Stanton Nuclear Security Fellows Seminar

PANEL 3: East-Asia Nuclear Issues

1. Rachel Carr, MIT NSE

Closing North Korea's nuclear test site: Opportunities for Cooperation and Confidence Building

On what issue are you working and why is it important?

I am looking at the future of North Korea's nuclear test site, Punggye-ri. North Korea has conducted six nuclear tests on this site, beginning in 2006. In spring 2018, North Korean officials declared the site closed and destroyed some tunnel portals, with international journalists looking on. That fall, Kim Jong Un reportedly told South Korean[1] and American[2] officials that technical specialists could come to verify the site's complete closure—but that inspection has yet to happen.

An international inspection and full closure of the Punggye-ri site could be a mutually agreeable, relatively low-stakes, confidence-building step in a larger program of retiring North Korea's nuclear complex. This is why it is important to think about and plan for. Presumably, full retirement of Punggye-ri would need to be traded for some concession from the US side; I will not try to define what that concession should be. Instead, I will see to define "international inspection and full closure of the test site" in a way that might be acceptable to all parties.

What is the big question that you are seeking to answer about that issue?

On technical level, the most interesting question is: How much can various types of inspections at Punggye-ri confirm about past nuclear tests conducted there—and in turn, how much can that information confirm about North Korea's nuclear capabilities and materials stockpiles?

The international community, especially the US, would likely value this data as a way to corroborate other assessments of North Korea's nuclear capabilities. And North Korea might actually be willing to share some forensic information as part of a Punggye-ri closure. This data would not reveal the most sensitive details of their nuclear program (e.g., precise design information or total fissile material stockpile). In fact, from the North Korean perspective, a thorough inspection could helpfully affirm the

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[1]Nikkei Asian Review, September 2018, "South Korea says Pyongyang willing to open up nuclear-weapons test site," https://asia.nikkei.com/Spotlight/N-Korea-at-crossroads/South-Korea-says-Pyongyang-willing-to-open-up-nuclear-weapons-test-site

[2]H. Shin and D. Brunnstrom, "Pompeo hails 'significant' North Korea progress; experts skeptical," Reuters, October 2018, https://www.reuters.com/article/us-northkorea-nuclear-pompeo/pompeo-hails-significant-north-korea-progress-experts-skeptical-idUSKCN1MH114

capabilities North Korea has announced to the world (e.g., that they have engineered a full thermonuclear device) and demonstrate their responsibility as an international actor.

With these different but potentially compatible objectives in mind, the key political question is: What is an inspection and closure regime that both North Korea and the US might agree to? Rather than seeking one optimal solution, I will try to provide a range of potentially attractive options.

Other important questions include: How much does the Punggye-ri site need to be remediated, to protect people and the environment in future years? And can forensic information gathered about past tests help to calibrate or crosscheck the international monitoring system for nuclear explosions?

How are you going to answer your question? What methods will you use and what evidence or cases will you explore?

On the technical level, the richest basis for analysis is the surprisingly large amount of information available about US and Soviet underground nuclear tests. This information is a good starting point for understanding the physical information that a nuclear test imparts on in its surroundings. Records of post-test inspections, ranging from direct borehole analysis to long-range environmental sampling, give initial insight into the kind of technologies that could be applied. I will study the available technical reports and talk with US specialists who worked on these studies.

Relevant techniques have advanced since the time of US and Soviet nuclear tests, so I will explore newer inspection approaches as well. In particular, I will seek inspection methods that are less physically invasive and therefore possibly more acceptable to North Korea. Here, it will be useful to build upon connections I have with fellow scientists interested in remote sensing of nuclear activities.

When it comes to understanding the politically motivated preferences of each side regarding next steps at Punggye-ri, evidence will be harder to pin down. I will start by reviewing all statements each side has made regarding the test site. As noted above, I do not expect to arrive at a perfectly tuned solution, only a set of potentially agreeable options.

What is your answer to the question you are asking? That is, what is your argument or conclusion even if it is still tentative at this point?

Several key pieces of information about the six past nuclear tests should be recoverable from Punggye-ri, including the yield of each test (with greater precision than remote seismic estimates have so far provided), the fissile material composition of each device (more completely than remote radionuclide sampling has allowed), and whether a device was fusion-boosted or a two-stage thermonuclear design.

As to what kind of inspection and closure regime would be palatable to both sides politically, I start with the optimistic view that both the US and North Korea might find reason to jointly extract some of this information from the site, and to use a joint closure process as a relatively low-stakes, confidence-building step in a larger denuclearization process.

How does your work fit into the existing work on your subject?

Some amount of planning for the future of Punggye-ri must be occurring inside the US government. These studies would not be publicly available. We do know that an expert on nuclear test site remediation, with experience at the former Soviet test site in Kazakhstan, was part of the US delegation to the February 2019 summit in Hanoi.

In the public domain, many studies have looked at prospects for retiring other nuclear sites in North Korea, particularly the Yongbyon nuclear research center. I have not seen a detailed study focused on Punggye-ri, possibly because its future seems simpler and less controversial than that of Yongbyon (although I think this is an actually an argument for such a study). Analysts for the 38 North website have produced the most work on the present state and future of Punggye-ri. But they have written that "inspection will have limited utility."[3]

There seems to be an opening for a technically detailed, publicly available study of the beneficial information that may be available at Punggye-ri, and realistic options for conducting a cooperative, complete site closure.

What policy implications flow from your work? What concrete recommendations can you offer to policymakers?

This study will offer options to policymakers, especially in the US, for how to approach the closure of Punggye-ri, one of North Korea's major nuclear sites.

What do you think is the weakest or most vulnerable aspect of your study and what sort of feedback would be most useful to you?

One objection to what I am proposing is: Why would North Korea allow international inspectors to extract any information about past nuclear tests from the Punggye-ri site?

My argument is that this could benefit North Korea. It could confirm statements they have made about their own nuclear capabilities and display their good faith as an international partner, all without compromising highly sensitive information. I think this view is supported by North Korea's apparent willingness to invite inspectors to the site, and by North Korea's pride in broadcasting information about their nuclear tests (versus more closely held aspects of their nuclear program). It would be useful to hear feedback on this argument.

[3]F. V. Pabian and J. Wit, "North Korea's Punggye-ri Nuclear Test Site: Current Status and Future Inspections," *38 North*, December 2018, https://www.38north.org/2018/12/punggye121218/

2. Julien de Troullioud de Lanversin, CISAC

Estimating Plutonium and Tritium Production for Nuclear Arms Control in Northeast Asia

On what issue are you working and why is it important?

My project seeks to combine technical research and policy analysis to improve our understanding of plutonium and tritium production and stockpiling for nuclear weapons in North Korea and China.

The existence and the potential expansion of North Korea's nuclear arsenal is a major regional and international security issue. China, who is believed to be on the verge of becoming the third nuclear weapon state by size of arsenal, is considering expanding the role and uses of nuclear weapons in its defense strategy mainly in reaction to a more hostile relationship with the United States.

The current size and future expansion of the arsenal of both countries are, however, strongly constrained by their nuclear material stockpiles and production capabilities. Investigating past and current production capabilities in these countries would greatly benefit efforts in nuclear arms control in Northeast Asia. Not only would it enable to better grasp the realities about nuclear capabilities in the region, but it would also help diffuse suspicions and mistrusts about the intentions of China and help formulate the most appropriate verification measures on production capabilities for arms control in North Korea.

What is the big question that you are seeking to answer?

Plutonium and tritium are key elements in modern nuclear weapons and can be produced in nuclear reactors. Unfortunately, both China and North Korea remain very opaque about their past nuclear material production as well as about their current production capabilities and dual-use technologies.

The limited information on China's past fissile material production capabilities and strategy has left significant uncertainties, of the order of 20%, in estimates of China's current plutonium stockpiles. There are no estimates of China's tritium production. Despite North Korea's declarations in 1992 and 2008 of its plutonium holdings estimates of the stockpile remain uncertain, and there is even less insight into its tritium production. This raises questions about the size of their nuclear arsenals, their capability to quickly enlarge these arsenals, and what stockpiles they would need to account for as part of capping, reducing and eliminating these arsenals.

The lack of transparency of China about their current production capabilities and technologies often translates into suspicions and misconceptions in the international community. The 2018 U.S. Nuclear Posture Review argues that "China's military modernization has resulted in an expanded nuclear force, with little to no transparency into its intentions" and presents China as more threatening to regional and global security. A verifiable and complete denuclearization or, at least, an effective arms control process in North Korea can only be achieved through a comprehensive understanding of North Korea's nuclear materials production capabilities. Lack of transparency in both countries notably includes dual-use technologies and projects such as China's plan for a closed fuel cycle as well as the construction of the Experimental Light Water Reactor (ELWR) in North Korea.

Considering that neither China nor North Korea will be willing to engage in transparency measures regarding their current plutonium holdings and their production capabilities, it is crucial to find ways to independently estimate their current stockpiles and understand their production capabilities.

The two questions that are then central to my research are:

1. How can we get a more accurate and complete understanding of plutonium and tritium production in China and North Korea without relying on their collaboration?
2. How can this knowledge improve our grasp on their current and future nuclear capabilities and instruct us on useful verification measures on nuclear material production for arms control efforts?

How are you going to answer your question? What methods will you use and what evidence or cases will you explore?

In order to produce better and more complete estimates of plutonium and tritium production in North Korea and China, my work will rely on state-of-the-art nuclear reactor physics simulations. I will use the first fully open-source reactor physics software (ONIX+OpenMC) that I have developed during my PhD to run full-core simulations of the production reactors in North Korea (5 MWe and possibly the IRT research reactor) and in China (Jiuquan and Guangyuan reactors). These simulations will also require thorough investigation on the past operational history and on the design of these reactors. I expect to rely on open-access documentation, exchanges with relevant experts and current news to gather this information. The modalities of concurrent production of tritium and plutonium in the same reactors are often unknown and yet, are critical to producing correct and complete estimates. I intend to undertake a meticulous reactor physics analysis to understand these production modalities.

I also propose to review the current and future civilian and dual-use nuclear material production capabilities in China and North Korea to understand how they could potentially be used for military purposes. For instance, China is considering establishing a civilian closed fuel cycle with production and recycling of plutonium as reactor fuel in a fleet of fast breeder reactors and a reprocessing plant with a capacity of 800 ton/year. This would have consequences for China's stocks of separated plutonium, which could be used for either civilian or weapons purposes. Meanwhile, North Korea is currently building its Experimental Light Water Reactor but its purpose is not clear. While this reactor would not be optimal for weapon plutonium production, it could be used to produce tritium.

Knowledge of current stockpiles of plutonium and tritium production capabilities will enable me to examine the various forms of constraint that are imposed on China's and North Korea's nuclear arsenals if they do not further produce plutonium or extend tritium production. In the case of North Korea, it will be interesting to understand what the consequences of dismantling the Yongbyon site would be on its nuclear arsenal as tritium production would have to cease. I will also investigate the various aspects and elements of China's and North Korea's production capabilities (including dual-use capabilities) that could enable them to expand and modernize their nuclear capabilities via the production of plutonium and tritium.

In the case of North Korea, a better understanding of their stockpiles of plutonium and production capabilities will help me in devising appropriate verification measures on the production of plutonium and tritium in the context of arms control or complete denuclearization. In particular, I am planning to apply my previous research on nuclear archaeology to design technical method tailored for North Korea's nuclear reactors that would enable us to independently verify plutonium and tritium production via on-the-field measurements and reactor physics simulations.

What is your answer to the question you are asking? That is, what is your argument or conclusion even if it is still tentative at this point?

I expect to obtain more accurate and more complete estimates of tritium and plutonium production in North Korea and China. These results will, however, still be affected by different types of uncertainty and it will be essential to characterize them qualitatively and quantitatively when possible. Regarding current capabilities, I expect to identify constraints and conditions that will help in understanding possible expansion of China's and North Korea's stockpiles as well as the time frame of these hypothetical increases.

Concerning China, I believe that a better understanding of their current and future production capabilities will discredit certain alarmist narratives on China's intentions about its nuclear capabilities. On the other hand, I will be able to identify potential elements or processes around China's production capabilities that should raise the concerns and attention of the international community. With regard to North Korea, I am particularly interested in understanding how they have produced (and still produce) tritium. Most importantly, I think my research will be a useful reference for policymakers when designing arms control or denuclearization processes in North Korea.

How does your work fit into the existing work on your subject?

What alternative arguments or explanations exist and why is your answer superior?

Only the estimates on plutonium production in North Korea were produced with rigorous, reactor physics simulations in other existing studies. In this work, detailed reactor simulations will be used for all estimates and I expect to obtain a better grasp on the uncertainty that affects these estimates. Because the software used for these simulations is open-source, the results produced will be easily reproducible by other scholars.

How does your work add to or change our understanding of the issue you are studying?

This project intends to understand for the first time the modalities and constraints inherent to the concurrent production of plutonium and tritium in the same reactor which could inform us on the different paths of production that North Korea and China could have taken.

Claims about the intentions of China and resulting perceived threats are sometimes at odds with the actual capabilities of the country. This study aims at providing a clear picture of China's stockpiles and production capabilities upon which future analysis and claims should be based on.

What do you see as your most important contribution?

Identifying the elements and processes in North Korea's production capabilities that should be monitored and verified to allow for an effective arms control mechanism or a complete denuclearization.

What policy implications flow from your work? What concrete recommendations can you offer to policymakers?

This project can help better inform policymakers on the constraining realities of North Korea and China nuclear materials capabilities but also on potential elements of concern. I believe my findings could improve the understanding policymakers in the west have on China's nuclear capabilities and intentions by providing factual numbers and not just interpretation. I also plan to use my results to formulate tailored verification methods on North Korea's production capabilities that could be integrated in a future arms control or denuclearization agreement.

What do you think is the weakest or most vulnerable aspect of your study and what sort of feedback would be most useful to you?

A crucial step in producing estimates on tritium and plutonium production with reactor simulations is to gather reliable and accurate information on the design and operational parameters of production reactors. I still need to identify the sources that I can use to extract this information. Some of this information might be very difficult to obtain or might not be accessible at all.

3. Jooeun Kim, CFR

Alliance Credibility and Nuclear Proliferation: U.S. credibility and the ROK's Nuclear Pursuit

How do you explain nuclear proliferation in military alliances? Of the nine nuclear states in the world today, four stepped out from under the umbrella of their nuclear-capable ally to develop independent nuclear weapons programs. Still others tried, but ultimately abandoned programs. The existing scholarship focuses primarily on the credibility of an adversary's conventional or nuclear threat as a source of nuclear proliferation. My project pays more attention to the ally's credibility as the source of an ally's nuclear choices, including nuclear pursuit and dissuasion from pursuit.

This research develops a framework of alliance credibility, arguing that non-nuclear states evaluate alliance credibility according to the perceived performance of their nuclear ally in salient crises. Crises are the most accurate means for non-nuclear states to assess an ally's credibility, as crises reveal two important sources of knowledge about the allies: credible commitment and private information. When the security patron backs down or performs poorly in a salient crisis, the protected state is more likely to doubt the future willingness of the patron ally to come to its defense. Moreover, if the ally does not come to the protected ally's assistance, the protected ally is also more likely to pursue nuclear capabilities. The state's confidence in its ally's credibility has decreased, as the patron ally's reticence might reveal a conflict of interest or a weakness in the alliance.

More specifically, this project examines the alliance credibility of the United States in the U.S.-ROK security alliance and its impact on South Korea's past and future nuclear choices. The research provides an analysis of how the U.S. crisis management in the 1960s influenced the perception of alliance credibility that led to South Korea's pursuit of a clandestine nuclear program in the 1970s. In doing so, the project updates the existing research on credibility to better explain what determines *alliance* credibility and when and how alliance credibility is damaged, and the consequences of damaged alliance credibility.

In order to test the argument, the project employs two research methods. A case study of and a survey experiment.

After consulting declassified materials gathered in U.S. National Archives, Presidential Libraries, and South Korean archival facilities, I conclude that unfavorable crisis management of the United States led to changes in South Korea's nuclear policy in the early 1970s. Even with tactical nuclear weapons stationed in Korea from the late 1950s, the South Korean government sought to develop an independent nuclear weapons program in the 1970s. By tracing the U.S. behavior in salient crises that occurred in East Asia, including the Blue House raid (1968), the Pueblo Crisis (1968), Tet Offensive (1968), the EC-121 shoot-down crisis (1969), and the end of the Vietnam War (1975), I show how the South Korean leadership assessed the alliance credibility of the United States. The research includes the detailed history of perception change in the South Korean government as it observed the negotiations between the United States and North Korea after the seizure of the USS Pueblo by the North Koreans soon after the Blue House raid in January 1968. Also, this study provides a detailed account of how

South Korea observed the U.S.'s crisis management and crisis outcome after the Tet Offensive in 1968 and the EC-121 crisis in 1969 which further influenced the perception of alliance credibility. Finally, the project shows how the Nixon Doctrine and the Vietnamization policy influenced South Korea's assessment of the U.S.'s reliability that led to changes in South Korea's defense policy, including the decision to develop its indigenous nuclear weapons program.

This research suggests that a U.S. administration's actions in crises (as opposed to peace-time rhetoric or provision of tactical nuclear weapons) will have a direct bearing on national security decision-making in Seoul. In other words, without salient crises occurring on the Korean peninsula, involving North Korea, Japan, or China, South Korea would not change its nuclear policy in the future. However, if there is a salient crisis in the near future, involving those states, and if the United States does not provide adequate support and assistance (unfavorable crisis management), there is a higher probability that South Korea would reassess the alliance credibility and change its nuclear polices. Thus, two conditions need to change in order for South Korea to reconsider its nuclear options: 1) the threat level from an adversary increases (salient crisis), and 2) the support level from the United States decreases, which would be tested in a crisis situation.

The survey experiment portion of the research analyzes how the South Korean public's view of alliance credibility changes when presented with different crisis management scenarios. Working with a survey research firm in South Korea with access to a sample of a representative population of South Koreans, the survey shows how the public views the credibility of the United States as an ally changes after presented with different U.S. actions in hypothetical crisis scenarios. Additionally, the survey informs how the perception of U.S. alliance credibility influences the respondents' support of an indigenous nuclear weapons program in South Korea. When the public was presented with favorable crisis management condition, 51.4% of the respondents said the United States is a credible ally. The credibility decreases by 19 percent points; only 32.4% of the respondents said that they found the United States credible. All results are statistically significant after controlling for various conditions. The results provide more nuanced evidence on the perception of alliance credibility and the desirability of an independent nuclear weapons program in South Korea in the future.

Lastly, the project provides long-term policy implications for the United States and South Korea for strong alliance management and continued nuclear nonproliferation in East Asia. The research project would facilitate interesting debate within the academic and policy communities on the ways in which the two allies can strengthen their alliance, how the South Korean public view the United States as an ally, and whether or not a continuous successful nonproliferation policy among U.S. allies in East Asia is possible. I argue that the alliance credibility that has consequences on nuclear proliferation within military alliances would be tested in salient crisis situation. While there has been debates on potential risk of East Asian states become interested in indigenous nuclear weapons, we do not have to be overly alarmed by the possibility due to the threats by North Korea nor U.S. leadership's rhetoric on alliance commitments. As the evidence of my research shows, U.S. alliance credibility will be tested in salient crisis situations and favorable crisis management is critical for non-proliferation.

Weakest aspect of the study and feedback needed: This study employed two methods to strengthen my theoretical claims but ultimately has two conflicting perceptions: that of a leader and that of the public. In the case study, I trace South Korea's dictator's assessment of U.S. credibility. On the other hand, the survey experiment did not show a statistically significant correlation between alliance credibility and the public's preference on South Korea's independent nuclear weapons program. Since nuclear decisions are usually made by the top leadership, what is the value added from the information from the survey experiment? What kind of literature including political psychology do I need to include to strengthen my project?

4. Alex Lee, MIT SSP

Prospect of Going Nuclear in the Aftermath of Fukushima: Case Study of Japan, South Korea, and Taiwan

Issue and Importance

In a world where leaders are competing over whose nuclear button is bigger and more powerful, non-nuclear states should be concerned about their survival. Although North Korea has continued to conduct nuclear tests, a domino effect or "reactive proliferation," as many experts predicted, did not occur in Northeast Asia. Non-nuclear states such as Japan, South Korea, and Taiwan (JST) have been adamant about upholding their non-nuclear weapons policies, while heavily condemning North Korea. The statuses of Japan, South Korea, and Taiwan as non-nuclear weapons states remain of continuing interest to policy analysts, security experts, and scholars of international relations. Why? Because many believe that reactive proliferation could still happen in Northeast Asia.

This research contributes to a deeper understanding of nuclear weapon ambitions in East Asia. Although comparative and single case studies of East Asia have improved our understanding of the motives for weapon development and restraints in the region, serious gaps remain. Thus, this research focuses on closing the gap between the expectations based on earlier scholarship and the current nuclear policies of JST Especially in the aftermath of the Fukushima incident, a wide range of political and social changes in JST has ensued as nuclear safety and security issues become even more salient. The wide-ranging changes in economic, safety, security, and social aspects of these states are directly and indirectly influencing the nuclear weapons policies of JST.

According to the comparative nonproliferation literature for East Asia, JST, as allies of the United States, have been walking a similar path regarding their nuclear decisions since the "second nuclear age." However, seven years after the Fukushima incident, Japan and the Abe administration circled back to nuclear power and decided to slowly reactivate their nuclear reactors. Moreover, the Abe administration is trying to move one step beyond the nuclear latency by setting up the legal basis, by inserting a phrase of "national security" into Article 2 of the Atomic Energy Basic Law of 1955 and by revising the Peace Constitution to acquire offensive capable weapons, necessary for acquiring nuclear weapons. In contrast, the progressive Moon administration in South Korea decided to gradually decommission their nuclear reactors while seeking alternative energy sources. Most shockingly, the Tsai administration of Taiwan decided to decommission all of its nuclear reactors by 2025. Thus, this research examines why JST are experiencing different outcomes in their nuclear decisions in the post-Fukushima era and how these deviating outcomes will influence these states' nuclear weapons policies in the coming years. The systemic study of how domestic coalitions interact or influence the nuclear decision-making processes would allow scholars and security and policy experts to make better-informed decisions.

The Big Questions

My research asks 1) why these states started to diverge in their decisions on nuclear policy in the aftermath of Fukushima (and not before). 2) How will these outcomes affect these states' latent nuclear capabilities and future decisions regarding nuclear weapons? In short, what is the likelihood of these states going nuclear?

Methods and Evidence

The main argument of these comparative analyses is that all conditions, both international and domestic, are eventually filtered through domestic politics during the decision-making process. Comprising case studies of JST, the case study chapters represent a controlled comparison of these three states' nuclear decisions in the aftermath of the Fukushima incident. The controlled comparison provides important benefits for improving our systematic understanding of the relationship between the interplay of coalitions and the nuclear orientation of each of these states.

To answer the central questions above, this research first examines the changes in both international and domestic conditions surrounding JST in pre- and post-Fukushima. Second, the pre- and the post-Fukushima debates, regarding nuclear energy, weapons, safety, and social norms, are explored to understand how and why these debates changed over time. Third, the pre- and the post-Fukushima domestic political dynamics of these states, more specifically, the nuclear policy arenas of these states are examined to better understand the ongoing nuclear debates and changing domestic political competition. Fourth, various nuclear issues and geopolitical circumstances are filtered through the lenses of the four domestic coalitions (the pro-nuclear energy coalitions, the pro-nuclear weapons coalition, the anti-nuclear energy coaltion, and the anti-nuclear weapons coalition) that shape the nuclear orientation of each state. Finally, in order to build trend data set on these states' nuclear orientations, the relationship between domestic coalitions within the debates and their influence over the nuclear orientations of each state are examined.

The study draws on evidence from nuclear policies, nuclear legislation, political speeches, government press releases, and policy statements, as well as the elite rhetoric, public opinion surveys, media representation, and activities of anti-nuclear groups. Furthermore, data collection has relied on mass media coverage and informal and formal interviews conducted by the author with salient political actors, such as prime ministers, politicians, bureaucrats, military leaders, and NGO's representatives.

Answers to Big Questions

My research observes the evolution of political segmentation and competition before and after the Fukushima incident and how they affect the nuclear decision processes of these states. As the Fukushima incident acted as a catalyst to diversify the domestic coalitions within the nuclear policy arenas, the rearrangement of political competition within the nuclear policy arenas of these states became the key factor in determining their nuclear orientations. A state's nuclear orientation is operationalized via the political behavior of domestic coalitions, which include those that are both pro- and anti-nuclear weapons and energy. This study contends that these three states' diverse outcomes in

their nuclear decisions were determined by the political behavior and the interplay of four domestic coalitions within the nuclear policy arena and by the ways in which the international and domestic conditions of security, economy, safety, and social norms were filtered through the lenses of these four coalitions.

It is highly unlikely that JST will reverse their non-nuclear weapons policies in the coming years. Yet, findings show that there are still some possibilities that reactive proliferation could occur in Northeast Asia. According to the findings of the case study chapters, Japan has the ambition to become the powerhouse of Asia once more. Nuclear weapons might not be an end goal for Japan, but a necessary step toward becoming a great power. As the Japanese leadership decided to move one-step beyond nuclear latency by setting up the legal basis necessary for acquiring nuclear weapons, this study contends that Japan is more likely to go nuclear than South Korea or Taiwan. This nuclear likelihood is due to the political motivations and consistency shown by its leadership on nuclear hedging since the end of World War II. Unlike South Korea and Taiwan, the Japanese leadership continuously used external threats, such as China and North Korea, to rouse nationalistic sentiment to justify its remilitarization which could lead to nuclear arming. In particular, the surge of nationalism in Japan should be carefully monitored because this will not influence its short-term, but will influence its long-term national strategy. Thus, this study cautiously envisions that Japan is more prone to go nuclear than South Korea or Taiwan if the U.S. nuclear umbrella fails to work properly or Japan finally decides to join the great powers.

In contrast, this study contends that South Korea is less likely to go nuclear than Japan in the coming years. Even though, the idea of acquiring nuclear weapons is still popular among many South Koreans, public support for nuclear weapons has shown a downward trend since 1999. Findings in the South Korean case study chapter showed that nuclear policy decisions by leadership were either made or reversed by strong public opinions. Unlike Japan, who would like to become one of the global leaders in both economy and security, South Korea has taken the position of a middle power in international politics. Thus, South Korea tends to be more cautious about their actions within the realm of international politics. This caution has been evident in the field of nuclear technology. Thus, this research contends that the only time that South Korea would ever go nuclear is if either the U.S. nuclear umbrella fails to work properly or Japan goes nuclear.

Existing Literature and My Research

The earlier scholarship provides different explanations as to why JST decided to abandon their nuclear ambitions and to maintain their non-nuclear weapons policies. These studies are in agreement that these three states will maintain their pre-Fukushima nuclear positions of intentional or unintentional fence-sitting (i.e., latent nuclear capabilities) for the foreseeable future. Yet, an apparent gap exists between the expectations of earlier scholarship and the current nuclear orientation of these states.

For Muthiah Alagappa (2007) and other realists, it is unlikely that China and North Korea will denuclearize or that geopolitical tensions in Northeast Asia will significantly de-escalate in the coming years. From the standpoint of T.V. Paul (2009), and Fitzpatrick (2015), states are reluctant to give up

their latent nuclear capabilities due to security uncertainties. For Solingen (2007), economic performance has taken precedence over all other political and social factors in terms of the political survival of the ruling coalition in East Asia. Finally, from the standpoint of Hymans (2011), it is hard for these states to shift their nuclear positions due to policy rigidity and veto players who tend to fight for their perceived interests even in crisis situations. The earlier scholarship lacks full power to explain post-Fuksuhima nuclear orientation of JST, as these states' orientation moves away from fence-sitting. My model of political segementation and competition is more suitable to explain the post-Fukushima nuclear orientation of JST.

Policy Implications

The surge of nationalism and the remilitarization of Japan could be a dangerous mix of traits that could force Japan to make a radical decision in regard to its nuclear weapons policy. I am concerned that Japan's remilitarization will not stop at just making it a normal state but might make it exceed the normal state by acquiring nuclear weapons. I will focus on the policy recommendations for the United States in the case of Japan going nuclear. This recommendation focuses on how to maintain U.S. influence in Asia while stopping the spillover effect of nuclear proliferation.

1. U.S. policymakers and diplomats need to quickly acknowledge Japan as a nuclear power.
2. Acknowledging Japan early on would provide the U.S. with more strategic choices and leverage over nuclear Japan.
3. U.S. policymakers and diplomats need to be more aggressive in pushing its non-proliferation policy toward South Korea.
4. U.S. policymakers and diplomats need to create a safety-net by inserting a statement into the US-South Korea Mutual Security Treaty that any movement toward the uranium enrichment and reprocessing steps should be considered a violation of the security treaty, thus voiding the treaty.
5. In the worst-case scenario, U.S. policymakers and diplomats should manipulate public opinion in South Korea to their advantage. Working with the main opposition party in South Korea to influence public opinion is highly recommended.

Weaknesses

One of the weaknesses of my research is that even though the Fukushima incident influenced the nuclear orientations of multiple states worldwide, the scope of this research is limited to the comparative studies of pre- and post-Fukushima JST. Another weakness is that nuclear debates and the interaction of coalitions allow this study to measure how much influential power each condition or coalition has within the nuclear policy arena qualitatively. However, it is complicated to quantify which condition(s) and coalition(s) have the most influential power within the nuclear policy arena of each state.