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Since the dawn of the nuclear age, only 10 states have successfully obtained nuclear weapons. Out of 195 countries in the world today, that is quite a small number. Beyond those 10, however, a relatively larger number of 32 states, at one time or another, have had what is known as a nuclear latent capacity. Technically speaking, latency is a state's possession of either an operational uranium enrichment or plutonium reprocessing capability—the two pathways that can yield the critical material for nuclear bombs or civilian nuclear energy generation. More generally, we consider latent states to be those who have this technological capability but have yet to use it to acquire nuclear weapons.

Despite the empirical prevalence and substantive importance of nuclear latency, international politics and political science have instead largely focused on understanding the consequences of the spread of nuclear weapons: why states want them or why they refrain, and what having nuclear weapons means for conflict and bargaining dynamics across the globe. Indeed, theories abound focusing on security, economic, and leadership characteristics connected to the

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pursuit or abstention from weapons. Likewise, a large literature describes the circumstances in which nuclear weapons are useful, the costs of using them, and the implications for deterring other states from attack and compelling them to change their behavior. Given the potential consequences of the use of just one nuclear weapon, this outsized focus on such a rare, but devasting, phenomenon is understandable. So too is the fact that the international community has spent significant time and effort to manage and limit the spread of nuclear weapons in order to mitigate the most negative of consequences.

Nuclear latency is more prevalent, but very little is actually known about it.

At the same time, while latency is more prevalent, very little is actually known about it. The academic and policy communities have yet to systematically analyze the potential impact of latency on the likelihood of war or arms racing between states, nor have they paid attention to what drives states to seek latency as an end in and of itself. Our argument, as we discuss below, is that the consequences of nuclear latency may be no less significant than those of nuclear weapons proliferation.

In some sense, latency is an old but also emerging technology with uncertain consequences. Historically, the varieties of states who have acquired it have very different characteristics. Japan, for example, arguably the most advanced latent state, currently maintains purely civilian energy-related aspirations. Iran, by contrast, retains latency but even recently has held weapons aspirations. Still others, like Taiwan, have toggled back and forth between a focus on energy and weapons during its long nuclear history. This variety in state experiences with latency is consequential in that it is hard to know which model a state currently pursuing latency is likely to follow in the future. Will these latent states, among others, pursue a civilian program in perpetuity, or might they one day seek nuclear weapons? It is especially difficult given that as outsiders looking into a state's decision making, it is very challenging, if not impossible, to be certain about that state's intentions, especially as they may change over time.

Further, there are any number of unanswered and related questions about why states pursue latency in the first place, and what the implications of its possession are for cooperation and conflict between states. Especially to the extent that this is a technology potentially likely to spread further in the future, as well as something whose proliferation the world may seek to try to stop, critical unknowns remain that require dedicated focus.

In what follows, we describe some key facets of nuclear latency, including the underlying motivation for its pursuit. We also discuss a few reasons why latency may be likely to spread in the coming years as a form of technology sanctioned

by the nonproliferation regime. We next assess the ways in which nuclear latency proliferation might be both harmful and beneficial for international politics. (If, for example, the United States and its nonproliferation partners might actually systematically encourage the acquisition of latency as a means to preventing a state from acquiring weapons, what will this mean for international stability?) Lastly, we articulate a research agenda focusing on critical questions whose investigation will help us better understand the latency phenomenon when the world encounters it. Given the possible proliferation of this technology and its wide range of potential consequences (both positive and negative), we argue that it is critical for analysts, scholars, and policymakers to better understand the strategic calculations that may underlie the development and implications of nuclear latency.

It's Not All about Energy

Examining the population of latent states historically, it might be tempting to conclude that states who have civilian energy interests or needs are those who acquire latency. For example, Belgium, Canada, the Czech Republic, the Netherlands, and Spain never had nuclear weapons programs, only energy-related complexes, making them nuclear latent states. And indeed, this is often the argument employed by states to quell potential concern—that it is purely for civilian requirements. Yet, the data suggests something more complicated. First, these five states are the minority. Seventeen additional latent states have had weapons programs at some point in their history. A remaining 10 states, who at one point had nuclear latency, comprise (or were formerly members of) the nuclear weapons club.

Second, when examining the patterns that develop across the full population of latent states, our large-N, cross-national statistical analysis reveals a different logic than just energy needs. We find that the drivers of nuclear latency are largely security-based as alliances, enduring rivalries, and economic capacity drive states toward its acquisition. The patterns mimic, but do not mirror exactly, the reasons why states pursue nuclear weapons. Despite claims to the contrary, concerns about energy market access or domestic energy consumption generally do not motivate states toward latency.[1]

The drivers of nuclear latency are largely security, not energy, based.

It is important to note that the acquisition of nuclear latency is not illegal according to the Nuclear Non-Proliferation Treaty (NPT). Indeed, the grand bargain between the original nuclear weapons' states (NWS) and the nonnuclear weapons states (NNWS) rests centrally on the right of the NNWS to pursue peaceful uses for nuclear technology and obligates the NWS to assist them. Though the treaty

has been in force since 1970, the recent signing of the Joint Comprehensive Plan of Action, or "nuclear deal" between Iran, the United States, EU3 (Great Britain, France, and Germany), Russia and China, has according to some, codified a specific right to enrichment, which has historically been vague.[2]

Collectively, the components of the NPT and the observed historical patterns suggest that there are a variety of reasons states might seek nuclear latency. Some may have real energy-related motivations. Some may have security concerns underlying their behavior. Others may simply wish to access the technical capabilities offered to them through the NPT. Either could yield a legal route to the technology that could leave open the possibility of hedging toward nuclear weapons, should the future necessitate it. In this way, both states desiring the bomb and those uncertain about it at present may similarly consider the pursuit of nuclear latency.

Understanding the Next Wave of Proliferation

The proliferation of nuclear weapons has traditionally pervaded conversations about the impact of military technology on key international security outcomes —conflict, bargaining, arms racing, efforts at cooperation, etc. The expectation was that this challenge would continue or even accelerate in the post-Cold War environment. Yet, despite North Korea's nuclear advances and growing arsenals among existing nuclear weapons states, new weapons proliferation remains relatively rare. This is not an accident of history. The United States and the USSR/Russia have spent significant amounts of time, money, political capital, and energy since the 1960s working with allies and partners to prohibit the spread of nuclear weapons. They have also worked to develop a tight control regime on the related technology and materials to make their proliferation much more difficult. Indeed, much of the success of the nuclear age—that there are only nine states with nuclear weapons currently—is a testament to the work of the international community in keeping it that way.

However, the global community is approaching a critical juncture in the nonproliferation age as new challenges emerge. Understanding the utility of nuclear weapons for deterrence or coercion, alliance cohesion, and cooperation remain critical questions in an evolving geostrategic environment where challenges may arise from the erosion of arms control generally and abrogation of specific treaties like the Anti-Ballistic Missile (ABM) Treaty and the Intermediate Nuclear Force (INF) Treaty. Critically, key challenges may also stem from individual states and their nuclear choices outside these regimes such as Iran.

While an NPT signatory, Iran was scrutinized by the nonproliferation community given concerns that it may have been developing enrichment and reprocessing

technology (ENR), and not just for civilian purposes. In 2003, it was publicly confirmed that Iran had indeed worked to conceal a clandestine nuclear weapons program. Since that time, the global community has worked diligently via sanctions, diplomatic pressures, the threat of military attacks, and cyber campaigns to prevent Iran from acquiring nuclear weapons. This effort resulted in the 2015 signing of the JCPOA nuclear agreement. In exchange for forgoing technology and materials that would allow it to develop operational nuclear weapons, the deal permitted Iran to retain enrichment technology, thus leaving Iran a latent state.

Iran's nuclear evolution signifies the types of new challenges that the international system may face more frequently in the coming decades. While avenues to immediate weapons proliferation may be more limited given the strictures of the nonproliferation regime, it is likely that the next wave of global proliferation may involve other states pursuing a similar path as Iran and emulating its progression. While Iran's path has not been costless, it is arguably less costly than those of Iraq or Syria who had their nuclear facilities attacked. This difference could encourage other states to pursue latency as an intermediary step. And it is because of this that we argue that more attention must be paid to the acquisition of latent technology.

A small number of states may have purely energy-related motivations for pursuing latency. For others, especially those interested in a weapons program or at least interested in the critical components that would leave open a future weapons option, passing through the latency stage could be very appealing. The United States has historically implemented costly coercive and punishment mechanisms on those members of the community caught pursuing a clandestine nuclear weapon. These policy levers include economic sanctions, diplomatic persuasion, cyberattacks, sabotage, and the threat or use of preventive military force. These tools can impose high economic, political, or military costs on states who suffer them.

Yet, pursuing latency—in as much as doing so is allowed for members of the NPT in good standing—permits states to be able to acquire a sophisticated hedge to a weapons future while *avoiding* the worst costs of the nonproliferation regime. Following the JCPOA, other states, including Saudi Arabia, are already making noise about this possibility in order to balance against the Iranian acquisition.[3] To the extent that the Saudis are not alone in voicing interest in pursuing latency, other states may also conclude that it is in their strategic interest to build a nuclear program via latency. It is likely then that the next wave of global proliferation may well involve other states following suit and pursuing a similar path as Iran.

The Risks of a Nuclear Latency Wave

The proliferation of latency is especially concerning given the uncertainty inherent in its development. Nuclear latent technology can be used for a

variety of benign purposes. Yet, the international community is often left to deal with the consequences when states use nuclear latency as a stepping stone along the way to nuclear weapons. The problem is that the international community often does not know until it is too late. Given the complexity in divining intentions coupled with incentives to misrepresent, developing a new international strategy for engaging nuclear latency is likely to be a tall order.

Several key questions emerge when considering just what that strategy should look like. Central to understanding latency is to understand what it actually means for international relations and strategic stability. More specifically, does latency yield deterrent benefits or increase the risks of conflict for those states who acquire it? How might latency impede broader diplomatic engagement and efforts at cooperation with those newly latent states? Is latency likely to produce domino effects that incentivize more actors to follow down this path of proliferation? Given these considerations, should the international community attempt to forestall the proliferation of latency in the first place? These are among the critical questions regarding nuclear latency that remain unexplored. Given latency's potential connection to cooperative—in addition to conflictual—dynamics in international politics, both the policy and the scholarly community need a much better understanding of its characteristics in order to understand how best to proceed.

What does nuclear latency actually mean for strategic stability?

First, consider the impact of nuclear latency on deterrence. On one hand, having a latent nuclear program could be akin to having nuclear weapons, given nuclear weapons' utility for deterrence. This logic suggests that because of the tremendous costs of nuclear use, potential adversaries might think twice about attacking nuclear-armed states, given the risk of suffering a nuclear attack in response. By extension, proponents of nuclear latency suggest that because latency is a credible signal of the potential ability to proceed to weapons acquisition, adversaries are similarly deterred from attacking latent states for fear of what may happen next. In this way, latency serves as a "virtual deterrent" affording its possessors many of the same deterrence benefits as weapons.[4]

On the other hand, our own research suggests that the deterrent benefits of nuclear latency may be overstated.[5] This follows Vipin Narang's argument that the simple possession of nuclear weapons is insufficient to afford states deterrence. Rather, states need specific nuclear postures in order to derive deterrence benefits.[6] While more research must be done to adjudicate between these competing arguments, the immediate policy implications may raise some alarm. If states can gain or *believe* they can gain a critical benefit of nuclear weapons without acceding to full weapons acquisition—and suffering the costs associated with being caught

doing so—this makes latency a much more attractive endeavor. And as a result, more states should be expected to pursue it.

Second, latency may serve as an effective bargaining tool that has an impact on dynamics with both adversaries and allies. Consider first how the development of nuclear latency may change how states interact within alliances, wherein some states rely on nuclear weapons patrons for protection. In alliances where interests start to diverge, the junior partner may signal a desire to pursue nuclear weapons in order to be able to provide for its own security, without the assistance of a patron. Historically, those patrons (usually nuclear weapons states) were also those states seeking to prevent further proliferation. The patron may try to coerce the junior partner away from nuclear weapons acquisition. The deal the protégé state would be able to strike with its patron, however, would likely be more lucrative if the protégé possesses a latent capacity. This is the case because a latent state can more credibly threaten to acquire nuclear weapons, given its existing technical capability. For example, West Germany used its latent capacity to drive a hard bargain with the United States in exchange for foregoing nuclear weapons during the Cold War. Theoretically, therefore, latent states are able to bargain more effectively and demand more from their patron.[7]

Beyond these interactions with an ally, states may also be interested in acquiring nuclear latency to alter the balance of power with potential adversaries.[8] Latent states may be better at compelling an adversary to back down in a conflict by demonstrating that they will go nuclear if their demands are not met. In these interactions, a latent state can more credibly threaten to take the final step and acquire nuclear weapons if the adversary does not concede to its demands. This threat may be especially powerful if the recipient state is conventionally superior and the latent state's acquisition of nuclear weapons could dramatically change the relative power between them. Fearing this future loss or change to the status quo, an adversary may be more likely to concede to the latent state's demands.[9]

These dynamics become especially worrisome as the number of latent states in the international system increases. For the United States, this may signal a loss of its freedom of mobility in foreign policy, as traditionally weaker allies make more sizeable demands in exchange for not obtaining nuclear weapons. Consider here Saudi Arabia's recent high-level nuclear cooperation discussions with U.S. Energy Secretary Rick Perry to build the first of its 16 planned nuclear power reactors.[10] This may show that the Saudis are leveraging American weapons proliferation fears in order to acquire civilian nuclear assistance. More generally, as a larger number of states are threatened by the diffusion of latency, it may produce arms races with the potential to spiral and escalate to conflict. This may be especially problematic in regions already prone to violent conflict and interstate war. In tense environments, even if states are genuinely not hedging their technology for nuclear weapons, they may find it difficult to credibly

signal their benign intentions and improve bargaining and cooperative dynamics. Especially given the multiple potential outcomes that follow from latency acquisition, and the often-limited intelligence on the true nature and intent of these programs, the likelihood of misperception and risk of conflict is particularly concerning.

Third, it is equally likely that latency influences other forms of interstate relations. Recall that the JCPOA, beyond offering economic carrots for stopping its potential development of nuclear weapons, also provided Iran the opportunity to reengage the international community. Latency thus has potential implications for cooperative dynamics between states writ large.

To begin exploring these relationships, our research with Eleonora Mattiacci employs large-N statistical analysis and investigates the likelihood of subsequent cooperation with the United States after the acquisition of nuclear latency.[11] We find that, on average, the United States is more likely to extend cooperative overtures to latent states whose programs are out in the open. We can consider here the case of Japan, which after 1972, received significant military and economic assistance from the United States as a result of maintaining an overt civilian latent program.

Importantly, since latency could be likely to produce either domestic energy or nuclear weapons, it is possible that the United States is attempting to coopt nuclear latent states via cooperative overtures to forestall a weapons future. In doing so, the United States can build up an initial bilateral relationship in order to have future coercive tools at its disposal to prevent the latent state from acceding to weapons. However, given the long history of U.S. counterproliferation efforts, latent states may be skeptical of U.S. offers and less inclined to cooperate in response. Thus, in these various ways, latency may yield mixed effects. On one hand, the United States may be more likely to offer cooperative overtures to latent states; while on the other hand, latent states may be simultaneously less likely to respond in kind. Admittedly, our study explores only one narrow type of international cooperation and much more work is necessary to explore myriad other types of bilateral and multilateral forms. But the implications remain clear: like other forms of technological advancements that change the status quo, latency too has important effects that go beyond the risk of conflict.

Nuclear latency has important effects that go beyond the risk of conflict.

Fourth and finally, latency may also be related to an age-old concern regarding nuclear weapons. Will the acquisition of nuclear latency by one state catalyze other states to initiate their own latent programs? So-called proliferation cascades have been a consistent fear in the weapons

realm, and the Saudi response to Iran's retention of enrichment described above alludes to this possibility. Though the scholarship on weapons-related cascades generally finds mixed effects, this remains, understandably, a significant concern in the policy community.[12] What the scholarship does demonstrate is that specific rivalries have historically led individual states to begin weapons programs in response to their own adversary's weapons' pursuit.[13] For example, Iran began its nuclear program because of the threat it perceived from the Iraqi and Israeli nuclear programs. Similarly, India started its domestic nuclear program following the first Chinese nuclear weapons test in 1964; Indian development subsequently catalyzed nuclear weapons interest in Pakistan.

While these and other examples do not suggest that proliferation in one state fuels a long proliferation cascade or domino effect globally, they do reveal that individual programs can have important mobilizing "impact" on specific rivals. The acquisition of nuclear latency may do the same. Iranian enrichment and other latent programs may compel additional states to seek comparable capabilities of their own and may already have. Further research would shed light on these dynamics as well as reveal their implications for crisis instability and the risk of tensions between two rivals turning into violent conflict. These and other questions remain to be explored in order to improve our understanding of how one state's possession of nuclear latency influences its relationship with other states in the system—rivals and otherwise—as well as drives other states' individual nuclear decision making.

While there is some recognition of latency's potential implications for a variety of critical aspects of international security politics, policymakers, analysts, and observers are currently making educated guesses about both the motivations behind certain nuclear latent policy decisions and how those decisions may influence interstate relations. We need to conduct more rigorous research on the aforementioned issues and others, ideally with better data than we have presently, in order to determine if and how the spread of nuclear latency is a concern for the international community. Whatever we learn will surely prove to be consequential for understanding the complexities of the phenomenon itself and also for policymakers working to be more strategic in our collective responses to nuclear latency.

Countering the Spread of Latency?

There is an alternative future to consider. It could be the case that rather than seek to stem the proliferation of latency, the international community should instead use latency as a bargaining tool to counter the spread of nuclear weapons. Throughout the historical record, there are numerous examples of the United States and other key figures in the nonproliferation regime employing a menu of carrots and sticks to incentivize nonproliferation or nuclear reversal.[14] Among this set of options includes the potential for some states to retain a latent nuclear capacity if they

agree to forgo continued development of a nuclear weapons program. Should, for example, Saudi Arabia opt to develop nuclear latency, we could imagine the United States offering a deal which allows the Saudis to retain this capacity in exchange for forswearing nuclear weapons acquisition. While uncertainty exists regarding what this latent state may ultimately do with this capability in the future, it could be a compromise that the international community may be willing to make in order to curb, or at least slow, the expansion of the nuclear weapons club.

There is no clear consensus for what can be done to counter the spread of latency, if we even want to.

Beyond this interesting but unexplored possibility, the fact remains that at present, there is no clear consensus or empirical foundation for what the international community can even do to counter the spread of latency, if it should choose to do so. Of course, this says nothing about whether such an effort is worth doing in the first place, again underscoring the need for the research attention described above. In our own preliminary research, with Molly Berkemeier and Paige Price Cone, we find that there are not clear effects for using traditional counterproliferation tools—sanctions, military force, diplomatic levers, etc.—to counter nuclear latency.[15] In other words, those tools that have historically been deployed against nuclear weapons *programs*, may not yield any general degree of success against nuclear latency.

While this research offers important, though inconclusive findings, to the extent that these initial results are indicative of a broader reality, this suggests that in a world where the international community chooses to attempt to stem the flow of nuclear latency around the globe and tries to convince individual states to roll back or abandon latent programs, the tools regularly deployed for countering weapons programs may not offer much hope for success. It is thus necessary to design new methods to better target and potentially rollback the latency phenomenon in particular. To the extent that latency is likely to continue to grow in the future, and if the global consensus is that its proliferation should be halted (despite its potential utility as a counterproliferation policy tool), more research is necessary to understand latency, its components, and its implications, as well as into specific tools to counter its spread.

Conclusion

Latency is likely to grow in importance over time and become a central element in the spread of nuclear technology in the 21st century and beyond. After decades of

laser-like focus on nuclear weapons, the scholarly community is slowly recognizing the substantive importance of the latency phenomenon. Likewise, the JCPOA and ongoing situation with Iran continues to capture the attention of the policy community. For both theoretical and practical reasons, both communities have a vested interest in understanding the complexities of this important feature of the international landscape. Appreciating these intricacies may help the international community to focus on better political and diplomatic avenues for managing the expansion of nuclear latency, and potentially curbing the demand for acquiring dual-use technology that could ultimately be utilized to manufacture nuclear weapons.

In addition, learning something about a dual-use energy and weapons-related technology such as latency may tell us something about other dual-use technologies. Specifically, understanding the development of nuclear latency and its implications may shed light on similar technologies which also have civilian and security applications, and where there is significant difference between the latent potential and actual weaponization. Two potential technologies could include drones and cyber platforms: both have many civilian applications and can also be weaponized. Moving forward, it will be important to understand where the spread of these technologies should be restricted, and where they should be encouraged. In this way, understanding latency—both the energy and weapons-related components—may help shed light on these and other emerging dual-use technologies, or old technologies that reemerge in some new form in the future.

The information gained will also be useful for designing nonproliferation policies specifically crafted toward and accounting for dual-use technologies, including but not limited to the development of nuclear-related capabilities prior to weaponization. This requires further analysis, not just from scholars looking at theoretical logics or empirical patterns over time, but from policymakers weighing their options more broadly when it comes to current or prospective crises. Yet, before we can comprehend how nuclear latency has an impact on either global politics or political science, and well before we hedge our bets in designing the appropriate policy tools to either confront and forestall or encourage its proliferation, we must take a much closer, rigorous look at the many aspects of nuclear latency.

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