Joint Military Exercises and Crisis Dynamics on the Korean Peninsula

Jordan Bernhardt Lauren Sukin

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Abstract

A number of proposals for reducing tensions with North Korea have discussed alterations to the program of joint military exercises (JMEs) that South Korea holds. North Korea has also repeatedly called for a reduction or secession of JMEs. Would limiting or halting JMEs be a useful concession for securing a reduction of tensions on the peninsula? We argue that JMEs do not deter North Korea but, instead, provoke provocative rhetoric and actions, demonstrating that North Korea views JMEs as a serious threat to its security. In this paper, we establish a relationship between JMEs and North Korea's actions. In response to a JME, North Korea can issue warnings or threats as well as take costly signals such as conducting missile or nuclear tests. Using new data on JMEs and North Korean behavior, we find that North Korea systematically responds with aggression to South Korean JMEs. Moreover, we find that the intensity of North Korea's responses to JMEs is driven by the severity of the threat particular exercises pose, indicating that North Korea responds to JMEs as serious security threats.

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1 Introduction

In the past several years, the U.S. and South Korea have conducted numerous joint military exercises (JMEs). These exercises vary in size from a few hundred people to hundreds of thousands of personnel. They practice a variety of military activities, including amphibious landings, anti-submarine warfare, close air support, and military search and rescue. Some of these drills also include the participation of additional countries, such as Australia or the United Kingdom. Military commanders and defense officials in the U.S. believe that U.S.-South Korea JMEs are important for maintaining joint readiness and interoperability (Denmark and Ford 2018; Stavridis 2018). JMEs are routine practice; during around one-third of the days between 1997 and 2016, South Korea was conducting at least one JME. The U.S. also routinely engages in JMEs, and it does so with a wide variety of its allies. JMEs contribute to military effectiveness, readiness, and interoperability. They are an important source of reassurance to allies, since they demonstrate the strength and credibility of defense pacts.

Military exercises can also be intended to deter the adversaries of participating states (Bernhardt 2020a; Blackwill and Legro 1989; Wolfley 2018). JMEs build mutual confidence in an alliance, increase interoperability between participant countries' militaries, and build skills that the militaries can use should an actual conflict occur. JMEs therefore signal military capabilities and resolve. However, efforts to deter with JMEs can also create security dilemmas by raising the level of the threat the target state faces. This can make crises worse by causing a spiral of reciprocal demonstrations of resolve (Jervis 1976, 1986).

Do U.S.-South Korean JMEs deter or provoke North Korea? North Korea has long complained about American and South Korean JMEs. Kim Il-Sung reportedly would grow visibly angry when discussing the large-scale Team Spirit exercises (Farrell 2009). Official North Korean news outlets have characterized the JMEs as "exercises for a nuclear war" and accused the U.S. and South Korea of "playing with fire" (KCNA 2010, 2012). The 2018 Singapore Summit between the U.S. and North Korea was nearly canceled due to North

Korean complaints about a U.S.-South Korean JME (BBC 2018). JMEs might be rational causes for concern, as the exercises improve participants' military capabilities and some countries have historically used military exercises as covers for mobilization in advance of an attack. In this sense, North Korean accusations about the nature of U.S.-South Korean JMEs are not without some basis.

It remains unclear, however, whether North Korea's harsh condemnations of JMEs are actually founded on perceptions that the JMEs are legitimately threatening to North Korea's security or interests. It is not uncommon for North Korea to issue statements or take provocative actions in response to non-threatening events (or seemingly no events at all). And the U.S. and South Korea usually deny North Korea's accusations, insisting that their JMEs are routine, legal, and defensive.

The question of whether—or to what extent—JMEs could provide negotiating leverage to the U.S. and South Korea has long been discussed among journalists and pundits. Many have suggested cancelling U.S.-South Korean JMEs could be a crucial step towards North Korean denuclearization, while others have cited concerns that this would hurt military interoperability, weaken the U.S. role in Asia, or advantage China.[1] President Trump even put forward such an offer at the 2018 Singapore Summit and in 2019, following the Hanoi Summit, ended a major exercise program so as to "support diplomatic efforts" (Ferrier 2019). But there is little empirical evidence assessing the role JMEs play in the threat environment on the Korean Peninsula, and the only previous systematic study of JMEs does not support the idea that altering the JME schedule could affect tensions with North Korea (D'Orazio 2012). Also unanswered in the empirical literature is the question of whether JMEs, generally speaking, are or even should be taken seriously as threatening activities.

Do JMEs contribute to high tensions on the Korean Peninsula or help manage them through deterrence? How does North Korea respond to JMEs of different types? These questions are vital to security policy. If JMEs are successfully deterring North Korea, then

1. On cancelling JMEs as a step towards denuclearization see Miller (2018). On the impact of cancelling JMEs on the U.S. role in Asia see Selegman (2018).

a continuation of the current JME policy would be an important component of managing tensions on the Korean peninsula. However, if North Korea truly sees military exercises as threats, JMEs could be contributing to the dangerous environment or even spurring North Korea to take provocative military actions. In this case, reducing JMEs—despite the possible decrease of South Korean confidence in the United States' security guarantee—might be a useful path towards increasing regional security. If, on the other hand, JMEs present little threat to North Korea and, therefore, North Korean condemnations of JMEs are simply the result of the regime seizing upon timely opportunities to further its broader agenda of anti-American and anti-South Korean propaganda, then suspending military exercises could actually make the security environment worse. It could strain the U.S.-South Korea alliance without achieving any real progress with North Korea. If exercises are merely a convenient excuse for a North Korean program of routine provocative behavior, then an offer to reduce JMEs would not be a concession important enough that North Korea would be willing to reciprocate by reducing provocative behavior. Instead, North Korea would likely find some other cause for complaint after JMEs ceased.

In investigating whether North Korea acts as if JMEs pose a significant military threat, we weigh in on the important policy debate about whether suspending military exercises on the Korean Peninsula is likely to be a useful concession for securing a reduction of tensions. We find a clear relationship between South Korean JMEs and North Korea's actions that suggests North Korea takes seriously the threat that JMEs pose. In response to JMEs, North Korea is more likely to issue threatening propaganda and more likely to conduct military provocations such as missile or nuclear tests. JMEs, therefore, are not deterring North Korean provocations but instead are creating a threatening security environment that encourages North Korean demonstrations of resolve. This finding suggests the U.S. may able to make changes to the number or type of JMEs it conducts with South Korea in order to manage tensions with North Korea. Our findings lend insight into a broader debate about whether JMEs pose legitimate threats to participating militaries' adversaries.

Why should JMEs be legitimately threatening? Even routine military exercises demonstrate military capabilities and the resolve to use them. They may also have positive effects on military capabilities by strengthening interoperability, readiness, and effectiveness. We theorize that North Korea should respond more strongly to South Korean JMEs that more effectively demonstrate or build military strength than to JMEs that do not. This would indicate that North Korea takes seriously the military threat JMEs pose and sees exercises as credible signals of resolve and capability.

We determine the threat-level of JMEs by the exercises' characteristics. We hypothesize that larger exercises, exercises that involve field maneuvers or practice traditional combat activities, and exercises that occur on the Korean Peninsula (or the seas surrounding it) should be more threatening. To the extent that North Korean reactions to JMEs are the result of concern about the potential consequences of particular JMEs—such as capability-building, signalling resolve, or preceding attacks—exercises with a higher threat-level should elicit more intense responses from North Korea.

Indeed, this is what we find. If, instead, North Korean responses to JMEs were not about their threat-level but instead about the opportunity to further a routine agenda of provocation, then North Korean reactions to JMEs should not vary based on the threat a specific JME poses. Ultimately, we find support for our theory that North Korea is significantly concerned about the threats to security that JMEs pose.

We test our theory using new data on South Korean JMEs. We do a series of tests around the execution of South Korean JMEs to see if they are correlated with North Korea conducting rare—but costly—provocative actions, such as cross-border incursions, missile tests, and nuclear activity, and whether different characteristics of JMEs affect the intensity level of such provocations. We also measure North Korean aggression using new data on anti-South Korean and anti-American rhetoric from official North Korean news sources between 1997 and 2016. Both the tests that examine North Korean rhetoric and the tests that focus on North Korean actions reveal that North Korea responds systematically and rationally to

JMEs. We show that the intensity of North Korea's responses is linked to the threat-level of the JME, indicating that North Korean reactions to JMEs are motivated by an understanding that JMEs can present a credible threat to North Korean security. In particular, we find that North Korea tends to respond most to field exercises, exercises that practice combat maneuvers, and exercises that involve more personnel. By responding to JMEs, North Korea is able to indicate its own resolve in response to the JMEs' signals.

We proceed by first outlining our theory relating JMEs to crisis escalation. We draw on the history of confidence- and security-building measures as well as bargaining theory. Next, we introduce both the new JME data and the North Korean behavior datasets. Section 4 includes our statistical analysis and discussion. Finally, we conclude by drawing lessons from our results for how changes in the schedule of U.S.-South Korean exercises is likely to influence the crisis atmosphere on the Korean Peninsula.

2 Theory

Countries have good reason to participate in JMEs with their allies. Exercises can improve interoperability, readiness, and other essential skills. They also provide clues to a country's military capabilities—its ability to fight and win a conflict as well as the scale of destruction it would impose—and its willingness to employ force. This latter component is particularly important in coalition environments, because there is significantly more uncertainty about an ally's willingness to come to the aid of its partner than there is about a country's resolve for defending itself (Danilovic 2001; George and Smoke 1974; Huth 1990). We should therefore expect allies to take actions, such as JMEs, that reinforce the credibility of their joint defense commitments.

While JMEs provide reassurance to allies and, in some cases, can contribute to deterrence, they can also be the source of tensions with adversaries. The logic of the security dilemma suggests actions that one side of a dispute take to demonstrate military capabilities and

resolve might appear threatening to opponents on the other side of the dispute (Jervis 1978). Other factors, such as geographic proximity, a history of tensions, or a belief that an adversary is violating the "rules of the game" can also contribute to a perception of being under threat (Cohen 1978). In response, an opponent might feel the need to demonstrate its own capabilities and resolve. Thus, responding to JMEs allows countries to show that they value highly what is disputed and are willing to fight for it; in the absence of these signals, states' adversaries have incentives to push for a larger share of the disputed object and may be more willing to take maximalist bargaining stances, even if that risks escalating the dispute to war.

States facing threats from JMEs may also want to send warning signals indicating that the costs of continuing the JMEs are high. States can use threatening rhetoric or military activities, such as troop mobilizations or missile tests, to help prevent JMEs that could increase the military capabilities of their adversaries. States can use rhetoric or military activities to manipulate risk for the opposing side (Schelling 1966), which can help in bargaining and deterrence or lead a security provider to question its willingness to aid a protégé. Warnings might, therefore, lead to a reduction in future JMEs or in the cohesion of the opposing alliance. North Korea could hope that its bellicose behavior will threaten the U.S. into abandoning South Korea. We expect that adversaries' responses to JMEs indicate serious concern about the threat that they think JMEs pose to their security. As a result, we expect a mirrored relationship between the signals of resolve and capabilities on each side of a dispute.

Distinguishing between offensive and defensive actions can be notoriously difficult. Jackson (2018) argues that North Korean strategic culture tends to view threat-making and offensive actions as key components of a fundamentally defensive strategy. It is possible, therefore, to interpret North Korea actions—such as issuing threats, initiating border incidents, or conducting missile or nuclear tests—as not necessarily offensive, but instead as part of what North Korea considers to be a defensive strategy to demonstrate its own capabilities

or resolve. Moreover, because tensions are regularly quite high on the Korean Peninsula, even actions that may seem defensive—such as issuing warnings—can be costly, since they have the ability to escalate ongoing crises. Thus, even negative rhetoric from North Korea can be costly; this suggests it is a credible indication of North Korean perceptions and resolve. Even if negative rhetoric is not directly costly, it can nonetheless convey information about North Korea's willingness to fight (Trager 2010).

Military exercises pose three main reasons for alarm. First, military exercises, due to their cost and complication, send signals of credibility and resolve. Second, military exercises can increase the capabilities of the allied states; in particular, exercises are useful for interoperability, readiness, and joint planning. Third, some exercises involve components such as military activities outside of traditional training areas, the calling up of reserves, or the deployment of additional troops and material from a partner country into its ally. In these cases, exercises look similar to preparations for attacks and could be used as cover for surprise attacks. Even when exercises do not lead to larger or unusual deployment patterns, bringing the participating units up to the readiness level necessary to conduct the exercise generally means units will be near their full authorized manning and equipment levels. Because there is an immediacy to the signals sent by JMEs that is uncommon to other types of resolve and capability signaling, adversaries of states conducting JMEs should respond quickly and visibly in order to signal their own resolve and heighten the costs of any escalation.

Historically, countries have used exercises to disguise offensive mobilization or reinforcement. Soviet troop rotations to Central Europe during the Cold War worried NATO planners because it was difficult to determine whether the exercise brought in additional troops before the ones they were supposedly replacing had departed (Blackwill and Legro 1989). In 1968, Warsaw Pact exercises in and around Czechoslovakia were used to improve command and control and to mobilize army units prior to the invasion by Soviet-led forces (Caravelli 1983). The start of the 1973 Yom Kippur War was also precipitated by military exercises. Egypt

began military exercises on its side of the Suez Canal five days before initiating hostilities. Its ability to use military exercises to mask its offensive intentions may have played an important role in the decision to go to war (Beard and Strayhorn 2018; Sheffy 2006). Similarly, the 1986-87 Brasstacks crisis between India and Pakistan involved a massive Indian military exercise, which some Indian generals and strategists hoped would spiral out of control and result in war (Bajpai et al. 1995).

While all military exercises ought to be considered signals of capability and resolve, not all exercises convey the same information or have the same signal strength. Some exercises have stronger effects on capability-building and perceptions of partner credibility, and some exercises are more likely to be connected to actual attacks. Among other things, exercises vary in their size, location, spontaneity, and the type of activity practiced. For example, the U.S. and South Korea held an exercise called *Invincible Spirit* in late July 2010. This exercise was not part of the standard U.S.-South Korea JME program, and it involved at least 8,000 personnel, 200 aircraft, and 20 ships, including an aircraft carrier. The exercise occurred on the peninsula and in the Sea of Japan and involved the live firing of ammunition to practice anti-submarine warfare, surface warfare, anti-air defense, and offensive bombing operations. Less than a month later, South Korea participated in a drill called *Pacific Reach*. This exercise was held in and around Singapore, brought together few aircraft, a handful of ships, and likely less than 1,000 personnel. The 2010 edition was the fifth time in 11 years it had been held, and none of the iterations had involved the use of live ammunition or practiced combat operations; they instead focused on combat search and rescue procedures. Other exercises practice offensive or defensive combat operations but do so using command post simulations while involving little or no field activity. The differences between exercises are vast, so the signals they send and responses they induce ought to reflect similar variety.

We expect that certain characteristics of JMEs will elicit larger or more vehement responses. Different JMEs 1) send different signals of strength or resolve, 2) increase or demonstrate different types of military capabilities, and 3) have different likelihoods of being linked

to actual attacks. We anticipate that all three mechanisms will trigger reactions by North Korea, but that concerns that JMEs are predecessors to an attack will be stronger than concerns about the role of JMEs in capability-building or signalling resolve.

First, we argue that exercises that involve more personnel or high-end equipment are more threatening than those that involve fewer personnel or that do not include high-end equipment. The more people involved in an exercise, the more expensive that exercise is to conduct. The willingness to conduct a large, expensive exercise is a strong signal of the willingness to conduct actual combat operations. Large, expensive operations are a costly signal of resolve (Fearon 1995). These exercises are also capability-building, because they are important to interoperability and can teach troops how to utilize new or sophisticated equipment. Preparations for an attack also involve mobilizing larger numbers of forces.

Second, we argue that exercises that involve field maneuvers are more threatening than purely command post exercises. Command post exercises have significant military value in terms of capability-building. They involve the working out of joint strategy, contingency planning, logistics bottlenecks, and other frictions that hinder interoperability and the deployment of joint forces. However, command post exercises tend to confine military activity to traditional military locations and thus ease the monitoring costs for potential adversaries. If activity is mostly limited to known bases and simulations, it is difficult to convert it at short notice into an actual attack. A field exercise, on the other hand, is easier to use as cover for actual mobilization. Field exercises can involve the use of live ammunition and units will need to have their prescribed equipment near full operational readiness. The larger space needed to accommodate field maneuvers also increases the monitoring costs for adversaries. Note that, while large field exercises sometimes involve command post activities, we categorize any exercise involving field activity as a field exercise, so that the categories for command post and field exercises are mutually exclusive. This is because our theory is primarily about the observability of the exercise, and any exercise involving both types of activities has the monitoring costs of a field exercise.

Third, recurring exercises should be considered more threatening than non-recurring exercises.[2] Many joint exercises are part of a named series and exercises under the series occur on a regular basis. For example, the *Foal Eagle* series of U.S.-South Korea exercises has been held annually in the spring every year since 2002 and previously was held each year in the fall.[3] Recurring exercises should incite responses because they serve as strong signals of resolve.[4] Importantly, recurring exercises are often keystones of defense pacts—as regular, visible signals of the alliance, they serve an important confidence-building role. By nature of their regularity, they indicate the continued importance to both parties of maintaining the alliance. *Foal Eagle*, for example, is often accompanied by significant media and political campaigns about the importance of the U.S.-South Korean alliance to both parties. Moreover, repeated exercises have particular military utility. Practicing certain maneuvers multiple times improves the ability to execute them in a conflict scenario; as a result, repeated exercises might reveal to adversaries the capabilities the participating states view as most vital to their defense efforts. Repeated exercises have also previously been used as covers for surprise attack, as with Egypt in 1973. Fear of recurring exercises, then, may be about the risk that a state could try to organize a surprise attack under the pretense of holding a recurring exercise. In the event of an actual mobilization, states might extend cover by attaching the label of a previously executed exercise series. We might also expect stronger reactions to recurring exercises because they are anticipated; therefore, the responses to these exercises may be planned in advanced. This is not inconsistent with our

2. These categories are also mutually exclusive. The first exercise in a series of exercises that are recurring is not classified as a recurring exercise, but every exercise thereafter is. This is because North Korea is unlikely to know if an exercise will repeat in the future. Moreover, our theory about the differences between recurring and non-recurring exercises hinges on the adversary already having information about the upcoming exercise and its effects; even if an exercise *will be* recurring, the first exercise in that series still has the characteristic uncertainty of a non-recurring exercise. If an exercise series changes names, exercises under the original and under the new name are both considered to be recurring exercises. For exercise series that began before 1997, the first exercise in our analysis is coded as recurring.

3. *Foal Eagle* did not occur in 2001 when it transitioned from a fall exercise to a spring exercise. In 2018 it was held in an abbreviated form, and it was canceled in 2019.

4. Note that recurring exercises are often quite large, which might also contribute to the significant reactions that occur in response to them; however, there are several reasons why the recurrence itself should increase the threat-level of these exercises.

theory. Choosing to plan significant responses to an anticipated exercise would demonstrate North Korea anticipates the threatening signals associated with the recurring exercise and determines these necessitate a complementary signal of resolve.

Fourth, the closer an exercise is held to a potential adversary's territory, the more threatening the exercise will be. Exercises on land or in seas that border an adversary prove that the coalition can deploy force to the potential battlefield. Bringing additional force into the operational theater also means that the balance of forces shifts in favor of the exercising coalition. However, if a coalition conducts an exercise in an area that does not border its adversary, it usually must subtract forces from the operational theater. While distant exercises could be as large and involve similar activities as exercises that border the adversary, because they are distant, they cannot be used as cover for mobilization for an attack. To attack, personnel and equipment would need to be shifted from the exercise location back to the operational theater.

Distant exercises, to be sure, still carry political importance and can be used to improve the coalition's joint military capability. If the reason adversaries respond to exercises is because they send a generic signal of the strength of the alliance and not because they potentially carry an immediate and concrete military threat, then the location of the JME would be irrelevant to the adversary's calculations. If adversaries are, instead, concerned about both the general alliance commitment as well as direct military threats, then we would expect distant exercises to elicit some response, but not as strong of a response as JMEs held near an adversary's territory.

Finally, the content of an exercise affects its threat-level. Some exercises involve the practice of the types of military activities directly applicable to a conflict. Tank maneuvers, combining infantry operations with artillery or air support, air defense, amphibious landings or paratroop operations, and surface or subsurface warfare operations are directly applicable to a conventional combat scenario. Some exercises, however, do not practice these types of conventional military activities and instead focus on activities such as delivering humanitar-

ian aid to disaster victims, conducting search and rescue or U.N. peacekeeping operations, or improving interdiction or logistics. These non-combat drills can serve important military purposes. They work out communication issues and increase the familiarization of and interoperability between different units. Communication, equipment, and doctrinal interoperability issues can pose serious limitation on a coalition's military capability, so non-combat exercises still generally increase the potential combat power of a coalition. Next to practicing actual combat operations, however, these types of exercises ought to appear less threatening, because they build capabilities that are less immediately useful in a potential attack.

We argue that North Korea should respond to JMEs because they maintain or increase joint readiness. Moreover, North Korea should respond more strongly to JMEs that pose a larger threat of attack. However, there is a key limitation to this argument. If South Korea were to completely cease conducting JMEs, that could decrease joint readiness, which might embolden North Korea. We might expect an emboldened North Korea to make more demands on South Korea or be willing to run greater risks of escalation. Ending all JME activity could cause secondary effects that would work in the opposite direction of our theoretical predictions. Our theory, therefore, speaks best to the effects of changes in the number and type of JMEs, short of abdicating the practice altogether.

Alterations in the schedule of exercises should be possible without significant harm to the U.S.-South Korean alliance. Moreover, survey experiments have shown that when the United States' security guarantee to South Korea is considered ironclad, it can raise fears that the U.S. could entrap South Korea into an unnecessary conflict; this encourages support for measures that would increase South Korean military independence, such as an indigenous South Korean nuclear arsenal (Sukin 2019a). Decreasing the threat-level of U.S.-South Korean JMEs through measures such as holding exercises that involve conflict maneuvers further away from the Korean Peninsula may be able to help address this concern without substantially depleting alliance cohesion.

While we argue that there are legitimate reasons for North Korea to find JMEs threat-

ening and therefore to respond to them, others have argued that any perception of North Korean belligerence around JMEs is not systematic. D'Orazio (2012) argues that any belief by people in South Korea and the U.S. that North Korea acts more hostile during JMEs is due to a perception bias. He argues that when South Korea and the U.S. conduct JMEs together, the media devotes more attention to whatever North Korea does or says. Therefore, people are more likely to notice what are, in fact, routine statements or activities. Moreover, he argues North Korea has no reason to respond to JMEs because it is often notified in advance of most exercises, such that the effect of JMEs is already "priced in" to North Korea's beliefs about the threats it faces long before the exercise occurs.

Similarly, Cha, Lee, and Lim (2016) argue that North Korean provocations and threats are not directly responses to JMEs but instead to the quality of U.S.-North Korean relations. That is, in periods of high tension, North Korea acts more belligerently than during periods of low tension. The perception of North Korean antagonism in response to JMEs might therefore be the result of the fact that high tensions can encourage the U.S. and South Korea to conduct more JMEs; these JMEs are then concurrent with North Korean aggression that was already occurring in response to the generally tense security environment. Both the D'Orazio (2012) and Cha, Lee, and Lim (2016) theories would predict exercises to have a null effect on North Korean belligerence and would anticipate that North Korea would not be responsive to the characteristics of exercises. Our research, however, demonstrates that neither of these interpretations hold. Instead, North Korea reacts systematically to both the timing and threat-level of JMEs.

There is also the possibility that JMEs effectively deter, in which case we would expect North Korea to respond to JMEs by reducing its level of bellicosity. While we argue that the security dilemma suggests North Korea should respond to what it views as threats with threats of its own, a defensive-minded North Korea might choose to deescalate in the face of demonstrations of South Korean alliance cohesion and military capabilities. Our research empirically tests whether North Korea responds at all to JMEs and, if so, whether their

response is to increase or decrease bellicose behavior. Ultimately, we find that North Korean rhetoric and behavior become more aggressive in response to JMEs, suggesting North Korea views JMEs as threatening rather than deterring.

In sum, our research refutes a number of theories that would suggest North Korea does not respond systematically to JMEs or to their threat level or that North Korea should back down in response to JMEs. Instead, we find that North Korea reacts to JMEs with heightened bellicosity compared to routine statements and activities. That is, following JMEs, North Korean propaganda contains more aggressive statements and North Korea is more likely to conduct provocations such as cross-border violence and missile or nuclear tests. Moreover, we find that North Korean bellicosity is proportional to the material threats associated with the JME in question. We find that North Korea responds directly to JMEs and their characteristics and that these responses are related to JMEs' strategic importance for signaling military capability and resolve.

3 Data

3.1 Independent Variable: Joint Military Exercise Data

We collect information about as many publicly identified South Korean JMEs as possible. We use data from Bernhardt (2020b). Bernhardt used LexisNexis to gather a large collection of news articles from major world newspapers, wire services, and the BBC's international monitoring service that might plausibly mention a JME. He then used supervised learning to narrow the set of articles to read more closely. Exercises were initially identified from this narrow subset before searching for additional information to fill in missing data about exact dates, activity type, or size as necessary. All the information comes from public reporting about military exercises. This process results in a dataset of 315 South Korean JMEs between 1997 and 2016 for which start and end dates are identifiable.

Since 1997, South Korea and the U.S. usually conduct two or three very large-scale

exercises on the Korean Peninsula each year. From 1997-2001, they conducted command post exercises called *Reception, Staging, and Onward Integration (RSOI)* in the spring and another called *Ulchi Focus Lens* in late summer. In addition, a field training exercise named *Foal Eagle* was conducted in the fall. From 2002 on, *Foal Eagle* has been conducted in the spring and combined with *RSOI*. In 2008, following South Korea assuming responsibility for wartime control of joint military forces, *RSOI* was renamed *Key Resolve* and *Ulchi Focus Lens* was renamed *Ulchi Freedom Guardian*. The command post exercises involved in *Key Resolve* and *Ulchi Freedom Guardian* include working out the logistics of integrating U.S. forces that would arrive in a conflict into active units and employing them in combat scenarios. These large-scale exercises tend to mobilize tens or even hundreds of thousands of personnel between the South Korean and U.S. militaries. Occasionally, other states that contribute to the United Nations' forces in Korea have also participated in the exercises. Since 2008, U.S. forces have also participated in most editions of the South Korean-led *Hoguk* field exercise in the fall, usually in the component of the exercise that practices an amphibious landing.

Besides these large-scale exercises, South Korea and the U.S. regularly hold a number of smaller exercise series in South Korea. These include the relatively small, annual air force exercises *Beverly Bulldog* and *Beverly Midnight*, the medium-scale biannual air combat series *Max Thunder*, the usually small-scale *Korean Interoperability and Training Program (KITP)*[5] and *Korea Marine Exchange Program (KMEP)*[6] series for the two countries' Marine Corps, and the two armies' *Warpath* command post and field training exercises. The two countries have also engaged in the non-combat series *Pacific Thunder* and a search and rescue drill with Japan during many years. South Korea has also hosted multiple interdiction exercises associated with the Proliferation Security Initiative, including the *Eastern Endeavor* series and certain editions of the *Deep Sabre* series. These exercises involve the U.S. as well as other countries such as Australia, Japan, or Singapore.

In addition to the exercises South Korea hosts and in which the U.S. participates, South

5. Sometimes referred to as *Korean Integration and Training Program*.
6. *KMEP* replaced *KITP* in 2012.

Korea also participates in a small number of exercise series that do not include the U.S. Most of these involve a relatively small number of forces and most began more recently than the major South Korean-U.S. JMEs. Ongoing series that do not include the U.S. include the *RokKiwi* anti-submarine series with New Zealand and the *Haedori-Wallaby* anti-submarine series with Australia. The small number of exercises that exclude the U.S. make it difficult to isolate the effect of U.S. involvement in South Korean JMEs.

Outside of the peninsula, South Korea has long participated in the biennial large-scale multilateral exercise *Rim of the Pacific (RIMPAC)* around Hawaii. It has also been a regular participant in the Thailand-hosted *Cobra Gold* series and the Guam-based *Cope North* exercises. It generally attends one edition of the *Cooperative Cope Thunder/Red Flag Alaska* air combat exercise per year. As a member of the Asean Defense Ministers Meeting-Plus (ADMM-Plus) group, it has attended various counter-terrorism, interdiction, and search and rescue exercises. Finally, it has participated in the peacekeeping training exercise *Khaan Quest* in Mongolia most years since 2008.

Beyond these recurring series, South Korea has hosted numerous one-off or unnamed exercises. Most of these exercises do not have publicly identified names. While many are on the smaller side, some have included many thousands of personnel and top-line equipment such as aircraft carriers. South Korea has also been a one-off participant in longer running exercise series hosted by other countries such as the Australian-led *Tandem Thrust* drills and the United States' *Red Flag* (Nevada) series.

We create a number of different measures for daily South Korean JME activity. The broadest measure is if South Korea was actively participating in any type of exercise, of any size, in any location. We also have time series for the log number of personnel actively participating in a South Korean JME, whether South Korea is participating in a field training exercise or merely a command post exercise, whether it is participating in a combat or non-combat exercise, and whether it is participating in a recurring exercise or an exercise that does not recur. We further divide exercises by whether or not the JME occurs in or around

the Korean Peninsula.

While our unit of analysis is the day, for all the measures of exercise behavior we employ a simple moving average over a 7-day period. There is, in most cases, either some notification of an exercise or we should expect that North Korea could observe preparations before the official start date. It also takes some time for exercise participants to return to their home bases, so the moving average helps capture these small lead and lag effects.[7]

Dependent Variables: North Korean Actions and Rhetoric Data

We would, ideally, be able to measure North Korean behavior using their own level of military mobilization. Such a measure would allow us to see if North Korea is taking concrete steps to prepare for a possible military attack. There is, unfortunately, no publicly available data on North Korean military mobilizations. We look, instead, at North Korean rhetoric and more easily observed military actions.

Our first measure of North Korean behavior draws on data from Cha, Lee, and Lim (2016) on North Korean provocations. This measure is important because provocations are costly and should therefore be credible signals. To measure the intensity of North Korea's provocative actions, we use a six-level ordinal measure.[8] The base intensity level in our measure, categorized as having an intensity score of 1, occurs when North Korea did nothing of note. Cross-border incidents that did not involve any exchange of fire receive an intensity score of 2. Next are cross-border incidents that did involve an exchange of fire but did not result in any casualties, followed by incidents involving an exchange of fire and at least one casualty; these actions receive intensity scores of 3 and 4, respectively. The fifth category is comprised of missile test incidents, and the sixth category, which is the highest intensity

7. We include in the online appendix an analysis that uses a 30-day moving average as a robustness check.

8. As a robustness check we also create two binary measures: one for periods in which a missile or nuclear test occur and a second for if North Korea takes any provocative action. The results are consistent with our ordinal measure; see online appendix. Because the measure is ordinal, we are not claiming that a move from an intensity level of 1 to an intensity level of 2 is necessarily the same as a move from level 2 to level 3. Instead, our measure simply states that the actions grouped into each level compose meaningful and distinct categories, and that the intensity of the actions in each category correspond to their intensity score.

level, contains nuclear incidents such as nuclear testing.[9]

We also measure North Korean behavior using North Korean propaganda. This data provides important insight into North Korean politics. In general, little is known about North Korean political activities and attitudes, since there are few sources of reliable information about the internal workings of the North Korean regime. State news, however, can be collected systematically and demonstrates the regime's prevailing attitudes towards certain events and circumstances. News sources can be used to detect changes from baseline attitudes, since publications are frequent. Because of their external-facing nature, we can presume that North Korean publications—or at least those released in English—have some intentional signaling components. Moreover, research has shown that North Korea propaganda reveals information about North Korean threat perception and signals the intentions of the North Korean regime (Sukin 2020). These messages also appear to taken seriously; in survey experiments, both South Koreans and Americans viewed North Korean rhetoric about escalation during conflicts as credible (Sukin 2019b).

State propaganda has often been overlooked as a source of information about regimes because it has traditionally been dismissed as "cheap talk." In the North Korean case, however, propaganda is one of a very limited number of sources of information accessible to foreigners, making a diligent investigation of propaganda a particularly important part of the processes of understanding the North Korean regime. While propaganda may be "inexpensive" compared to kinetic activities, it still has a cost; producing propaganda requires material resources, such as staff and distribution methods, and can raise tensions or even provoke actions by adversaries. This is especially true for propaganda produced in English, where production is more difficult and the readership is primarily foreign. Additionally, North Korea appears to consider its propaganda efforts vital to the survival of its regime; the North Korean leadership is often involved in directing content, and several top leaders

9. Missile and nuclear tests are our highest level of activity because they demonstrate the ability to impose costs directly on countries other than South Korea. While conducting a missile or nuclear test expends a weapon that would be potentially useful in a conflict, North Korea's arsenal is currently large enough that it maintains sufficient retaliatory firepower even after a test.

have started out with positions in the propaganda arm.

We collect all available English-language articles published by the official Korean Central News Agency (KCNA) from January 1st, 1997 to December 31, 2016. KCNA publishes some of its material in English. Although many English-language KCNA articles are translated versions of articles originally written in Korean, not all Korean-language articles are translated into English. This suggests that there is a selection process where KCNA or other government officials determine which articles should be read by foreigners. While there may be multiple reasons for translating a given article, English-language articles can be interpreted in part as sending a direct signal to international audiences, although some such articles may simultaneously be meant to send signals to North Korea's domestic public or elites. Although we do not rule out the possibility that many of the articles we analyze could have dual domestic and foreign audiences, because we are using only English-language articles, the rhetoric we analyze likely has some intended international signaling role.

We use our dataset of KCNA articles to create a daily measure of North Korean sentiment. When KCNA uses more negative language, that should be associated with issuing warnings and threats. Conversely, when KCNA uses more positive language, that is less likely to be associated with threats or warnings to other countries.[10] We employ the Wilson, Wiebe, and Hoffmann (2005) collection of positive and negative words to characterize KCNA's language and augment it with a list of positive and negative words gleaned from reading many KCNA articles.[11] We measure the overall daily sentiment by taking the difference between the percentage of words KCNA uses that are negative minus the percentage that are positive.[12] Like with the JMEs, we use a weekly moving average to smooth this time series, which enables us to detect not only when North Korea responds at the same time as a JME, but also when it responds in advance of the JME (because it has been notified) and when it responds a few days after the JME. Extended news cycles mean that we should not expect

10. On the use of negative language as a proxy for threats and resolve, see McManus (2014).

11. Our results are consistent when we use just the original Wilson, Wiebe, and Hoffmann (2005) list of positive and negative words.

12. We also employ the Porter (1980) stemmer and discard common stop words.

all responses to an exercise to occur on the same day as that exercise.[13]

Control Variables

While we argue that North Korean behavior should be influenced by JMEs, it is possible that North Korea also responds to other events. If JME activity was also correlated with these other events, then our regressions would suffer from omitted variable bias. We control for a number of other variables that could correlate with JMEs and relate to North Korean behavior. First, we control for South Korean domestic politics. North Korea could try to influence South Korean elections through its words or actions and South Korean politicians could try to time exercises for electoral purposes. We therefore control for when South Korea is holding national elections. South Korea defines a formal campaign period for both presidential and legislative elections, and we designate all days during the campaign season as well as election day as an election period.

Second, JMEs and North Korean behavior might respond to diplomatic activity, so we control for any high-level diplomatic contact between the U.S. and North Korea over the latter's missile and nuclear programs. We use data from the CSIS Beyond Parallel project to record when there are major summits such as the Six Party Talks, as well as when other, more minor, diplomatic interactions occur (Schoff and Lin 2019). Cha, Lee, and Lim (2016) argues that North Korea primarily responds to this type of diplomacy rather than to JMEs, which suggests that there should be a positive association between active diplomacy and North Korean bellicosity. Moreover, if Cha, Lee, and Lim (2016) is right, including this control should lead us to finding a null result for our independent variable measuring JME activity.

Third, we control for United Nations-imposed economic sanctions. It is possible that exercise timing or activity type changes in response to the intensity of economic sanctions imposed on North Korea. To account for United Nations-imposed sanctions, on each day, we

13. Using alternative measures such as the percentage of words that are negative or the number of negative words does not substantially change our analysis; see the online appendix.

record the most recent United Nations Security Council resolution that imposed economic restrictions on North Korea. If North Korea responds to changes in the sanctions regime, then excluding this would bias our results.

We also include year and quarter fixed effects in all of our models. The year fixed effects create a different baseline level of bellicosity or threat-issuance for each year. This means that our models control for world or peninsula-specific events that change the baseline propensity for North Korea to take a provocative action or issue a threat. Quarter fixed effects allow us to control for seasonal or other factors that vary over the course of the year. For example, weather patterns can make it easier to engage in military activity at certain times, and troop rotations often happen at around the same time each year.

Econometric Approach

To examine statistically whether North Korean actions are associated with South Korean JMEs, we employ a series of ordered probit regressions. These actions are more infrequent than the articles published by KCNA, so we use the action with the highest intensity level that North Korea employs during a given week rather than a simple moving average. To account for the auto-correlation in our data, we calculate all standard errors using a time-series blocked bootstrap with fixed time periods of 30 days. When we examine the language used by KCNA, we employ ordinary least squares with a lagged dependent variable and Newey-West heteroskedastic and auto-correlation robust standard errors to account for temporal dependence. The unit of analysis for all models is the day.[14]

We might also be concerned that exercise activity is endogenous to the threats and provocations of North Korea. There is one prominent example in which JMEs were used to respond to North Korean actions. Following the sinking of the South Korean ship *Cheonan* in March 2010, the U.S. and South Korea held a large anti-submarine focused exercise *Invincible*

14. There are some exercises for which we could not find the number of personnel involved. In the analyses that use this independent variable, we choose to drop from the sample days on which we know there is a JME but do not know the number of active personnel.

Spirit in July and subsequent large and irregular naval exercises in September and November. Many exercises, however, occur on semi-regular schedules, although the size and length of the exercises can change. While the association between a one week lag of the threats used by KCNA and whether South Korea is participating in a JME is positive, it is statistically insignificant, which suggests South Korea is not systematically using JMEs to respond to North Korea's own behavior.[15]

Our statistical tests allow us to measure the association between JMEs and North Korean behavior. The models, however, assume a rough baseline of South Korean and allied forces' military readiness and alliance cohesion. This means that, although our models allow us to test for what the direct effect of ending exercises would be on North Korean behavior, they cannot account for the possibility that North Korea would be emboldened by a complete lack of any JMEs. Our tests, therefore, are limited in what they can say about a total abdication of the practice of conducting JMEs. Our models are most reliable in assessing the effects of variations in the type and amount of JMEs.

4 Analysis

We begin by looking at the timing of South Korean JMEs in relation to North Korean provocative events. We employ a series of ordered probit models that test the effects of different exercise types on North Korean responses and control for other possible causes of North Korean bellicosity. All of our models control for electoral, diplomatic, and economic factors that might influence North Korea. They also include year fixed effects to account for any secular changes in North Korean behavior and quarter fixed effects to control for weather or other seasonal factors that might lead North Korea to act differently at different points in the year. These controls are important because they indicate that the effects of JME characteristics are significant even after accounting for North Korean responses to circumstances that might encourage North Korea to react more strongly than it otherwise

15. For regression results see online appendix Table 15.

would in order to seek negotiation leverage. Thus, even if North Korea is hoping that its negative responses to JMEs will help provide it with the ability to achieve more of its goals during negotiations, this does not fully explain North Korea's reactions to JMEs. It is still the case that North Korea reacts more often and more strongly to JMEs that pose greater concrete threats to its security.

Table 1 shows that JMEs are not deterring North Korean provocations but that, instead, South Korean exercises are statistically significantly associated with North Korea taking more provocative actions. In line with our expectations, we also find that field JMEs, combat JMEs, and JMEs in which more personnel participate[16] are associated with higher likelihoods of North Korea conducting cross-border incidents, missile tests, or nuclear tests. We cannot, however, reject the null hypotheses that the coefficient for field JMEs is equal to that for command post JMEs ($p = 0.667$) or that the coefficient for combat JMEs is equal to that for non-combat JMEs ($p = 0.200$). We also find recurring exercises are positively associated with increased provocations whereas non-recurring exercises are negatively associated (a test for equality cannot be rejected, $p = 0.173$), suggesting North Korea is concerned that recurring exercises will be used to mobilize for attacks or is concerned about the alliance signalling effect of recurring exercises.

To examine the substantive effect of each type of exercise, we compute the percentage increase in probability that North Korea takes a given action on a given day during which only that type of exercise occurs. We measure this relative to a null model, in which the probability that North Korea takes the given action is equal to the observed probability of the action across all days. While we are not claiming to have causally identified the effect of each exercise, these values can be thought of as akin to the treatment effect of a single

16. When looking at the effects of personnel size, we drop exercises for which there is no data on personnel numbers. Since large exercises are more likely to have had their personnel numbers reported, this somewhat limits our ability to talk about the effects of personnel numbers when exercises are small. However, the omission of some small exercises makes for a harder test for our theory, since increases in personnel when exercises are *already* fairly large should matter only if North Korea is responsive to the *precise* size of exercises rather than to other elements that size can signal, such as whether the exercise appears to be important or complex. Ultimately, we find that increases in personnel involved in an exercises do cause North Korea to react more strongly to that exercise.

Table 1: Ordered Probit Results Pooling Inside and Outside ROK

	Dependent variable:				
	DPRK Belligerent Action Level				
	(1)	(2)	(3)	(4)	(5)
Any JME	0.159**				
	(0.077)				
Cmd. Post JME		0.088			
		(0.236)			
Field JME		0.166**			
		(0.081)			
Combat JME			0.212**		
			(0.088)		
Non-Combat JME			−0.073		
			(0.158)		
Recurring JME				0.175**	
				(0.079)	
Non-Recurring JME				−0.058	
				(0.275)	
log(JME Personnel)					0.027**
					(0.013)
Summit Diplomacy	−0.033	−0.031	−0.028	−0.031	0.026
	(0.201)	(0.202)	(0.201)	(0.202)	(0.202)
Election Period	0.689**	0.689**	0.704**	0.676**	0.546*
	(0.315)	(0.316)	(0.316)	(0.316)	(0.310)
UNSC Res. 1695	−0.398	−0.402	−0.434	−0.420	−0.528
	(2.577)	(2.595)	(2.666)	(2.583)	(2.646)
UNSC Res. 1718	−4.740**	−4.743**	−4.726**	−4.759**	−4.958**
	(1.894)	(1.906)	(1.895)	(1.892)	(1.950)
UNSC Res. 1874	−4.388*	−4.384*	−4.355*	−4.408*	−4.792*
	(2.358)	(2.368)	(2.359)	(2.359)	(2.550)
UNSC Res. 2087	−0.082	−0.076	−0.092	−0.081	−0.774
	(3.054)	(3.044)	(3.149)	(3.082)	(3.359)
UNSC Res. 2094	0.430	0.425	0.470	0.394	−0.272
	(2.281)	(2.279)	(2.283)	(2.286)	(2.548)
UNSC Res. 2270	0.707	0.696	0.777	0.682	−0.097
	(2.376)	(2.377)	(2.382)	(2.383)	(2.638)
UNSC Res. 2321	−4.318	−4.311	−4.225	−4.339*	−5.285*
	(2.757)	(2.716)	(2.689)	(2.615)	(2.875)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	7,299	7,299	7,299	7,299	6,396
AIC	5,990	5,986	5,979	5,985	5,249

Note: *p<0.1; **p<0.05; ***p<0.01

Standard errors calculated using time-series block bootstrap with 30-day fixed windows.
UN sanctions use UNSC Res. 825 as the base category.

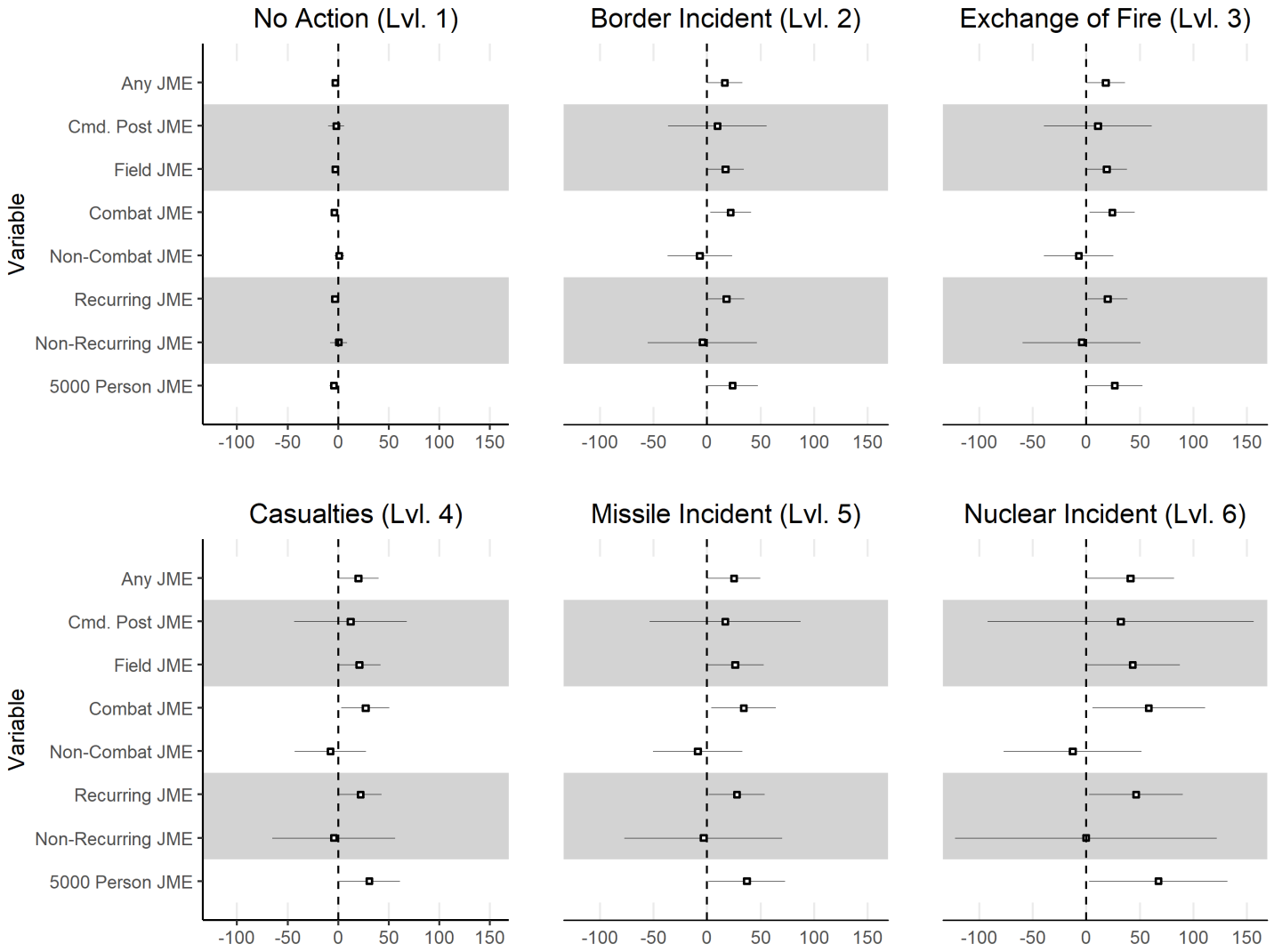

Figure 1: Percent Increase Probability of Observing Belligerence Level Over Null Model. Models from Table 1. Boxes are the mean estimate and lines represent 95% confidence intervals.

exercise of that type occurring but no other type of exercise occurring.[17] Figure 1 shows the results. While the baseline probability that North Korea takes any belligerent action is rare, the percentage increase in probability that North Korea takes provocative actions during JMEs can be quite large. During field exercises and recurring exercises the probability of a border incident or missile test increases by around 15%-25% and the probability of a nuclear test increases by around 45%. For combat exercises and brigade-size exercises, which are substantially smaller than the major *Foal Eagle* and *Ulchi* exercises, the increases are even larger. The increase in probability of a border incident for these exercise types is 20%-30% and the probability of nuclear tests increases by 60%-65%.

When we separate exercises that occur in or around South Korea from those that occur further away, we find mixed support for the hypothesis that exercises that occur on the peninsula are generally associated with more bellicose behavior. We no longer find that field exercises, no matter their location, are statistically significantly associated with North Korea's actions. We do find that combat exercises outside the peninsula and larger exercises on the peninsula are associated with higher levels of belligerency (the p-levels for the test that the coefficients for combat exercises in and outside of Korea are equal is 0.788 and for combat and non-combat exercises outside of Korea being equal is 0.302, while the p-value for the coefficients for personnel size inside and outside the peninsula is 0.955). When we interpret the magnitude of the effect (Figure 2) we see that, while the effects are no longer as precisely estimated, the mean effect size is still substantial. The effect of brigade-size exercises on the peninsula is now only statistically significant at the 90% confidence level, but the results show that they are associated with an increase in the probability of border incidents, missile tests, and nuclear tests, with the latter being more than 60% more likely. Interestingly, the location of the exercise does not seem to substantially change the predicted increase in probability for field exercises, combat exercises, recurring exercises, and larger exercises. However, while the confidence intervals are quite large, the difference in the mean

17. We average over the observed combinations of the control variables.

Table 2: Ordered Probit Results Separating Inside versus Outside ROK

	Dependent variable:				
	DPRK Belligerent Action Level				
	(1)	(2)	(3)	(4)	(5)
Any JME in ROK	0.148				
	(0.116)				
Any JME outside ROK	0.170				
	(0.118)				
Cmd. Post JME in ROK		0.233			
		(0.264)			
Field JME in ROK		0.143			
		(0.120)			
Cmd. Post JME outside ROK		−0.303			
		(0.803)			
Field JME outside ROK		0.190			
		(0.126)			
Combat JME in ROK			0.180		
			(0.117)		
Non-Combat JME in ROK			−0.591		
			(0.546)		
Combat JME outside ROK			0.268*		
			(0.150)		
Non-Combat JME outside ROK			−0.005		
			(0.181)		
Recurring JME in ROK				0.153	
				(0.115)	
Non-Recurring JME in ROK				0.028	
				(0.463)	
Recurring JME outside ROK				0.195	
				(0.123)	
Non-Recurring JME outside ROK				−0.178	
				(0.338)	
log(JME Personnel in ROK)					0.025*
					(0.013)
log(JME Personnel outside ROK)					0.027
					(0.018)
Summit Diplomacy	−0.033	−0.035	−0.026	−0.030	0.029
	(0.202)	(0.202)	(0.202)	(0.202)	(0.205)
Election Period	0.687**	0.683**	0.689**	0.674**	0.549*
	(0.315)	(0.315)	(0.319)	(0.318)	(0.320)
UNSC Res. 1695	−0.403	−0.426	−0.447	−0.419	−0.513
	(2.587)	(2.616)	(2.633)	(2.611)	(2.619)
UNSC Res. 1718	−4.743**	−4.750**	−4.721**	−4.756**	−4.980**
	(1.895)	(1.896)	(1.892)	(1.891)	(1.967)
UNSC Res. 1874	−4.392*	−4.394*	−4.353*	−4.412*	−4.801*
	(2.362)	(2.363)	(2.362)	(2.361)	(2.561)
UNSC Res. 2087	−0.117	−0.119	−0.067	−0.135	−0.832
	(3.115)	(3.046)	(3.025)	(3.070)	(3.331)
UNSC Res. 2094	0.404	0.390	0.463	0.376	−0.177
	(2.282)	(2.286)	(2.275)	(2.285)	(2.587)
UNSC Res. 2270	0.684	0.661	0.808	0.676	−0.294
	(2.373)	(2.378)	(2.370)	(2.375)	(2.664)
UNSC Res. 2321	−4.324	−4.350*	−4.207	−4.360*	−5.578*
	(2.638)	(2.615)	(2.626)	(2.584)	(3.083)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	7,276	7,276	7,276	7,276	4,794
AIC	5,986	5,979	5,970	5,978	5,029

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors calculated using time-series block bootstrap with 30-day fixed windows.
UN sanctions use UNSC Res. 825 as the base category.

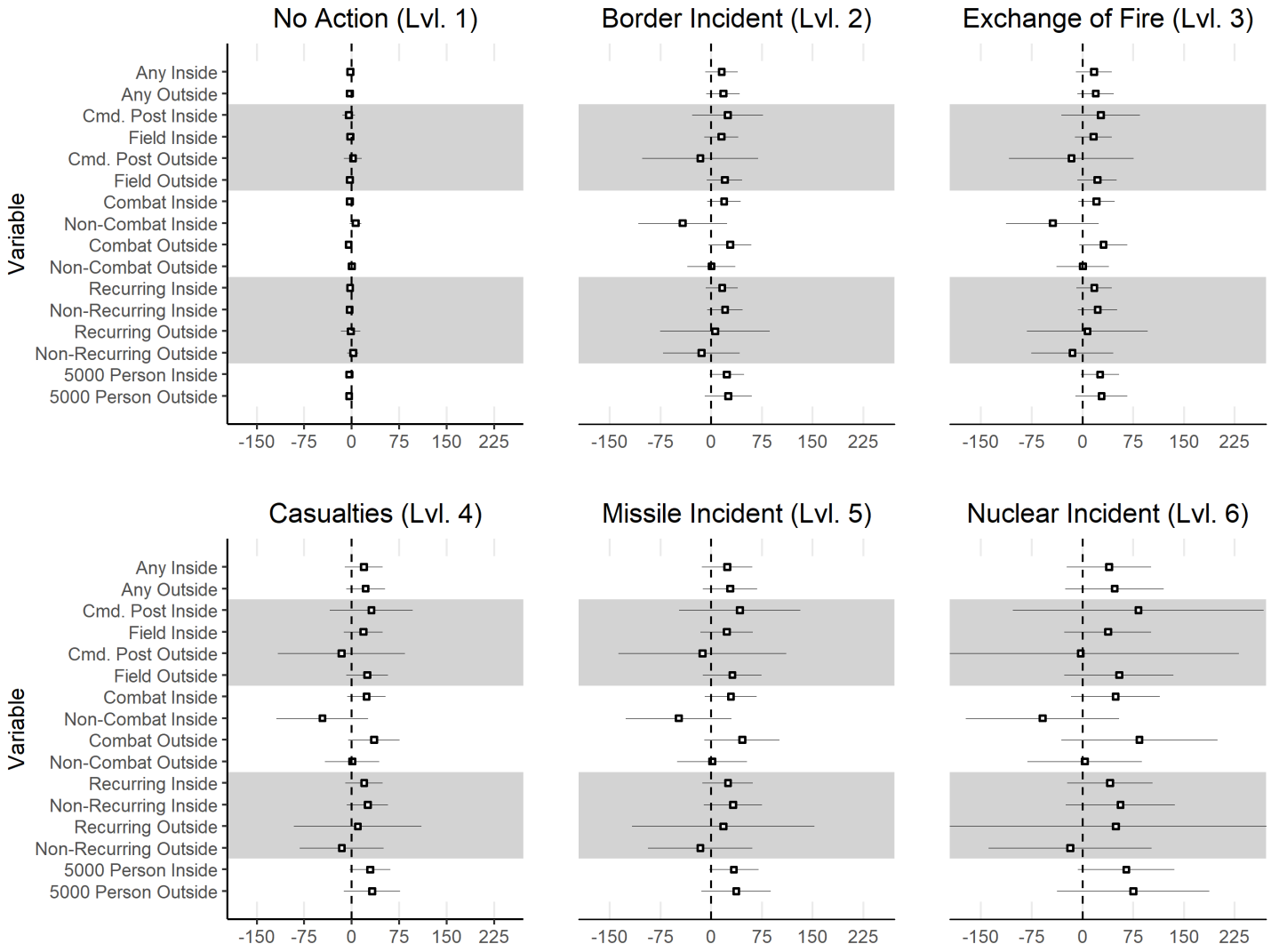

Figure 2: Percent Increase Probability of Observing Belligerence Level Over Null Model. Models from Table 2. Boxes are the mean estimate and lines represent 95% confidence intervals.

effect for non-combat exercises and for non-recurring exercises are quite large, with virtually no change from the baseline probability of an event when South Korea conducts an extra-peninsular non-combat exercise and a lower probability when it conducts one at home. With respect to non-recurring exercises, North Korea is more likely to act out when the exercise is nearby, but less likely to do so when the exercise is far away. We generally, however, cannot differentiate between the effects of conducting exercises locally or not.

The most consequential control variable is whether it is an election campaign period in South Korea. We find North Korea is significantly more likely to engage in belligerent behavior during such periods. This could represent attempts by North Korea to influence election outcomes in South Korea. This effect is about three times larger than the significant JME effects. We also find effects for U.N. sanctions. Relative to the period under U.N. Security Council Resolution 825, the periods under resolutions 1718, 1874, and 2321 are associated with large and significant reductions in North Korean provocative behavior.

In the online appendix, we show a number of additional robustness checks. Our lower levels of bellicose action include cross-border incidents, which could occur despite the policy intentions of Pyongyang. Missile and nuclear events, however, occur only at the direction of senior policymakers and military leaders. We therefore include results from logit regressions where the dependent variable is whether North Korea conducts a missile or nuclear test. The results are similar to the ordered probit regressions. We also test for whether exercises are associated with any belligerent action. These results, if anything, are more favorable for our hypotheses—although we prefer the more fine-grained measure of provocative behavior—than the results reported above. We find that provocative actions are positively associated with field exercises, combat exercises, and larger exercises on the Korean peninsula. There are reasons for each of these exercise types to pose a significant threat to North Korean interests; concern about these exercises could be causing North Korea to respond belligerently to these events in order to signal its own resolve. The results are also largely consistent if we use our preferred ordered-probit specification but employ a 30-day moving average rather than the

7-day moving average in the main analysis or if we subset to just JMEs that involved the U.S., rather than all South Korean JMEs.[18]

We now turn to measuring North Korea behavior using our measure of net-negative sentiment in KCNA articles. While the results using the provocative action dependent variable are important substantively, the actions' rarity does pose some problems for consistent estimation. Our measure of net-negative sentiment is measured daily and is continuous, so that we capture more frequent and subtle variations in North Korea belligerence. We regress the weekly moving average of KCNA sentiment on different measures of the moving average of JME activity. Positive coefficients mean that KCNA's language was increasingly negative and bellicose around the occurrence of JMEs. The main results are contained in Table 3. We find that periods in which South Korea is conducting JMEs are associated with greater negative sentiment in KCNA articles. We interpret this as support for the hypothesis that North Korea cares about South Korean JME activity and uses threats and warnings in KCNA to show its own resolve. The results from our analysis using the threats issued by KCNA are broadly similar to those using the more concrete behavior measure, which should increase our confidence that the sentiment analysis method is picking up real threats and warnings.

We further disaggregate exercises to examine whether the type of exercise affects North Korean responses. We find support for the hypothesis that larger exercises should be more threatening than smaller exercises. Moving from a period in which there are no exercises to one in which a battalion size exercise (1000 people) occurs is associated with an increase of 0.2 standard deviations in net negative sentiment and moving from a battalion (1000 people) to a brigade size exercise (5000 people) is associated with a further increase in net negative sentiment of 0.05 standard deviations. A day during which an exercise involving 50,000 personnel occurs—which is on the smaller side for most iterations of the large *RSOI/Key Resolve-Foal Eagle* spring maneuvers and the *Ulchi Focus Lens/Ulchi Freedom Guardian* summer exercise—is associated with an increase in net negative sentiment of 0.11 standard

18. There are only 14 exercises in which the U.S. did not participate. These exercises lasted a total of 92 days. Exercises involving the U.S. number 301 and account for 4,204 total days.

Table 3: OLS Results Pooling Exercises Inside and Outside ROK

	Dependent variable:				
	Net Negative Sentiment (%) in KCNA Articles				
	(1)	(2)	(3)	(4)	(5)
Any JME	0.341***				
	(0.078)				
Cmd. Post JME		0.517**			
		(0.227)			
Field JME		0.314***			
		(0.080)			
Combat JME			0.363***		
			(0.094)		
Non-Combat JME			0.255		
			(0.205)		
Recurring JME				0.352***	
				(0.086)	
Non-Recurring JME				0.203	
				(0.289)	
log(JME Personnel)					0.061***
					(0.013)
Summit Diplomacy	0.374**	0.369**	0.376**	0.377**	0.405**
	(0.159)	(0.159)	(0.159)	(0.159)	(0.164)
Election Period	−0.075	−0.076	−0.069	−0.082	−0.116
	(0.297)	(0.297)	(0.299)	(0.296)	(0.306)
UNSC Res. 1695	0.936***	0.943***	0.926***	0.925***	0.863**
	(0.309)	(0.311)	(0.308)	(0.308)	(0.344)
UNSC Res. 1718	−0.063	−0.059	−0.063	−0.072	−0.149
	(0.329)	(0.329)	(0.329)	(0.329)	(0.359)
UNSC Res. 1874	−0.286	−0.301	−0.277	−0.294	−0.337
	(0.546)	(0.539)	(0.552)	(0.545)	(0.610)
UNSC Res. 2087	2.095***	2.094***	2.094***	2.109***	1.966***
	(0.649)	(0.646)	(0.654)	(0.645)	(0.734)
UNSC Res. 2094	1.223	1.221	1.236	1.212	0.966
	(0.764)	(0.764)	(0.764)	(0.763)	(0.845)
UNSC Res. 2270	1.857*	1.870*	1.881*	1.857*	1.519
	(1.004)	(1.002)	(1.009)	(1.005)	(1.096)
UNSC Res. 2321	1.934**	1.929**	1.960**	1.919**	1.808*
	(0.930)	(0.929)	(0.929)	(0.929)	(1.026)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	6,732	6,732	6,732	6,732	5,900
R^2	0.394	0.394	0.394	0.394	0.407
Adjusted R^2	0.391	0.391	0.391	0.391	0.403
Residual Std. Error	1.655	1.655	1.655	1.655	1.666
F Statistic	131.733***	128.028***	127.909***	127.903***	121.868***

Note: *p<0.1; **p<0.05; ***p<0.01

All models include week-lagged dependent variable and Newey-West HAC robust standard errors. Coefficients and standard errors multiplied by 100 to display percentage point change. UN sanctions use UNSC Res. 825 as the base category.

deviations compared to a day during which South Korea conducts a battalion size exercise. The coefficient on combat exercises is larger than that for non-combat exercises, as our theory predicts, but we cannot reject the hypothesis that the two types of exercises are associated with identical responses ($p = 0.659$). We do not find support for the hypothesis that field exercises will be more threatening than command post exercises; instead, while both types of exercise are associated with more negative sentiment, command post exercises appear to be slightly more threatening, though again we cannot reject a null hypothesis that the estimate effects are equal ($p = 0.388$).[19] We find that recurring exercises are associated with a significant increase in North Korean threat-making but that non-recurring exercises have no significant association with North Korean threats, although we cannot reject the hypothesis that the two estimates are the same ($p = 0.640$).

The above results pool exercises that occur in or around South Korea with exercises South Korea participated in that occur away from the Korean Peninsula. Table 4, which further disaggregates exercise activity by whether it is held in South Korea, shows that, pooling across all other exercise types and size, North Korea only reacts strongly to JMEs in or around South Korea (we can reject the null hypothesis that the coefficients for JMEs in South Korea and those outside South Korea are identical with $p = 0.047$). We find a positive and statistically significant effect for field exercises held in South Korea but not for field exercises held outside the peninsula or for command post exercises, no matter their location. Unlike with our results above that pool exercise location, we find that field exercises that occur on the Korean Peninsula are associated with more negative sentiment than are command post exercises, but we cannot rule out that the estimates for the two exercise types are equal ($p = 0.879$). Consistent with our theory, we find that, with respect to combat versus non-combat exercises, North Korea only reacts negatively to combat exercises and does so only if they occur on the Korean Peninsula. There is no statistically significant

19. If we use an alternative sentiment measure that does not include our list of additional positive and negative words the coefficient on command post exercises is both smaller than that for field exercises and not statistically significant. See online appendix Table 1.

Table 4: OLS Results For Exercises Separating Inside versus Outside ROK

	Dependent variable:				
	Net Negative Sentiment (%) in KCNA Articles				
	(1)	(2)	(3)	(4)	(5)
Any JME in ROK	0.502***				
	(0.115)				
Any JME outside ROK	0.135				
	(0.127)				
Cmd. Post JME in ROK		0.442			
		(0.335)			
Field JME in ROK		0.495***			
		(0.122)			
Cmd. Post JME outside ROK		0.681			
		(0.544)			
Field JME outside ROK		0.085			
		(0.128)			
Combat JME in ROK			0.510***		
			(0.122)		
Non-Combat JME in ROK			0.346		
			(0.398)		
Combat JME outside ROK			0.091		
			(0.156)		
Non-Combat JME outside ROK			0.217		
			(0.229)		
Recurring JME in ROK				0.487***	
				(0.120)	
Non-Recurring JME in ROK				0.734*	
				(0.411)	
Recurring JME outside ROK				0.176	
				(0.144)	
Non-Recurring JME outside ROK				−0.345	
				(0.407)	
log(JME Personnel in ROK)					0.076***
					(0.014)
log(JME Personnel outside ROK)					0.016
					(0.019)
Summit Diplomacy	0.372**	0.365**	0.369**	0.382**	0.402**
	(0.157)	(0.158)	(0.158)	(0.158)	(0.165)
Election Period	−0.057	−0.054	−0.072	−0.062	−0.116
	(0.303)	(0.303)	(0.305)	(0.301)	(0.318)
UNSC Res. 1695	0.919***	0.963***	0.927***	0.887***	0.874**
	(0.310)	(0.322)	(0.312)	(0.308)	(0.351)
UNSC Res. 1718	−0.071	−0.052	−0.080	−0.098	−0.174
	(0.321)	(0.323)	(0.322)	(0.326)	(0.352)
UNSC Res. 1874	−0.291	−0.301	−0.316	−0.327	−0.346
	(0.552)	(0.533)	(0.556)	(0.556)	(0.609)
UNSC Res. 2087	2.093***	2.098***	2.078***	2.009***	1.961***
	(0.648)	(0.633)	(0.649)	(0.660)	(0.727)
UNSC Res. 2094	1.207	1.199	1.167	1.170	0.975
	(0.753)	(0.743)	(0.760)	(0.755)	(0.818)
UNSC Res. 2270	1.719*	1.723*	1.662	1.712*	1.777*
	(1.007)	(0.991)	(1.024)	(1.001)	(1.051)
UNSC Res. 2321	1.841**	1.842**	1.774*	1.785*	2.075**
	(0.923)	(0.911)	(0.941)	(0.927)	(0.981)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	6,732	6,732	6,732	6,732	5,718
R^2	0.396	0.397	0.396	0.397	0.418
Adjusted R^2	0.393	0.393	0.393	0.394	0.414
Residual Std. Error	1.652	1.652	1.652	1.651	1.657
F Statistic	129.098***	122.242***	121.983***	122.363***	119.850***

Note: *p<0.1; **p<0.05; ***p<0.01

All models include week-lagged dependent variable and Newey-West HAC robust standard errors. Coefficients and standard errors multiplied by 100 to display percentage point change. UN sanctions use UNSC Res. 825 as the base category.

association between North Korea's reactions and non-combat exercises in South Korea or between North Korea's reactions and combat or non-combat exercises outside of South Korea. However, our theory suggests that the association of North Korean negative sentiment should be larger for combat exercises in South Korea than for non-combat exercises in South Korea, and we cannot dismiss the hypothesis that effect is the same ($p = .702$). We only find a statistically significant association between exercise size and negative sentiment for exercises that occur near North Korea, and we can reject the hypothesis that the effect of exercise size when the JME is in South Korea versus when the JME is held abroad are equivalent ($p = 0.015$). While we find that both recurring and non-recurring exercises are associated with more negative sentiment if they take place around the Korean Peninsula, we find that non-recurring exercises elicit a response over 1.5 times as large as recurring exercises, but we cannot reject the hypothesis that recurring and non-recurring exercises in South Korea are associated with the same response by North Korea ($p = 0.567$).

That we find no statistically significant associations between extra-peninsular exercises and North Korean sentiment suggests that the location of the exercise is an important part of North Korean perceptions. We argued that exercises that occur near North Korea might appear more threatening because they have the potential to mask mobilizations for an actual war, and North Korean behavior is consistent with this hypothesis. If North Korea is responding to perceptions of South Korea's alliance credibility, it appears to only interpret exercises that South Korea hosts in and around its territory as signals of credibility. To the extent that some of the military interoperability benefits from conducting JMEs can be gained regardless of location, South Korea might consider holding more exercises outside of the peninsula.

In both the pooling and separating specifications, our control variables behave largely as expected. Consistent with Cha, Lee, and Lim (2016), we find that North Korea issues more provocative propaganda during important diplomatic engagements, such as Six Party Talks. This effect is generally smaller than that of the exercises we argue are threatening, although

the difference is slight. Interestingly, the results in the online appendix that omit the North Korean-specific sentiment terms show no significant association between diplomatic activity and North Korean threats, while still showing the positive associations between JMEs and threats. There are no statistically significant associations between North Korean negative rhetoric and South Korean elections. Relative to the baseline effect of the sanctions put in place by U.N. Security Council Resolution 825 in 1993, we find significant increases in North Korean threats during the periods in which resolutions 1695, 2087, 2270, and 2321 were the most recent sanctions resolution, although again this appears dependent on using the augmented sentiment list. The effect sizes for these sanctions regimes are between 2 and 4 times as large as the effect sizes for JMEs, although it is unclear why North Korea responds more to some changes in sanctions regimes than others.

We include a number of robustness checks in the online appendix. We probe the sensitivity of our rhetorical dependent variable by using a number of alternative specifications. We limit the sentiment analysis to only the words in the original list developed by Wilson, Wiebe, and Hoffmann (2005). We calculate just the percentage of negative words appearing, rather than the difference between the percentages of negative and positive words, and we try the raw number of negative words. The results are consistent no matter the specification. We also use our primary specification but with a 30-day moving average rather than the 7-day moving average we favor, and the results are again consistent. Finally, we subset to only South Korean JMEs in which the U.S. was a participant. There are very few exercises in which the U.S. did not participate, so it is not surprising that the results with this specification are nearly unchanged.

5 Conclusion

What role do JMEs play in the state of tensions on the Korean peninsula? Would limiting or halting U.S.-South Korea JMEs—as some U.S. policy experts and the North Korean

government have recommended—actually be a useful concession for the important foreign policy goal of reducing tensions? If so, when are JMEs most threatening to the North Korean government?

We answer these questions by linking the threat-level and timing of JMEs to the frequency and types of North Korea's responses. To the extent that North Korea perceives JMEs as a legitimate threat, we should observe variations in North Korean responses to exercises based on the threat-level associated with the exercise. In the absence of such variation, we might conclude that North Korea's rhetoric around JMEs is simply part of a regular program of provocation and therefore that cessation or alteration to the U.S.-South Korea exercise schedule would have little effect on North Korea's provocative behavior or the overall level of tensions on the peninsula. Moreover, one might expect JMEs to actually deter provocative behavior. Instead, we find that North Korea is not deterred by exercises, but that it responds with belligerent behavior. Moreover, the intensity of North Korea's responses to JMEs varies systematically with the threat-level posed by those exercises. This suggests that the North Korean government views JMEs as a legitimate threat, one requiring a reciprocal demonstration of resolve.

We outline several ways that specific types of JMEs should be more threatening than others. For example, we suggest that exercises involving large numbers of personnel, field maneuvers, or conventional combat exercises should result in strong responses by an adversary because these types of exercises signal high levels of resolve and capability. Additionally, exercises with greater proximity to the adversary's territory should be considered dangerous to the adversary because they demonstrate rapid deployment capabilities and raise the specter of an attack. We examine the extent to which high-threat exercises, i.e. exercises that demonstrate these characteristics, provoke stronger responses from North Korea than do low-threat exercises.

Our research provides several pathways for how policymakers and military planners can reduce the threat-level of exercises. For example, since exercises closer to North Korea are

perceived as more threatening than distant exercises, one option for military planners is to move exercises off the peninsula. This allows exercises that need to involve other features that can be perceived by North Korea as threatening—such as size, field maneuvers, or high-end equipment—to continue while posing a lower risk of sparking North Korean belligerence. Policymakers can use knowledge of how North Korean threat perception operates vis-á-vis JMEs to balance the features of planned JMEs so they are minimally threatening to North Korea while still enabling the militaries involved to acquire and practice valuable skills. For example, should the U.S. and South Korea need to build interoperability around new high-end equipment, they could choose to do so using an exercise with a small number of personnel. Our research substantiates the idea that North Korea's responses are not only characterized by concerns about its adversaries' military capabilities but also by concerns about their resolve. That is, North Korea should be less concerned about certain types of exercises that demonstrate lower resolve, even if these exercises still build alliance strength or improve military interoperability.

Although our research indicates reasons why scaling back exercises could have advantages for U.S. security interests regarding North Korea, it does not support a complete cessation to U.S.-South Korea JMEs. In fact, this paper demonstrates that exercises are seen as credible signals of military capability and resolve. Used in moderation, exercise can help keep North Korea in check. Moreover, JMEs with South Korea are designed not only to deter North Korea but also to reassure South Korea. However, we find that there are number of possible changes that the U.S. could make to its schedule of JMEs in order to better balance the need to reassure South Korea with the goal of minimizing the risk of North Korean provocations.

The findings presented in this paper suggest that changing the U.S.-South Korean JME schedule has the potential to reduce North Korean provocations, including warnings, threats, cross-border violence, and missile or nuclear tests. These provocations are individually dangerous—for example, cross-border violence has often involved causalities—and they also increase the risk of accidents, miscalculations, or other pathways to conflict escalation. Steps

that could reduce their frequency or intensity, therefore, could be valuable to a number of international actors, including the U.S. and South Korea. Our evidence suggests that JMEs are considered legitimately threatening by North Korea as well as that North Korea's responses to JMEs is proportionate to the threat those JMEs pose. Thus, scaling back JME activity overall or altering the content of JMEs to reduce their threatening nature may be a useful method of managing tensions with North Korea.

Reducing the threat posed by North Korea's nuclear program is a particularly vital foreign policy goal. If North Korea has developed nuclear technology as a response to what it perceives to be a threatening security environment, then reducing North Korean threat perceptions will be a necessary component of any successful plan to curtail its nuclear program. That is not to say that changes to JMEs alone would sufficiently diminish the threat to North Korea. However, decreases to the threat-level or frequency of JMEs could play a role in a broader package of policies designed with this intention.

Overall, South Korean JMEs, particularly those that come closest to practicing large combat scenarios, are significant predictors of increased vitriolic rhetoric, cross-border skirmishes, and missile and nuclear activities on the part of North Korea. Consistent with classic notions of brinkmanship and crisis bargaining, we find that North Korea counters South Korean displays of strength, capability, and resolve with signals of its own. This ebb and flow of exercises that North Korea perceives as threats being met with counter-threats suggests both a rationality on the part of the North Korean leadership and an opportunity to tailor JMEs to shape North Korean threat perceptions and reduce the risk of war on the Korean Peninsula.

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