

Conventional Artillery and Nuclear Missiles in North Korea

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A Game Theory Approach to Credible Threats

There has been much discussion of what a Second Korean War might look like. I think it is misguided. I am just a game theorist with a bit of Japan expertise, not a Korea expert or a military expert, so what I write here might also be misguided. I hope, though, that it starts the real experts--- or even just the real journalists--- to thinking along the lines of game theory. When we think about Korea in 2017, we need to put the Korean War out of our minds and make a fresh start. What's relevant is not the Incheon landing or the Chosin Reservoir, it is the Cuban Missile Crisis and Dr. Strangelove. We are a world like that of the ICBM, the Berlin garrison hostage, and mutually assured destruction.

Thus, only a small part of the military picture in Korea is relevant: North Korean artillery and the almost-ready nuclear missiles. I will show that the artillery is essential to North Korea for defense, but that it could be leveraged to have value for extortion by nuclear missiles. Hence, it is crucial for the United States, South Korea, Japan, and China to eliminate that threat by force or the threat of force.

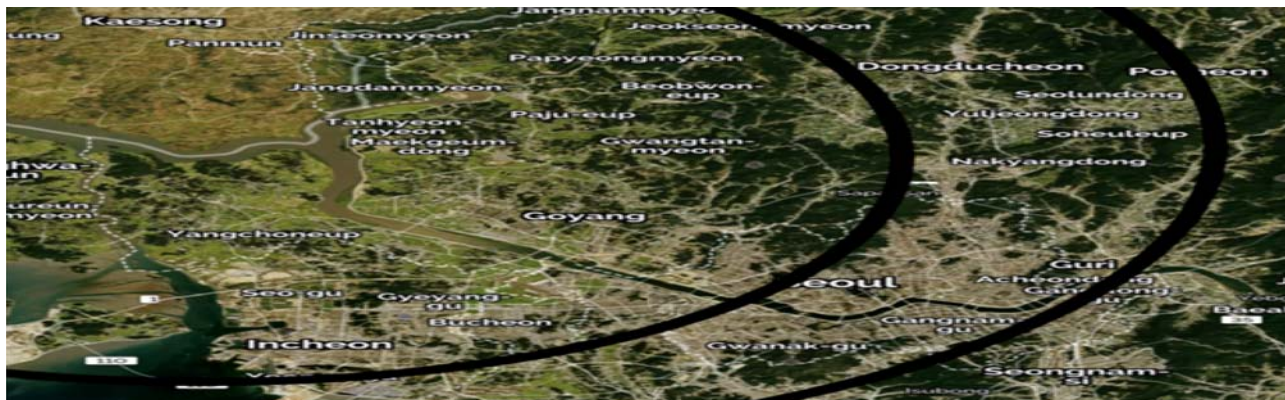
North Korean once was a country that swept away South Korea's army with ease and backed by China fought the United States military to a standstill. Now it



backed by China fought the United States military to a standstill. Now, it is a basket case. The economy is a wreck, the government is corrupt, the leader is a joke, and the citizens are more oppressed than anybody in the world. The army is still large, but nobody thinks it could defeat South Korea, not even if the United States armed forces left. It would be too risky for fragile North Korea to try an invasion, especially since the ideology of revolutionary Communism has slowly changed into the divine monarchy of Kims.



As a result, the North Korean army now has two purposes. One is to enslave North Koreans. The other is to defend against South Korea. Invasion by South Korea is a real threat. Koreans are nationalistic. North Koreans would be happy to invite South Korea to invade if unrest broke out. South Koreans want reunification, despite worrying about the cost. The United States has overthrown governments in Iraq and Libya for outrages against humanity trivial by comparison with North Korea's and has shown it has no qualms about violating national sovereignty in the interest of justice. So North Korea is right to be worried.



Nuclear missiles are good for

deterrence, but before we come to that, let's think about current North Korean strategy. The army cannot defeat an invasion by South Korea (together with the United States--- but I will just say "South Korea" when I mean the Korea-US alliance). What it can do, however, is make the invasion costly. That "Swiss strategy" is easier for North Korea than for Switzerland because Seoul is only about 20 miles from the border. That is within the range of large-calibre artillery. Even if North Korean missiles can be intercepted, and even though its air force could be destroyed at the border, artillery shells can get through.

Thus, North Korea's best strategy is to put 100% of its artillery in the part of North Korea closest to Seoul, the Kaesong salient, and to put 100% of its infantry and armor there to protect the artillery. The function of the artillery is not to protect Pyongyang; it is to kill Seoul civilians. The function of the rest of the army is to protect the artillery briefly while it does its job.

North Korea has 130mm and 170mm guns (5-inch and 7-inch) with ranges of 25 and 35 miles using special "bleeding" or rocket-assisted projectiles. The black arcs on the map show how far they can reach into South Korea. North Korea also has 122mm and 240mm multiple rocket launchers (5- and 9-inch), with about the same two ranges, and 300mm (12-inch) rockets that can reach 120 miles. Sources say that the 300mm rockets alone could hit Seoul with 350 metric tons of explosives in a single volley, about the same amount as 11 B-52 bombers. The 170mm and 240mm weapons in aggregate can fire an astonishing 10,000 rounds per minute. In addition, North Korea has SCUD and home-grown missiles, but although their ranges are longer, they are less numerous, less dependable, and easier to intercept. The artillery is relatively simple, especially because it is like old-style coastal artillery, which could spend years practicing to hit a narrow range of targets in the harbor. The gunners do not have to learn barrage-rolling or infantry communication or how to read topographic maps. The rate of fire and concealment can be honed to perfection.

South Korea is well aware of the Kaesong artillery and has done its best to counter it with fire-spotting technology and missile, air, special operations, and infantry forces to eliminate it. I would be not surprised if every North Korean gun that revealed itself by firing were destroyed within 24 hours. However, 24 hours is too slow. This is not battle, but terror and a terror attack does not have to last an entire day.

Besides defense, though, the North Korean military does have another purpose: to make money. Although it is unlikely the army could be made profitable on net, there are two ways it can help defray its own costs. One is arms sales. As a gangster state, North Korea has nothing to lose by engaging in criminal activities, and the government has no doubt decided that the nation's top talent is better used for that than for industrial production. Such things as drug sales, internet crime, and arms sales to embargoed nations and terrorist groups are more lucrative than exporting shoes and T-shirts.

The army can also make money by extortion. North Korea's army is too weak to engage in plunder by conquest, but it is strong enough to engage in demanding nuisance fees. Would it be worth \$20 billion per year to South Korea to avoid Seoul being bombarded? North Korea could be like the Barbary Pirates of 1800, who were enough of a nuisance to extract a goodly amount of their revenue as protection money, but so poor that that same amount was trivial to the European countries that paid it. The United States, having more principle and less monetary calculation, ironically, than the aristocratic Europeans, proved problematic on the shores of Tripoli and eventually France ended the game by conquering Algeria. However, the Barbary pirates did have a good run for their money.

The problem is making the threat to bombard Seoul credible. The threat is credible if South Korea invades the North. If a South Korean invasion begins, and Kaesong is about to be occupied, North Korea has nothing to lose by destroying Seoul. If South Korea purposely bypasses Kaesong to avoid triggering that response and heads straight for Pyongyang, the Kim regime would see its demise and, again, might as well destroy Seoul and get a bit of revenge. Either way, the threat of bombardment is credible.

On the other hand, if North Korea simply says it will shell Seoul unless \$20 billion is deposited in a certain Swiss bank account, that threat is not credible. If South Korea refuses, and North Korea shells Seoul, South Korea will respond by destroying the guns. Once the guns are gone, South can conquer North without fear of retaliation. North Korea will have almost literally "shot its wad." South Korea may have lost 100,000 people, but that is small comfort for the Kim regime if it loses power. Thus, looking ahead, South can see that North will not retaliate and its \$20 billion demand can be safely refused.

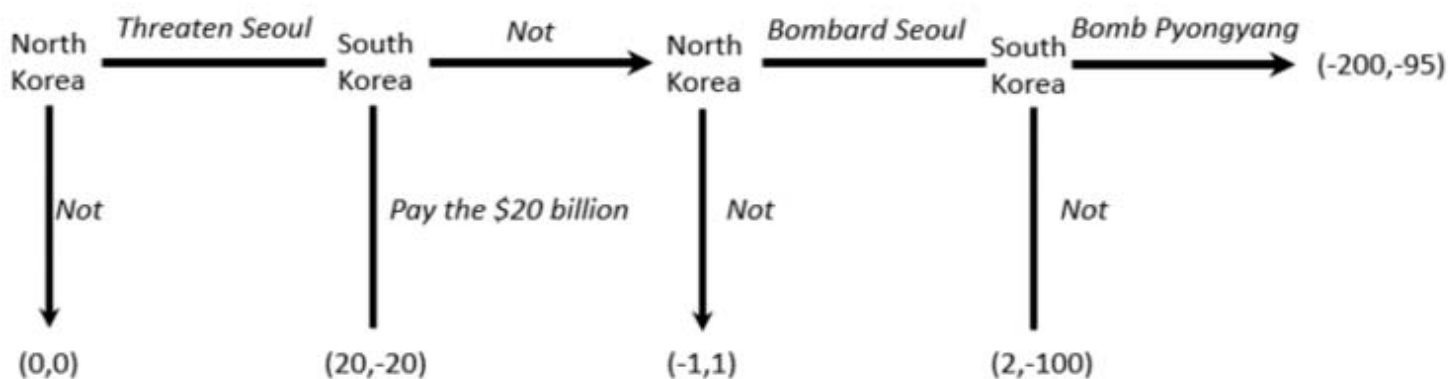


Figure 1: The Game Without Nukes (Payoffs to DPRK, ROK)

Figure 1 depicts the situation as a game theory tree. Working back from the end, a player's best choice at each point in time is indicated by an arrow. The exact payoffs do not matter. Adjust them as you please within what is reasonable, and the results remain the same.

North Korea might imitate the Barbary pirates and makes smaller demands and smaller threats. It could demand \$1

North Korea might imitate the Barbary pirates and make smaller demands and smaller threats. It could demand \$1 million and threaten just 5 minutes of bombardment, and that might work better. I will not go into that analysis. Just note two things. First, it seems that North Korea has not tried this (though if it has tried it, both countries would want to keep the deal secret), which is evidence that it does not think the threat is credible. Second, this strategy is always dangerous, because things can go wrong by accident. A North Korean colonel might bombard for 10 minutes instead of 5, for example, because he gets distracted by a phone message like the accountant envelope-giver at the 2017 Academy Awards, and someone in the South decides this is an invasion, not a 5-minute shelling. The result would be an invasion, and the Kim regime would have lost power, prosperity, and life in an operation with upside potential of just \$1 million, a mere six months of cognac funding.

However, let us turn to missiles and nuclear weapons. The North does not need them for defense against the South. The Kaesong salient artillery is sufficient for that and much cheaper. So what use are nuclear missiles?

First, nuclear missiles would be useful for deterring invasion by China. Northern artillery cannot reach anywhere important in China, and China would not be impressed merely by the threat of killing some thousands of unimportant people near the North Korean border, many of whom would be ethnic Koreans anyway, since many Koreans have always lived on the Chinese side of the border in Manchuria. A missile that could reach Mukden or Beijing, however, would be a threat that was not just credible but painful.

Does North Korea need to fear invasion by China? Yes, but not much. The status quo is good for China. On its border is a militarily weak Korea. Within its border, a small area of Manchuria is inhabited by ethnic Koreans and a large area of Manchuria was part of the Korean kingdom of Koguryo. Getting it back is the theme in some of the TV dramas that are such an important part of the South Korean popular culture. In 2006's *Jumong*, the title character unites factious Korean tribes to fight off Han China and found the Koguryo kingdom; in 2011's *Warrior Baek Dong Su*, the warrior aids a crown prince who valiantly fights against Chinese dominance. I would not be surprised if that TV show were well known in China also since Korean dramas are widely exported.

Modern democracies generally are not revanchist, but that very term recalls that one was--- Third Republic with its resentment for the loss of Alsace-Lorraine. Thus, it is prudent for China to maintain a weak neighboring Korea.

On the other hand, all this depends on the Kim regime preventing internal revolution. The day it becomes clear that the Kim regime might not survive, China will want to act. To prevent a revolution that might merge with South Korea or become equally prosperous on its own, China would need to act and either prop up the Kims or pre-emptively kill them and replace them with a Chinese puppet. A Korean nuclear threat would prevent that.

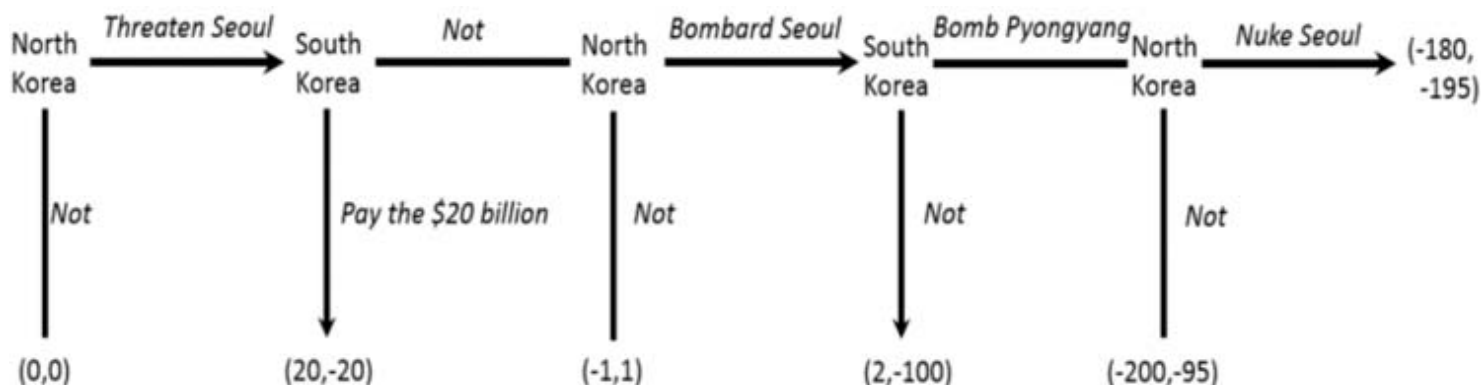


Figure 2: The Game With Nukes (Payoffs to DPRK, ROK)

Such is the first use of nuclear weapons. The second use is for profit. Foreign sales could be lucrative and by themselves make nukes worthwhile. I can imagine any number of Muslim regimes lining up to purchase. In addition, nukes are good for extortion in themselves and a good backup for artillery. Imagine now that Kim has nuclear missiles pointed at Seoul. This changes the game from Figure 1 to Figure 2. There is now a new move at the end, Nuke Seoul or Not. Many of the arrows change, though, because that last move changes everything. Now, if the South

bombs Pyongyang, the North responds by nuking Seoul, a calamity for both but at least yielding revenge for the North. Thus, Seoul will not bomb Pyongyang and its threat to do so evaporates. If its threat to bomb Pyongyang evaporates, North Korea is free to bombard Seoul. Since North Korea now has a credible threat to bombard Seoul, South Korea will pay the \$20 billion, and since South Korea will do that, North Korea will issue the threat that starts the whole process.

The game tree illustrates this by assigning numerical payoffs and putting an arrow on the best move for each player at each decision node.

This is why nuclear weapons matter so much. They would matter even without the Kaeson salient artillery, in fact, because if the North had several reliable nuclear missiles, it could replace the artillery bombardment with one of them, saving the others for retaliatory backup. And North Korea could issue these credible threats not just to South Korea but to China and Japan. It is crucial, of course, that North Korea have good enough missiles as well as nuclear bombs. Possession of just an artillery-fired version of the bomb would merely strengthen the bite of the artillery. What North Korea needs is enough delivery range to keep its nukes safe from an initial rush by the South Koreans or another Kaesong-targeted response such as an American nuclear bomb.

We can extend the game tree still further, though I will not add to the figures. North Korea must first acquire missile-delivered nuclear bombs and demonstrate that they work (or at least have a good shot at it). South Korea, the United States, Japan, and China all want to prevent that. I am surprised that China has not done so with economic sanctions. The reason may be that sanctions would weaken the Kim regime so much that it would fall, and China does not want that, so too strong a sanctions threat is not credible. Japan does not have the military strength to do anything except provide moral support. I do not know about South Korea, but the United States does have the military reach to stop the nuclear program. This could be by bombing its manufacture, or by serious military action against North Korea in the form of bombing or infantry landings. Military action along the border is too risky; it risks accidentally triggering the Kaeson artillery. Seizure of a northern coastal city or bombing of some city or military target other than Pyongyang (again, too much risk of accidental response) would have minimal risk. Moreover, though the U.S. military would be horrified, the risk could be further minimized by announcing the time, date, and target of the attack. This would increase U.S. casualties, but it would be important for preventing a full-scale war.

It is perhaps worthwhile to mention the optimal North Korean response to this credible threat of U.S. attack. North Korea must realize and has realized, as the North Vietnamese did, that America's strong point, our rule of law, is also our weak point. Presidents have four-year terms, limited to two terms. Bombing North Korea is an action with short-run costs and long-run benefits. Thus, if North Korea can persuade the President that it will delay its development of nuclear missiles until his term has finished, the President will be tempted to leave the problem to his successor. Moreover, such a North Korean promise will ordinarily be credible, since North Korea wants to give the current U.S. President as much breathing space as possible. Now that we are in 2017, however, with the weapons well along the way to development, an eight-year horizon may be too long to use that strategy. Our President also is well situated to play what Nixon called the "Madman strategy": pretend to be crazy enough to ignore costs and push ahead with violent responses on every possible occasion---for example, bomb Syria after a minor and possibly staged a gas attack. Indeed, many liberals in America think President Trump is literally insane, as witness the confident declaration of 35 psychologists at Yale. Incomplete information is a big part of the situation, so let us leave it at that for now.

What are we to make of all this? My conclusion is that it would be in North Korea's best interest to develop nuclear missiles, as a source of revenue from arms sales and extortion. The extortion would come from China, South Korea, the United States, and Japan, so it is in their best interest to stop North Korea from developing nuclear missiles. Either China or the United States--- and probably South Korea even without U.S. approval--- could do this by military action. Such action would be in gross violation of North Korea's sovereignty, but nobody in the world would care about that. Which of the three countries should do it? They should all get-together and talk to make sure everyone is on the same page. Which country does it depends on the military ability and domestic political cost, on details that I personally don't know enough about. It should be possible to reach an agreement, however, with appropriate side-payments to compensate whoever has to bear the costs--- with Japan included in the side payments, if not the military strike. North Korea will back down if presented with an ultimatum; if irrationally, it does not, the military solution is straightforward.

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