Playing to the Audience: Responses to Violations of International Order

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Abstract

When international laws or norms are violated, an enforcer can punish the violator, offer concessions for its renewed compliance, or tolerate it. Punishment is often costlier than concessions or toleration, but signals to other states that violation will be met with penalties rather than rewards or acceptance. By influencing other states' expectations about what will happen if they get caught violating, the choice of response can thus encourage or discourage subsequent compliance. Anticipating this, an enforcer is more willing to punish when it faces a larger audience of potential near-term violators. Focusing on the nuclear nonproliferation norm, we show statistically that enforcer responses appear to have affected whether states subsequently pursued the bomb historically, and that this effect is as strong as other hypothesized determinants of proliferation decisions. We also use primary sources to document that policymakers recognized and heeded this influence in a range of cases.

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How is international order enforced? Facing a state that has acted in violation of international law, norms, or the expectations of powerful actors in the international community, an enforcing state or international organization could impose a penalty, offer a reward for renewed compliance, or ignore it altogether. A reward would make both sides better off than a penalty and still end the violation, so why would an enforcer ever resort to penalties? How does the character of enforcement affect subsequent compliance?

These questions are of central importance in a variety of realms of international order. Should a member of the European Union violating liberal norms be cast out, offered special incentives to desist, or ignored? Is it better to enforce human rights conventions by trying and convicting dictators who have committed atrocities or by offering them comfortable exile? Should states suspected of pursuing nuclear weapons be sanctioned and attacked or instead bribed to halt their programs?

We analyze a model of the interactions between a set of states that might violate international order and an enforcer that might use rewards or penalties to stop them. In equilibrium, states' choices of whether to violate depend on their expectations of how the enforcer will respond if they are discovered. These expectations are determined by the enforcer's past history of responses: a history of penalties discourages violation, while a history of rewards or acceptance encourages them. Anticipating this influence, the enforcer weighs the immediate, higher cost of using penalties rather than rewards against the subsequent benefit of deterring other states from engaging in violations. The larger the audience of potential near-term violators, the more likely that the enforcer resorts to punishment.

We apply our theory to the context of nuclear proliferation. The pursuit of nuclear

weapons is a very high-stakes violation of international order. Proliferants gamble on the jackpot of becoming a recognized nuclear power but risk a devastating response if their program is discovered before it succeeds. For a state like Iran considering this wager, it is crucial to know: if discovered to be on the verge of success, would the US attack, offer a deal, or tolerate it? The US has done some of each historically, with radically different consequences for the violator. Iraq was invaded, with Saddam Hussein overthrown and then hanged, while India's proliferation was tolerated and North Korea was given relief from sanctions and ample aid.

Because violating the nonproliferation norm can lead to such drastically varying responses, it should be an easy context in which to observe the operation of our theory. Any state that might pursue nuclear weapons should keenly observe and be influenced by enforcers' responses to other violators, and an enforcer should carefully consider this influence when deciding how to respond to a discovered proliferant.

We first test our model's predictions in a statistical analysis of the historical record of nuclear weapons programs and responses to them. We show that deals to stop, and toleration of, proliferation encouraged other states to pursue nuclear weapons, while attacks discouraged them from doing so. We also demonstrate indirectly that the presence of a larger audience of potential near-term proliferants pushed enforcers toward attacking rather than making a deal. Finally, we show that the effect of past treatment of nuclear programs is comparable to or stronger than those of other variables previously theorized to drive attempts at proliferation. It thus appears that enforcers' behavior is a potent determinant of whether states seek the bomb.

We then use case studies, drawing on archival and secondary sources, to provide evi-

dence for the mechanisms through which enforcers' actions against proliferants influence the audience. We show that the leadership in potential proliferants drew conclusions about how they would be treated based on how they saw enforcers treat others. We also demonstrate that policymakers in enforcer states understood that their choice of response would be influential to an audience and took into account its expected reaction when making decisions about nonproliferation policy.

Scholars of international law emphasize the role of reciprocity, reputation, and retaliation—all means of penalizing noncompliance—in enforcing international laws and norms (Guzman, 2008), but have only recently begun to consider the possible role of rewards (van Aaken and Simsek, 2021). Scholars of coercive diplomacy have long recognized the possibility of either carrots or sticks being used to elicit compliance, but have focused mostly on the cost-effectiveness of each as an instrument for affecting the behavior of the current violator (Bernauer and Ruloff, 1999; Drezner, 1999; Jentleson and Whytock, 2005; Nincic, 2010) and how domestic politics (Milner and Tingley, 2015) or hold-up problems (Carnegie, 2015) affect the enforcer's choice of instruments. By contrast, we consider the choice an enforcer makes between carrots and sticks, the effect this choice has on other potential violators, and how the latter influences the former.

Closer to our own mechanism, Carnegie and Carson (2018) consider the choice an enforcer makes between publicizing or concealing a state's violation. As in our theory, this choice is driven by the anticipated reaction of an audience to a revealed violation. Our analysis complements theirs by showing how the same concern influences the choice not only of whether to publicize, but also of how to respond to, a violation.

Our study helps to fill an important gap in theorizing about nuclear proliferation. Prior

works explain why nuclear weapons programs sometimes lead to preventive attacks (Benson and Wen, 2011; Debs and Monteiro, 2014); how these attacks depend on the progress of a program and intelligence estimates thereof (Bas and Coe, 2012, 2016); and the viability, content, and timing of deals to stop a program (Bas and Coe, 2018; Coe, 2018; Coe and Vaynman, 2020; Spaniel, 2015). However, none of these theories specify why enforcers resort to attack in some cases but make a deal in others. Moreover, all of these analyze a purely bilateral context: an enforcer faces a lone proliferant, and neither has any potential to influence or be influenced by interactions with other states. By contrast, Coe and Vaynman (2015), Gavin (2015), and Miller (2014*a*) analyze a context with multiple proliferants and show that an enforcer is motivated to stop attemped proliferation by the influence this will have on future proliferation. But none of these considers the tradeoff an enforcer faces in deciding *how* to respond to attempted proliferation.

Our research theorizes and documents a novel channel by which one proliferant can influence others. We set aside the previously-recognized possibilities that one state's proliferation might increase another's insecurity (Bleek, 2010) or provide a source of assistance with weapons-relevant nuclear technology (Kroenig, 2009), either of which might increase other states' likelihood of seeking nuclear weapons. Instead we focus on how an enforcer's use of force or diplomacy in response to a proliferant's program can influence other states' desires to invest in programs.

Theory

We proceed to setup a simple model of the interaction between a set of states that might violate international order—which we refer to as masculine "potential violators"—and another state that would like to stop them from doing so—a feminine "enforcer." The model allows us to clarify how the potential violators' behavior depends on the past actions of the enforcer, and how this affects the enforcer's decision-making.

In each of infinite rounds, a set of N states each simultaneously choose whether or not to violate. If a potential violator does not, then he receives a payoff of zero. For each state that does, Nature independently and randomly determines whether he is subject to intervention by an enforcer E, with probability τ, or not, with probability $1-\tau$. We term a violator that is subject to intervention a "threatened violator" and one that is not an "unthreatened violator." E then simultaneously chooses among penalizing, rewarding, or tolerating each threatened violator, but has no choice except to tolerate each unthreatened violator. If she punishes a particular threatened violator, his turn ends with him receiving $-p_V < 0$ and her getting $-p_E < 0$. If she instead employs rewards, his turn ends with him getting $r > 0$ and her receiving $-r$. A tolerated violator gets away with it, with a payoff of $s > 0$ for him and of $-s$ for the enforcer, and ceases to play in subsequent rounds. We assume that $r < p_E < s$. Payoffs in future rounds are discounted by $\delta \in (0,1)$.

Consider the model's features. If a state undertakes a violation, it may never be subject to intervention by another state (with probability $1-\tau$). This could occur in either of two ways. First, the enforcer might not detect that a state is violating the norm, so that the violator is able to proceed unmolested. Second, the enforcer might detect that the time for intervention is ripe, but then realize that the violator is too strong or too important for

the enforcer to credibly and successfully intervene to stop it. This happened, for example, when the US balked at the prohibitive costs of attacking China's nuclear weapons program and at the consequences for the larger Cold War of abandoning Pakistan over its program. If instead the violator is both caught in time and weak and expendable enough that intervention is cost-effective (with probability τ), then the enforcer will intervene. Think here of the US attack on Iraq and deal with Libya in 2003 over their programs.

Intervention entails either punishing violation or rewarding renewed compliance. Punishment is costly for both sides, and might consist of diplomatic outcasting, the imposition of economic sanctions, or military intervention. Rewarding comes from a deal in which the enforcer pays the violator to cease. We assume that both punishment and reward stop the violation at least temporarily, but the threatened violator might subsequently choose to renew it.[1] Toleration entails the state being allowed to continue in its violation.

For the enforcer, making a deal with a threatened violator is better than punishing him ($r < p_E$), which in turn is preferred to allowing him to succeed in the violation ($p_E < s$). The violator also prefers a deal for renewed compliance to punishment ($r > -p_V$), so that both sides are strictly better off making a deal than imposing and suffering punishment, but he likes a successful violation better than making a deal to stop ($r < s$).

Importantly, the model assumes that whatever one potential violator does, and however the enforcer responds to it, there are no direct consequences for any other state. Obviously this is not always true empirically. States that got nuclear weapons sometimes proceeded to transfer nuclear technology, materials, or expertise to other states, making it cheaper

[1]Theoretically, there should be no difference in the efficacy of a reward or a penalty of the same magnitude: each is an incentive that shifts the utility of violation relative to compliance by the same amount.

and easier for those states' nuclear programs to succeed. One state's proliferation can also undermine the security of neighboring rivals, increasing their motivation to seek nuclear weapons. We assume direct consequences like these away in order to isolate an *indirect* channel by which an enforcer's response to one violator can influence subsequent states' behavior: via their expectations about how the enforcer would respond to their own attempts.

Proposition 1 *There is always an equilibrium in which every potential violator violates the norm, and the enforcer, if given the chance to intervene, always uses rewards.*[2]

The intuition here is straightforward: if every potential violator is going to do it no matter what, then the enforcer should just use the cheapest way possible to stop those states against which it can intervene. Because making a deal is cheaper than punishing and results in a better outcome than toleration, the enforcer therefore always makes a deal. From a potential violator's prospective, choosing to violate is therefore expected to lead either to success or to a deal with the enforcer. Either way, he is better off violating than not.

If the enforcer is ever to punish violation, it must be because she expects that doing so will influence subsequent behavior. This is also possible in equilibrium.

Proposition 2 *If and only if* $\tau s \leq (1-\tau)p_V$ *and* $p_E - r \leq \frac{\delta}{1-(1-\tau)\delta}N(\tau s + (1-\tau)r)$*, there is an equilibrium in which, as long as the enforcer has always punished a violator, no potential violator will attempt it and the enforcer would punish any threatened violator*

[2]"Equilibrium" means subgame-perfect Nash equilibrium. Proofs appear in the online appendix.

that did so alone. If any violator receives a reward or is tolerated, all subsequently violate and the enforcer only uses rewards when intervening.

In this equilibrium, so long as violation has met with penalties in the past, each state expects that, if he breaks the norm, he will likely be punished. He therefore rationally refrains from violating so long as the risk of punishment ($(1-\tau)p_V$) outweighs the expected benefit of successful violation (τs). If some past violator instead received a reward or succeeded, then other states expect that attempted violation will result in either a reward or success, making it rational for them to attempt it. Thus, states' behavior depends on their *expectations* about how the enforcer will respond, which they form based on her past responses.

In deciding whether to penalize or reward a violator, the enforcer must consider both the immediate cost of her response and its influence on other states' expectations. The former argues for her rewarding, because it is cheaper ($r < p_E$). The latter argues for her penalizing, because by doing so she preserves expectations that any discovered violation will be met with punishment and thereby deters others from attempting it. Punishing is rational so long as its immediate higher cost ($p_E - r$) is outweighed by the benefit of deterring potential violators from subsequently attempting it, which would result either in success or a deal ($\delta N(\tau s + (1-\tau)r)$).

Obviously, the worse successful violation or a deal would be for the enforcer (i.e., the lower is $-s$ or $-r$), or the less costly punishment would be (that is, the lower is p_E), the more likely it is that the enforcer will resort to penalty rather than reward. Doing so is cheaper and averts worse outcomes for the enforcer. The more likely any violator is to be unthreatened (higher τ), the more likely the enforcer is to penalize, since future attempts

at violation are likelier to succeed. However, this also makes it more difficult to use the threat of penalty to stop attempts, as the potential violator is less likely to be deterred from trying.

Crucially, the willingness of the enforcer to punish also depends on what we term the "audience": how many potential violators are there to be influenced by the enforcer's choice, and how soon might they violate? First, the more such states there are (i.e., the greater is N), the greater is the number of potential future attempts at violation that the enforcer's decision today will influence. This makes it more important to pay the cost of punishment now in order to avoid the cost of more rewards or successful violation occurring later. Second, the closer states' incipient or ongoing violations are to succeeding (which can be interpreted as higher δ), the more immediate is the threat of future attempts at violation. This also tilts the enforcer's tradeoff in favor of punishment in order to head off these nearer-term dangers.

These results yield clear observable implications for the behavior of both potential violators and enforcers. The occurrence of a penalty on, reward for, or toleration of some violator should alter states' expectations about what will happen if they subsequently try it. In turn, these expectations should affect their willingness to do so.

Hypothesis 1 *If an enforcer tolerates a successful violation, other potential violators are encouraged to attempt it.*

Hypothesis 2 *If an enforcer penalizes a violator, other potential violators are discouraged from an attempt.*

Hypothesis 3 *If an enforcer rewards a violator, other potential violators are encouraged to do so.*

Knowing that the choice of penalty or reward might alter the expectations and therefore behavior of other states, enforcers should condition their choice on the size of the audience that might be thereby influenced, and on how quickly that audience might succeed in violating the norm.

Hypothesis 4 *If there is no audience of potential near-term violators, an enforcer should make a deal with the violator at hand. The larger the audience, the more hesitant an enforcer will be to deal rather than punish.*

The most obvious way to test this last hypothesis requires that we identify which states are perceived to be in the "audience of potential near-term violators" for some aspect of international order. This is difficult to do across many states and years in support of a statistical analysis. The audience may not include all the world's states, but it is surely larger than the subset of states that have ever violated, or even seriously considered violating the norm or law in question. For example, countries that lack the budgetary or technological means to pursue nuclear weapons are unable to violate the norm of nonproliferation. They cannot be influenced by enforcers' responses to nuclear programs, and so are not members of the audience. But the audience for this norm is more than just the subset of states that ever demonstrated a serious interest in nuclear weapons. The audience should also include all those states that did not, *but would have* had enforcers more often chosen toleration or rewards in response to others' nuclear programs.

Because we do not have a large-n measure of the audience, we can only test Hypothesis 4 indirectly in our statistical analysis. As we will explain shortly, that analysis examines the proliferation decisions of a set of M states that is over-inclusive: it includes the audience but also other states that were never going to pursue nuclear weapons no matter what

any enforcer did, so that $M \geq N$. When N is relatively large, the average influence over the $M \approx N$ states we examine should also be relatively large, and thus so should the effect size we find if our theory is correct. By contrast, when N is relatively small, the average influence of an enforcer's decision over the $M \gg N$ states we examine should be diluted by all the states who are not in the audience and thus not influenceable by definition. Because enforcers are more likely to make deals when N is smaller and to punish when it is larger, we have the following observable implication.

Hypothesis 5 *The estimated effect of punishment on states' violations should be larger in magnitude than that of deals.*

Linking Pursuit of Nuclear Weapons to Enforcer Responses

Of the many concerns of international order, stopping the spread of nuclear weapons may be among the most important. Perhaps as a result, the enforcement of nonproliferation has varied dramatically in its consequences for both violators and enforcers, ranging from invasion and regime change at one extreme to security guarantees and formal alliances at the other. Precisely because such drastic outcomes can plausibly occur, potential violators of nuclear nonproliferation should be strongly influenced by the past history of responses to others' violations, and enforcers should weigh this influence heavily in their decisions about how to respond. Nuclear nonproliferation thus offers a promising arena in which to observe our theory at work.

We resort first to a large-N investigation of the empirical association between enforcers' responses to nuclear programs and states' subsequent nuclear activity. Our uni-

verse of cases is the set of country-years in which each country does not yet have nuclear weapons but is currently exploring or pursuing them or might plausibly begin to do so. We operationalize this universe as the set of country-years that manifested some interest in nuclear technology, in the form of either an atomic energy commission or a nuclear physics/chemistry department in a higher education institution, from 1939 to 2018.[3]

Our dependent variable is the change in a state's interest in seeking nuclear weapons. We assemble seven observable indicators of changed interest from Bleek (2017).[4] *Explore* and *Pursue* are dichotomous variables that capture the onset of exploration and pursuit of nuclear weapons. *Program* marks the onset of either exploration or pursuit, whichever comes first. *End* marks the year in which a state terminates pursuit or exploration. *Accelerate* records a change either from no interest to exploration or pursuit, or from exploration to pursuit. *Decelerate* captures program termination or a transition from pursuit to exploration. Finally, *Status Change* is -1 when there is deceleration, 1 when there is acceleration, and 0 when there is no change in activity from the previous year.

Our independent variable is the recent history of responses by enforcers to other proliferants. We operationalize "recent" to mean within the last five years, and use three measures corresponding to the most consequential possible responses.[5] For each state-year, *Attack* records how many other states suffered a preventive attack on their nuclear

[3]Our results are robust to instead including *all* countries in the analysis.

[4]We made six revisions to this data: we code India as acquiring nuclear capability in 1974, since as we document this was perceived by other countries as acquiring nuclear weapon capability; Iran as stopping from 2003 to 2005 and 2015 to 2018 and North Korea in 1994, when both appear to have complied temporarily with nonproliferation deals; Syria as exploring starting in 1997, based on US intelligence estimates; and Ukraine as exploring from 1991 to 1994, based on Budjeryn (2016).

[5]Our results are robust to instead using the past three or four years.

program within the previous five years, using data from Bas and Coe (2016).[6] *Deal* records how many other states made a late-stage nonproliferation deal, in which concessions are offered for stopping their program, in that window, using data from Bas and Coe (2018).[7] Finally, *Toleration* marks how many other states acquired nuclear weapons in the window.[8]

We purposefully ignore the many milder responses to suspected nuclear weapons program that regularly occur, such as the imposition of economic sanctions (Miller, 2014*b*), export controls (Gheorghe, 2019), or the signing of nonproliferation deals before a state's program is nearing success, which feature less generous rewards (Bas and Coe, 2018). Because these responses entail lesser consequences for both violator and enforcer, any effect they have on behavior should be smaller and so harder to observe. We focus attention on the most consequential responses, which should generate the strongest signals in the data.

Table 1 reports the number of program accelerations and decelerations that occurred within the subsequent five years of each response type, relative to the total number of observed accelerations and decelerations. We report these counts for three time periods: the entire era of nuclear weapons pursuit (1939–2018); the period during which the world knew that nuclear weapons were technologically feasible (1945–2018); and the period when enforcement of nonproliferation was more consistent (1969–2018), which is when all the late-stage deals and all but one set of attacks occurred. We also report the counts we would expect to see if the response type is in fact unrelated to nuclear program activity. We use binomial tests to determine p-values: how likely a count as favorable to our theory as the one we actually observe is to arise by chance, if responses and activity are independent

[6]We added the assassination and cyber attacks on Iran's program from 2010 to 2012.

[7]We added the late-stage deal between the US and West Germany in 1969.

[8]Qualitatively similar results obtain if we instead use dummy variables that record whether an attack, deal, or toleration (respectively) occurred in the window.

of each other.

Table 1: Changes in Nuclear Weapons Program Following Enforcer Responses

In the five years after a:	**1939–2018** Accelerations	Decelerations	**1945–2018** Accelerations	Decelerations	**1969–2018** Accelerations	Decelerations
Toleration	**41*** ** of 54	16 of 25	**41*** ** of 46	16 of 25	**19*** ** of 24	12 of 19
expected count	29.0	13.4	26.7	12.5	10.8	8.5
p-value	.0007	.9	.000005	.9	.0007	1.0
Attack	**16*** ** of 54	12 of 25	**14*** ** of 46	12 of 25	**7*** ** of 24	**12** of 19
expected count	28.3	13.1	24.2	13.2	13.2	10.5
p-value	.0006	.7	.002	.7	.01	.3
Deal	17 of 54	**6*** of 25	17 of 46	**6** ** of 25	**17** ** of 24	**6*** of 19
expected count	20.9	9.7	19.3	10.5	12.4	9.82
p-value	.9	.09	.8	.05	.05	.06

Counts that support the theory are in bold; * p<.1, ** p<.05, *** p<.01.

Toleration and attack are each strongly associated with accelerations in nuclear program activity, statistically and substantively. As H1 and H2 predict, tolerations appear to encourage acceleration, while attacks appear to discourage it. Neither is associated in the direction the theory expects with deceleration, although this may be an artifact of the smaller sample: there are only half as many decelerations as accelerations in the data. Deals are associated with decelerations in activity, and with acceleration from 1969 on, both in the direction H3 predicts: deals appear to encourage acceleration and discourage deceleration. However, they are not associated with accelerations in the direction the theory predicts for the periods that include the early years of the nuclear era.

These results are suggestive, but they ignore the facts that responses are not independent of each other (if a toleration occurs, it means both a deal and an attack did not for that state-year) and that they may also be occurring in close chronological proximity to each other, so that an attack is quickly followed by a deal. To account for these facts, we turn

to logistic regressions of our measures of nuclear weapons program activity on the three response types. Table 2 reports the results.

Table 2: Proliferation Behavior Soon After Enforcer Responses, Response Counts

	Program	**Pursue**	**Explore**	**Accel.**	**Decel.**	**End**	**Status Ch.**
Toleration	0.703***	0.606*	0.913***	0.699***	-1.028***	-1.065***	0.007**
	(0.003)	(0.090)	(0.000)	(0.002)	(0.000)	(0.000)	(0.017)
Attacks	-0.512**	-1.263**	-0.481**	-0.673***	0.318***	0.340***	-0.003**
	(0.018)	(0.010)	(0.040)	(0.003)	(0.007)	(0.005)	(0.026)
Deals	-0.258	0.292	-0.407	-0.114	-0.970**	-0.935**	0.001
	(0.316)	(0.393)	(0.213)	(0.587)	(0.023)	(0.029)	(0.317)
Observations	5413	5681	5410	5681	475	475	5880

Logistic regression with standard errors clustered on audience countries, except Status Ch., which is linear regression.
Sample of countries that manifested interest in atomic energy, post-1945. For each coefficient, p-values are reported in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Consistent with H1 and H2, toleration appears to encourage increases in nuclear program activity and discourage decreases, while attacks have the opposite apparent effect, and these results are statistically significant for all measures of activity. As H3 predicts, deals appear to discourage decreases in activity. However, deals have only a statistically and substantively weak association with increases in activity, with the sign of this association uncertain. We also find support for H5, since the coefficient on deals is smaller in magnitude than that for attacks in *Status Change*, the only measure of activity that combines increases and decreases in activity and thus gives an overall estimated effect.

Next we can compare the substantive effects of enforcer responses to those of other determinants of proliferation behavior. Table 3 presents regressions of our measures together with control variables that extant literature identifies as important causes of nuclear weapons pursuit. *Interstate Conf* and *Civil Conf* capture episodes of interstate and civil

violence a country suffers (Marshall, 2019); *Nuclear Rival* marks the presence of a long-term rival with nuclear weapons (Thompson and Dreyer, 2011); *GDP per capita* measures the country's PPP-adjusted level of economic development (Feenstra, Inklaar and Timmer, 2015); and *Polity* scores the regime type of the country (Marshall, Gurr and Jaggers, 2014). Similar support for our hypotheses emerges from these regressions, though with somewhat attenuated statistical significance due to the addition of variables and smaller samples.

Table 3: Proliferation Behavior Soon After Enforcer Responses, Response Counts

	Program	**Pursue**	**Explore**	**Accel.**	**Decel.**	**End**	**Status Ch.**
Tolerations	0.675*	0.104	0.905**	0.498*	-0.693**	-0.739**	0.003
	(0.055)	(0.746)	(0.014)	(0.061)	(0.040)	(0.043)	(0.230)
Attacks	-0.515	-2.025**	-0.526	-0.729*	0.475***	0.509***	-0.003*
	(0.119)	(0.026)	(0.145)	(0.052)	(0.000)	(0.000)	(0.067)
Deals	-0.349	-0.123	-0.486	-0.308	-0.399	-0.330	0.000
	(0.300)	(0.783)	(0.222)	(0.248)	(0.413)	(0.509)	(0.741)
Interstate Conf	0.391***	0.342	0.363***	0.275**	-	-	0.015**
	(0.002)	(0.292)	(0.007)	(0.048)			(0.030)
Civil Conf	-0.052	0.045	0.012	0.015	0.176	0.168	-0.001
	(0.598)	(0.645)	(0.893)	(0.833)	(0.462)	(0.523)	(0.196)
Nuclear Rival	2.391***	2.917***	2.604***	2.279***	0.475	0.252	0.005
	(0.000)	(0.001)	(0.000)	(0.000)	(0.458)	(0.691)	(0.559)
GDP per capita	-0.019	-0.107*	-0.029	-0.044	0.093**	0.110***	-0.000
	(0.469)	(0.064)	(0.321)	(0.149)	(0.011)	(0.006)	(0.503)
Polity	-0.041	0.093**	-0.020	0.002	0.027	0.013	-0.000
	(0.347)	(0.042)	(0.668)	(0.948)	(0.415)	(0.735)	(0.252)
Constant	-5.533***	-5.406***	-5.791***	-4.914***	-3.319***	-3.441***	0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.369)
Observations	4582	4804	4581	4804	301	301	4923

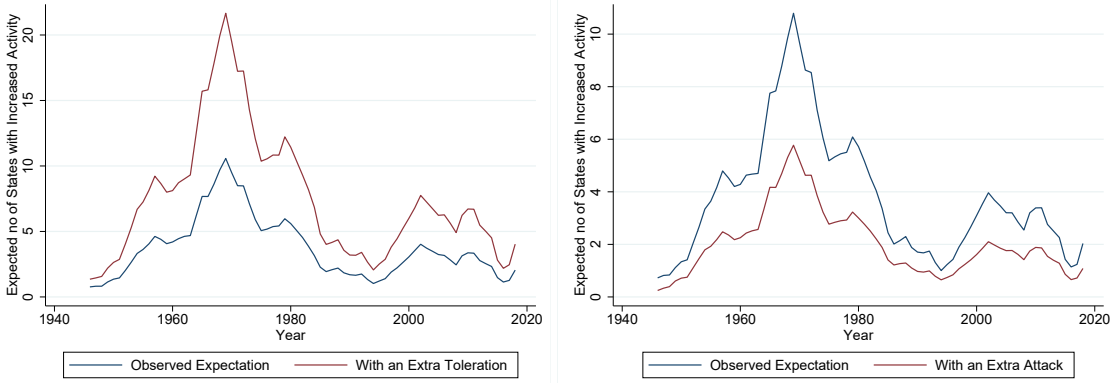
Logistic regression with standard errors clustered on audience countries, except Status Ch., which is linear regression.
Sample of countries that manifested interest in atomic energy, post-1945. For each coefficient, p-values are reported in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

The substantive effects of an enforcer's responses can be quite large. Consider the perspective of a state with a non-trivial chance of seeking nuclear weapons: one with a nuclear rival, experience of an interstate conflict, polity score 0 and average GDP per capita. If this state has not observed any enforcer response within the past five years, our *Accelerate* model places its baseline probability of accelerating its nuclear efforts (beginning a program or moving from exploration to pursuit) at .064. If instead it had observed an attack on another country seeking nuclear weapons, the probability of acceleration drops to .035, a 45% reduction. Instead observing toleration of another country's successful program raises the probability of acceleration to .096, a 50% jump. These effects are comparable in magnitude to those of other variables thought to be highly influential in a state's decision to seek the bomb. Removing the state's nuclear rival would decrease the probability of acceleration to .007, an 89% reduction, while eliminating its experience of interstate conflict would decrease the probability to .050, only a 22% drop.

Next consider the perspective of an enforcer who must tolerate, attack, or make a deal with a proliferant whose program is on the verge of success. Suppose, for example, that in 1964 the US had attacked rather than tolerated China's near-success nuclear weapons program, as it seriously considered doing (Burr and Richelson, 2001). If the attack prevented China from going nuclear for the next five years, Taiwan would both have observed an attack rather than a toleration and also have lacked a nuclear rival. As a result, its model-estimated probability of initiating a nuclear weapons program in those five years would have fallen from .56 to .03, a 95% drop. Even if the attack had failed and China had still gone nuclear in 1964, Taiwan's chance of starting a program would still decrease to .24, a 57% reduction.

Of course, a chosen response affects an entire audience of potential proliferants, not just one as in our illustration above. Other strong determinants of proliferation activity such as nuclear rivalry or experience of interstate conflict do not have such widespread effects, because most states have few rivals and most interstate conflicts involve few states. To fairly compare their effects to those of enforcer responses, we must calculate the *aggregate* effect of a response across the whole audience. To do that, we calculated the effect of an additional attack or toleration in a given year on each audience country's probability of acceleration, from a country-specific baseline based on observed regressor values from the Accelerate model in Table 2. We then simulated the expected number of new programs within a five-year period under the baseline scenario and under the hypothetical addition of one specific response. Figure 1 presents these comparisons over time for attacks and toleration. On average, an attack results in approximately 47% fewer accelerations within the following five years. For instance, an additional attack in the early 1960s would be expected to be followed by fewer than 6 accelerations in the next five years, instead of the 10 that would be expected to occur otherwise in the attack's absence. An additional toleration during the same period would almost double the expected number of accelerations, from 10 to about 21. The percentage effect remains high in different time periods, ranging from a 77% to a 117% increase in the five-year expectation for an additional toleration, and a 35% to 66% reduction due to an attack. These effects are much larger than those of a few states acquiring a nuclear rival or experiencing interstate conflict.

Figure 1: Expected Number of Accelerations in Next Five Years



In Policy-Makers' Own Words

Next we draw on primary and secondary sources to show that potential proliferants keenly observed enforcers' responses to other states' nuclear programs and updated their expectations of how their own program would be treated, leading them to accelerate or decelerate their efforts to develop nuclear weapons. We also show that enforcers expected their choice of response to particular proliferants to influence other states' willingness to seek weapons, and heavily weighed the size of the audience in those choices.

We surveyed the whole set of tolerations, attacks, and deals and what evidence we could find (supportive or not) about the reactions of other states to these responses as well as the deliberations of the enforcer in choosing each response. Here, we present only the cases in which the evidence for our hypotheses was strong and unambiguous. The point is to demonstrate convincingly that, in at least some cases, policymakers in both potential proliferants and the enforcer were influenced in the way our theory predicts and for exactly the reasons our theory specifies. For brevity, case evidence for the enforcer's

choice of response (H4) is relegated to the online appendix.

Tolerating India Encouraged Brazil, South Africa, and Yugoslavia (H1)

We used primary documents from Brazil, South Africa, and Yugoslavia, as well as recently published secondary sources on these countries' nuclear programs, to investigate the accelerations in their programs after the toleration of India's test of a "peaceful nuclear explosive" (PNE) in 1974. These are cases in which the usual explanations for proliferation leading to further proliferation do not apply: India posed no security threat to any of these countries and there is no indication than any of them saw India as a source for assistance in obtaining nuclear technology. The available evidentiary record instead supports our theory (specifically, H1): when South Africa, Brazil, and Yugoslavia witnessed the toleration of India's successful test, they concluded their own programs would also be tolerated and were encouraged in their pursuit.

South African officials closely monitored Washington's reaction to the Indian PNE. They took note of US government agencies' inability to arrive at "a definite posture on the matter" despite the official mantra that they opposed proliferation due to "the adverse impact it would have on world stability" (Louw, 1974). The enforcer's turning a blind eye to New Delhi's back-door weaponization led the leadership in Pretoria to expect that "a South African nuclear test, possibly proclaimed to be a PNE, would be tolerated" and "would not lead to excessive international reaction" (Rabinowitz, 2014, 111). By the end of 1974, Prime Minister John Vorster gave the green light for "the development of a limited nuclear explosive capability and the construction of an underground test site" (Albright, 1994, 41).

Immediately after India's PNE, Brazil's foreign minister thought the superpowers "will feel tempted to make the safeguard norms more rigid" and restrict nuclear cooperation with non-NPT signatories like Brazil (Azaredo da Silveira, 1974). But as decisive action from the enforcers failed to materialize, the Brazilians understood that India went nuclear "without any serious resistance from Washington" (Araújo Castro, 1974).

The Brazilian government "welcomed enthusiastically the singular success of the Indian A[tomic] E[nergy] C[ommission]" (Singh, 1974*a*). That the Indian PNE was a source of inspiration for the Brazilians is evidenced in Foreign Minister Antonio Francisco Azaredo da Silveira's statement that "Brazil and India are going together," proceeding along on a "parallel path" (Singh, 1974*b*). Moreover, after India tested its nuclear device, the leadership in Brasilia reportedly started "boasting of the fact that they have the capability and [...] the motivation to build an atomic bomb" (Araújo Castro, 1975).

Brazil had long considered the possibility of building and detonating a nuclear artifact, following the same route as India (Costa e Silva, 1967). But its efforts to secure the necessary technology had been languishing since the 1950s. The Indian PNE prompted Brazil to sign a nuclear cooperation agreement with West Germany for the pursuit of enrichment and reprocessing technology (Abreu, 1974). The decision to acquire this technology from West Germany was motivated by the desire to have a dual-use nuclear program, following the Indian example (Patti, 2014, 100).

The Brazilians expected their weaponization efforts to be treated the same way as India's, especially after American policy-makers stated in 1975 that "[w]e cannot stop them [the Brazilians] if they do that [build an atomic bomb] on their own" (Araújo Castro, 1975). As a result, Figueiredo approved the launch of the "Projeto Autonomo" (the Autonomous

Program), also known as the "Parallel Program" (Patti, 2014, 158). The enforcers' mild reaction to the Indian PNE thus encouraged Brazil's own nuclear program by leading the Brazilian government to expect that its own nuclearization would be tolerated.

The government of Yugoslavia also expressed admiration and support for India's PNE, congratulating India on its "great technological success, which raised hopes that other developing countries could follow the same path" (Bondžić, 2016*b*, 324). That New Delhi's nuclear pursuits served as an example for Yugoslavia's is evidenced in the admission by a high-ranking official in Belgrade that Yugoslavia "has long been a follower of India's nuclear research" (Bondžić, 2016*a*, 145). The Yugoslav leadership emphasized that India's PNE "deserves all the more attention because [India] is a developing country", setting a useful precedent for Yugoslavia (Bondžić, 2016*a*, 143-144).

President Tito had previously considered building nuclear weapons but abandoned this ambition in 1962 after the normalization of Soviet-Yugoslav relations. India's PNE catalyzed Yugoslavia's resumption of its nuclear weapons program (Potter, Miljanic and Slaus, 2000). The month after India's test, Tito summoned the directors of the security and scientific establishments in Yugoslavia and ordered them to "utilize dramatically expanded nuclear power program as a cover for a parallel military effort" (Potter, Miljanic and Slaus, 2000, 66). After some internal deliberations on which type of technology would provide the best cover, the Yugoslav leadership settled on the nuclear power plant it had agreed to buy from the United States in 1973 (Toon, 1973). The toleration of the Indian PNE spurred the expansion of the Yugoslav nuclear program, leading to expedited construction of this reactor.

Attacking Iraq Discouraged Iran and Libya (H2)

We examined primary and secondary sources in Arabic, English, and Farsi about Iran's and Libya's updating of expectations about their own treatment after the US invasion of Iraq in 2003 to disarm it of weapons of mass destruction. The punishment meted out to Iraq had the hypothesized effect: both were discouraged in their pursuit of nuclear weapons because they feared suffering the same fate.

In the aftermath of the invasion, the Libyan leader Muammar Gaddafi "increasingly saw the pursuit of a nuclear weapon as counterproductive in terms of security" (Braut-Hegghammer, 2008, 71). Given that Saddam's nuclear weapons program brought about his downfall, Libya expected to suffer the same fate (Corera, 2006, 182; Bowen, 2006, 64). Indeed, Gaddafi described the nuclear weapons program as "a danger and threat to Libya's very integrity" (Corera, 2006, 182). As a result, in December 2003, he agreed to dismantle Libya's nuclear weapons program and submit its activities to international inspections (Sanger and Miller, 2003). Gaddafi admitted that "the war in Iraq may have played a role in his decision to dismantle his country's weapons of mass destruction programs" (CNN, 2003). Saddam's fate taught him that now the Libyan regime "risked a U.S. invasion or preemptive strike" (Braut-Hegghammer, 2016, 213). The lessons Gaddafi learned from Saddam's experience prompted him to ask the British and the Americans for "assurances that there would be no secret efforts to pressure the direction of regime change in Libya" like those that toppled the Iraqi leader (al Islam Gaddafi, 2004). "As soon as we got these assurances, everything went forward," his son confessed in 2004 (al Islam Gaddafi, 2004). The Libyan leadership then ended its nuclear program in a deal made with the US and UK.

Iran launched a covert nuclear weapons program in the late 1990s called Project 110.

In the aftermath of Iraq's invasion, that large-scale effort was halted (Arnold et al., 2021, 233). According to a summary of documents from the Iranian Nuclear Archive, Iran's leadership decided to "reorient" Project 110 towards "a more disguised, albeit smaller nuclear weapons program" (Albright, Heinonen and Stricker, 2019). The fear that Iran would be subjected to a US invasion pushed Tehran to change course (Albright, Heinonen and Stricker, 2019).[9] An April 2003 statement by President Muhammed Khatami makes clear Tehran's apprehension about a US attack: "They tell us that Syria is the next target, but according to our reports, Iran could well follow" (Takeyh, 2003, 23). To avoid that fate, the Iranians put out feelers to the Bush administration in May 2003, offering "full transparency for security that there are no Iranian endeavors to develop or possess WMD, full cooperation with IAEA based on Iranian adoption of all relevant instruments" (Kristof, 2007, 1). Even though this offer was spurned, the leadership in Tehran kept its nuclear program in a dormant state, for fear that "Washington would marshal support through the United Nations Security Council for a limited military strike or coercive rollback of Iran's nuclear fuel cycle" (Volpe, 2015, 230).

The Deal with North Korea Encouraged Iran, Libya, and Syria (H3)

To ascertain whether the audience is emboldened by the deals enforcers offer to other proliferants, we examined primary and secondary sources in Arabic, Farsi, and English about the impact of the 1994 Agreed Framework with North Korea on the nuclear programs of Iran, Libya, and Syria. Direct evidence from these countries' policymakers is scant. How-

[9]There are other reasons for the decision, including more intrusive IAEA inspections and a more energetic diplomatic push from the UK, France, and Germany (Albright, Heinonen and Stricker, 2019).

ever, we infer that the North Korea deal encouraged their pursuit of the bomb from the fact that, soon after the deal was made, all three states greatly increased their nuclear efforts and pursued technologies that were qualitatively different from their earlier acquisitions.

According to the IAEA, in July 1995 Libya "made a strategic decision to reinvigorate its nuclear activities" (Montgomery and Mount, 2014, appendix) after years of stagnation. Subsequently, Gaddafi began pursuing "the building blocks for a nuclear weapons program through the Khan network" as well as with the help of Libyan physicists based abroad (Braut-Hegghammer, 2016, 203). Gaddafi made his renewed nuclear ambitions clear in January 1996, when he urged Arab states "to try by any means" to get nuclear weapons (Braut-Hegghammer, 2016, 203). That the Libyan leader made such a public statement suggests that he believed the enforcer would either tolerate proliferation or try to strike a deal with countries bent on acquiring nuclear weapons.

The size, progress, and nature of the Iranian nuclear program also changed radically after the Agreed Framework. Before 1994, progress within the Iranian nuclear program was "slow and erratic" and Tehran's quest for "nuclear independence failed miserably" (Corera, 2006, 67; Coll, 2006). A.Q. Khan offered Iran centrifuge designs and machines in the second half of 1993, but it wasn't until October 1994—by which point the Agreed Framework had become a reality—that the Iranians struck a deal with Khan (Corera, 2006, 69). Between 1994 and 1996, the Khan network transferred centrifuge designs, materials, and machines to Iran, allowing for the launch of the Iranian enrichment program in 1997 (Corera, 2006, 69; Director General, 2003).

Iran adopted "an ambiguous nuclear posture," which experts have described as "a trick that Iran clearly learned from North Korea as it was developing its nuclear program in the

1990s" (Sigal, Wit and Ehteshami, 2009, 31). The North Korea deal helped Iran in its dealings with the international community as it sought transfers from above-board suppliers like Russia. "Washington's promise to supply the DPRK with light-water reactors (LWRs)" served "as a precedent" for Iran's 1995 Bushehr deal with Russia (Szalontai, 2021, 83). Tehran even took the risky step of seeking sensitive nuclear assistance—that is, assistance that could only be useful for building nuclear weapons—from Russia (Albright and Hinderstein, 2004, 63-64). In the second half of the 1990s, Iran engaged in a whole range of activities "relevant to the development of a nuclear explosive device" (Director General, 2015, 6).

Syria followed a path similar to Iran's. Two years after the North Korea deal, Syria began operating its first research reactor, acquired from China (Gheorghe, 2019, Codebook p. 40). Simultaneously, the Assad regime sought IAEA assistance to expand the Syrian nuclear program and subsequently upgraded its yellowcake pilot plant near Homs (Director General, 1998, 44). Syria also used the IAEA to secure nuclear technology from established suppliers like Belgium and the Netherlands, including hot cells for a cyclotron facility in Damascus (Fitzpatrick, 2008, 78). These public pursuits offered a cover for Syria's secret cooperation with North Korea, which began in 1997 (Riedel, 2013, 41). Pyongyang supplied Damascus with a gas-cooled graphite-moderated research reactor, which could have produced fissile material for a nuclear bomb (Riedel, 2013, 41). The timing of Syria's new nuclear activities indicates that the leadership in Damascus had come to believe that the consequences of pursuing nuclear weapons would not be dire.

Broader Implications

We close by highlighting two broader implications. Our theory holds that an enforcer's choice of response to a state violating the international order will influence other states' expectations of how they will be treated, thus affecting their decisions about whether to do so. Of course, states will be influenced only if they observe the enforcer's choice. Our theory therefore implies that enforcers should attempt to conceal responses they anticipate would encourage other states to violate. We leave serious testing of this prediction to subsequent research, but the evidence currently available in the context of nuclear nonproliferation is consistent with it. The US sought to conceal the fact of proliferation by Israel, South Africa, and Pakistan by making a deal with each of those states not to test their newly-acquired weapons, precisely because it feared that being seen unambiguously to have tolerated their programs' success would encourage other states to follow their examples (Carnegie and Carson, 2018; Rabinowitz, 2014; Rabinowitz and Miller, 2015).

The US has also sought to conceal some of the nonproliferation deals it has made. Those with South Korea and Taiwan were negotiated via quiet diplomacy, with the resulting agreements not publicized. We can also see echoes of this concern in the US refusal to negotiate directly with or make public concessions to Iran in the run-up to the 2003 deal with the EU-3, and in the US hesitation to make its 2003 deal with Libya explicit. In all of these cases, the US perceived a danger of encouraging an audience of potential near-term proliferants. By contrast, the negotiations with Iran that led to the 2015 deal were conducted openly and resulted in a formal, publicized agreement. So far as we know, the US perceived no other state as a near-term proliferation concern at the time.[10] This might

[10]Concerns were expressed about Saudi Arabia and the United Arab Emirates being

explain why the US felt comfortable making a deal in public view.

We showed that the historical record is consistent with our theory when it comes to the context of nuclear proliferation. More broadly, our evidence strengthens the case that the nonproliferation regime has had a large effect on the occurrence of proliferation, relative to what would have happened in its absence.[11] It has been argued that the US and the Soviet Union were the principal enforcers of nonproliferation, and that their enforcement should be viewed as a constitutional element of the overall nonproliferation regime (Coe and Vaynman, 2015). It is easy to believe that the US or USSR were important to preventing particular instances of proliferation, by intervening directly to stop particular states from acquiring nuclear weapons, as in cases like West Germany or Iraq. However, this kind of direct intervention was relatively rare. Most of the time, most states that might have pursued nuclear weapons were not obviously coerced by any enforcer. A skeptic might argue that because the nonproliferation regime was only rarely enforced, it cannot be responsible for the absence of widespread proliferation. Our evidence seriously undermines this argument. It suggests that, quite apart from the enforcers' record of stopping particular states' programs, their occasional resort to force against those states has influenced many other states to abandon the pursuit of nuclear weapons *even absent any direct intervention against them.*

Our findings imply that the nonproliferation regime works in the same way as domestic laws against criminal behavior. Even though some criminals get away with it or make deals to escape punishment, the fact that others are visibly subjected to severe consequences by

encouraged to pursue weapons by the Iran deal (Kaplow and Gibbons, 2015). However, both countries are likely many years from indigenously producing nuclear weapons.

[11] See Fuhrmann and Lupu (2016) for a review of the debate over the regime's efficacy.

law enforcement deters many others from engaging in criminal behavior at all. Similarly, some states get nuclear weapons or make deals to avoid punishment when caught. But others are attacked by enforcers of nonproliferation, and the fear of suffering the same treatment discourages many states from seeking the bomb. Enforcers play to the audience, and the audience responds.

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Playing to the Audience: Responses to Violations of International Order Online Appendix

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Contents

A Proofs of Propositions

Proposition 1: Take the strategies of all the potential violators in any particular subgame as given: they will always violate. We will show that the enforcer's strategy in that subgame is optimal. If the enforcer gets a chance to intervene, her choice does not affect the future behavior of any potential violator, by construction. Thus E strictly prefers rewards over penalties since $-r > -p_E$. Now take E's strategy and those of all but one potential violator as given, so that we can show that the remaining potential violator's strategy is best. That violator's choice does not affect the future behavior of any other potential violator or of the enforcer, after the current round. Not violating yields a payoff of 0 in this round, while instead violating gets $\tau s + (1-\tau)r > 0$, so violation is strictly preferred.

Proposition 2: By Proposition 1, the given profile of strategies constitutes a subgame-perfect equilibrium for any subgame in which a violator has been rewarded or tolerated, so we need only consider subgames in which neither has yet occurred. Suppose E has the chance to intervene against a single state that has violated. Rewarding him gives an immediate payoff of $-r$, and leads every subsequent state to violate while E responds, when given a chance to intervene, with a reward. The continuation value of this for E,

from the next round onward, is, for each potential violator, $V \equiv \tau s + (1-\tau)[r + \delta V] = \frac{1}{1-(1-\tau)\delta}[\tau s + (1-\tau)r]$. Since there are N potential violators in this subgame, the total continuation value for E is NV. If instead E were to use penalties, she would receive an immediate payoff of $-p_E$, and no state would subsequently violate, yielding a continuation value of 0. The second condition in the proposition is thus equivalent to E preferring penalties over rewards in this subgame.

In any subgame in which E has the chance to intervene against i states that have simultaneously violated, her optimal response is determined by the same condition, except with $p_E - r$ multiplied by i. These conditions are irrelevant for equilibrium since the version stated in the proposition is sufficient to stop a violator from deviating on his own.

Backing up to the previous subgame, consider the choice of a potential violator. If he does not violate, he receives a continuation value of 0. If he does, his continuation value is $\tau s - (1-\tau)p_V$, where the first term is if E is not given the chance to intervene and the second term is if she is. The first condition in the proposition is thus equivalent to any potential violator preferring compliance in this subgame.

B Event Order for Large-N Analysis

Because there are instances where enforcer responses and/or proliferation behaviors happened in the same year, we had to determine the order in which these occurred so as to correctly code which events came after others. Below we list all the same-year events in the temporal order we used for all our analysis, along with justifications for that order.

1942: The US started pursuit, then Germany was attacked, then the USSR started

exploration. US began pursuit on January 19 (Bleek, 2017, 9). The attack on Germany happened in October (Fuhrmann and Kreps, 2010, Appendix, 6). USSR began exploration "late that year" (Bleek, 2017, 10).

1943: The USSR started pursuit, then Germany was attacked. The former happened in February (Bleek, 2017, 10), the latter in February, April, and the most visible attack (a joint US-UK bombing raid) in November (Fuhrmann and Kreps, 2010, Appendix, 6, 11).

1945: Germany was attacked, then Germany's exploration ended, then the US acquired, then Japan's exploration ended and France's, Sweden's, and Switzerland's started. The attack on Germany occurred in March and April (Fuhrmann and Kreps, 2010, Appendix, 11), and its exploration ended with the war in Europe on May 8. US acquisition is dated to the Trinity test on July 16. Japan's exploration ended with the war in Asia on August 15. France's exploration began on October 8 (Bleek, 2017, 11), Switzerland's when its Atomic Energy Committee was established (Bleek, 2017, 33) in November (Cerutti, 2012, 73). Sweden also started exploring after war ended (Jonter, 2016, 41).

1949: Israel started exploration, then the USSR acquired, then Yugoslavia started exploration. We conservatively assume Israel's start came before the Soviet test (the reverse order would support H1), based on the influence the US bomb had on Israeli scientists (Rabinowitz, 2014, 72–73). The Soviet test was on August 29. Yugoslavia's exploration began in September (Potter, Miljanic and Slaus, 2000).

1952: The UK acquired, then China started exploration. While the UK test occurred in October, Prime Minister Churchill announced it in February (Daniel, 1952). China began exploring in May (Bleek, 2017, 12).

1964: China acquired, then India and Indonesia started pursuit. China tested on Octo-

ber 16, Indonesia started November 15 and India on the 27th (Bleek, 2017, 17, 38).

1967: Indonesia ended and Taiwan began exploration, then Israel acquired, then Japan started exploration. While Indonesia signed a safeguards agreement on June 19, the decision to end exploration arguably happened in 1966 with Sukarno's replacement with Suharto, the latter not a supporter of the program (Cornejo, 2000, 38, 41). Taiwan actually began its Hsin Chu program in 1966, not 1967 (Albright and Stricker, 2018, 10). Israel acquired in May (Bleek, 2017, 14). Japan began exploration later that year, as implied by the working of a commission to explore nuclear weapons "for two and a half years beginning in 1967" and ending with a final report in 1970 (Kase, 2001, 58).

1969: South Africa started and Switzerland ended exploration, then West Germany made a late-stage deal, then South Korea started exploration. South Africa's exploration began with the decision "to build a secret pilot scale uranium enrichment plant" (Bleek, 2017, 14) in February (Albright and Stricker, 2016, 8). Switzerland ended its program by signing the NPT on June 24, and West Germany "codified a tacit bargain with the United States in which it renounced nuclear weapons" by doing the same on November 28, though the deal had been negotiated over the previous months (Gerzhoy, 2015, 124). South Korea began "in late 1969" (Siler, 1998, 59) but Bleek (2017, 22) notes the first concrete actions seemed to have happened in early 1970.

1974: India acquired, then Iran and Yugoslavia started exploration and South Africa started pursuit. India's test was on May 18, while Iran's exploration is coded as beginning with an interview the Shah gave in which he said Iran would have nukes "sooner than it is believed" (Bleek, 2017, 28). That interview occurred on June 23 (Burr, 2009). Tito first announced a decision to resume exploring nuclear weapons in a meeting of govern-

ment officials "in early June" (Potter, Miljanic and Slaus, 2000). South Africa's pursuit is coded as beginning with Prime Minister Vorster's decision to develop a nuclear explosive capability (Bleek, 2017, 15), which occurred after a successful test of a scale model of a gun-type device in May (Albright, 1994).

1978: Taiwan made a late-stage deal, then Argentina and Romania started exploration. Taiwan committed itself to nonproliferation in 1976 (Bleek, 2017, 39), although prolonged negotiations with the US over specific activities Taiwan would not be allowed to engage in continued until September 1978 (Burr, 2007*b*). Argentina is reported to have started exploring in October 1978 (Benjamin, 1978) and Romania in late (most likely December) 1978 (Gheorghe, 2014, 327).

1979: Iran ended exploration, then Iraq was attacked, then South Africa acquired. Iran's exploration ended with the Shah's overthrow in February (Bleek, 2017, 28), while the first attack on Iraq's program, Israel's sabotage of French facilities producing reactor cores for Iraq (Fuhrmann and Kreps, 2010, Appendix, 4), occurred on April 6 (Perlmutter, Handel and Bar-Joseph, 2003, 53). It was "not until the second half of 1979" that South Africa had a viable weapon design and enough enriched uranium (Albright, 1994).

1980: North Korea started pursuit, then Iraq was attacked, then Egypt ended. The former is coded on beginning construction of a larger reactor at Yongbyon (Bleek, 2017, 20), but new sources have this construction starting in 1979 (IAEA, 2014). Israel assassinated a key Egyptian scientist assisting Iraq's program on June 14 (Perlmutter, Handel and Bar-Joseph, 2003, xxxvii) and bombed a related facility in Rome in August 1980 (Perlmutter, Handel and Bar-Joseph, 2003, 61). Iran launched an air raid on Osiraq in September (Fuhrmann and Kreps, 2010, Appendix, 3). Egypt's exploration ended in December

(Bleek, 2017, 36).

1981: South Korea made a deal, then Iraq was attacked, then Iraq started pursuit. South Korea completed a bargain with the US to stop its pursuit of nuclear weapons early in 1981 (Siler, 1998, 75–78). Iraq's Osirak facility was struck in June, and Bleek codes it as beginning pursuit soon after (Bleek, 2017, 27).

1987: Taiwan restarted exploration and Yugoslavia ended, then Pakistan acquired. Taiwan's restart of exploration is coded on the basis of its decision to build a plutonium reprocessing facility (Bleek, 2017, 40), but recent research shows this happened much earlier, in 1983 (Albright and Stricker, 2018, 157). Yugoslavia ended its program on July 7 (Potter, Miljanic and Slaus, 2000). The exact timing of Pakistan's acquisition is not publicly known, with (Bleek, 2017, 16) stating that "one could make a plausible case for coding this one or several years later", so we assume it came last.

1991: Iraq was attacked, then Algeria ended and Ukraine started exploration. The Gulf War took place from January 17 to February 28. Algeria ended its exploration by agreeing to place its facilities under IAEA safeguards (Bleek, 2017, 45) in the spring (Burr, 2007*a*). Ukraine only became independent in the latter half of the year.

1994: We treat the Agreed Framework and Budapest Memorandum as deals made simultaneously with North Korea and Ukraine. They were simultaneously negotiated and formalized within less than two months of each other (US Congress, 1995*b*, 67, 74-75).

2003: Iraq was attacked, then deals were made with Iran and Libya simultaneously. The Iraq War's invasion phase ran from March 20 to April 30 (Rayburn and Sobchak, 2019, 81). We treat the EU-3 deal with Iran and the US/UK deal with Libya as simultaneous, since they were negotiated at the same time and announced within two months of each

Table 1: Proliferation Behavior Soon After Enforcer Responses, Weighted Response Counts, Program Start

	Unweighted	**Time**	***ν*-clear**	**Ideal Pt.**	**Polity**
Toleration	0.675*	1.238**	1.501***	1.261*	1.682***
	(0.055)	(0.016)	(0.000)	(0.097)	(0.000)
Attacks	-0.515	-0.606	-0.265	-0.513	-0.469*
	(0.119)	(0.107)	(0.307)	(0.203)	(0.083)
Deals	-0.349	-0.087	0.139	0.202	0.565
	(0.300)	(0.847)	(0.800)	(0.726)	(0.358)
Interstate Conf	0.391***	0.424***	0.415***	0.617**	0.276*
	(0.002)	(0.002)	(0.001)	(0.014)	(0.100)
Civil Conf	-0.052	-0.053	-0.065	-0.087	-0.044
	(0.598)	(0.571)	(0.570)	(0.627)	(0.671)
Nuclear Rival	2.391***	2.326***	1.963***	2.937***	2.115***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP per capita	-0.019	-0.024	-0.033	-0.003	-0.027
	(0.469)	(0.408)	(0.423)	(0.886)	(0.374)
Polity	-0.041	-0.047	-0.031	-0.094	-0.069
	(0.347)	(0.275)	(0.449)	(0.216)	(0.102)
Observations	4582	4582	2982	3227	3947

Logistic regression with standard errors clustered on audience countries. For each coefficient, p-values are reported in parentheses. Sample of countries that manifested interest in atomic energy, post-1945.
* p<0.1, ** p<0.05, *** p<0.01

other (Sauer, 2015, 106; Braut-Hegghammer, 2008, 55).

C Robustness Checks for the Large-N Analysis

We first allow for the possibility that audience countries may learn more from some responses than others, considering four alternative weighted response counts. Focusing on *Program Start* as the dependent variable, these results are presented in Table 1. First, *Time* assigns more weight to more recent responses within the five-year window. *ν-clear* more heavily weights responses that target a proliferant with more similar nuclear infrastructure to the audience country, based on the ν-Clear measure by Smith and Spaniel (2020).

This version allows for the possibility that states might learn more from proliferants who rely on the same relevant infrastructure in pursuing nuclear weapons. *Ideal Pt.* aims to capture preference similarity of the audience country with the response target. In this variant, responses to countries that tend to vote similarly with the audience country in the UN General Assembly receive a larger weight (Bailey, Strezhnev and Voeten, 2017). Finally, *Polity* assigns more weight to responses to proliferants that have similar Polity scores.

In general, the weight assigned by audience country i to a specific response to country j is $w_{ij} = \frac{\bar{\delta}-\delta_{ij}}{\bar{\delta}}$, $w_{ij} \in [0,1]$, where $\bar{\delta}$ is the maximum dyadic distance in the sample in that weighting scheme. For instance, in regime type similarity weighting, the maximum regime difference in the sample is 20 based on the Polity scores, between a fully autocratic country with a score of -10 and a full democracy with 10. δ_{ij} is the dyadic distance between the audience country a_i and the response country r_j in that weighting dimension.

Tables 2 through 4 present various robustness checks to Table 3 presented in the paper. These consider (i) all audience countries instead of those that manifested interest in atomic energy (Table 2); (ii) Response dummy variables instead of response counts (Table 3); and (iii) only observations from 1969 and after (Table 4).

D Case Evidence for H4

We draw on evidence from all the cases discussed in the paper to show that the anticipated influence on the audience was a central consideration in the enforcer's choices of response. We use primary and secondary sources from the United States to examine its expectations regarding the consequences for proliferation of tolerating India, attacking Iraq, and making

Table 2: Proliferation Behavior Soon After Enforcer Responses, Response Counts, All Audience Countries, post-1945

	Program	**Pursue**	**Explore**	**Accel.**	**Decel.**	**End**	**Status Ch.**
Toleration	0.552**	0.512	0.752***	0.585***	-1.028***	-1.065***	0.004**
	(0.020)	(0.161)	(0.003)	(0.009)	(0.000)	(0.000)	(0.021)
Attacks	-0.497**	-1.267**	-0.473**	-0.674***	0.318***	0.340***	-0.002**
	(0.024)	(0.011)	(0.048)	(0.004)	(0.007)	(0.005)	(0.028)
Deals	-0.263	0.267	-0.404	-0.128	-0.970**	-0.935**	0.001
	(0.313)	(0.441)	(0.221)	(0.547)	(0.023)	(0.029)	(0.287)
Constant	-5.748***	-6.322***	-6.031***	-5.438***	-1.931***	-1.980***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(1.000)
Observations	9956	10224	9953	10224	475	475	10423

Logistic regression with standard errors clustered on audience countries, except Status Ch., which is linear regression.
All countries, post-1945. For each coefficient, p-values are reported in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 3: Proliferation Behavior Soon After Enforcer Responses, Response Dummies, post-1945

	Program	**Pursue**	**Explore**	**Accel.**	**Decel.**	**End**	**Status Ch.**
Toleration	1.636***	1.431**	2.181***	1.756***	-0.963***	-1.026***	0.009**
	(0.000)	(0.017)	(0.003)	(0.001)	(0.010)	(0.008)	(0.013)
Attacks	-1.004***	-1.627***	-1.090***	-1.228***	0.737**	0.817**	-0.009***
	(0.005)	(0.008)	(0.003)	(0.000)	(0.034)	(0.026)	(0.006)
Deals	0.123	0.854**	-0.264	0.244	-1.042	-1.023	0.006*
	(0.769)	(0.047)	(0.584)	(0.435)	(0.102)	(0.117)	(0.083)
Constant	-5.968***	-6.573***	-6.402***	-5.756***	-2.186***	-2.233***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.952)
Observations	5413	5681	5410	5681	475	475	5880

Logistic regression with standard errors clustered on audience countries, except Status Ch., which is linear regression.
Sample of countries that manifested interest in atomic energy, post-1945. For each coefficient, p-values are reported in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

Table 4: Proliferation Behavior Soon After Enforcer Responses, Response Counts, post-1969

	Program	**Pursue**	**Explore**	**Accel.**	**Decel.**	**End**	**Status Ch.**
Toleration	1.002***	0.683**	1.321***	0.952***	-0.491	-0.491	0.004
	(0.006)	(0.020)	(0.002)	(0.001)	(0.285)	(0.285)	(0.234)
Attacks	-0.657*	-1.287***	-0.587	-0.856**	0.171	0.171	-0.002
	(0.058)	(0.004)	(0.146)	(0.012)	(0.191)	(0.191)	(0.118)
Deals	-0.104	0.034	-0.163	-0.074	-1.282***	-1.282***	0.002
	(0.699)	(0.922)	(0.666)	(0.716)	(0.000)	(0.000)	(0.124)
Constant	-5.586***	-5.441***	-6.168***	-5.071***	-1.701***	-1.701***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.998)
Observations	4491	4616	4487	4616	274	274	4766

Logistic regression with standard errors clustered on audience countries, except Status Ch., which is linear regression.
Sample of countries that manifested interest in atomic energy, post-1969. For each coefficient, p-values are reported in parentheses.
* p<0.1, ** p<0.05, *** p<0.01

a deal with North Korea.

The US had long worried about the effects of an Indian nuclear test on other potential proliferants, and anticipated that acquiescing to India's nuclearization would embolden other countries. US intelligence estimates made specific connections between India's weaponization and Brazil's nuclear pursuits: "Should another Latin American country, one of the lesser European nations (such as Spain, for example), any African country or India obtain or produce nuclear weapons, there would almost certainly be strong pressure upon the Brazilian government to acquire similar weapons" (Office of Intelligence Research, 1957, 5). The 1965 Gilpatric Committee forecast that "an Indian or Japanese decision to build nuclear weapons would probably produce a chain reaction of similar decisions by other countries, such as Pakistan, Israel and the UAR" (Gilpatric, 1997). Several months before the test, American officials concluded that "apparent US acquiescence could lead

[Japan, Germany, Israel], and others, to anticipate nothing more severe if they became Member No. 7 in the nuclear club" (Brewster, 1973). Just after the test, they admitted that "as a result of the Indian nuclear test, other non-nuclear weapons states will tend to rethink their decisions regarding independent nuclear weapons or nuclear explosives programs" (NSC Under Secretaries Committee, 1974, 2). A Special National Intelligence Estimate identified Brazil as one of the "potential third-generation proliferators" that would follow in India's footsteps (CIA, 1974, 38).

The US expectation that India's nuclearization would set a bad example for other countries and encourage them to make a dash for the bomb did materialize (Brewster, 1973; Porter, 1974;Szalontai, 2011, p. 7). But Washington did not perceive itself to be in a position to stop India's program, and so felt it had to accept it despite the consequences.

The US decision to invade Iraq was strongly encouraged by the influence this was anticipated to have on other potential proliferants. Butt (2019) offers extensive documentation that "the United States fought Iraq mainly for its demonstration effect," to instill fear in other potential proliferants and induce them to forswear nuclear weapons. Indeed, high-ranking officials within the Bush administration expressed concerns that tolerating Iraq's alleged nuclear pursuits would prompt other countries in the region, including Iran and Libya, to follow a similar path (Rumsfeld, 2011, 717). The invasion of Iraq was therefore intended to serve, according to Undersecretary of State John Bolton, as "a cautionary example of what can happen to other states that refuse to abandon their programs to build weapons of mass destruction" (Sanger, 2003).

Moreover, the US believed that the audience of potential proliferants included states that might acquire nuclear weapons in the near future. In the lead-up to the invasion of

Iraq, Bolton called Syria a rogue state "intent on acquiring weapons of mass destruction" (Bolton, 2002), alleged that Syria had undertaken "potential nuclear weapons efforts" (Nuclear Threat Initiative, 2005), and spoke of "Iran's ongoing interest in nuclear weapons" and Libya's "longstanding pursuit of nuclear weapons" (Bolton, 2002). Fears that Tehran was quickly moving towards acquiring a nuclear weapon capability were compounded by revelations about the scale of uranium enrichment at Natanz, following IAEA visits in February 2003 (Corera, 2006, 81). By the time the US invaded Iraq, the intelligence community had also learned that Libya had received centrifuge technology from the Khan network. This discovery prompted a revision of estimates about when Libya might have a nuclear weapon from 2015 to 2007 (Iraq Intelligence Commission, 2005, 257-260). As additional intelligence on the Khan network came in, US concerns about Libya's possible progress toward a nuclear weapon mounted over the course of 2002 and into 2003 (Corera, 2006, 169-172). If the leadership in Tehran and Tripoli did not show receptiveness to US demands to end their programs, the Bush administration considered subjecting both to preventive attacks to stop them (Volpe, 2015; Jentleson and Whytock, 2005, 73).

The US government recognized that the 1994 Agreed Framework with North Korea might be seen as rewarding bad behavior and thus set a dangerous precedent (US Congress, 1995*c*, 8). Specifically, it would signal to other proliferants that it paid off to defy the NPT (US Congress, 1994*b*, 9). Iran, Iraq, and Libya were often suggested as the most worrisome candidates for being influenced in this way (US Congress, 1995*a*, 13), with Iran of particular concern given the CIA's estimate that Tehran was "in the process of developing [an atomic] bomb" (US Congress, 1994*b*, 35). The Clinton Administration dismissed these criticisms, arguing that "such analogizing is misguided" because the circumstances

of each potential proliferant were so different from Pyongyang's that they did not lend themselves to a comparison with North Korea (US Congress, 1995*c*, 17-18). More specifically, Iraq's nuclear weapons program had just been put "out of business," Libya and Iran had "very rudimentary nuclear infrastructure," and other potential proliferants such as Syria were discounted (US Congress, 1994*a*, 21; US Congress, 1995*c*, 17-18; Montgomery and Mount, 2014, 373; US Congress, 1994*a*, 13-14; Nutt, 2019, 342). Precisely because the potential proliferants were not seen as serious near-term concerns, the administration argued the deal with North Korea would not "prompt would-be proliferators to try a similar breakout" (US Congress, 1995*c*, 14). Thus, the perception that the audience presented little near-term risk contributed to Washington's decision to make a deal with North Korea rather than impose severe sanctions.

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