is to further develop theory and to rigorously test any new theoretical developments through in-depth process-tracing analysis of an ever more complete historical record. Most proliferation scholars today are not content simply to add to the old laundry lists of proliferation incentives and disincentives. They also show a strong commitment to going beyond simply developing plausible hypotheses and noting interesting correlations. The cutting edge of the proliferation literature today tries to explicate in detail the political processes that generate specific kinds of nuclear choices. This commitment to understanding processes also inevitably means conducting careful, systematic historical case studies. The literature's traditional reliance on declassified American intelligence (Richelson 2006) and the folk knowledge of the non-proliferation community is no longer enough. Most proliferation scholars have realized that the way forward is to investigate history much more closely. The proliferation field's commitment to detailed analysis of specific historical cases has had the additional benefit of making this scholarly literature unusually comprehensible and instructive to our colleagues in the policy world.

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