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Deniability in the Nuclear Nonproliferation Regime: The Upside of the Dual-Use Dilemma

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Nuclear technology is often "dual-use," having both peaceful and military applications. This is widely regarded as a lamentable fact, as states can pursue nuclear weapons under the guise of peaceful intentions. However, this article proposes an upside to the nuclear dual-use dilemma: the deniable nature of dual-use technology makes it more amenable to coercive counterproliferation. Caught proliferators are more likely to come into compliance if they can elude audience costs by denying that they were ever out of compliance. Thus, the dual-use dilemma is both the bane of the nonproliferation regime *and* a boon to its coercive enforcement. Poor knowledge of past nuclear programs can hamper future verification. Counterintuitively, however, the effectiveness of nonproliferation regime institutions created to promote transparency—the Treaty on the Non-Proliferation of Nuclear Weapons and the International Atomic Energy Agency (IAEA)—may be enhanced by not directly challenging the denial of past nuclear activities. This research uses interviews and archival evidence from the IAEA, US government, and South African apartheid government. At a time when ongoing nuclear disputes revolve around questions of transparency and admissions of guilt, this article contributes to scholarly and policy debates about secrecy, face-saving, counterproliferation strategy, and the role of international institutions in coercive bargaining.

Con frecuencia, la tecnología nuclear es de "doble uso," y tiene aplicaciones tanto pacíficas como militares. Esto se considera en general como un hecho lamentable, ya que los Estados pueden buscar armas nucleares bajo la apariencia de intenciones pacíficas. Pero este artículo propone un aspecto positivo del dilema del doble uso nuclear: la naturaleza negable de la tecnología de doble uso la hace más susceptible a la contraproliferación coercitiva. Los proliferadores atrapados tienen más probabilidades de cumplir las normas si pueden eludir los costos de audiencia al negar que alguna vez hayan incumplido. Así, el dilema del doble uso es tanto la perdición del régimen de no proliferación y una ventaja para su aplicación coercitiva. El escaso conocimiento de los programas nucleares del pasado puede dificultar la verificación futura. Sin embargo, de forma contraria a la intuición, la eficacia de las instituciones del régimen de no proliferación creadas para promover la transparencia, el Tratado de No Proliferación Nuclear (TNP) y el Organismo Internacional de Energía Atómica (OIEA), puede mejorar si no se cuestiona directamente la negación de actividades nucleares pasadas. Esta investigación utiliza entrevistas y pruebas de archivo del OIEA, el gobierno de Estados Unidos y el gobierno del apartheid sudafricano. En un momento en que las disputas nucleares en curso giran en torno a cuestiones de transparencia y admisión de culpabilidad, este artículo contribuye a los debates académicos y políticos sobre el secreto, el salvamento, la estrategia de contraproliferación y el papel de las instituciones internacionales en la negociación coercitiva.

La technologie nucléaire est souvent « à double emploi » puisqu'elle a à la fois des applications pacifiques et militaires. Cette situation est largement considérée comme un fait regrettable, car les États peuvent mener des recherches sur les armes nucléaires sous couvert d'intentions pacifiques. Mais cet article suggère un avantage du dilemme du double emploi de la technologie nucléaire : la nature contestable de cette technologie à double emploi la rend plus propice à une contre-prolifération coercitive. Les proliférateurs pris en défaut sont davantage susceptibles de se mettre en conformité s'ils peuvent échapper aux coûts publics qu'ils encourraient en prétendant qu'ils n'ont jamais été en non-conformité. Le dilemme du double emploi est donc à la fois le cauchemar du régime de non-prolifération et une aubaine pour son application coercitive. La méconnaissance des programmes nucléaires passés peut entraver les vérifications futures. Cependant, contre toute attente, l'efficacité des institutions du régime de non-prolifération créées pour promouvoir la transparence—TNP et AIEA—peut être améliorée en ne remettant pas directement en question le déni des activités nucléaires passées. Cette recherche s'appuie sur des entretiens et des preuves d'archives de l'AIEA, du gouvernement américain et du gouvernement d'apartheid d'Afrique du Sud. À l'heure où les différends nucléaires tournent autour de questions de transparence et d'aveu de culpabilité, cet article contribue aux débats universitaires et politiques sur le secret, le sauvetage des apparences, la stratégie de contre-prolifération et le rôle des institutions internationales dans les négociations coercitives.

Introduction

Nuclear technology is often "dual-use," having both peaceful and military applications. Scholars and policymakers have long lamented this tragic fact as an impediment to nonproliferation—a loophole that allows cheaters to pursue nuclear weapons without "breaking the rules" (Wohlstetter 1976/77). However, the dual-use problem has dual effects. It also has an underappreciated upside: nuclear proliferation is more receptive to coercion *because* it is often deniable.

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Table 1. Coercive counterproliferation attempts

Counterproliferator(s)	*Proliferator*	*Evidence of deniability*	*Bargain dates*	*Affirms theory*
USA	Israel	Yes	None[a]	✗
Egypt	Israel	No	None[*]	~√
USA	West Germany	Yes	1969	√
USA	Taiwan	Yes	1976–1981	~√
USA	Taiwan	Yes	1988	√
USA	South Korea	Yes	1981	√
Israel	Iraq	No	None[*]	√
USA	Pakistan	Yes	None	✗
USSR, USA, France, UK	South Africa	No	1977	✗
USA	South Africa	Yes	1989	√
USA	Algeria	Yes	1992	~√
USA, Russia	Kazakhstan	No	1992	✗
USA, Russia	Belarus	No	1992	✗
USA, UK, Russia	Ukraine	No	1994	✗
USA	Iraq	No	None[*]	√
China, Russia, USA, South Korea	North Korea	Yes	1994–2003	~√[b]
USA, UK	Libya	Yes	2003	√
EU3	Iran	Yes[c]	2003–2005	~√
Six-Party/USA, South Korea	North Korea	No	None	√
P5+1, EU	Iran	Yes	2015–2018	√[d]

√ = Affirmed ~√ = Partially Affirmed ✗ = Miss.
[*] = Brute force used.
[a]Nuclear testing bargain not counted.
[b]I consider multiple efforts to pressure Pyongyang as part of this same extended DPRK nuclear crisis episode.
[c]The IAEA had not yet outlined its concerns about possible military dimensions. This episode may be better understood as concealment rather than deniability.
[d]The Iran case is ongoing.

The dual-use nature of nuclear technology is a boon to the coercive enforcement of the nonproliferation regime. Its chief institutions—the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the International Atomic Energy Agency (IAEA)—by their design have not impeded deniability. Counterproliferators who embrace such deniability are more likely to succeed in compelling violators who can save face when they come into compliance. Without negating the real negative consequences of the "dual-use" dilemma, this article builds out a theory of its underappreciated upside.

This research is motivated by two puzzles in the literature on coercion and nonproliferation. First, as better empirics emerge from archives, nuclear scholars have begun to show just how coercive and secretive enforcement of the nonproliferation regime has been historically (Rabinowitz 2014; Miller and Rabinowitz 2015; Bas and Coe 2016, 2018; Carnegie and Carson 2018; Miller 2018). This follows a turn in the literature away from drivers of proliferation (Sagan 2011; Monteiro and Debs 2014) toward the process of proliferation, decisions taken en route to the bomb (Levite 2002; Narang 2016/17), and the process of counterproliferation, including why states attack nuclear programs (Fuhrmann and Kreps 2010), when sanctions impede proliferation (Solingen 2007; Miller 2014), and how patrons coerce allies (Gerzhoy 2015; Colgan and Miller 2019). However, this empirical progress has left a puzzle: why is coercion so successful in stemming nuclear proliferation? In a domain where violators are highly motivated by security fears, it should be difficult to persuade a proliferator to abandon its pursuit of a nuclear ace. Yet, coercive counterproliferation attempts have a 70 percent success rate (table 1). Some would put the figure even higher, given unobserved deterrent successes of economic sanctions (Miller 2014). By comparison, the broader literature on coercion finds much lower average success rates over all type of stakes. Sechser (2011) finds that stronger compellers achieve their aims just 36 percent of the time. Other studies of American coercive diplomacy find that Washington's threats have succeeded 18, 29, and 31 percent of the time.[1] Or, on average across major studies, Downes (2018) finds a 35 percent success rate. While selection issues abound, there are few cases of proliferators who have not been challenged on their path to the bomb.[2] Power, it seems, by no means heralds coercive success.

Second, in the broader literature on coercion in international politics, scholars concur with Schelling (1966, 82) that compellence is more difficult than deterrence in part because conceding is "more conspicuously compliant, more recognizable as submission under duress … less capable of being rationalized as something that one was going to do anyhow."[3] Yet, sometimes, targets of compellence concede with little humiliation. This pattern presents itself empirically in cases of nonproliferation, where compellence succeeds uncommonly often. Allies and adversaries of their coercers alike have successfully denied past investments in nuclear weapons. In 2015, even Iran denied, and was permitted by its coercers to deny, its known violations of the NPT while making concessions to rein in its nuclear program and accept more intrusive inspections. Why are proliferators able (or allowed) to deny their transgressions, especially when an institution dedicated to transparency—the IAEA—is involved? Is face-saving easier in cases of compellence than scholars of coercion have

[1] Blechman and Kaplan (1978); George and Simons (1994); and Art (2003), respectively.
[2] Pre-NPT acquirers were not seriously challenged coercively (US, USSR, UK, France, China).
[3] A survey of coercion literature agrees (Greenhill and Krause 2018).

recognized? The nuclear literature itself has only just begun to explore the trade-offs of transparency in arms control negotiations (Coe and Vaynman 2020) and in authoritarian bureaucracies (Braut-Hegghammer 2020).

This article argues that coercive nonproliferation is aided by the deniability inherent in much nuclear technology and the subtle design of nonproliferation regime institutions. The "dual use" nature of nuclear technology facilitates coercive enforcement of nonproliferation obligations by allowing for the deniability of wrongdoing once it is caught. This public opacity of intentions makes proliferators more responsive to behind-the-scenes coercion. Leaders can deny, primarily to domestic audiences, that they have conceded anything at all. Of course, coercion may still fail if threats and assurances lack credibility or severity (Schelling 1966; Greenhill and Krause 2018; Pauly 2019), but caught proliferators are more likely to accede if deniability is available to them. While counterproliferators do not always embrace this opportunity for face-saving, when they do coercion is more successful. This article thus explains the strategic interactions of proliferators and counterproliferators[4]—how they compete in public, private, and through institutions; under what conditions nonproliferation policies succeed; and why some states are permitted to deny their cheating.

It is safe to say that there are many reasons why far more states have pursued nuclear weapons than have acquired them, and why, three-quarters of a century on, a WWII military technology is still in the hands of only nine countries (Sagan 2011). This article builds out novel mechanisms for a school of thought that asserts the nonproliferation regime rests ultimately on enforcement by great powers, who punish or threaten violators (Coe and Vaynman 2015; Colgan and Miller 2019). As empirical studies have generally found that the NPT "works" to stem proliferation, scholars continue to debate why (Fuhrmann and Lupu 2016). That some proliferators end their pursuit at an acceptable level of nuclear "latency" is consistent with such bargaining over how much nuclear capability coercers are willing to accept (Fuhrmann and Tkach 2015; Mehta and Whitlark 2017; Bas and Coe 2018). Nevertheless, this article does not falsify alternative theories. The nonproliferation regime—with the NPT at its core—may still have created a norm against the possession of nuclear weapons (Rublee 2009; Budjeryn 2015), solved coordination problems through reciprocity (Keohane 1984; Sagan 2011), or resolved domestic political disagreements by elevating bureaucratic and industrial voices against proliferation (Sagan 2011).

In the institutions' literature, scholars debate why powerful states ever turn to international institutions to settle political disputes when they possess unilateral means of persuasion. Answers are manifold, including norm promotion (Finnemore and Sikkink 1998), realizing the mutual gains of settlement (Simmons 2002), or reciprocity and concern for one's own reputation (Keohane 1984). I highlight the role of institutions as important intermediaries of coercive enforcement. Institutions can facilitate the face-saving deniability necessary for targets to comply with coercion at lower reputational costs.

The second section develops the theory and its mechanisms. The third section presents a medium-N analysis of the entire universe of coercive counterproliferation cases. The descriptive statistics show a surface correlation between concession and deniability worthy of deeper investigation. The fourth section shows the theory's explanatory power in the case of South Africa, including within-case variation, based on process tracing of IAEA, US government, and South African apartheid-era archival documents. The fifth section considers the costs of face-saving deniability, including trade-offs with future verification, and remaining questions on dual-use deniability. The sixth section concludes.

Theorizing Nuclear Deniability

The opacity of state intentions enabled by "dual use" nuclear technology facilitates coercion by sparing targets the reputational costs of making nuclear-related concessions. Violators caught pursuing nuclear weapons are more likely to stop or rollback if they can deny that they were ever up to no good. Coercive bargains can be struck more readily. The NPT and the IAEA have not impeded this kind of deniability.

Disengaging Audiences from Coercive Bargaining

All coercion comprises two types of stakes. The first is the "issue stake"—the matter over which a demand is made. A demand to end a nuclear weapons program is over the issue of nuclear weapons. The second stake, intrinsically tied to the first, is the "reputational stake." Targets of coercion must wonder whether in backing down they will incur a reputational cost in the eyes of domestic or international observers.

That these two stakes are linked is a key reason why scholars of coercion have long noticed that states are loath to concede to compellent demands (Art 1980, 10; Sechser 2010; Art and Greenhill 2018, 18). And while scholars continue to debate whether it is possible for states to develop certain reputations (Press 2005; Sartori 2005; Weisiger and Yarhi-Milo 2015), there is general concurrence that state leaders consistently believe it to be so. President Kennedy lamented his inability to back down in the Cuban Missile Crisis not due to the stakes themselves but a prior firm public stance; he eventually struck a secret compromise (Sagan 2000).

Such fears may derive from either domestic or international audiences. Domestically, democratic leaders accountable to voters may fear that they will suffer at the polls if they concede to foreign threats (Fearon 1994). However, autocratic leaders, too, have selectorates to worry about and seem no more willing to make public concessions, especially personalist dictators (Weeks 2008).[5] Moreover, leaders in all regime types concern themselves with international audiences and consider whether bowing to one state's demands will invite others to predate in the future (Sechser 2010).

In coercive bargaining, face-saving deniability aims to sever these audiences from a coercive interaction by maintaining in their eyes a narrative that downplays the target's concessions. States may aim to elude international or domestic audiences, but the domestic mechanism is deductively stronger of the two.

First, a state conceding to compellence will struggle to keep its concessions private from its coercer while still striking a bargain; therefore, deniability may not prevent the same coercer from coming back for more in the future. Deniability may, however, reduce the likelihood of a third party drawing strong inferences about the coercibility of the conceding state. This is more likely if the third party has less independent capacity to monitor the conceding state's behavioral change for itself, for instance, through intelligence collection.

Second, deniability allows conceding governments to avoid paying domestic audience costs. An electorate or selectorate must first believe that concessions were made in

[4] See also Solingen (2012); Saunders (2019); and Mehta (2020).

[5] Personalist regimes are also more likely to proliferate (Way and Weeks 2014).

order to blame someone for making them. Conceding governments may avoid this blame by maintaining a public narrative that diminishes the extent of their concessions. Domestic publics have less independent capacity to judge the truth of a coercive bargain for themselves. Moreover, publics are readily swayed by elite opinion makers—an effect magnified by political partisanship (Guisinger and Saunders 2017)—while even demonstrably false narratives, if repeated enough, can find shocking tribal devotion (Greenhill forthcoming; Kahneman 2011). Denials deemed "implausible" to informed ears, therefore, may still be publicly useful.

In sum, deniability keeps uninformed audiences, including domestic observers and third parties without independent inspection or intelligence collection capacity, in the dark. Deniable concessions thus help to disengage reputational stakes from issue stakes. A target of coercion may concede while maintaining that the proscribed behavior never occurred and therefore that it gave up little or nothing at all. Low-visibility concessions permit more face-saving in compellence than conventional wisdom appreciates (Schelling 1966). All else equal, if a target believes it can evade international or domestic audience costs, it concedes more readily. And coercers can more easily cater to these incentives when bargaining over nuclear technology.

Contributions to the Study of Deniability

Deniability—plausible or implausible—is a strategic use of feigned ignorance. It is achieved by not asking questions that you do not want the answers to. Denial is distinguished from pure lying by its strategy; liars lie, deniers deliberately mislead.

In international politics, rife with its own hypocrisy (Krasner 1999), deniability finds its roots in state secrecy. Secrecy can conceal information from prying eyes, but secrecy is not always about concealment. Sometimes, even when the empirical facts are broadly known, secrecy maintains policymaking flexibility by keeping events deniable, if not unseen, and by sheltering decisions from public scrutiny. Carson (2018) shows how strategic deniability allowed the United States and the Soviet Union to tacitly collude to keep the Korean War limited. Poznansky (2019) further identifies covert action as a means of avoiding the hypocrisy costs of violating international law.[6] Even "open secrets" that are implausibly deniable can serve a strategic purpose (Carson 2018). Ample evidence has a hard time overcoming state interests.

My argument is therefore complementary to existing literature on the role of secrecy in coercive bargaining, which emphasizes how private communication affects the credibility of signals—threats and assurances (Yarhi-Milo 2013; Carson and Yarhi-Milo 2017; McManus and Yarhi-Milo 2017)—and challenges the conventional wisdom that public commitments are best (Fearon 1994). A long tradition of scholarship has observed how secrecy helps states save face. However, we often fail to appreciate how manipulable it can be (Simmons 2002; Ramirez 2018). That transparency and publicity may hinder statecraft also fits with other recent findings in the context of crisis bargaining (Kurizaki 2007; Brown and Marcum 2011; Debs and Weiss 2016). By focusing on the decisions to make public versus private threats or assurances, scholars have as yet under-investigated the political, technological, or institutional conditions that permit opaque concessions.[7]

In the nuclear literature specifically, conventional wisdom conceives of deniability only insofar as it *facilitates* proliferation by masking opaque nuclear weapons programs under the guise of peaceful intentions (Cohen and Frankel 1990; Hecht 1998; Narang 2016/17, 132).[8] This article proposes that states can also turn such deniability into face-saving off ramps. In so doing, it adds to recent work on the use of tacit bargaining and secrecy in the nonproliferation regime to check the second-order consequences of proliferation: to protect norms (Carnegie and Carson 2018) and prevent proliferation cascades (Rabinowitz 2014; Miller and Rabinowitz 2015). However, I focus on the first-order counterproliferation.

Nuclear Deniability

Nuclear concessions are deniable for three reasons. First, nuclear pursuits are among states' most highly guarded secrets (Saunders 2019). Whether because certain research and development is proscribed or because it is protected as intellectual property, nuclear secrecy keeps technical progress out of the public eye. The fewer people who know the truth, the easier it is to deny it.

Second, most nuclear technology is by nature "dual-use." It can be used for the peaceful purposes of producing clean energy and treating cancers or for the military purpose of developing highly destructive weapons. The human capital and research reactors that enable breakthroughs in medical treatments and basic science can provide a knowledge base for a bomb program. Centrifuges that enrich uranium to low levels to fuel light-water reactors are capable of enriching uranium to weapons-grade concentrations. This dual-use problem is well known and the reason for regulation in the first place. It is also the characteristic of nuclear technology that lends itself most to coercive enforcement.

Third, the nonproliferation regime and its institutions by their original design have not impeded such deniability and have thus facilitated the face-saving that allows proliferators to comply with coercion at lower reputational costs. Said another way, the regime institutionalizes the "technopolitics" of deniability in the nuclear domain (Hecht 1998, 46). This institutional role is not epiphenomenal to the nature of dual-use technology. Rather, it is the result of the politics at play during negotiation and design of these institutions. And there is little evidence in the historical record that founding negotiators were concerned with the dynamics of coercion and face-saving.

The NPT has allowed for the denial of past nuclear pursuits by requiring member states to declare present and future nuclear activities *at the time of accession* to the Treaty. This design reflected the forward-looking desire of treaty negotiators in the 1960s to freeze in place the status quo of five formal nuclear weapons states and no more (USACDA 1969; Bunn 1992). Moreover, the NPT does not codify a clear line between weapons activities (prohibited by Article II) and civilian activities (permitted by Article IV) (NPT 1968). This is not an error. Negotiators discussed the vagueness explicitly and agreed not to specify what types of facilities, investments, or experiments would be permitted or restricted. As Volpe (2019, 827) observes, the resulting language created an undefined dual-use "grey area." Negotiators instead left it up to the IAEA, through "safeguard" inspections provided

[6] Poznansky (2020) also defines another type of executive deniability.

[7] Targets may make private concessions even during public coercive diplomacy.

[8] Narang is too strong in claiming that "discovery [of weapons programs] undermines the plausibility of such denials." Instead, denials may be privately implausible but publicly useful.

for in Article III, to determine what was permitted or not on a case-by-case basis.[9]

Yet, the IAEA's design has similarly permitted deniability. Often described as a "nuclear watchdog," the IAEA is commonly thought to be an organization devoted to transparency, discovering and revealing misbehavior. Such a view is inconsistent with the institution's design. The IAEA is tasked not with investigation per se but with verifying the "correctness and completeness" of member state declarations.[10] Its delegated authority looks more forward than backward. To the extent that the IAEA discovers illicit proliferation, it does so if states cheat at declared facilities. The IAEA, therefore, relies on intelligence sharing from member states to rein in clandestine nuclear programs, sometimes waiting to be invited in as a neutral verifier of independent political agreements (Carnegie and Carson 2020).

This basic structure conformed to the interests of the leading states that established the IAEA. They were, however, not thinking about coercion. The mandate of IAEA safeguards was kept narrow, emphasizing technical measurement and accounting over less "objective" metrics, in order to appeal to more states to join (Roehrlich 2016; Weichselbraun 2020). Nuclear material producers, such as South Africa, also insisted on looser regulations for raw materials (Hecht 2006). As such, the IAEA was not established to judge state intentions. Furthermore, during the later negotiation of the NPT, the rules governing IAEA safeguards had to be coordinated with those of the European Atomic Energy Community (EURATOM). European negotiators, both because they were believers in the postwar European federalist mission and because they sought to preserve "exclusive control of nuclear activities in Europe," would not allow EURATOM to be replaced by a larger, global institution (Mallard 2014, 14). A compromise ensued to "harmonize" EURATOM's less intrusive safeguards regime with the IAEA's envisioned practices. As Mallard (2014) shows, this harmonization required a degree of "opacity" and "ambiguity."

Superficially, the IAEA then seems a poorly designed institution, incapable of enforcing nonproliferation with one hand tied behind its back. Yet, the combination of private state-based intelligence collection with IAEA-based information gathering is actually advantageous: it has helped enforcers to strike pragmatic compromises between verification and deniability. It allows caught proliferators to communicate what they cannot admit out loud (that they cheated). And when states reach a threshold of confidence that they can detect future transgressions, there is little need to rake cheaters over the coals. The IAEA thus has an underappreciated role as an interlocutor for coercive bargaining.

Nuclear institutions are not unique in this regard. I add to established literature on "constructive ambiguity" and international organizations, which has shown how the negotiation and evolution of international agreements benefit from strategic imprecision and interpretability (Chayes and Chayes 1993; Best 2005). Hard security issues, however, are infrequently considered in this literature.[11] Nor does such work engage with "deniability," distinct from "ambiguity"—ambiguous facts are interpreted differently, deniable facts are known to both sides in private.

Most importantly, each of these permissive conditions—secrecy, dual-use technology, and institutional design—is filtered through the key independent variable of state strategy. For coercers to realize the face-saving benefits of deniability in coercion, it is not enough just for technologies or institutions to permit it; they must themselves play along. Deniability takes two. Thus, not all dual-use proliferation activity is deniable, because counterproliferators vary in the degree to which they *embrace* the material and institutional factors that permit deniability. Deniability is a switch that coercers can turn off—by publicizing what they know and consistently pushing for more transparency. The fifth section considers why states might not wish to embrace it.

The following sections show through a medium-N analysis that deniability is associated with successful nonproliferation bargains and through process tracing that the political utility of deniability can be preserved during nonproliferation verification inspections. My theory predicts that I should find evidence consistent with three hypotheses. Hypothesis 1 refers to the broad relationship between deniability and nonproliferation bargains, while Hypothesis 2 and Hypothesis 3 express predictions about the mechanisms by which nuclear deniability reduces barriers to striking bargains.

First, a general relationship should exist between deniability and successful coercive counterproliferation.

H1: *When coercive counterproliferators embrace deniability, they will be more likely to achieve their aims. Conversely, when they demand public confessions, they will be less likely to achieve their aims.*

Second, caught proliferators themselves should behave in a manner consistent with a desire to deny their weaponization intentions and do so by appealing to the civilian applications of their technological pursuits. When engaging with nonproliferation institutions—the NPT and the IAEA—these proliferators should be able to maintain their public denials.

H2: *Conceding proliferators will attempt to deny past weaponization intentions, appeal to the civilian applications of their investments, and find that the processes of the NPT and IAEA do not impede their denials.*

Third, in cases of denial, caught proliferators who reverse or roll back their programs should be able to do so while paying low domestic audience costs.

H3: *Conceding proliferators permitted to deny their past weaponization intentions will elude audience costs associated with backing down.*

Coercive Counterproliferation

As a simple test of Hypothesis 1, I examine the full universe of proliferation cases ($n = 34$) (Bleek 2017). Of these cases, I code twenty episodes of economic or military coercive counterproliferation.[12] The same proliferator may account for multiple episodes of coercive counterproliferation if an earlier bargain broke down and renewed coercion began again (table 1). I then code each episode according to

[9] The Nuclear Suppliers Groups also sought to fill this gap with export controls.

[10] The IAEA also prioritizes its mission of providing assistance with peaceful nuclear technology. Over time, the IAEA has embraced more of its role as a detector (Weichselbraun 2020), including through negotiation of the Additional Protocol.

[11] Simmons (2010) review makes no mention of the NPT.

[12] Cases do not count if policymakers discussed but rejected the option of coercing (e.g., Soviet, French, or Chinese proliferation). Some cases lack sufficient evidence of coercion, e.g., US pressure on Sweden, Italy, Japan, or Australia lacked express threats. Some episodes include brute force, which can be the result of bargaining failure. However, I exclude cases of purely covert brute force, e.g., Israel–Syria 2007, because coercion must present the target with a choice to concede; Israel offered none. Nonetheless, deniability is notable even in the 2007 case (Haas and Yarhi-Milo 2020/21).

Table 2. Nonproliferation bargains are associated with deniability (coercer[s]–proliferator bargain date)

	Coercive bargain	*No coercive bargain*
Deniability permitted	USA–West Germany 1969 USA–Taiwan 1976–1981 USA–ROK 1981 USA–Taiwan 1988 USA–South Africa 1989 USA–Algeria 1992 China, Russia, USA, ROK–DPRK 1994–2003 USA, UK–Libya 2003 EU3–Iran 2003–2005 P5+1, EU–Iran 2015–2018	USA–Israel USA–Pakistan
Deniability not permitted	USSR, USA, France, UK–South Africa 1977 USA, Russia–Kazakhstan 1992 USA, Russia–Belarus 1992 USA, UK, Russia–Ukraine 1994	Egypt–Israel Israel–Iraq USA–Iraq Six-Party/USA, ROK–DPRK

whether the proliferator made concessions to strike a coercive bargain (indicated in table 1 by years), and whether the coercer(s) allowed the proliferator to keep private any aspect of its nuclear proliferation violations[13] (see the Online Appendix).

As table 1 shows, counterproliferators have successfully struck coercive bargains with 70 percent (fourteen out of twenty) of the proliferators they have threatened. Some studies would put the figure even higher given unobserved deterrent successes. Accounting for just the known deterrent successes in Miller's (2014) coding of aspirants vulnerable to sanctions (additional cases[14]: Australia, Egypt) would put the success rate at 73 percent. Nonetheless, selection effects skew these observations, since counterproliferators, chiefly the United States, do not opt to confront every proliferator coercively. Yet, even including as "failures" cases where coercive confrontation was considered but rejected (USSR, France, China, India) or cases met with covert brute force instead of coercion (Syria), the success rate remains above 50 percent and well above the baseline of coercive success across other domains (35 percent, discussed earlier).

Of these twenty cases, fourteen affirm or partially affirm the importance of deniability, evidence in favor of Hypothesis 1. As table 2 shows, coercers permitted deniability in ten of the cases in which they struck a coercive bargain (top-left); and they did not permit it in four cases of failed coercion (bottom-right). Consider, for instance, how face-saving deniability may have helped to mitigate the "cheater's dilemma" in which Iraq found itself agonizing over how much it should reveal about Saddam Hussein's weapons of mass destruction (WMD) programs (Braut-Hegghammer 2020). Washington went to war instead.

Among friends, while the United States has acted coercively to stop allied proliferation, it has typically done so quietly. For instance, Washington pressed West Germany with threats of abandonment into signing the NPT. However, it did so behind closed doors (Gerzhoy 2015). The United States has also concealed evidence of allies cheating on the NPT—Taiwan and South Korea, especially—concurrent with coercing them back into compliance (Albright and Stricker 2018, 235; Miller 2018). Naturally, a patron's significant leverage over clients also contributes to the higher likelihood of success; face-saving deniability is merely one underappreciated tool of coercion.

On the other hand, bottom-left and top-right quadrants of table 2 are inconsistent with the theory. No falsifiable theory explains every case; nevertheless, these episodes stand out for other reasons, too. In 1977, Moscow publicly accused South Africa of preparing to conduct a nuclear test in the Kalahari Desert. While Pretoria did not test, the coercive "bargain" proved ephemeral as the public crisis only made South African leaders more resolved to weaponize (I consider this case in detail later). The rest of the cases of successful coercive counterproliferation without deniability (bottom-left) are former Soviet states that inherited nuclear weapons at the end of the Cold War. Kazakhstan and Belarus gave them up readily. Ukraine held out for a security assurance. Finally, Israel and Pakistan, who were permitted some deniability but did not agree to coercive bargains (top-right) are also unexplained by this article's theory. The Carter Administration imposed punishing sanctions on Pakistan for its nuclear pursuits, but ceased them after 1979 when Pakistan proved an important partner in countering the Soviet invasion of Afghanistan (Miller and Rabinowitz 2015; Narang 2021). It remains debated, too, how seriously Washington pressured Israel over its nuclear weapons programs (Narang 2016/17; Jackson 2019). Permitting deniability is not without risk and can be taken advantage of in ways I discuss in the fifth section.

This medium-N investigation suggests that there is a potential relationship between deniability and coerced concessions (Hypothesis 1). This evidence alone is not strong, as there is limited variation, nor does it reveal the nature of any relationship.

Given the small universe of cases and the need to parse mechanisms, I turn to process tracing next. The ideal case study to test this theory and its mechanisms is one in which the proliferator had a sophisticated weapons program, was pressured to end it and permit IAEA inspections, and subsequently chose to come into compliance with the nonproliferation regime. Most importantly, ample evidence must be available from the archives of the proliferator.

With these criteria, I turn first to the case of South Africa, relying on interview and documentary evidence from the IAEA Archives, US archives, and South African

[13] I count concessions of any kind—the proliferator agreed to give up *some* capability. Evidence of deniability is coded as "Yes" if policymakers in the coercer(s)'s government(s) acknowledged the desire of the proliferator to save face through opacity of its nuclear intentions, offered or chose to keep admissions private, or did not force a public reckoning of past weaponization behavior.

[14] Other cases already in table 1.

apartheid-era government archives. Scholars should not be convinced of the mechanisms of this article's theory without access to the kind of rich evidence from a proliferator that South Africa offers. Moreover, what readers should take away from this case is not the falsification of existing explanations for South Africa's nuclear reversal. Instead, they should see the clear evidence of the mechanisms: how dual-use deniability facilitated face-saving, how such deniability helped the South African leadership to elude audience costs, and how the NPT and IAEA did not impede such deniability despite fulsome verification and inspection. Doing so in a case like South Africa should give us confidence that the dual-use dilemma's upside has similarly facilitated face-saving in other cases of coercive counterproliferation without archival records but with similar actors—coercers, caught proliferators, and the IAEA. Moreover, if deniability proved embraceable over the construction of an actual nuclear arsenal, as in the case of South Africa, it is more likely that deniability could be plausible over less egregious covert pursuits of nuclear technology, such as hedging or experimenting with the production of fissile material.

South Africa is also a harder case for the theory because economic sanctions alone do not explain Pretoria's decision to dismantle its nuclear arsenal. Coercive sanctions on South Africa were linked to both the end of apartheid and signature of the NPT. As the case reveals, under such pressure, President F.W. De Klerk valued the face-saving that came with denial of South Africa's past nuclear sins as he attempted to maintain white political support while navigating negotiations toward democracy.

I look for evidence to affirm or disconfirm the hypotheses and I consider two alternative explanations for deniability in cases of counterproliferation. First, one may observe something that resembles deniability if potential proliferators have truly pulled the wool over enforcers' eyes. That is, actual concealment may appear in retrospect to be deniability. One must distinguish, therefore, between who knew what about the proliferator and what they did not know. Tacit collusion must be understood by both sides.

Second, short of seeking concessions, coercers may carve out room for deniability because they wish to prevent the second-order effects of admitting failures to stop proliferation. Doing so may prevent proliferation "cascades" (Miller 2018) or preserve the fiction that a norm is not violated (Carnegie and Carson 2018). In such cases, coercers have prioritized mitigating the consequences of proliferation over stopping it (Rabinowitz 2014).

The case of South Africa reveals substantial support for the hypotheses. I then turn to shadow cases to augment the generalizability of my findings. Within-case variation from an earlier episode of coercive counterproliferation against South Africa, plus the experiences of caught proliferators Taiwan, Libya, North Korea, and Iran, also affirm the impact of dual-use deniability on coercive bargaining while illuminating its costs and risks.

South Africa

Ostensibly to protect trade secrets but also part of a weapons hedging strategy, South Africa refused to join the NPT and accept comprehensive inspections. Pretoria eventually built a clandestine arsenal of six nuclear warheads. Washington, Moscow, and others sought to enforce the nonproliferation regime, with varying intensity over time, and largely failed until the South African apartheid regime ended. In 1989, when South Africa did agree to finally sign the NPT, its leadership sought to deny that it had built nuclear weapons. Enforcers tacitly colluded to grant Pretoria deniability, affirming Hypothesis 2 and Hypothesis 3. During a 1977 episode of coercion, which I consider in reverse chronological order at the end of this section, Soviet publicity spoiled an opportunity for face-saving denial and a stung Pretoria doubled down on its clandestine nuclear program. This within-case variation provides additional evidence in favor of Hypothesis 1.

In 1989, President De Klerk sought to end South Africa's international isolation through both domestic political reform and signing the NPT. The two issues—apartheid and the NPT—were related. International sanctions were linked to both. Neither alone could bring economic relief (Liberman 2001, 73–74; Giliomee 2012; Von Wielligh and von Wielligh-Steyn 2015, iii–iv). Yet, Pretoria planned to sign the NPT without ever admitting that it had constructed nuclear weapons. Delaying accession until July 1991 and a safeguards agreement with the IAEA until September 1991 bought South Africa time to dismantle and destroy evidence.

In contemplating giving in to coercive pressure and signing the NPT, South Africa planned and executed an explicit strategy of deniability (evidence affirming Hypothesis 2). A November 17, 1989 summary of an Atomic Energy Corporation (AEC) meeting on possible NPT accession noted that "decontamination is a major problem … IAEA inspectors using sensitive equipment will be able to detect the prior existence of 95 percent enriched product [weapons-grade uranium]." South Africa's cover would be blown. Rather, the AEC suggested a cover up rooted in deniability. It advised that the uranium metal in nuclear weapon cores be "reduced to highly enriched [UF6] gas," and that South Africa could "'come clean' and admit that it has enriched uranium to weapons grade, but that it has not made weapons." While "some records would have to be destroyed," the process could be completed in twelve to eighteen months. "If we came clean on the 95 percent enriched product … " the memo further explained, "the "secret" would be out. Manufacture of weapons however need never be admitted" (Carter 1989). De Klerk accepted this deniability strategy in November 1989 as part of his decision to sign the NPT.

That South Africa's nuclear weapons program had been highly secret also facilitated denial. Those deciding to dismantle the program "had to justify their actions only to the very small group of ministers and military leaders who knew about it," writes Möser (2019, 11). No more than ten people were fully read into it, nor was it ever discussed at official Cabinet or State Security Council meetings (Richelson 2006, 373). De Klerk sought to turn this secrecy into deniability.

Only after its dismantlement program was completed, South Africa concluded a Comprehensive Safeguards Agreement. South Africa then submitted its "Initial Report" to the IAEA on October 31, 1991, accounting for all uranium in physical and chemical form. It claimed a stockpile of over 2,700 tons of uranium (Von Wielligh and von Wielligh-Steyn 2015, 233), 880 pounds of highly enriched uranium (Richelson 2006, 376), and 350 kg of 90 percent–enriched uranium (Purkitt and Burgess 2005, 127). The first IAEA inspectors arrived in November to verify.

The IAEA Eases Denial

An IAEA team of senior safeguards officials, led by Dmitri Perricos, met with the South African AEC officials on three occasions between December 1991 and August 1992 and conducted twenty-two inspections missions between October 1991 and September 1993 (Van Wyk 2012, 183).

Throughout this process, South Africa was allowed some leeway in confessing its nuclear sins (evidence affirming Hypothesis 2).

In truth, South Africa tested the limits of plausible deniability. Upon delivery of its Initial Report to the IAEA, Pretoria admitted that it had produced weapons grade uranium. However, the report made no mention of nuclear weapons, the conversion of UF6 HEU into uranium metal, nor the existence of facilities to do so (Heinonen 2014). The explicit "main objective" of the dismantlement effort, as described in the February 1990 official AEC document, was "to dismantle the present 5 [*sic*[15]] nuclear weapons … melt down the highly enriched uranium they contain and store it safely and perform the necessary cleaning operations to attach credibility to the statement that the RSA did manufacture highly enriched uranium but did not undertake the final step of manufacturing nuclear weapons" (AEC 1990). Under orders of President De Klerk, the AEC was thus not to explicitly admit the production of nuclear weapons (Von Wielligh and von Wielligh-Steyn 2015, 234).

South Africans largely obeyed but relied on some assistance from the IAEA. A few days prior to delivering the Initial Report to the IAEA, for example, South African scientist Von Wielligh had dinner in Vienna with an IAEA counterpart, Juha Rautjärvi. Toward the end of the meal, Von Wielligh offered, "To prepare you for any possible misinformation … I want to tell you that the report will show that we do possess weapons-grade uranium—and in large quantities at that. Unfortunately that is all I can say at this stage." His dinner partner "lost his voice, raised his eyebrows, and then did the diplomatic thing and made no response at all." The pair "drove back to the IAEA's headquarters in silence" (Von Wielligh and von Wielligh-Steyn 2015, 235).

Similar experiences followed. At the first official meeting between the South African AEC and the IAEA inspections team, Von Wielligh recalled, "The Initial Report remained lying on the table like the corpse with a dagger in its back but all eyes were averted and nobody asked the obvious question. It was stated on the first page that South Africa had declared a few hundred kilograms of weapons-grade uranium, but the IAEA team asked no questions and the AEC team volunteered no information" (Von Wielligh and von Wielligh-Steyn 2015, 241). As the former head of the AEC, Waldo Stumpf recollected, citing his understanding of the institutional design of the NPT: "the IAEA was seeing signs of a past [weapons] program … " but "the NPT looked only forward, not back." "They never asked us, so we never had to lie," he observed, "One of those funny things" (Stumpf 2014).

During a later inspection mission in early 1992, Perricos produced a map and pointed to a remote location. His AEC hosts knew why he was asking to visit the Kalahari Desert site where South Africa had been caught digging nuclear testing shafts in 1977, but they did not let on and simply agreed to take him. At the inspection, the IAEA found the site as the military had left it in 1988: a shed with a concrete slab in the middle. Perricos knew fully well that the slab plugged a hole hundreds of meters deep, but he merely asked the staff sergeant what it was for. "It is a ramp, sir … for fixing trucks," he replied (Von Wielligh and von Wielligh-Steyn 2015, 247–48). Perricos reportedly smiled wryly and departed with environmental samples. The official inspections report noted only that "the team was told that the building was used by the Air Force for storage and as a workshop" and that the environmental samples produced "no evidence that the location has been used or is being used for the testing of nuclear explosives" (IAEA 1992, para 27).

Indeed, the IAEA's reports followed similar logics. The 1992 IAEA Board of Governors Report made no mention of a weapons program. IAEA inspectors had met five times with AEC officials. The purpose of South African weapons-grade uranium appears not to have come up at any of the meetings.

Instead, the IAEA focused on the future. It made its primary task "nuclear material accountancy" to "ensure that no significant quantity was missing from the declared inventories" (Heinonen 2016, 153).[16] Then it gathered information and access for verification going forward. After the inspections mission was complete, Perricos and two IAEA colleagues explained their thinking:

> The inventory of HEU declared by South Africa in its initial report was substantial. The IAEA recognized that this material could have been taken to indicate that a significant component of the HEU inventory had been recovered from an abandoned nuclear weapons program or, less likely, had been accumulated to supply a planned nuclear weapons program which had been abandoned prior to its implementation. South Africa had no obligation to declare what had been the past purpose of this material. Equally, the primary task of the IAEA was to ascertain that all nuclear material had been declared and placed under safeguards; priority was given to this task (Baeckmann, Dillon, and Perricos 1995, 46).

What mattered was the future, not the past. Pretoria would have deniability.

Coming Clean

Finally, at a time and place of his own choosing, De Klerk admitted that South Africa had built and dismantled nuclear weapons. He did so after surviving key domestic political threats to his leadership. On March 24, 1993, at a joint session of Parliament, De Klerk announced that South Africa "did, indeed, develop a limited nuclear deterrent capability," but dismantled it because it was "an obstacle to the development of South Africa's international relations" (De Klerk 1993; FBIS 1993a). De Klerk emphasized that as it had joined the NPT as a nonnuclear weapons state, South Africa had technically not broken any rules. "We were not, in terms of the NPT itself, obliged to tell them," De Klerk asserted in a post-speech press conference (FBIS 1993b; Stumpf 1995/96, 7).

After South Africa came fully clean about its nuclear weapons program, the IAEA mission, now supplemented with additional weaponization experts, expanded to confirming the arsenal's dismantlement and establishing measures to detect its reconstruction (Heinonen 2014). Three IAEA inspectors visited the Kentron Circle/Advena facility on March 25, 1993. And inspectors witnessed the "rendering useless" of the Kalahari test shafts in July 1993 (IAEA 1993, 10). Most importantly, the IAEA audited the records of material transfers between the AEC and ARMSCOR and concluded that "HEU originally supplied to ARMSCOR/Circle had been returned to the AEC and was subject to Agency [IAEA] safeguards at the time of entry into force of the safeguards agreement" (IAEA 1993, 9). Thus, there was no hidden material between 1991 and 1993. It was all declared.

[15] South Africa had six weapons, plus a seventh under construction.

[16] A decades-long categorization of material in waste drums eventually proved this negative (Heinonen 2014).

The IAEA officially confirmed the dismantlement of South Africa's nuclear weapons on August 14, 1994.

Why Did South Africa Seek Deniability?

De Klerk knew that South Africa's transition to democracy and the end to apartheid was precarious. Deniability provided some domestic political cover (evidence for Hypothesis 3). The historical counterfactual is not merely that South Africa would not have dismantled its nuclear arsenal or signed the NPT without deniability. Pretoria had additional reasons for nuclear reversal, especially racist fears of handing over nuclear weapons to a black-majority government.[17] Rather, in the absence of denial, Pretoria may have tried and failed to come out of the cold if De Klerk and reform-minded conservatives lost domestic support and hardline conservatives precluded any compromises on apartheid or the NPT.

De Klerk's coalition faced daunting domestic political opposition during the four years that elapsed between giving the order to eliminate its nuclear weapons (1989) and truly coming clean (1993). When De Klerk began negotiations with the African National Congress (ANC) toward democracy and an end to apartheid, the Conservative Party rallied Afrikaner voters and accused De Klerk of treason and betrayal of white rule. The opposition proved effective, as the Conservatives drubbed De Klerk's National Party in local elections (Giliomee 2012, 342). De Klerk then gambled to turn the tables, reclaiming some legitimacy to lead by winning a 1992 national referendum on his policy of reform through negotiations (Giliomee 2012, 343). As Stumpf recalls, "De Klerk was a bit uncertain how to make this [denuclearization] public for domestic reasons—at that point he was not so sure how the white electorate would react in total to all his reforms. That only came about in 1992 when he had the last whites-only referendum" (Stumpf 2014). De Klerk's domestic support was fragile. Keeping the opposition in the dark on his other concession—dismantling a nuclear arsenal—was politically valuable.[18] Only after negotiations with the ANC had advanced sufficiently was De Klerk willing to acknowledge his acquiescence on the nuclear issue. Disclosing the concession too soon could have turned just enough of the white public against his leadership to jeopardize the domestic reform process, which if unsuccessful would keep sanctions in place. In August 1990, Department of Foreign Affairs Deputy Director General Herbert Beukes described the De Klerk government's thinking: "the nuclear issue is perceived domestically to relate to national security and it would therefore be political suicide for the President to take on another controversial domestic political issue at the present time" (Möser 2019, 11).

Washington's Response

De Klerk aired his domestic constraints in an August 1990 letter to President Bush. In private, he acknowledged that he was the target of coercion, writing, "My situation is further complicated by linking foreign demands for change to punitive measures rather than incentives of encouragement" (De Klerk 1990). Then De Klerk proposed that deniability of concessions could be useful to him. "It is important for our domestic political programme," wrote De Klerk, "that any appearance of being responsive to foreign agendas be avoided." The language echoed a request De Klerk had made before his election to Assistant Secretary of State for African Affairs Hank Cohen while discussing how to navigate an end to apartheid: "we can't be seen as taking orders from the Americans" (Baker and DeFrank 1995, 223).

De Klerk received the face-saving he wanted during a critical time. Four months before De Klerk's letter, the CIA had already assessed correctly that he would "have to walk a fine line to maintain his support in the caucus and in the electorate, but as substantive talks [with the ANC] approach, the possibility of a significant and embarrassing white backlash looms large. The Conservatives are poised to make political hay" (CIA 1990). Secretary of State James Baker further advised President Bush in September 1990 that De Klerk's reform agenda was in domestic jeopardy and "needs help" (Baker 1990). Baker had indeed earlier told Foreign Minister R.F. "Pik" Botha directly that the administration was "sensitive to your domestic political concerns" (Baker and DeFrank 1995, 222).

Records of Washington's direct engagement with De Klerk's government primarily pertain to the issue of apartheid, but the lighter touch appears to have applied to the nuclear issue as well. As then-NSC staffer Daniel Poneman recalled of the nuclear issue specifically, "I think we were sensitive to De Klerk's domestic political constraints" (Poneman 2019). Of course, Washington was not willing to sweep it under the rug without verification. Declassified US intelligence estimates reveal great interest in the question of whether South Africa was being truthful in its declarations to the IAEA, but with an emphasis on materials accountancy and control—a less public approach.[19] They suspected South Africa had actually weaponized but wanted to know whether it had stashed away enough fissile material for a "bomb in the basement." While IAEA verification progressed, the US State Department's intelligence bureau (INR) briefed IAEA officials on its own intelligence (Richelson 2006, 377). They also took note of South Africa's openness to inspection, ultimately judging the probability of a "bomb in the basement" to be remote (Reiss 1995, 25).

The "dual-use" deniability of South Africa's secret nuclear weapons program, aided by the institutional designs of the IAEA and NPT, allowed De Klerk to save face domestically while his coercers concerned themselves with gathering enough intelligence for future verification (evidence in support of Hypothesis 2 and Hypothesis 3).

Within-Case Variation: Kalahari 1977

Examining an earlier instance of coercive counterproliferation against South Africa further demonstrates some of the virtues of a quiet approach (evidence in favor of Hypothesis 1). In August 1977, Soviet satellites detected suspicious activity at a military site in the Kalahari Desert: South Africa was digging bore holes for nuclear testing and preparing for a cold test. Instead of embracing the coercive advantages of face-saving dual-use deniability, however, Moscow went public with its accusations (TASS 1977). It asked Washington, Paris, London, and Bonn to bring pressure on Pretoria to desist (FRUS 1977a). (The IAEA played no role in the 1977 Kalahari episode.)

Washington lamented the heavy hand. A draft reply to Brezhnev (written by Warren Christopher) thanked the

[17] De Klerk did leave to the ANC a stockpile of highly enriched uranium.

[18] Interrupted by jeers from the Conservative Party benches during his March 1993 speech, De Klerk said, "From their tone and interjections I deduce that they would like South Africa to still have an atom bomb at its disposal" (FBIS 1993a).

[19] Though they had less evidence to publicize, ANC leaders also put pressure on De Klerk to come clean. The nuclear issue had indeed long been part of the ANC's global campaign of naming and shaming the apartheid regime (Van Wyk and Van Wyk 2020).

Soviets for their discovery but emphasized "the Soviet Union will recall that when, in the course of our consultations on non-proliferation, the United States has raised sensitive questions with the Soviet Union, we have avoided public comment" (NPIHP 1977a). President Carter himself scrawled in the margins of a memo from National Security Advisor Brzezinski, "If they have to lie about what their plans were, let them do so—Let them save face. J.C." (FRUS 1977c). However, Soviet publicity had spoiled the opportunity.

Still, pressure came down on Pretoria. On August 18, US ambassador William Bowdler warned South African Foreign Minister Pik Botha that testing a nuclear device would rupture the two states' relations and constitute a "serious threat to peace" (NPIHP 1977b). France threatened to cut off fuel supplies for the Koeberg nuclear reactor (Liberman 2001).

Botha and others reacted with denial (FRUS 1977b). Their cover story: digging for water in the desert. However, the United States shared imagery of the site preparations and South Africa backed down from its imminent test. In conceding, Prime Minister Vorster claimed that South Africa did not intend to develop or test nuclear explosive devices and that the Kalahari test site was not designed for use to test nuclear explosives—a seemingly implausible denial to knowledgeable ears (NPIHP 1977c).

The fallout from the episode reveals the downsides of a failure to embrace deniability. South Africa cursed the Soviets for their publicity and drew stark lessons about the reputational costs of the Kalahari episode. Its embassy in Washington cabled back to Pretoria that media coverage of the incident was "creating the impression that the government has yielded to international pressure" (NPIHP 1977d). They feared that audiences had learned "that pressure on South Africa is more productive" (NPIHP 1977e). It was a "watershed" moment, in their eyes. After 1977, the South African government doubled down, believing that it must acquire a nuclear deterrent (Narang 2021).

The Costs of Face-Saving Deniability

That nuclear technology is "dual-use" lends itself to both the deniable pursuit of nuclear weapons *and* the potential for face-saving concessions if caught. Yet, embracing the benefits of face-saving deniability can be costly in ways that the South Africa case does not reveal. This section considers the risks of permitting deniability and additional questions that flow from the logic of the theory.

Trading-Off Deniability and Future Verification

Despite its coercive utility, face-saving deniability can hinder the long-term goal of nonproliferation if embracing it diminishes the chances of detecting future violations. In such cases, too much deniability resembles actual concealment.

The United States may have made such a mistake in the case of 1970s Taiwanese proliferation. Taiwan signed the NPT in 1968 but went ahead with a small-scale plutonium reprocessing operation. In 1976, IAEA inspectors detected missing plutonium, and the United States came down hard on Taipei in private. Yet, Washington also concealed evidence of its ally's cheating (Miller 2018). As Albright and Stricker (2018, 235) note, handling the matter in private allowed "both sides [to] save face and avoid critical public and international scrutiny." The United States was satisfied but should not have been. Taiwan restarted its military nuclear program around 1981 and planned to separate plutonium in a disguised facility meant to evade US and IAEA detection. Washington only later learned of this deception through a CIA-cultivated human source in Taiwan, Colonel Chang Hsien-yi. "If not for Chang Hsien-Yi's defection in 1988," writes Narang (2021) of the extent of the deception, "Taiwan's renewed effort to hide a nuclear weapons program may have succeeded."

The United States similarly struggled to track the evolution of Pyongyang's nuclear weapons efforts over time, especially its clandestine uranium enrichment. Coercive bargaining that struck the 1994 Agreed Framework navigated contentious issues of future transparency and past cheating. To convince other Clinton administration officials to support the Agreed Framework, its chief negotiator, Ambassador Gallucci, argued that "you cannot sacrifice the future on the altar of the past" (Sigal 1998, 83). Yet, success in limiting one North Korean pathway to the bomb (plutonium) left little monitoring of another (highly enriched uranium).

Embracing the coercive benefits of deniability, therefore, requires learning enough about a past nuclear weapons program to build a strong verification program to detect future violations, while not seeking more confessions than necessary for that endeavor. It is a risk calculation, as even close inspection is no guarantee of detecting weaponization, to which the American experience in Israel can attest (Cohen and Burr 2020).

The case of Iran put this trade-off clearly on display. The P5+1 allowed Iran to deny its past nuclear sins as part of coercive bargaining over the 2015 Joint Comprehensive Plan of Action (JCPOA). To do so, they had to navigate the contentious issue of the IAEA's open investigation into the "Possible Military Dimensions" (PMD) of Iran's past nuclear program. Multiple American administrations had demanded that Iran "come clean" about its past weaponization activities (IAEA 2014a, 20). The issue imperiled any agreement. To overcome it, Washington and its partners purposely focused on gathering enough intelligence for verification in the future while carving out deniable space for Iran to save face. "We know what they did. We have no doubt. We have absolute knowledge with respect to the certain military activities they were engaged in," said Secretary of State John Kerry in June 2015, "What we're concerned about is going forward" (Toosi 2015). Other administration officials described the strategy similarly. "It was never an issue for the United States about whether there were possible military dimensions. We knew there were," said lead negotiator Ambassador Wendy Sherman (Sherman 2019). Washington sensed the game and played its strong hand strategically. Jake Sullivan acknowledged the tacit collusion: "The Iranians asserted from start to finish that all of this was a bunch of bunk, that they had never attempted to weaponize. But we knew, and they knew that we knew, and we knew that they knew we knew" (Sullivan 2018).

For its part, the IAEA agreed to "accelerate" the resolution of Iran's PMD file concurrent with JCPOA negotiations (IAEA 2015a; IAEA 2015b, 3). Its final report reads as a restatement of the IAEA's concerns, followed by Iranian invocations of the alternate civilian purposes of any suspicious dual-use technology. Detonator research was, for instance, explained by a desire to "improve safety requirements for certain operations involving conventional explosives" (IAEA 2015b).[20] Laid bare, PMD was an agreed-upon fiction. It did not actively lie; it just did not dig for the truth. As long as the IAEA could verify the limits of the nuclear program

[20] IAEA access to the suspicious Parchin site was one productive step in the PMD resolution.

going forward, Iran was allowed to (im)plausibly deny that it had been up to no good.

Other Incentives to Demand Transparency

Detectors of nuclear cheating may have other incentives to forego the face-saving benefits of dual-use deniability. First, deniability may hinder a coercer from gathering international support for enforcement (Carnegie and Carson 2020). This may be more common in cases where a state has already chosen to prevent proliferation by brute force. For instance, Colin Powell's infamous 2003 presentation on supposed Iraqi WMD to the UN Security Council attempted to legitimize the United States' impending use of force. That the nuclear nonproliferation domain consists of cases heavy on great power enforcement may bias in favor of permitting deniability (Coe and Vaynman 2015); strong states should require fewer allies to generate coercive leverage. Perhaps a study in a domain of more multilateral enforcement would reveal different dynamics for deniability.[21]

Second, a coercer may wish to leverage the deniability of the nonproliferation regime to coercive advantage but fail because another actor with knowledge of a proliferator's misdeeds refuses to cooperate in the tacit collusion scheme. In 1977, as discussed, the Soviet Union went public about South Africa's preparations for a nuclear test in order to pressure the United States to more aggressively counter Pretoria's plans. Today open-source intelligence could serve a similar function, publicly revealing satellite imagery, perhaps limiting opportunities for denial.

Third, there may be domestic political costs to a coercer if it is caught tacitly colluding. One reason leaders may make public threats in the first place is because they want to be able to claim victory. In such circumstances, leaders may also find themselves in a "commitment trap," whereby they feel compelled to push for public concessions because they have promised as much (Sagan 2000). Moreover, policymakers may disagree over how much deniability is permissible or desirable.

Fourth, a counterproliferator may push for greater transparency if it believes that public concessions send a signal of a target's commitment to nonproliferation. Perhaps a cheater is more likely to intend to cheat again if it does not come fully clean. Officials in the Bush administration made such an argument about Muammar Qaddafi's nuclear weapons program (Tobey 2018). Yet, even Libya was strategically allowed to save some face in its 2003 coercive bargain. Wishing not to admit that it bowed to American pressure, Libya was permitted to announce that it had "voluntarily" disarmed "of its own free will" (UNSC 2003).

Conclusion

It is a lamentable fact of the nuclear age that states can pursue nuclear weapons under the guise of peaceful intentions. However, this "dual-use" dilemma has an unappreciated upside: violators can save face and pay lower reputational costs when conceding to coercive counterproliferation. The core institutions of the nonproliferation regime—the NPT and the IAEA—have not impeded this deniability of past nuclear activities. In practice, they have permitted it. Thus, the dual-use dilemma became both the bane of the nonproliferation regime and a boon to its coercive enforcement.

This theory appreciates the role of privacy in nuclear rollback and reversal. Violators are more likely to come into compliance if they can deny they were ever out of compliance. As the nuclear safeguards regime evolves and expands to include a broader scope of facilities, verification methods should preserve some public opacity, albeit without gaps in detection. Environmental sampling, expanded through the IAEA's Additional Protocol, is one such technique that can maintain public deniability. Verification is not only about overcoming mistrust; it is also about burying the past and turning over a new leaf. To do this valuable work, the IAEA must be well funded.

It is vital that scholars continue to theorize and explain the role of the IAEA in coercive international politics. This article has shown yet another way that science and technology inform political decisions—they help leaders to communicate what they cannot say out loud. When opponents of a coercive bargain complain that it is "built on lies," they are correct but miss the point (BBC 2018). Agreeing to useful fictions is part of the bargain. Future scholarship may productively build on this insight by further examining the relationship between state intelligence apparatuses and institutions like the IAEA (Carnegie and Carson 2019 and 2020).

In his 1880 essay "On the decay of the art of lying," Mark Twain lamented the "growing prevalence of the brutal truth." "An injurious truth has no merit over an injurious lie," he wrote as he praised "magnanimous liars" who recognize the difference (Twain 1882). Smart coercers are magnanimous liars. They can embrace the "dual-use" deniability afforded to violators of the nonproliferation regime and wield it to coercive advantage.

Supplementary Information

Supplementary information is available at the *International Studies Quarterly* data archive.

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[21] For a general theory of why some coercers tacitly collude while others do not, see Nutt and Pauly (2021).

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