“Who Needs MacArthur?”: Analyzing South Korea’s Counterinvasion Capability against North Korea

by

Jonghyuk Chung

B.A., Seoul National University (2009)

Submitted to the Department of Political Science in Partial Fulfillment of the Requirements for the Degree of

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ABSTRACT:

Assuming there is another North Korean invasion; could the South Koreans counterinvade North Korea and prevail even without the United States' assistance? This paper studies the possibility of a South Korean counterinvasion against North Korea by looking at the qualitative combat dynamics and performing a formal campaign analyses based on the Korean peninsula’s conventional military balance. This study first analyzes the process of the South Korean defensive against the North Korean invasion, and examines South Korea’s likely counterinvasion scenarios and assesses their chances of success. These scenarios vary based on North Korea’s likely courses of action once its offensive fails, depending on whether the North Koreans retreat to the military demarcation line or hold their position within the South territory.

According to this paper’s analysis, South Korea is capable of counterinvading North Korea in all the scenarios suggested. South Korea possesses a qualitatively superior force with better readiness and logistics powered by a stronger economy, while the North Koreans lack the force effectiveness necessary to carry out their theory of victory. First, the South Korean forces are capable of fending off a North Korean invasion while inflicting severe damage to the North Koreans; second, the South Korean forces would inflict considerable casualty to the North Koreans during their retreat; finally, the South Korean offensive would be capable of breaking through the weakened North Korean defense.

This study makes several contributions. First, it examines the puzzle of South Korean counterinvasion that has been underdiscussed despite its political and strategic significance. In doing so, the study presents an opportunity to explain North Korea’s recent behaviors and the United States’ redefinition of its role involving the peninsula, hence increasing our understanding of the East Asian security dynamics. Second, by providing an updated survey of the peninsula’s conventional balance, this study enhances our knowledge in the two Korea’s strategic capabilities which have undergone considerable changes. Third, this study advances our usage of campaign analyses by applying a phased use of the models with changing parameters. This approach enables us to analyze multi-phased campaigns comprised of different dynamics with better accuracy.

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Title: Ford International Professor of Political Science
I. Introduction

When the North Korean invasion of 1950 failed at the Pusan (Busan) perimeter, Douglas MacArthur decided to counterinvade North Korea and end the war for good. His ambitious northward march ended with a crushing defeat in the winter, and his successors decided to hold the front near the 38th parallel despite the South Korean government's outcry for another counterinvasion. Now, more than 60 years later, could the South Koreans do it by themselves? Assuming there is another North Korean invasion; could the South Koreans thwart the North Korean offensive, and succeed in a counterinvasion by breaking through the North Korean defense even without American reinforcement?

The conventional military balance in the Korean peninsula has been one of the most popular subjects in military campaign analyses – 1.2 million troops, 6,000 tanks, and 14,000 artillery tubes amassed in a mere 250 km front without a proper peace treaty have raised persistent worries of a second Korean War since the very next day after the 1953 armistice. Could South Korea defend itself against the second North Korean invasion? The South Korean public still fears a repeat of 1950. However, according to the analyses of the past decade, the United States-South Korean alliance’s capability to prevail is no longer in doubt. Even more, the security studies field has now reached a tacit agreement that South Korea alone can fend off a North Korean offensive even without U.S. intervention. Ever since South Korea’s military buildup and

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2 Although the Korean War ended with an armistice treaty (休戦), the two Koreas have not signed a peace treaty to this day. Hence to both Koreas, the 1953 armistice is still considered as a temporary ceasefire agreement (休戦). For the South Korean government’s description of the treaty, see Republic of Korea, The 60th Anniversary Commemoration Committee of the Korean War, *Korean War*, http://www.koreanwar60.go.kr/10/2003020500.asp (accessed on August 21st, 2011).

3 In 1994, North Korean official’s threat to make Seoul into a “sea of flame” raised a public fiasco which even led to a hoarding of water and food. In 2004, National Assemblyman Park Jin claimed that “(without the U.S. forces) defense line will break down in 15 days once the North Koreans invade.” His statement led to a prime-time political battle between the ruling and the opposition party.


5 Opinions on South Korea’s independent defensibility differed until mid 1990s, but ever since, almost all published academic analyses in the Korean theatre agreed that South Korea possesses sufficient force power to thwart the North Korean invasion. For details, see Nick Beldecos and Eric Heginbotham, “The Conventional Military Balance in Korea,” *Breakthroughs*, no. Spring (1995): 3-10; Taik Young Hamm, J.J. Suh, and Narushige Michishita, *Bukhan*
North Korea’s economic breakdown, established works on the peninsula’s conventional force balance agree that North Korea is no longer capable of defeating the South Koreans – the foe that it nearly drove into the sea 60 years ago.

There is, however, one important question that has not been discussed. If South Korea stops the North Korean offensive by itself, could it take the next step? Once there is another North Korean invasion, the South Korean government is unlikely to stop with a successful defense and there will be considerations of a counterinvasion to overthrow the Kim regime and reunify the peninsula under Seoul’s control. Despite the existing OPLANs (operation plans) stating counterinvasion as the ultimate objective in case of a North Korean attack, South Korea’s counterinvasion capability remains an underdiscussed subject despite its strategic and political significance. Only a few analyses briefly considered the possibility of a U.S.-South Korea’s joint counterinvasion, but there has been no study on whether the South Koreans could do it alone. Redeployment of the 2nd Infantry Division and the return of the wartime operational control to Seoul mean that the South Koreans no longer can take U.S. support for granted. Then, could South Korea counterinvade North Korea and prevail even without the United States’ assistance?


6 OPLAN are not officially disclosed to the public, but several reports on the current OPLAN have provided a detailed analyses on OPLAN 5026 and OPLAN 5027’s counterinvasion process. On the other hand, these OPLAN technically are American-Korean combined forces doctrines presuming the U.S. control over the wartime operational command. Hence these OPLAN’s cannot be fully applied to this study while we could guess that the independent South Korean counterinvasion would resemble these OPLAN to some degree. For details on the OPLAN 5026 and 5027, see Globalsecurity.org, http://www.globalsecurity.org/military/ops/oplan-5027-3.htm (accessed on August 19th, 2011) The latest analysis of the updated OPLAN has been provided by Hwang’s recent analysis of the possible Korean campaign.(This work is the latest publication on the Korean peninsula’s conventional balance) Il-do Hwang, Kim Jong-il, Gonporul Ssoaolida (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats), KODEF (Korea Defense Forum) Security Series 17 (Seoul: Planet Media, 2009), 221–235.

7 On the possibility of U.S.-South Korea joint counterinvasion, see Joshua M. Epstein, Conventional Force Reductions: A Dynamic Assessment (Brookings Institution Press, 1990); Rossiter, Winning in Korea Without Landmines.; Kaufmann, Assessing the Base Force; Scobell and Sanford, North Korea’s military threat.; The mentioned works differ in the American-South Korean capability to counterinvade North Korea.

8 The United States 2nd Infantry Division (2ID) is undergoing a redeployment process from the military demarcation line (MDL) to Camp Humphreys in Pyungtaek, approximately 100 km below Seoul. Such redeployment is considered as the removal of the USFK (United States Forces Korea)’s “tripwire” function which was expected to trigger the United States’ automatic intervention in case of a North Korean invasion.

9 Since the Korean War, the USFK commander has held the South Korean military’s wartime operational control as the commander of the Combined Forces Command (CFC.) Empowered by this authority, the USFK commander had
Based on the current conventional military balance on the Korean peninsula, this paper studies the possibility of a South Korean counterinvasion against North Korea by looking at the qualitative combat dynamics and performing a formal campaign analyses. The analysis proceeds in the following steps. First, the paper analyzes the process of the South Korean defensive against the North Korean invasion. As the established literatures in the field agree, the North Korean offensive is almost certain to fail. But what matters in this stage is the amount of damage that both sides would suffer before they move on to the next phase of the war.

Then the paper analyzes South Korea’s likely counterinvasion scenarios and assesses their chance of success. These scenarios vary based on North Korea’s probable courses of action once its offensive fails. In this paper, I suggest two major scenarios based on each side’s military doctrines, assets, and historical precedents.

In the first scenario, counterinvasion begins with North Korea’s retreat and South Korea’s pursuit. I assume that the North Korean forces would retreat toward their current defense line above the demilitarized zone (DMZ). This stage analyzes the amount of damage that the South Korean pursuit could inflict before the North’s Korean People’s Army (KPA) return to its fortified position in the military demarcation line (MDL).

The pursuit is followed by South Korea’s actual counterinvasion. Based on the remaining (and reinforced) force level from the two previous phases, this phase evaluates the possibility of South Korean breakthrough toward Pyongyang against the North Korean defense at the military demarcation line.

The second scenario presumes North Korea to hold its position once its offensive fails. Instead of retreating to North Korea, the KPA establishes its defense line at the advance point in the South Korean territory. The counterinvasion’s success depends on whether the South Korean counteroffensive could pierce this defense.

According to my analysis, South Korea is capable of counterinvading North Korea in all the scenarios suggested. This paper’s conclusion is in three parts. First, the South Korean forces are

the command authority of all allied forces in the peninsula in case of a war (even exceeding the authority of the South Korean president). This authority has been subject to fierce public debates for many years as the opponents saw it as a major breach of the South Korean sovereignty while the supporters justified it as a mean to tie down the American commitment to the peninsula. The wartime operational control is scheduled to be returned to the South Korean military in a few years, but the explicit timetable is still under doubt. For details, see In-moon Chung, “Misunderstandings on the Transfer of Wartime Operational Control,” Nautilus Institute, n.d., http://www.nautilus.org/publications/essays/napsnet/forum/security/0671Moon.html. (accessed on August 22nd, 2011)
capable of fending off a North Korean invasion while inflicting severe damage to the North Koreans; second, the South Korean forces would inflict considerable casualty to the North Koreans during their retreat; and finally, the South Korean offensive would be capable of breaking through the North Korean defense.

Breakdown of the North Korean defense may not be synonymous with the capture of Pyongyang or the instant end of the Kim regime, but several experts and military officers agree that collapsing the North Korean defense would ensure the capture of Pyongyang and North Korea’s eventual defeat. Several factors contribute to this reasoning, such as North Korea’s inability to fight a long war, its excessive concentration of forces on the front, the short distance between the front and Pyongyang, and the regime’s excessive political and economic dependence on Pyongyang. This paper’s focus on the breakdown of forward defenses could be debated in further studies. Even so, there is no doubt that the breakdown alone would be a significant advantage to the South Korean forces by inflicting heavy damage to the North Korean forces whose ability to replenish fighting power is severely limited.

As all wars are unique and comprised of ever-changing dynamics, an accurate prediction of a war’s dynamics and outcome may be an impossible mission. Nonetheless, the field of security studies has developed several methods ranging from qualitative analysis to formal modeling in order to analyze the campaigns. Combined with a deep understanding of the campaign and the combatants, those methods could be a powerful tool to simulate the war’s process and results to a considerable degree. Even if those estimates may not be a perfect prediction, they would still be a contribution to our knowledge in the campaign and the security dynamics involved.

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10 Hwang, Kim Jong-il, Gonporul Ssoaloalida (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats), 220–224.
11 The Kim regime’s dependence on Pyongyang is quite significant. Not only it is the regime’s capital, it is considered as the hub of military communication, logistics, and mobilization and also the only place capable of performing those functions due to an underdevelopment of North Korean infrastructure and nationwide highway network. Moreover, Pyongyang is the regime’s key political asset as only the members of the “core class (핵심계층: consisted of party members, military officers, descendents of anti-Japan independence movement fighters)” are allowed to reside. It is also known that the “discontent class” (불만계층: normally consisted of political dissidents and descendents of capitalist class) cannot receive a permit to live in the city. For Pyongyang’s value to the regime, see Sung-jang Jeong, Hyundae Bookhanui Jungchi: Yuksa Inium Gwonryuckchegye (Politics of Contemporary North Korea: History, Ideology, and Political System) (Seoul: Hanwool Academy, 2011), 308–310.
12 This analysis predicts that North Korea would lose approximately 67.5 armored division equivalents (ADE) among the fully mobilized (standing forces + reserves) forces of 73.1 ADE throughout the entire process. For the detailed simulation results, see appendix. For the ADE count of the South Korean and North Korean standing army, see Table 4. Detailed explanation of the formal analyses, the concept of ADE and the limitations of the North Korean economy will be provided in the later sections as well.
To elaborate the result of my analysis, this paper relies on several campaign analysis methods developed by the field of security studies. First, the paper provides a historical perspective highlighting the differences between the counterinvasion attempts during the Korean War and those that could occur in a future conflict, examining the how the balance has changed and how it would affect South Korea’s chance of success.

Second, I discuss the campaign’s general characteristics by analyzing the current balance between the South and North Korean conventional forces, alongside an analysis of the combat terrain and the two Korea’s economic potential to support the war.

Finally, the paper moves onto the campaign analysis of the two possible counterinvasion scenarios. The analysis proceeds in three parts, each part presenting the analysis of 1) defense, 2) pursuit (in case North Korea chooses to retreat), and 3) the counterinvasion phase by explaining the qualitative combat dynamics and running computer simulations of the combat results based on a formal modeling.

The overall counterinvasion is a multi-phased campaign, comprised of complex dynamics within and among phases. (For example, even within the single phase of the North Korean invasion, the combat dynamics during and after a surprise would be very much different.) This characteristic requires us to comprehend those complexities while refraining from uniformly applying a single approach throughout the phases.

To resolve this issue, this paper applies a phased use of formal models with changing parameters while providing a detailed analysis in the qualitative changes within each phase’s combat dynamics.\(^\text{13}\)

Even under a range of assumptions favoring North Korea, the overall analysis indicates that South Korea is likely to succeed in a counterinvasion against the North.

II. Historical Perspectives

South Korea’s counterinvasion in the Korean theatre would be composed mainly of three stages: initial defense, pursuit of the retreating enemy (if it chooses to retreat), and the counteroffensive

\(^{13}\) Detailed treatments and change of parameters are provided will be discussed in later sections. For summaries on each phase’s parameter assignments and their changes within the phases, see List 1, 2, 3, and 4.
against the North Korean defense. Hence the counterinvasion’s success will be evaluated on the South Korean forces’ capability to 1) fend off the North Korean offensive while minimizing its own damage and inflicting maximum damage to the enemy, 2) inflict maximum damage to the retreating North Korean forces during pursuit, and 3) breakthrough the North Korean defense in the most effective way. Then, how would the counterinvasion proceed in the Korean theatre and what conditions would affect each stage’s chance of success? One of the most productive methods to approach this question is to gain insights from the historical background, by comparing the current tactical environment with the historical cases and identifying the conditions that would strengthen or weaken the counterinvasion’s prospect.

This section provides a historical analogy of the two counterinvasion attempts during the Korean War and compares the main differences with the current operational environment. The UN forces’ counterinvasion during September 1950 was an astounding success, deemed one of the most successful counteroffensives in modern military history. The 1951 spring counteroffensive’s result was rather moderate, succeeding in repelling the Chinese-North Korean forces above the 38th parallel but refraining from the actual counterinvasion. Then the relevant question becomes whether the South Korean forces, without the U.S. support, could repeat the dramatic successes in 1950 while overcoming the obstacles that hindered the counterinvasion in 1951.

The UN forces’ first success came when North Korea’s September offensive against the Busan Perimeter (120 km above Busan) failed, while MacArthur’s Inchon landing operation (Operation Chromite) severed the lines of communication (LOC) from the North. On September 16 the UN forces launched their counteroffensive from all sectors of the perimeter. KPA front commander Kim Chaek attempted to hold the line, but on September 23 he concluded that the defense was impossible and ordered a full retreat. However, the UN forces’ breakout offensive from the

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14 The course of counterinvasion can vary depending on the operational environment. MacArthur’s counterinvasion was coupled with a major amphibious operation in order to sever the enemy’s line of communication followed by an enveloping attempt. China’s counterinvasion during the winter of 1950 was initiated with the concealment of massive infantry, followed by a surprise attack and a major offensive. For the detailed description of the two operations, see Roy E. Appleman, *South to the Nakdong, North to the Yalu (June-November 1950)* (Dept. of the Army, 1998); Clay Blair Jr., *The Forgotten War: America in Korea, 1950-1953* (Naval Institute Press, 2003); Byung Joon Chung, *Hankuk Junjaeng (Korean War)* (Seoul: Dolbaegae, 2006); Tae Gyun Park, *Hankuk Junjaeng (Korean War)* (Seoul: Chaegkwahamgga, 2005).

15 MacArthur was even praised as the “God of Military (Gunshin: 軍神)” to a number of South Koreans. Chung, *Hankuk Junjaeng (Korean War)*, 132.
perimeter coupled with the enveloping operation from Inchon literally annihilated the retreating NK forces. Consistent battlefield air interdiction (BAI) and cutoff of the LOC led to the complete breakdown of KPA discipline and logistics.\(^{16}\) Approximately a week after the initial counteroffensive, the North Korean command structure collapsed.\(^{17}\) Records tell that even the high-ranking officers discarded their uniforms and abandoned their units.\(^{18}\) Among the 150,000 North Korean forces that crossed the 38th parallel in June, only 25,000 survived and retreated to the North Korean territory.\(^{19}\)

After a week of replenishment, the UN forces initiated its counterinvasion on October 9 and met almost no resistance at the 38th parallel as the entire North Korean military was near total destruction. The counterinvasion was a remarkable success, reaching an astounding advance rate of 18km per day before the Chinese offensive in late October thwarted the entire process.\(^{20}\)\(^{21}\)

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\(^{16}\) Battlefield Air Interdiction (BAI) is defined as an air-to-surface attack focused on delaying or impeding the movement of tactical and operational reserves toward or in the vicinity of the battlefield. Barry R. Posen, *Inadvertent Escalation: Conventional War and Nuclear Risks* (Cornell University Press, 1992), 44.

\(^{17}\) Park, *Hankuk Junjaeng (Korean War)*, 181.

\(^{18}\) Republic of Korea Military Academy, *HangukJunjaengsa Budo (Appendix to the History of the Korean War)* (Seoul: Republic of Korea Military Academy, 2000), 341.

\(^{19}\) The size of North Korean casualty is estimated to be even larger as the KPA continued to mobilize its rear forces and militias throughout its offensive. Park, *Hankuk Junjaeng (Korean War)*, 221.


\(^{21}\) An advance rate of 18km per day is considered quite astounding even among the historical cases. According to Jeffrey Record's analysis of the Blitzkrieg, the German Panzer Corps (1st, 2nd and 10th Panzer Divisions) recorded a 6km per day advance rate during their breakthrough of the French defense line near Sedan. Jeffrey Record, “Armored Advance Rates: A Historical Inquiry,” *Military Review* 53, no. 9 (1973): 64. Cited from Posen, *Inadvertent Escalation*, 121.
After the devastating defeat in the "Coldest Winter" and the second loss of Seoul, the UN forces initiated their second counteroffensive on February 5, 1951. The UN forces' air superiority was the operation's key element while the ground offensive gradually proceeded in a

Map 1. The UN First Counteroffensive and the Chinese Winter Offensive (1950)  

relative sense. The UN forces were able to advance 51 km in 13 days, reaching the southern tributary of the Han River 10 km away from Seoul. After fending off the Chinese ‘Fourth Phase Offensive’ in mid-February, the UN forces began the second stage of the counteroffensive. After 14 days of fighting, the UN forces advanced 50 km and recaptured Seoul, establishing the “Phase Line Kansas” around the 38th parallel which became the line of attrition warfare for the next two years. It is widely believed that the UN forces had sufficient power to break through the Chinese forces and capture Pyongyang once more. However, the risk of escalation and casualties to follow restrained the UN forces from the actual counterinvasion attempt. General Paik Sun-yup, South Korean Chief of the General Staffs, recalled in his memoir that General James Van Fleet (Commander of the US 8th Army) concurred that Pyongyang could be taken but the accomplishment was not worth the risk.

24 Bernard Brodie criticizes the decision to halt as “(the UN forces) unquestionably had the forces to execute (the offensive) plan,” and there was “no doubt that the Communist forces were ripe for destruction.” For details, see Bernard Brodie, *War and Politics*, 1st ed. (Longman, 1974), 92–95. Eliot Cohen shares Brodie’s opinion as he argues “…little could have stopped (the allied troops) from retaking Pyongyang and indeed driving back to Yalu.” Eliot A Cohen, *Military Misfortunes: The Anatomy of Failure in War* (Free Press, 2005), 189.
Compared to the Korean War, the current operational environment has a few characteristics that would make the counterinvasion a more difficult task. First, it would be difficult to inflict as much damage as in 1950 during the pursuit – not because the South Korean force has become weaker, but ironically, because it has become stronger. The KPA’s dramatic success in their initial blitzkrieg enabled them to advance 350 km below the 38th parallel in 21 days. The distance was astounding, but it also meant that the KPA had to cover the same distance during its retreat while being exposed to the UN force’s pursuit and air-to-surface attacks. But now, it is unrealistic to assume that the North Koreans would repeat a similar success against the strengthened South Korean defense. Even the most pessimistic South Korean analysis predicts

Map 2. The UN Second Counteroffensive (1951)


that the North Korean surprise would soon turn into a war of attrition. This change lessens the prospect of a North Korean offensive’s success. However, it also reduces the distance that the KPA has to retreat once its offensive fails. In 1950 the Inchon landing severed the North Korean lines of communication while enveloping their forces, but the shortened distance of the North Korean advance would lessen the possibility of such an operation as well.

Second, counterinvasion would be more difficult as the North Korean defense has increased in density compared to 1950. After the devastating defeat in September, the North Koreans did not have the force strength to stall the UN forces’ northward advance. There basically was no resistance in the North until the Chinese forces launched their deadly surprise in the winter. In contrast, the North Koreans now possess 1.02 million active forces alongside 600,000 armed reserves and 5.7 million paramilitary troops. The KPA is likely to suffer heavy casualties after its offensive fails. Nevertheless, they would have enough force strength to deploy 1 Armored Division Equivalents (ADE) per 25km in the main corridors of battle as recommended by Mearsheimer and Posen.

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28 Hamm and Suh’s simulation based on the Epstein Model estimates that even the worst case scenario for the South Koreans would take at least 30 days before the collapse of the South Korean defense. Hamm, Suh, and Michishita, Bukhan Gunsamjewi Jeajomyung (The Military of North Korea: A New Look), 5:379–383.
29 Density is one of the key elements of a successful defense, as a sparsely distributed defense allows the attacker to pierce the vacuums within the defense line. Once a hole is breached, the offensive exploits the hole and envelops the defense line from the rear, leading to the collapse of the entire front. The Korean War would be a representative example as the South Korean forces lacked sufficient manpower to populate the entire front. The sparsely distributed South Korean forces did not have the depth to withstand the North Korean assault or fill the hole among the defense lines. In contrast, a dense defense could withstand the impact of an enemy assault by creating a “kill zone” from various directions while denying a breach that the attacker could exploit. Hence one of the foremost tasks for the defender is to mobilize enough manpower to populate the front and establish a dense defense. Combined with the concept of force-to-space constraint, a dense defense allows the defender to thwart the assault of even a numerically superior foe.
31 The Armored Division Equivalent or ADE, is a measure devised by the U.S. Department of Defense that reflects the firepower, mobility, and protection of each force. Although there is no universal agreement on the best measures of relative combat power, the ADE has been the most popular measure and has been frequently used in many military campaign analyses. The ADE formula relies upon the methodologies known as the Weapons Effectiveness Index (WEI) and the Weighted Unit Value (WUV). A WEI represents a score relative to a set standard for each category of weapons. For example, a Soviet T-62 tank registered a1.03 against the U.S. built M-60AI tank. Multiplying the number of weapons by its WEI score and a set category weight produces its WUV score. Adding the WUV total for all weapons and dividing it by a set number produces its ADE total. A 1976 U.S. armored division served as the original baseline and numbered 47,490 WUVs. However, this study uses Charles Kupchan’s figure of 48,586 WUVs as the baseline. The ADE has several weaknesses that fail to comprehend the reality of warfare and those limitations will be discussed in the following sections to increase this paper’s validity. For this particular
On the other hand, there have been several changes that would enhance the possibility of South Korean counterinvasion, especially compared to the case of 1951. First, the overall strengthening of the South Korean forces increases the chance of success during the defense (the first phase of the counterinvasion process) inflicting severe damage to the North Korean offensive. The South Korean forces' force density in the defensive line has increased approximately 3 times compared to 1950 in raw numbers, not to mention the dramatic improvement in their quality and firepower. In 1950 the North Koreans ruptured the South Korean defense in a mere three-day campaign with only 5,200 killed in action. But when the UN forces established their defense line in 1951, the Chinese offensive had to suffer a devastating 10:1 force exchange ratio in favor of the defenders. Against the dense and qualitatively superior South Korean defense, the North Korean offensive is almost certain to suffer substantial damage. The North Korean doctrine is based on the belief that it has to invest its entire resources in the initial offensive. Hence the failure of such an offensive, alongside high casualties, would seriously degrade North Korea’s defense capability against the subsequent phases of the South Korean counterinvasion.

<table>
<thead>
<tr>
<th></th>
<th>North Korea (DPRK)</th>
<th>South Korea (ROK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manpower</td>
<td>198,830</td>
<td>105,751</td>
</tr>
<tr>
<td>Tanks</td>
<td>242 T-34</td>
<td>0</td>
</tr>
<tr>
<td>Artillery</td>
<td>552 howitzers; 1,728 mortars</td>
<td>91 howitzers; 960 mortars (0 self-propelled artillery)</td>
</tr>
<tr>
<td>Air Power</td>
<td>220 Mig-15</td>
<td>22 training aircraft (0 fighters)</td>
</tr>
</tbody>
</table>

*Table 1. The Conventional Balance at the Korean War’s Outbreak* (For the current conventional balance, see Table 3 and 4)

<table>
<thead>
<tr>
<th></th>
<th>North Korea (DPRK)</th>
<th>South Korea (ROK)</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Munsan</td>
<td>21,000</td>
<td>9,715</td>
<td>2.2:1</td>
</tr>
<tr>
<td>Cholwon-Uijeongbu</td>
<td>32,000</td>
<td>4,500</td>
<td>7.1:1</td>
</tr>
<tr>
<td>Hongchun</td>
<td>36,938</td>
<td>9,112</td>
<td>4.1:1</td>
</tr>
</tbody>
</table>


32 Beldecos and Heginbotham report that South Korean forces were able to deploy only one division per 58km in 1950. Beldecos and Heginbotham, “The Conventional Military Balance in Korea.”

33 Ibid., 2.


Table 2. The Force Deployment Ratios in the North Korean Main Avenues of Approach

<table>
<thead>
<tr>
<th>Area</th>
<th>North Korean</th>
<th>South Korean</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Coast</td>
<td>17,000</td>
<td>6,866</td>
<td>2.5:1</td>
</tr>
</tbody>
</table>

Second, although the North Korean retreat (the counterinvasion’s second phase) may have become less difficult, nonetheless it is not an easy task. While retreating, the KPA will be exposed to the South Korean air force’s relentless battlefield air interdiction (BAI). In 1950, South Korean air power did not even exist while the UN forces deployed approximately 170 aircraft for BAI and air interdiction (AI). Now South Korea possesses 467 fighters and 60 attack helicopters capable of BAI missions during the pursuit. Not to mention the South Korean air force’s increase in sheer numbers, the modern aircraft have shown revolutionary improvements in every factor of air-to-ground operations such as sortie rates, kill rates per sortie, survival rates, and readiness. Retreating KPA would have less distance to cover, but this advantage would be partially neutralized by the dramatically increased BAI effectiveness from the South Korean air force.

The pursuit will be further strengthened by the improvements in South Korean ground forces’ combat effectiveness. In 1950 and 1951 the UN force’s pursuit was hindered by the mountainous terrain and armored forces’ limited night operation capability. Today the increased mobility of the armored forces, improvements in artillery range, and an overall increase in the night operation capability would empower South Korea’s combat strength against the retreating North Koreans.

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36 Sangmun Seo, 6.25 Junjaengsa (History of the Korean War) (Seoul: Republic of Korea, Institute of Military History, 2005), 123–130.
37 Chung, Hankuk Junjaeng (Korean War), 71–73.
38 Estimate of the South Korean helicopters vary, as the International Institute for Security Studies (IISS) suggests 424 while the South Korean Ministry of Defense suggests 680. It is also unclear as how many of them are capable of air-to-surface attack missions. 60 AH-1J/1F Cobras are specifically categorized as “attack helicopters,” but it is also reported that a considerable portion of multirole and transport helicopters are modified (such as being equipped with TOW antitank missiles) to carry out air-to-surface attacks.
39 The limited night operation capability of the armored forces was a serious hindrance to the UN force’s first counteroffensive. Paik Sun-Yup recalls his conversation with a U.S. officer (name unspecified in Paik’s memoir) who refused to operate the tanks during the night, “(the U.S. officer told me that) a tank may be a tiger during the day but it turns into a cat during the night.” In response, Paik ordered his South Korean infantry to advance during the night risking the absence of the armored support.
40 Air Interdiction (AI) is defined as an air-to-surface operations focused on delaying the movement of large numbers of reinforcements and supplies to the battle area, frequently involving attacks against enemy lines of communication. For details, see Posen, Inadvertent Escalation, 45.
Third, there are changes that would strengthen the prospect of the South Korean counteroffensive against the North Korean defense (the counterinvasion’s third phase). First of all, the quality disparity between the South and North Korean forces has widened significantly. Experts and military officers agree that the quality difference between the current South and North Korean forces is even wider than the difference between the UN forces and the KPA during the Korean War. At the war’s outbreak the KPA was one of the few advanced forces in the world, possessing a full suite of modern Soviet weapons including the newest versions of the T-34 and Mig-15 while the South Korean forces had literally no means to destroy the North Korean tanks or fighters (see Table 1.) Even the U.S. forces had to struggle against the North Koreans at the initial phase of the war. At the Battle of Taejon (Daejon) the North Koreans showed an impressive maneuver against the U.S. 24th Infantry Division, destroying 65% of the division’s equipment and capturing Major General William Dean. Even as thoughtful a military chronicler as Eliot Cohen described the North Koreans as a “...tough, brutal, and well-equipped” force that the “fighting American soldiers watched in disbelief.”


The South Korean forces had a number of 57 mm anti-tank guns and 2.36 inch rockets, but those were virtually useless against the North Korean tanks. According to Park, the only effective countermeasure was a suicide attack: to climb up the tank and pitch a grenade or a Molotov Cocktail inside. The South Korean anti-air capability was even worse, not possessing a single fighter or an effective anti-air gun. Park, Hankuk Junjaeng (Korean War), 74. Another point worth mentioning is the North Korean force’s combat experience at that time. In February 1950, Kim Il-sung and Mao Zedong made a secret agreement to transfer the PLA’s Korean soldiers to the North Korean ground forces. In contrast to the South Korean forces devoid of an actual combat experience, the North Korean 12th and 4th Division was mostly consisted of the elite Korean soldiers who participated in the Chinese Communist Party’s war against the Kuomintang. The North Korean commanders such as Moo Jung, Bang Ho-san, and Lee Gwon-mu were also renowned generals in the PLA, and the Soviet advisors considered their command capability far superior to Kim Il-sung or Kim Chaek. For details, see Myung-soon Chang, Bukhangunsayeongu (A Study of the North Korean Military) (Seoul: Palbokwon, 1999), Ch.1; Hamm, Suh, and Michishita, Bukhan Gunsamunjeewi Jaejomyung (The Military of North Korea: A New Look), 5:85–90. Chen Jian, “In the Name of Revolution: China’s Road to the Korean War Revisited” in William Stueck(ed.), the Korean War in World History (Lexington: Kentucky: The University of Kentucky, 2004) 93-125.

However, according to the recent report on the Korean peninsula’s military balance, North Korean force quality and readiness “fell to the ground,” and this quality difference would have a significant effect on the actual combats. In the Korean theatre, the main avenues of approach are limited to three corridors that are 50km wide at the most. Force-to-space constraints become evident in this kind of terrain, and the defensive force could limit the enemy’s offensive with a limited number of forces. Against a fortified enemy in a narrow corridor, the offensive’s success depends on deriving a favorable force-to-force exchange ratio. This is where the quality of both forces becomes an essential element, as the offense’s quality superiority can offset the typical advantage given to the defense forces such as concealed position, fortification, and effective logistics. Even the renowned Chinese offensive in the winter of 1950 suffered an exchange ratio of 3:1 in favor of the UN forces, and its second offensive in the spring experienced a devastating figure of 10:1. But the UN forces’ following offensive in the spring showed an approximate exchange ratio of 1:2.5 in the offense’s favor. If this quality gap has widened, the South Korean counterinvasion’s chance of success would increase even further.

Fourth, the gap between the two sides’ ability to sustain a long war is another overarching difference worth mentioning. Success of a counterinvasion depends largely on maintaining a stable flow of supply and reinforcement within the enemy territory, and this is where a state’s capability to fight a long war matters. In 1950, the North Korean GDP was 32% larger than that of the South and the population was just about equal. North Korea was able to sustain the war for three years with its own resources, but South Korea’s wartime economy was sustained by massive American economic aid. More troublesome was the lack of an industrial base to support

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48 This ratio has been estimated based on the casualty records from Appleman, South to the Naktong, North to the Yalu (June-November 1950); Blair Jr., The Forgotten War; Beldecos and Heginbotham, “The Conventional Military Balance in Korea”; Chung, Hankuk Junjaeng (Korean War); Park, Hankuk Junjaeng (Korean War). For the most detailed casualty records on the Korean War, see Republic of Korea Military Academy, Hangukjunjaengsa Budo (Appendix to the History of the Korean War), Ch.3.
49 Chung, Hankuk Junjaeng (Korean War), 241.
50 While China provided substantial military support, their economic support was constrained to its own forces. Republic of Korea Military Academy, Hangukjunjaengsa Budo (Appendix to the History of the Korean War), 87.
the war. The UN forces had to suffer a severe ammunition shortage during the counterinvasion as most ammunition had to be shipped from Japan or the United States then transported all the way from Busan to the North. Even more, South Korea did not have any proper highway networks at that time.

Now the situation has changed to quite the opposite. Definitive economic data on North Korea is not available, but most reports agree that the South Korean economy exceeds the size of the North by at least forty times with a population twice the size of the North Koreans (see Table 6.) This striking gap leads to the two sides' difference in their ability to endure a long war. Even if North Korea’s surviving forces could establish a dense defensive line, the endurance of that defensive line remains in doubt. Even in the mid-90s, general consensus was that 30 to 90 days is the limit at which the North Korean economy could support an all-out war within its doctrine. Having suffered the famine, economic isolation and monetary collapse, the current North Korean economy is deemed to be in much worse shape. In the Korean War, a static war of attrition did not work to either side’s advantage. However, in the current operational environment, a stalemate is likely to favor the South Koreans. Even if their initial breakthrough attempt fails, the South Koreans can choose to wear down the North Korean defense until they could find a rupture to exploit.

To summarize, the various changes in the operational environment are unlikely to neutralize the South Korean capability to counterinvade North Korea. The shortened distance of retreat would lessen the amount of KPA casualties and it would establish a denser defense against counterinvasion. Nonetheless several improvements in South Korea’s combat strength, alongside the widening gap in economic power, raise the possibility of a successful counterinvasion. Compared to the Korean War, the initial stage of defense would play out to South Korea’s favor. The stage of pursuit-retreat and counteroffensive should go through an intensive campaign analysis to assess the impact of these changes.

51 Park, Hankuk Junjaeng (Korean War), 67.
III. Characteristics of the Campaign: Terrain and Fighting Forces

Before moving onto the actual campaign analysis of defense, pursuit, and counteroffensive, it is necessary to examine the factors that will define the setting of the actual campaign. For such purpose, this section analyzes the physical characteristics of the operational environment and the strength of both fighting forces without an outside intervention. This approach enables us to understand the constraints given to both sides and how they would operate the available assets under those constraints. How would the terrain affect the campaign; what assets does each side have, and by what kind of doctrines would the two Koreas operate those assets?

III-1. Terrain

The North Korean terrain has been relatively underdiscussed as previous works were more focused on the South Korean defensive capabilities. Nevertheless, there is less need to separate the terrain of the defensive and counterinvasion campaigns. Shared approach avenues linking the two capitals, narrow and short theatre, almost identical terrain features above and below the DMZ, and relatively short distance between the front and Pyongyang (125km) constrain the combatants to share the same terrain features and attack corridors throughout the counterinvasion process (defense, pursuit, and counteroffensive).

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54 This study assumes the allied states such as the United States or China as an uninvolved third party. In this study, other states do not provide military support; C4ISR assistance; weapons lend-lease; or any kind of aid. The South and North Korea could import weapons or other goods with hard currency (which would amplify South Korea’s economic advantage,) but this option is likely to matter less considering the estimated length of the war. (According to this analysis’ simulation, the war is likely to end within two months at the most. For the estimated timetable, see Appendix.)

55 The distance in straight line between the DMZ and Seoul is approximately 40km. The length of the attack corridors range between 47 km and 50km.
The Korean terrain generally favors the defender, especially by hindering the offense force’s movement and providing covers for the defenders. Mountains cover approximately 70% of the peninsula, and three mountain ranges converge near the DMZ. Ridge lines and hills provide cover from direct fire and ground observation. Complex relief systems, rivers, and numerous rice

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paddies impede the movement of the offensive force as well.\textsuperscript{57} According to Ralph Clough, the Korean terrain hinders both the attacker and defender while relatively favoring the defender. The defender, for its part, confronts terrain that slows the lateral movement of reinforcements and supplies. The attacker, on the other hand, must travel along three predictable and relatively narrow corridors.\textsuperscript{58} The geographical advantage becomes unclear in the pursuit phase as both sides' movement and logistics would be impeded. The retreating forces are likely to suffer in movement as they would avoid exposed corridors in order to lessen the effectiveness of air-to-surface attacks. From the pursuing force’s perspective, mountainous terrain will increase the risk of an enemy ambush, thereby lessening the speed of pursuit. However, such danger would be lessened if the pursuing forces possess adequate C4ISR (Command, Control, Communications, Computer, Information, Surveillance, and Reconnaissance) capability to detect and avoid the enemy surprise.\textsuperscript{59} In 1950 the PLA was able to surround the UN forces without being detected, but a massive ambush of such size is unlikely to be repeated considering the development in C4ISR capability.\textsuperscript{60}

Attack corridors’ limited number and width further complicates the mobility problem. The military demarcation line is 250km long (about one-third of the central European front during the

\textsuperscript{57} Cold winter weather could make the advance easier by freezing the rivers and rice paddies, but it will also increase the POL (petroleum, oil, lubricant) burden especially to the North Korean war economy suffering from energy shortages. For details on the North Korean military’s energy demand and supply, see David von Hippel, “Estimated DPRK Energy Use: Analytical Approach and Draft Updated Results” (presented at the DPRK Energy Expert Study Group Meeting, Stanford University, California, June 26-27); David von Hippel, An Estimate of Energy Use in the Armed Forces of the Democratic People’s Republic of Korea (San Francisco: Nautilus Institute for Security and Sustainable Development, 1997).


\textsuperscript{59} C4ISR is a term used by the United States military to represent the group of military functions involving the overall operation coordination. The term was derived from C2(Command and Control,) adding several functions necessary for an effective operations coordination. Command and control refers to the ability of military commanders to direct forces. The addition of communications to the grouping reflects the fact that communications is required to enable this coordination. In modern warfare, computers are also a key component to execute the overall process. ISR stands for Intelligence (information gathering), surveillance, and reconnaissance. The term generally describes methods of observing the enemy and one's area of operations. A military’s C4ISR effectiveness is now considered as the key element of the modern warfare. For a detailed explanation on the term, see Elinor C. Sloan, Security and Defence in the Terrorist Era: Canada and the United States Homeland (Foreign Policy, Security, & Strategic Studies), 2nd ed. (McGill-Queens University Press, 2010), Ch.7.

\textsuperscript{60} The 8th Army was already surrounded by the PLA at the moment of the Chinese “Second Phase Offensive,” but the UN command had no clear information on the PLA’s actual size and deployment until the offensive. Douglas MacArthur and Edward Almond (commander of the 8th Army) were aware of the Chinese presence, but they considered the Chinese forces to be small in size while lacking information on the Chinese intention. Chung, Hankuk Junjaeng (Korean War), 148-150. For a detailed historical analysis of the Chinese surprise and the UN force’s defeat, see David Halberstam, The Coldest Winter: America and the Korean War, 1st ed. (Hyperion, 2007). With the assistance of a high-altitude and satellite intelligence available to the South Korean forces, an ambush of that size and lethality is likely to be detected in prior.
Cold War), but provides only three narrow corridors of attack suitable for armored and mechanized units. The three primary routes are the Cholwon and Munsan corridors in the west that connect Seoul and Pyongyang, and the East Coast corridor alongside the coastline of the East Sea (Sea of Japan) (see Map 2).

<table>
<thead>
<tr>
<th>KAESONG-MUNSAN</th>
<th>CHORWON VALLEY</th>
<th>EAST COAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaesong-Munsan North</td>
<td>Kumwha Valley</td>
<td>Taedong Mountains</td>
</tr>
<tr>
<td>Chorwon West (MSR 3)</td>
<td>Chorwon West</td>
<td></td>
</tr>
</tbody>
</table>
The two corridors in the west are called the “Western Front,” and considered the most important strategic points in the peninsula as they provide direct approaches to the two capitals. The Munsan corridor, located 30kms eastward of the Yellow Sea, presents approximately 50 kilometers of front but includes the Imjin River as a potential obstacle before reaching Seoul. To the north, the corridor is impeded by the Daedong River before leading to Pyongyang. Existence of these rivers and numerous streams amplifies the importance of engineer force elements in the actual campaign. The Cholwon corridor near the middle of the DMZ involves the 47-kilometer-wide corridor linking Seoul and Pyongyang. For both South and North Korea, the majority of their forces and their best units are concentrated in these two avenues of approach.

The most narrow and relatively less significant invasion route involves the 10-kilometer-wide East Coast Corridor, also known as the “Eastern Front.” It does not provide a direct route to either Seoul or Pyongyang, but this corridor has its own strategic significance. Once a breakthrough is achieved, the corridor could be used to take Wonsan or Kangnung, the coastal cities which are the hubs of the East Coast road network. (see Map 2 and 3.) Such maneuver allows the offense to flank the enemy capital or attack the rear of the enemy forces at the Western Front, or to clear the East Coast for amphibious landings. Considering the dense defense at the Western Front, a breakthrough at the Eastern Front remains an attractive option for the offense.

These three corridors are considered to be isolated from each other due to the network of dense mountain ranges and rivers, and the lack of road system linking each corridor. Hence it is difficult for the attacker to flank the defender at the nearby corridor before achieving a breakthrough at the front. On the other hand, this isolation among the corridors means that even

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63 The Cholwon corridor is often called as the “Central Front,” but in most military analyses and historical descriptions it is considered as a part of the Western Front.

64 The most notable attempt to pierce the East Coast was the Chinese PLA’s 1951 “May Offensive” (also known as the second part of the Chinese “Fifth Phase Offensive.”) When the PLA’s “April Offensive” (the first part of the Chinese “Fifth Phase Offensive.”) at the Western Front ended without much success, the PLA Commander Peng De-huai directed the main effort toward the Eastern Front in order to flank Seoul and cut off the lines of communication between Seoul and the Western Front. At the Battle of Hyunri (May 16^{th} - May 22^{nd}) the PLA annihilated the South Korean 3^{rd} Corps, but failed to exploit the breakthrough as the U.S. 3^{rd} Division and the South Korean 6^{th} Division quickly sealed the breach. For details, see Stokesbury, A Short History of the Korean War, 136-137; Park, Hankuk Junjaeng (Korean War), 179-181.

65 The attacker needs to reach Seoul (or Pyongyang) or Kangnung (or Wonsan) in order to access the other fronts. Even during the Korean War, there were no such attempts to flank the defenders at the nearby corridors until the attacker achieved a breakthrough at its corridor.
a single breakthrough could be fatal to the defender. The defender would have less time to transfer its forces from the other corridors, and due to short distance between the two capitals, there would be “less space to trade for time” before preventing the attacker from exploiting the breakthrough.66

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66 According to Epstein, the defender could slow down its pace of force attrition by withdrawing. By giving away the “space” to the enemy, the defender can establish a stronger defense while shortening its supply lines and gaining more time to regroup its forces. On the other hand, Epstein’s critics point out that withdrawal can be extremely dangerous as it exposes the retreating force’s rear to the enemy without a proper defense. Furthermore, loss of the “space” can be a considerable damage to the defender by itself. In a short theatre like the Korean peninsula, withdrawal cannot be extended indefinitely as the two side’s capitals are relatively close to the front. Even a minimal loss of territory could be quite critical to the defense. For the concept of “trading space for time,” see Epstein, “The 3,” 160–164. For Mearsheimer’s critique, see Mearsheimer, “Assessing the Conventional Balance.”
Map 5. Military Demarcation Line Area with Topography\(^{67}\)

These limited avenues of approach impose considerable force-to-space constraints on both the attacker and the defender. \(^{68}\) A simple law of physics limits the number of forces that can operate


within a given space. The attacker is constrained by the fact that it cannot deploy as much force as it wants, and the defender faces the same problem but could guard the corridor with less force thanks to the advantages given to the defenders. Although concentrating excessive number of forces in a limited sector may be possible, it would not be a reasonable option as the concentrated forces will be extremely vulnerable to area-affect ammunition. Based on these reasoning, regarding the attacker, Barry Posen suggests two ADES operating along a front of 25 kilometers as the possible maximum. For the defender, a range of 0.5 to 1 ADE is recommended to guard 25 kilometers of front while occupying 15 to 25 kilometers in depth. While these numbers apply to the attack corridors or the “breakthrough sectors,” Posen also notes that the attackers and defenders can deploy 1 ADE per 25 km in the non-breakthrough sectors to “tie down” the opponents.

Applying Posen’s criterion, the force-to-space constraint becomes evident in the Korean theatre. Among the 250 km front, the aggregate width of the attack corridors are 110km at the maximum. At this width, the attacker can deploy only 14.4 ADE (8.8 ADE at the corridors) at the front on D-Day while the North Korean total troop strength exceeds 62 ADE. South Korea’s total troop strength is around 42 ADE, but it only needs 10 ADE to populate the front.

This narrow theatre generally favors the South Korean side. First, the North Koreans will be limited from fully exploiting its numerical advantages. Second, a force-to-force combat exchange ratio becomes crucial as only a portion of the entire forces would be engaged in the

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70 The author thanks Barry Posen for providing this input.


72 Different works have provided various figures for the width of each corridor. Beldecos and Heginbotham, Suh proposed 15km for Cholwon and Munsan, Hillier suggests 24km and Masaki claims 50 km. As for the East Coast, Beldecos and Heginbotham, Suh suggest 4km width while Masaki and Hillier settle with 10km. In this analysis, I apply Masaki’s measurement (50km, 50km, 10km) for three reasons. 1) Throughout the past decades, armored forces’ mobility has increased to operate even in mountainous terrains. 2) If we accept Beldecos and Heginbotham’s measurement, the aggregate width of the breakthrough sectors is only 34 km among the 250km-wide front. This figure is rather unrealistic based on the precedents of the Korean War and the North Korean force’s deployment pattern. 3) Applying the maximum width would provide a favorable assumption to the numerically superior KPA, thereby increasing the salience of this campaign analysis.

73 To see the equation of this calculation, see Posen, “Measuring the European Conventional Balance,” 58–59.

74 These figures could be subject to a sensitivity analysis in the further studies as the two Koreas may take the risk and concentrate more forces in a given sector or may choose to populate the front with less force level. In this paper, the analysis sets the above criteria as the default parameter.

actual combat. In this sense, qualitatively superior South Korean forces are likely to gain the upper hand.\footnote{The Battle of Thermopylae would be a similar example, in which the well-disciplined Spartans forced substantial attrition to the Persians utilizing the narrow access of the “Hot Gate.”} Third, air power’s importance would be even more significant as the ground force’s deployment rate and movement will be constrained, and South Korea enjoys complete advantage in the air force. Fourth, limited number of forces deployed at the breakthrough sector means that it will take a longer time to drain the enemy force strength before achieving a breakthrough. In this battle of endurance, economically superior South Korea is more likely to prevail while the North Korean war economy will be under considerable pressure.

The two sides’ defensive fortifications should also be mentioned. Both sides have fortified their entire front in order to impede the attacker’s movement while providing concealed positions to the defender.\footnote{Once the attacker has a numerical superiority in an open terrain, the attacker could concentrate its fires against the target from multiple directions while the target has to distribute its fires around the numerically superior foe, As a result, the numerically superior side’s kill rate increases by a geometric progression as the combat proceeds. (This logic became the basis of the “Lanchester Square Law.”) However, a concealed position could partially neutralize this disadvantage as it limits the target’s exposure to the enemy’s targeting. Only a limited number of enemies could observe the target while the target could now engage in a head-on battle with the attacker without being attacked from multiple directions. For Lepingwell and Homer-Dixon’s discussion of the Lanchester Law and the effect of concealment, see John W. R. Lepingwell, “The Laws of Combat? Lanchester Reexamined,” \textit{International Security} 12, no. 1 (July 1, 1987): 89-134; Thomas F. Homer-Dixon, “A Common Misapplication of the Lanchester Square Law: A Research Note,” \textit{International Security} 12, no. 1 (July 1, 1987): 135-139.} Alongside a network of tank ditches, underground facilities, minefields and frontwide Concertina-wired fences, the South Korean defensive preparations include pre-chambered concrete slabs, bridges, and boulder-strewn fields that could be detonated to block the enemy advance route.\footnote{Peter Hayes, \textit{Pacific Powderkeg: American Nuclear Dilemmas in Korea} (Lexington Books, 1990), 153.} An underdeveloped road network near the DMZ compels the attackers to travel a long way before they could access the roads, and urban sprawl above Seoul (Goyang, Ilsan, Euijeongbu, Tongduchun) functions as an obstacle against the North Korean offensive as well.

Information on the North Korean fortifications is relatively unknown, but several intelligence reports indicate that North Korea has established a massive fortification system that includes numerous underground facilities to stock artillery tubes and armored vehicles, and a number of those facilities are believed to be cross-linked by underground tunnel networks.\footnote{Considerable portion of the North Korean artillery are reported to be deployed within these underground facilities to avoid South Korean air-to-surface attacks and artillery barrages. This deployment pattern may increase the survivability of the North Korean equipment but might degrade the lethality of the North Korean surprise as the process of moving the artillery out of the facility is likely to be detected by the South Korean surveillance.} A number of
North Korean “underground attack tunnels” linked to the South Korean territory often are hyped as concealed avenues of approach, but several studies already concluded that such tunnels have little military value. In this project, the paper assumes that the North and South have established defense fortifications of a similar level, which will be reflected in the parameters during the campaign analysis.

Another point worth mentioning is the two Koreas’ vulnerability to amphibious operations. Both sides possess equally long coastlines that hinder concentrated defense, reaching 2,495 km for the North and 2,413 km for the South (roughly 10 times longer than the 250km ground front). The problem is further exacerbated by the short distance between the coast and the two capitals: Seoul and Pyongyang are within 40 km of the coastline. Considerable difference between the ebb and tide impedes an amphibious landing, but the long coastline surrounding the entire peninsula raises consistent cautions against the enemy’s coastal operations.

(2) Conventional Military Balance

<table>
<thead>
<tr>
<th></th>
<th>North Korea (DPRK)</th>
<th>South Korea (ROK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Manpower (Army)</td>
<td>1,190,000 (1,020,000)</td>
<td>655,000 (522,000)</td>
</tr>
<tr>
<td>Reserve Manpower</td>
<td>Armed: 600,000</td>
<td>Armed: 4,500,000</td>
</tr>
<tr>
<td></td>
<td>Paramilitary: 5,700,000</td>
<td></td>
</tr>
<tr>
<td>Special Forces (Manpower)</td>
<td>88,000</td>
<td>1 (Special Warfare) comd; 7 bde;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 counterinfiltration bde</td>
</tr>
<tr>
<td>Armored</td>
<td>1 div; 15 bde</td>
<td>4 independent bde</td>
</tr>
<tr>
<td>Command</td>
<td>N/A</td>
<td>3 army HQ (the 1st ROK Army,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the 2nd Operational Comd, the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3rd ROK Army); 8 corps HQ; 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Capital Defense) comd</td>
</tr>
<tr>
<td>Mechanized</td>
<td>2 corps; 4 div</td>
<td>5 div (each: 2 mech inf bde, 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>armd bde, 1 recce bn, 1 fd arty</td>
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</table>

80 North Korea's several “invasion underground tunnels” exposed below the DMZ raised a public havoc in the 1980s, but the experts agree that those tunnels’ value as an invasion route is severely limited. According to Hamm and Suh, those tunnels are not wide enough to function as an advance route and could be easily detected. For details, see Hamm, Suh, and Michishita, Bukhan Gunsamunjeenui Jaejomyung (The Military of North Korea: A New Look), 5:339-342. Korean Institute for Defense Analyses, 2008-2009 Dongbuka Gunsaryuk (2008-2009 Northeast Asian Military Powers), 201.
81 Suh, Power, Interest, and Identity in Military Alliances, 49–53.
82 South Korean marine forces are included into the ground order of battle. In contrast, North Korea does not have marine forces as a separate branch of service.
83 South Korean males are under a reserve obligation of 68-100 hours per year in the First Combat Forces (Mobilization Reserve Forces) or Regional Combat Forces (Homeland Defense Forces) for 7 years after their discharge from the conscription. After 7 years, they are automatically enlisted to the Civil Defense Forces to serve until the age of 45.
<table>
<thead>
<tr>
<th>Section</th>
<th>North Korea (DPRK)</th>
<th>South Korea (ROK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Battle Tanks</td>
<td>3500+: (T-34/T-54/T-55/T-62/Type-59/Chunma/Pokpoong&lt;sup&gt;85&lt;/sup&gt;)</td>
<td>2,414: 1,000 K-1; 484 K1A1; 253 M-48; 597 M-48A5; 80 T-80U; (400 M-47 in store)</td>
</tr>
<tr>
<td>Light Tanks</td>
<td>560+: (PT-76; M-1985)</td>
<td>N/A</td>
</tr>
<tr>
<td>Armored Personnel Carriers</td>
<td>2,500+: (BTR-40/BTR-50/BTR-60/BTR-80A/BTR-152)</td>
<td>2,780</td>
</tr>
<tr>
<td>Armored Infantry Fighting Vehicles</td>
<td>N/A</td>
<td>100+: 40 BMP-3; 60+ K21</td>
</tr>
<tr>
<td>Artillery (Self Propelled/Towed)</td>
<td>8,500+: (SP 122mm M-1977/M-1981/M-1985/M-1991; 130mm M-1975/M-1981/M-1991; 152mm M-1974/M-1977; 170mm M-1978/M-1989 TOWED 122mm D-30/D-74/M-1931/37; 130mm M-46; 152mm M-1937/M-1938/M-1943</td>
<td>4,853+: (SP 1,353+: 155mm 1,340: e300 K-9 Thunder; 1,040 M-109A2 (K55/K55A1); 175mm some M-107; 203mm 13M-110 TOWED 3,500+: 105mm 1,700 M-101/KH-178; 155mm 1,800+ KH-179/M-114/M-115)</td>
</tr>
<tr>
<td>Multiple Rocket Launcher</td>
<td>5,100+: (107mm Type-63; 122mm BM-11/M-1977)</td>
<td>185: (130mm 156 Kooryong; 227mm 29 M-270 MLRS. All)</td>
</tr>
</tbody>
</table>


<sup>85</sup> Chunma (Swift Steed) and Pokpoong (Hurricane) are the North Korean alterations of T-62 tanks. Exact specifications are unknown, but most analysts agree that both are equipped with 115mm gun and explosive reactive armor (ERA.) These models are considered to be more effective than most T-62 available, but their effectiveness against the South Korean 3rd generation main battle tanks (K-1, K1A1) is still under serious doubt.
In a numerical bean-count, the North Korean ground forces outnumber the South Korean Army in every category imaginable. Estimates vary, but the North Korean army is said to number approximately 1,020,000 soldiers, outnumbering the 522,000 South Korean ground forces by 1.95:1. Similarly, the North outnumbers the South in tanks; armored personnel carriers and artillery by roughly two-to-one (see Table 2.)

Table 4. Ground Forces Equipment

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar</td>
<td>7,500</td>
<td>6,000</td>
</tr>
<tr>
<td>Helicopters(^{87})</td>
<td>302 (Attack: 20 Mi-24 Hind; Multirole: 80 Hughes 500D, Transport: 15 Mi-8 Hip/Mi-17 Hip H; 48 Z-5; 139 PZL Mi-2 Hoplite, etc.)</td>
<td>424: (Attack: 60 AH-1F Cobra/AH-1J Cobra; Multirole: 130 Hughes 500D; 45 MD-500, etc.)</td>
</tr>
<tr>
<td>Air Defense (Guns/Surface-to-Air Missiles)</td>
<td>11,000+</td>
<td>1,138+</td>
</tr>
<tr>
<td>Total ADE (Armored Division Equivalent)</td>
<td>63.19002</td>
<td>42.94757</td>
</tr>
</tbody>
</table>

2-1. Ground Forces

In a numerical bean-count, the North Korean ground forces outnumber the South Korean Army in every category imaginable. Estimates vary, but the North Korean army is said to number approximately 1,020,000 soldiers, outnumbering the 522,000 South Korean ground forces by 1.95:1. Similarly, the North outnumbers the South in tanks; armored personnel carriers and artillery by roughly two-to-one (see Table 2.)

\(^{86}\) Army TACtical Missile System. For details on the system, see Lockheed Martin, [http://www.lockheedmartin.com/data/assets/12818.pdf](http://www.lockheedmartin.com/data/assets/12818.pdf) (accessed on August 23rd, 2011)

\(^{87}\) As mentioned earlier in the footnote, no sources provide clear information on how many helicopters would be capable of air-to-surface attack operations as a number of helicopters are believed to be modified to be capable of ground attacks. As there is no clear data, in this paper the campaign analysis presumes that all helicopters from the both sides would be combat capable. This assumption may seem radical, but this analysis mitigates the assumptions’ boldness by assigning very conservative kill rates for each CAS and BAI asset. For details of the simulation, see the later sections.

\(^{88}\) These data account for all the equipment available to both sides, while not accounting for the actual rate of operation. Due to the North Korean force’s poor readiness and shortage of ammunition, POL (petroleum, oil, and lubricants) and spare parts, it is doubtful if all these equipment will be ready for action at the war’s outbreak. According to Von Hippel’s simulation based on North Korea’s energy availability and demands, the operation of North Korean equipment will be seriously limited. For the simulation results, see von Hippel, “Estimated DPRK Energy Use: Analytical Approach and Draft Updated Results”; von Hippel, *An Estimate of Energy Use in the Armed Forces of the Democratic People’s Republic of Korea*. On an updated analysis in the North Korean force’s poor readiness, see Korean Institute for Defense Analyses, 2008-2009 Dongbuka Gunsaryuk (2008-2009 Northeast Asian Military Powers), 90–101.

\(^{89}\) According to the South Korean Defense White Paper’s estimate, North Korea’s ground forces consist of 15 corps-class elements and 90 infantry or motorized infantry divisions and 57 armored, mechanized infantry, and special forces brigades. (The available data do not indicate if these elements are fully manned.) The South Korean regular
Such numerical disadvantage becomes mitigated once we go beyond this simple bean count and comprehend the quality and firepower gap. If the two sides' force effectiveness is calculated on an ADE basis, the gap narrows down to 63.19 and 42.94 ADE, or a ratio of 1.47:1. The full mobilization of reserve forces further lowers the ratio to 1.33:1.

Even this ratio does not fully acknowledge the South Korean army’s relative effectiveness. ADE has been praised as an effective indicator of ground force’s relative combat effectiveness, but it also has been widely criticized for excluding such factors as ammunition availability, logistical support, training, communications which all play a key role in a modern warfare.\(^90\)\(^91\)\(^92\) In all these factors South Korea is believed to possess a significant advantage compared to the KPA. Numerical superiority plays a crucial role in warfare, but without an effective command and support the numerical superiority cannot be fully utilized.\(^93\) Posen applied 1.5-times force multiplier to the NATO due to its command, control and logistics advantage to the Warsaw Pact\(^94\) and the C4ISR gap between the two Koreas are believed to be even wider than that.

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\(^92\) The South Korean dependence on the American ammunition supply was considered one of the South Korean military’s biggest weaknesses. However, South Korea’s recent purchase of the USFK’s ammunition stock of the WRSA (War Reserve Stock for Allies) has resolved the issue to a considerable degree. For the details on the South Korean purchase of ammunition, see Yonhap News, October 8th, 2008.

\(^93\) A point worth mentioning in this aspect is the comparison between the North Korean and South Korean MRL (multiple rocket launcher) forces. The KPA MRL force outnumbers the South Koreans by a striking ratio of 27.56:1 (5,100 vs. 185) and this numerical difference is the core of the North Korean advantage in the force power measurement. Although, the relative difference between the two MRL forces are believed to be much lower. The South Korean MRL forces are supported by a computerized C4ISR system which automates the process of target acquisition, target assignment and firing control while the North Koreans have to rely on a manual fire control. Moreover, the South Korean MRLs are equipped with automated reloading systems that would enable a rapid reloading and continuous fires while the North Korean MRLs have to load their ammunition manually. Although the North Korean forces may clearly outnumber the South Koreans in the number of tubes, it is unclear if the North would enjoy a similar advantage in the number of rounds that could be fired in a given time, not to mention the overall firepower. In 2004 the South Korean Defense Minister Yoon Kwang-wong testified in front of the National Assembly that the 240mm North Korean MRLs could be destroyed “within 6 minutes.” Shindonga, December 1st, 2007.

\(^94\) For Posen’s discussion of the 1.5 force multiplier, see Posen, *Inadvertent Escalation*, 100.
between the NATO and the Pact. If the same multiplier is combined to the South Koreans, its force effectiveness now surpasses the North by the ratio of 1:1.12.

The South Korean advantage is likely to be strengthened even further in the actual ground battle. Although the ADE is a measure “based on quantity and quality of major weapons,” it is criticized as underestimating the actual combat effectiveness of qualitatively superior weapon systems combined with a better C4ISR. Such criticism has been proved in historical precedents and campaign analyses. In the ADE basis the difference between a M1A1 and T-72, T-55 tank is a mere 0.18 and 0.25 (1.31 vs. 1.13, 1.06). In the Battle of 73 Easting, however, the U.S. 2nd Armored Cavalry Regiment (ACR) mostly consisted of M1A1 routed the Iraqi Republican Guard’s T-72, T-55 brigades with an astounding record of 0:85. It cannot be guaranteed that the South Korean army could repeat such a legendary feat, but we still can expect the South Korean armored forces to have a firm advantage against the North Korean counterparts. While the South Korean main battle tanks (K1, K1A1) are considered to match the M1’s quality, T-55 and T-62 remain as the main elements of North Korean armored forces.

The limitation of ADE in comparing the conventional force balance is further revealed in the two Korea’s defense spending. The accumulated spending difference between the South and North for the last 17 years exceeds a striking figure of 310 billion dollars while North Korea’s 2009 defense spending was only 6.17 billion dollars. But for the last 17 years, on an ADE basis, the South Korean combat effectiveness has increased by 2.82 ADE while the North Korean ADE has increased by 6.24. This unrealistic figure reflects that ADE does not fully comprehend the contemporary trend of military force strengthening which requires considerable financial investment. The South Korean investment in C4ISR development, O&M (operation and

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97 Epstein, Conventional Force Reductions, appendix C.
98 For detailson the Battle of 73 Easting, see Thomas Houlahan, Gulf War: The Complete History, 1st ed. (Schrenker Military Pub, 1999).
100 The data is derived from Stockholm Peace Research Institute Military Expenditure Database, Republic of Korea Defense White Paper, Hamm, Arming the Two Koreas, 360–365.
maintenance), R&D (research and development), and weapons procurement left out in ADE comparison should return great dividends in an actual combat.

2-2 Air Power

<table>
<thead>
<tr>
<th></th>
<th>North Korea (DPRK)</th>
<th>South Korea (ROK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fighter</td>
<td>458: 40 F-7B Airguard; 107 J-5; 100 J-6; 120 J-7; 46 MiG-23ML Flogger; 10 MiG-23P Flogger; ε35 MiG-29A/S Fulcrum</td>
<td>233: 20 F-5B Freedom Fighter; 142 F-5E Tiger II; 32 F-5F Tiger II</td>
</tr>
<tr>
<td>Fighter Ground Attack</td>
<td>48: 30 MiG-21bis Fishbed; 18 Su-7 Fitter</td>
<td>234: 70 F-4E Phantom II; 39 F-15K Slam Eagle (21 more on order 2010–2012); 118 F-16C Fighting Falcon (KF-16C); 46 F-16D Fighting Falcon (KF-16D); (some F-4D Phantom II in store)</td>
</tr>
<tr>
<td>Ground Attack</td>
<td>34 Su-25 Frogfoot</td>
<td>N/A</td>
</tr>
<tr>
<td>ISR (Intelligence, Surveillance, and Reconnaissance)</td>
<td>N/A</td>
<td>48: 1 E-737 (3 more on order 2011-2014); 4 Hawker 800RA; 20 KO-1; 17 RF-4C Phantom II; 5 RF-5A Tiger II</td>
</tr>
</tbody>
</table>

*Table 5. Air Power Comparison*

As noted before, the narrow Korean theatre amplifies the importance of air power and air-to-surface CAS and BAI missions would significantly affect the overall course of warfare.

In the air power category, the South is considered to hold a solid advantage. Although the South is slightly outnumbered in the number of fighters (467:547), the quality gap between the two air forces surpass this numerical advantage.

The first factor to be noted is the quality gap between the aircraft. North Korea’s Mig-21, Mig-23, and Mig-29 are less likely to prevail against South Korea’s F-16 and F-15K. The Mig-21 and 23 are regarded as inferior to the F-16 in almost every aspect ranging from operation range to armament. Mig-29’s maneuverability may surpass F-16 and maybe even the earlier versions of F-15, but the model’s electronic warfare capability and armament inferior to the South Korean air force’s F-series. Such quality gap has been proven by the actual combat records. In 1982 at the Battle of Bekka, the Israeli air force’s F-15 A/B shot down 82 Syrian Mig-21/23/25 while losing none, and even the Mig-29 was proven no match against the F-15 C/E during the Gulf
War. 102 Due to North Korean air force’s poor readiness and O&M it is unclear if the North Korean Mig-series would have better effectiveness compared to the Syrians or Iraqis. On the other hand, South Korea’s F-15K is an upgraded version of the F-15E, considered one of the most advanced F-15s deployed. The F-15K surpasses other aircraft in the peninsula in every category imaginable, such as firepower, speed, maneuverability, electronic warfare, radar, night operation capability, combat radius and so forth. As shown in the Battle of Bekka and other cases of modern air battle, this quality gap between the fighters could derive a striking difference in actual combat results. 103

The Second factor is the difference in pilot skills. The difference in aircraft quality may be partially overcome by the pilot’s skills as shown by a few German Bf-109 aces against the technologically superior allied fighters. However, North Korean pilots’ combat skills are under serious doubt. Flight time is considered as an indicator of the training intensity and pilot skills, but North Korea’s economic breakdown and ensuing shortage of jet fuel have limited the flights since the mid-90s. According to the South Korean Air Force’s testimony in the National Assembly, South Korean pilots’ flight time averaged 135 hours per year. 104 On the other hand, recent estimates on the North Korean fighters’ annual mission hours are quite striking. According to von Hippel, the North Korean fighters and bombers flew 24 hours per year in 1990, however, on 2005, the figure dropped to 13 hours. 105 The KPA officers escaped from North Korea supports the testimony and von Hippel’s estimate, as they remark “(the pilots) had to rely on a verbal training instead of a flight simulation or an actual flight.” 106

Third, South Korean air force’s C4ISR capability clearly surpasses the North Korean air force. Recent procurement of the E-737 AWACS (Airborne Warning and Control System) will raise South Korean air power to a new level, enabling early target acquisition and rapid deployments.

103 The F-15 in all air forces had a combined air-to-air combat record of 104 kills to 0 losses (mostly against the Migs) as of February 2008. No air superiority versions of the F-15 (A/B/C/D models) have been shot down by enemy forces. John Correll. “The Reformers.” Air Force Magazine, February 2008, Vol. 91 Number 2, 44.
This C4ISR advantage plays a key role in the air combat, as it enables the South Korean aircraft to detect, target, and attack the enemy fighters even before being detected by the North Koreans.

Fourth, North Korea lacks effective anti-air assets against the South Korean air superiority. The number of North Korean air defense guns and missiles is quite astounding, approximated around 11,000. But their actual combat effectiveness is not as impressive as their number. The North Korean anti-air assets lack the mobility and the supply of ammunition required to protect the ground forces inside the enemy territory. Most air defense guns are immobile and fixed at the North Korean territory while the MANPADS (MAn-Portable Air Defense System) and mobile air-defense guns are limited in quality and their ammunition supply is under doubt.

North Korean anti-air assets would not be very much effective inside North Korean territory during a South Korean counteroffensive. Mostly consisting of outdated SA-2s and SA-3s, North Korea's surface-to-air missiles are limited in accuracy and considered less effective against South Korea’s high-altitude flights capable of electronic warfare and anti-radar missions. Even more troublesome is the lack of an effective radar system to detect the South Korean flights. Mobile radars are limited in number and even the fixed radars have shown several problems in surveillance radius and readiness according to North Korean officers. Pyongyang is considered to have one of the most dense air-defense systems in the world. However, a well-established defense at the capital would have less meaning once the battle at the front is lost.

Based on these reasons, the South Korean air force is likely to gain air control at the early stages of the war, exposing the North Korean ground forces to relentless CAS and BAI.

2-3. C4ISR

The aforementioned South Korean advantage is further amplified by South Korea’s superiority in C4ISR. C4ISR was once considered as the South Korean force’s most critical weakness until

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108 One officer even mentioned that “human observation...is still the primary mean of surveillance.” Lee, *Bukhangunaemun Gunbbongi Upda (The North Korean Military does not have Breadbiscuits)*, 282–283.
109 The term stands for Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance. For a detailed explanation of the concept, see footnote 59.
the early 21st century due to its heavy dependence on the U.S. forces’ C4ISR assets. But the U.S. forces’ redeployment and the U.S. intention to return the tactical command forced the South Korean government to develop its own C4ISR capability. After almost a decade and accumulated investment of approximately 10.2 billion dollars, now the South Korean military is regarded to possess a world class C4ISR system. Recent development of the KJCCS (Korea Joint Command and Control System) and acquisition of E-737 AWACS and RQ-101 UAV (Unmanned Aerial Vehicle) will strengthen the South Korean C4ISR even further.

On the other hand, the North Korean C4ISR system is considered to be nearly none-existent. Lacking satellites, high-altitude surveillance system or unmanned aerial vehicle (UAV), North Korean C4ISR still relies on a pre-modern human intelligence (HUMINT) and eye observation. Several media reports have covered the North Korean effort to train the so-called “Cyber Soldiers,” but their role is limited to an elementary electronic warfare such as hacking. Even a bigger problem is the lack of electronic command and control. The former KPA officers report that it is difficult to find a single computer at the battalion level. Even with a significant numerical superiority, North Korean capability to fully utilize its forces remains questionable.

This advantage provides powerful force multipliers in a number of areas including command, control, and communications (C3), reconnaissance, surveillance, and target acquisition (RSTA), and electronic warfare (EW). Battle management C3 systems such as the KJCCS and ATCIS (Army Tactical C4 Intelligence System) exploit and disseminate information needed to conduct synchronized operations. RSTA systems can peer deep into enemy territory, enabling South Korean forces to locate and engage enemy units long before they reach the battlefield. EW systems, such as airborne jammers, can be used to disrupt enemy communications and blind sensors such as air defense radars. In concert, these assets would give South Korean

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110 Scobell and Sanford, North Korea’s military threat, 4:44–51.
111 Although the South Korean system is considered inferior to the U.S. system, the U.S. officers who observed the system operation gave very positive feedback. The South Korean military also expressed satisfaction in their press releases. On South Korea’s recent C4ISR capability development effort, see Sung-ki Jung, “S. Korean Army Seeks To Build Net-Centric, Mechanized Force,” Defense News, June 16, 2008.; Hwang, Kim Jong-il, Gonporul Ssoaolida (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats), 83–89.
112 Donga Ilbo, June 7, 2006.
113 Lee, Bukhangumaemun Gumbbangi Upda (The North Korean Military does not have Breadbiscuits), 87.
114 Electronic Warfare’s (EW) effectiveness may be limited against the North Korean forces as they are less likely to rely on an electronic-based C4ISR but instead utilize wired communication such as buried phone lines, or even a human messenger. On the other hand, North Korea’s reliance on those outdated systems would degrade their overall effectiveness throughout the war even without being damaged by the South Korean EW efforts.
commanders a clear picture of the battlefield, greater capacity for operational coordination, and the ability to confound their North Korean counterparts.

C4ISR’s importance in the Korean theatre is often overlooked, but C4ISR could be crucial to the counterinvasion’s success in every phase imaginable. Early reconnaissance will determine the prevention of North Korean surprise, and an effective RSTA will minimize the damage from the much feared North Korean artillery barrage by enabling a rapid counterbattery mission. Finally, the victory in a breakthrough battle is largely determined by the difference in force dexterity—a timely reinforcement among the corridors to exploit the breach or to plug it. Success in a multi-sector breakthrough battle largely depends on meeting the force need to populate the front while maintaining the force effectiveness. This is where the dexterity becomes important, as when one side fails to meet the force need at a given sector, a quick reinforcement from other sectors or the rear is necessary before the enemy exploits the force shortage. Detecting the breach and sending reinforcements while maintaining the balance of force distribution among the sectors is a very complex process. An effective and rapid C4ISR is essential for this task.

(3) Economy, Logistics and Readiness

<table>
<thead>
<tr>
<th></th>
<th>North Korea (DPRK)</th>
<th>South Korea (ROK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>23,990,703</td>
<td>48,500,717</td>
</tr>
<tr>
<td>Manpower fit for Military Service (age 16-49)</td>
<td>10,066,704 (Male: 4,836,567)</td>
<td>21,033,275 (Male: 10,864,566)</td>
</tr>
</tbody>
</table>

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115 As mentioned earlier, in 2004 the South Korean Defense Minister Yoon Kwang-woong testified in front of the National Assembly that 240mm North Korean MRLs could be destroyed “within 6 minutes,” and 170mm self-propelled artillery could be destroyed “within 11 minutes.” Shindonga, December 1st, 2007.

116 The PLA’s Fifth Phase Offensive during the Korean War is one of the historical cases which show the importance of force dexterity in multi-sector breakthrough battles. In May 1951, when the PLA commenced the second stage of its Fifth Phase Offensive, the UN defense at the Eastern Front was shattered at the Battle of Hyunri and the entire Eastern Front was exposed to the PLA’s exploitation. The total collapse of the Eastern Front was narrowly prevented as James Van Fleet instantly dispatched the U.S. 3rd Division and the South Korean 6th Division from Hwachun to plug the breakthrough. The South Korean government’s official record of the battle praised this timely reinforcement as “a bold decision...saved the Front from a disaster.” Republic of Korea Military Academy, Hangukjunjaengsa Budo (Appendix to the History of the Korean War), 42.

117 According to CIA World Factbook, this category refers to the number of males and females falling in the military age range for a country (defined as being ages 16-49) and who are not otherwise disqualified for health reasons; accounts for the health situation in the country and provides a more realistic estimate of the actual number fit to serve. https://www.cia.gov/library/publications/the-world-factbook/fields/2025.html#kn (accessed on July 9th, 2011.)

118 Every North Korean male within the age of 14 to 60 (female: 14 to 30) is expected to receive a partial military training of at least 100 hours per year, although the availability of equipment (personal firearm, ammunition, etc.) are unknown. Republic of Korea Ministry of Defense, Gukbangbaeksuh 2010 (Defense White Paper 2010), 27.
Table 6. Economic Comparison

Economic considerations further limit the North’s prospects for success and would continue to do so. Despite its massive firepower and numerical superiority, limitations in logistics and readiness depreciate the actual strength and North Korean forces.

North Korea has few domestic sources of energy and earns insufficient foreign exchange to purchase large supplies of energy on the open market. Even worse, the drastic failure of 2010 monetary reform drove North Korean credit to the ground. Consequently, the North faces chronic energy shortages of all types. Of greatest relevance to the military, North Korea is very short of oil and related products (or POL, which stands for petroleum, oil, and lubricants). Even though much of their nationally available stocks are reserved for military use, a reserve of 30 to 90 days of active military operations is considered an “optimistic scenario”. According to von Hippel’s simulation on the North Korean energy demand and supply, 50% of the ground equipment would be inoperable after D+30 due to energy shortage, not by enemy fires. As for the air force and navy, he presents even more skeptical estimates. Aircraft would cease operation after 24 hours and 90% of naval forces is likely to cease operation in 5 days. His argument should be further discussed, but it is quite evident that the lack of resources makes victory in a long war a dim prospect for the North.

119 As for the South Koreans, military training is available to the conscripted forces (2 years of service), reserves (7 years of service after discharge), and Civil Defense Forces (service until age 45.) Although exact data are unavailable, approximately 7.7 million males (aggregate sum of the standing army, reserves and Civil Defense Forces) within the age range of 20 to 49 are expected to have received a military training. 120 All data of 2010 unless otherwise notified. 121 According to von Hippel, approximately 8% of the energy is consumed by the military, an exceptionally high figure. von Hippel, “Estimated DPRK Energy Use: Analytical Approach and Draft Updated Results.” 122 Hwang, Kim Jong-il, Gopporul Ssoolida (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats), 188–193. Hwang cites Beldecos and Heginbotham for this threshold of 30 to 90 days, and calls it a lucky scenario for the North. Beldecos and Heginbotham’s estimate was made on mid-90s, but the North’s energy condition has significantly worsened ever since. 123 Von Hippel’s estimation method is as follows: he estimates the number of fuel-using vessels, vehicles, aircraft, armaments from non-classified sources, and estimate hours of use for classes of equipment, and use characteristics of equipment to estimate fuel use for equipment population in each year. Based on the estimates of fuel use during routine exercises, fuel use by the North Korean military for 30 days of full-time combat is approximated around 130,000 tons. von Hippel, “Estimated DPRK Energy Use: Analytical Approach and Draft Updated Results,” 14.
Logistical problems also constrain the North's force readiness. As the North's energy problems have worsened, field exercises have been cut back and the routine training are conducted without actual operation of the equipment.\(^{124}\) Given the complexity of combined arms warfare, the inability of the North to train and coordinate its forces diminishes its prospects for conducting a successful "blitzkrieg."

(4) Doctrine.

Based on this conventional balance, how would both sides utilize their assets? More explicitly, what would be their "theory of victory"? Attributing one's own doctrine to the enemy without question is arguably one of the most common and the most hazardous mistakes that a military commander could make, leading to an exaggeration of the advantages within their own doctrine while overlooking the factors that are integral in the enemy's theory of victory.\(^{125}\) To avoid this risk, an assessment of a military balance should accompany a thorough analysis of the combatants' doctrines. A prospect of victory could be estimated with more accuracy if one side is deemed to be lacking the resources to realize its own doctrine while the other can.

The difference between the North and South's military doctrine in the first phase (North Korean invasion is relatively well known. North Korean forces have been optimized for high-tempo mechanized breakthrough and exploitation operations.\(^{126}\) They have supplied their forces liberally with artillery and would probably try to mass their fires on narrow sectors of the front to create breaches for their armored forces. Special operations also figure prominently in North Korean doctrine. The North has 80,000 special forces personnel in twenty-two brigades and a

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\(^{124}\) According to one officer's testimony, a considerable portion of equipment is only operated during the annual summer/winter exercises due to fuel shortages. Lee, *Bukhangunaenun Gunbangi Upda (The North Korean Military does not have Breadbiscuits)*, 250. Von Hippel’s simulation on the North Korean force’s energy usage supports these reports. According to his estimate, the average hours of maneuver of tanks and armored vehicles were only 80 hours in 2005. This figure was a 20% decrease compared to 1990. von Hippel, “Estimated DPRK Energy Use: Analytical Approach and Draft Updated Results,” 6.

\(^{125}\) The UN force’s devastating loss in the winter of 1950 is considered as the representative example of such failure. MacArthur and his staffs presumed the PLA to share the Soviet-style doctrine (as the KPA did) and mistook its material weakness (lack of armored equipments and aircraft) as an overall operational weakness, even considering the PLA as a force inferior to the KPA. The PLA’s doctrine based on infantry swarming, deception, and maneuver was taken less notice while the UN command had almost an absolute faith in its air power advantage, which later turned out to be relatively less effective against the well-camouflaged PLA in the mountainous terrain. For details, see Cohen, *Military Misfortunes*, Ch.7. The Israeli Army’s struggle against the Egyptian Army’s initial offensive during the Yom Kippur War could also be considered as a similar case. For details, see Martin Van Creveld, *Military Lessons of the Yom Kippur War: Historical Perspectives* (SAGE Publications Ltd, 1975).Martin Van Creveld, *Command in War* (Harvard University Press, 1987), Ch.6.

number of independent battalions. Although most of these units would be deployed along the front as assault forces, some would be assigned to infiltrate by air and sea in an effort to create chaos behind South Korean defensive lines. In particular, they would probably target command posts, supply depots, and airfields.  

Named by Kim Il-sung as the “Juche Art of War (주체전법: 主體戰法),” this North Korean doctrine based on the combined warfare of armored assault and rear infiltration was idolized as the symbol of Kim Il-sung’s military expertise. The ascendance of the Soviet-trained officers to the military leadership in the 1970s strengthened the armored warfare’s importance within the North Korean doctrine while the emphasis on guerilla infiltration was curtailed. Led by Oh Geuk-ryul and Lee Ha-il, these officers laid the foundation of the current North Korean force structure optimized for a Soviet-style all out armored assault.

South Korean forces are deployed in the so-called "Hollingsworth line," which itself comprises three defensive belts also known as FEBA (Forward Edge of the Battle Area) - A, B and C. Approximately eight of the nineteen ROK infantry divisions are deployed in the first line, while the remainder are deployed in the second line, beyond the range of the bulk of North Korea's artillery. The 3rd Army (TROKA) guards the Western Front while the 1st Army (FROKA) is in charge of the Eastern Front. The South Korean armored and mechanized forces would probably be used to counterattack the North Korean forces wherever they might threaten to break through. Against the North Korean special forces infiltration the 2nd Operation Command (also known as the 2nd Army) deploys three counter-infiltration brigades which would

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128 An overview of the North Korean doctrine is introduced in Chul-man Kim, “Hyundaejunjangeui Teuksunggwau Seungriewui Yoin (Characteristics of the Modern War and the Factors of Victory),” Geunroja (Workers) 8 (August 1976): 34-36. This article written by a KPA general is considered one of the most elucidated discussions of the North Korean theory of victory. On the ascendance of the Soviet-trained officers within the KPA command, see Chang, Bukhanguisayeongu (A Study of the North Korean Military), 154–155. Chang argues that Kim Jong-il was behind these changes.  
129 The line was named after General James Hollingsworth, the Commander of the USFK in 1973. The line runs 3 to 6 km south of the DMZ and includes three lines of defense called Alpha, Bravo, and Charlie. Very little unclassified information exists about their locations and fortifications. Some of the more common and well-known fortification aspects include the use of reinforced bunkers for South Korean weapons aimed at corresponding "killing zones." FEBA-C (Charlie) is widely known as the South Korean Army’s final defense line before Seoul although its exact location has not been mentioned in the sources available to the public. For more information on the Hollingsworth line, see Hayes, Pacific Powderkeg, 153; Masaki, “The Korean Question,” 371.; Chung Min Lee, "Holding the Hollingsworth Line: Conventional Deterrence in the Korean Peninsula," in Harold C. Hinton, et al., The U.S.-Korean Security Relationship: Prospects and Challenges for the 1990s (Washington, D.C.: Pergamon-Brassey's, 1988), 130 Beldecos and Heginbotham, “The Conventional Military Balance in Korea,” 5–7.
be dedicated exclusively to this task alongside the reserve or active-duty infantry divisions not allocated to front-line defenses. While the North Korean attack is being contained by South Korean ground forces, the South Korean air force, technologically far superior to that of the North, will impose rapid attrition on North Korea's armor and artillery massed in the narrow attack corridors.

In contrast to the North Korean offensive and South Korean defensive doctrines, the two Korea's theories of victory at the subsequent phases are unknown. Many sources cite the relatively well known OPLAN (Operation Plans) 5026 and 5027 as South Korea's official theory of counterinvasion. But these OPLANs are the American-Korean combined plans presuming the U.S. control of the wartime operations and U.S. intervention to the campaign; thereby it cannot be fully applied to define the course of South Korea's independent counterinvasion. As for North Korea, not a single source discusses even the possibility of its offensive's failure, providing no information on the North's defense plan against the South's counteroffensive.

For this analysis, we could only infer the North and South Korean doctrines from fragmented sources, historical precedents and the two sides' assets available for the counterinvasion process. War is an ever-changing dynamics and a perfect inference of the process may be never possible. But the given constraints (from military to economy) to the two Koreas limit the number of options that both sides could undertake. My analysis of the possible counterinvasion scenarios will be discussed in the following sections.

Doctrine reflects intentions and plans but does not necessarily portend outcomes. French doctrines prior to the Second World War relied heavily on the revival of trench warfare and line defense, but when war came, tanks, aircraft and armored breakthrough dominated the battlefield. In the present context, one should not infer that because one side or the other wants to fight and win in a particular way, they would be able to do so. Anyone contemplating the likely outcome

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131 The South Korean military is currently undergoing a process of making its own operation plan assuming the South Korean operational command. Although, we could guess that the South Korean independent counterinvasion doctrine would resemble these OPLAN to some degree while ruling out the U.S. intervention.

132 Even the combinations of those options would make an infinite set of possibilities but it still would be a contribution to our knowledge to analyze the likely process of the campaign. For the discussions on the inherent limitations of the campaign analyses, see Mearsheimer, "Assessing the Conventional Balance"; John J. Mearsheimer, Barry R. Posen, and Eliot A. Cohen, "Reassessing Net Assessment," *International Security* 13, no. 4 (April 1, 1989): 128-179.

of a war in Korea must therefore make judgments about what would be possible under the wartime conditions.

IV. Campaign Analysis

(1) The Scenarios (The Possible Doctrines of the Counterinvasion Phase)

This section conducts a campaign analysis of the South Korean counteroffensive, based on the doctrines and conventional military forces as of 2010. As for the campaign’s courses of action, the paper suggests two scenarios as the two Korea’s most likely options throughout the campaign.

This paper analyzes the South Korean capability of counterinvasion hence both scenarios begin with 1) the North Korean blitzkrieg and South Korean defensive. However, the two scenarios part way at the end of the first phase as they differ on the North Korean action after the failure of the offensive.

In the first scenario, 2) North Korea retreats to its territory and South Korean begins its pursuit, then this scenario moves onto 3) South Korea’s armored breakthrough attempt against the North Korean defensive established at the current defense line.

In the second scenario, however, 2) North Korea holds its position instead of retreating, and the South Korean counteroffensive attempts to break through that line.

There is no guarantee that the actual counterinvasion would exactly replicate these scenarios. Once the offensive fails, the KPA may even retreat deep into the North Korean territory without attempting to stall the South Korean counteroffensive. Nevertheless this paper assumes that the KPA choose either one of the aforementioned two scenarios. Its war objectives, assets, and given constraints make these scenarios reasonable inferences.

In order to infer North Korea’s courses of action, we should first look at each scenario’s cost and benefits. North Korea’s choice would depend on the significance of those benefits and costs. While my two scenarios provide a balanced cost-benefit analysis, the other possible scenarios do not provide much benefit while holding considerable risks that the North is unlikely to tolerate.
My first scenario (retreat and regroup at the military demarcation line) provides North Korea an opportunity to shorten its lines of communication while utilizing the benefits of the fortified facilities against the South Korean counteroffensive. Considering the limitations of North Korean mobile anti-air assets, KPA would prefer to return to the defense line where their low-altitude anti-air systems are already deployed. Retreating into the MDL would also improve the already dire logistics situation by shortening the distance from Pyongyang. The German retreat after the Operation Zitadelle and the Battle of Bulge could be considered a similar precedent.

The second scenario has its merits as well. While the first scenario enjoys the benefit of a fortified position and shortened lines of communication, it holds the risk of exposing the rear to the enemy pursuit and BAI. Holding the position at their advance point could neutralize such risk. Also, shortening the lines of communication may not be too much of a benefit as North Korean logistics would have already met its limits at this stage of the war. Then retreating to improve logistics would not make much difference for the North. Kim Chaek’s original plan in 1950 was to hold the line as well, and he ordered a full retreat only when such option was deemed impossible.

Also, this scenario could reflect the possibility of the South Korean counteroffensive before the failure of North Korean breakthrough attempt. The South Korean army may try to break out from its defensive position if it deems the KPA to be weakened or if it could no longer tolerate an additional North Korean advance. This South Korean counteroffensive will resemble the process of the second scenario.

However, retreating deep into the North Korean territory is a less likely option for the North Koreans. The option provides little benefit compared to its significant costs. Considering the short distance to Pyongyang and the mobility of the modern armored forces, North Korea is very likely to lose Pyongyang if the KPA does not hold its position at least near the MDL.\textsuperscript{134} Staging an urban warfare in Pyongyang may be an option but such option would have minimal effect on the war’s outcome as the South Korean forces will simply surround Pyongyang and capture the northern territories while cutting off the lines of communication until the regime’s morale and

\textsuperscript{134} During 1950, it took only 8 days for the UN forces to capture Pyongyang when the KPA failed to hold a successful defensive. Park, \textit{Hankuk Junjaeng (Korean War)}, 140. At the Eastern Front, the UN forces recorded an advance rate of 26 km per day during the first week of counterinvasion.
resources wear out. Gaining “time for space” may be important, but Pyongyang is too much important to be considered as an ordinary “space.” Moreover, as long as the retreat is extended, the KPA casualties from the South Korean pursuit will increase indefinitely. For these reasons this option is unlikely to be chosen by the North Koreans and will be ruled out in this campaign analysis.

In both scenarios South Korea is assumed to counterinva North Korea by attempting an armored breakthrough against the North Korean defense. Of course the South Korean counterinvasion could take various forms besides an armored offensive. South Korea may not pursue the North Korean forces to avoid ambush or to replenish its own force strength. Or South Korea may choose to conduct a war of attrition in order to wear down the North Korean defense instead of attempting an armored breakthrough. But I justify this paper’s assumption in four ways.

First, the current South Korean doctrines (notably OPLAN 5027, although its applicability to the South Korean counterinvasion remains in doubt) directs the forces to conclude the war by pursuing the KPA and breaking through the enemy defense line.\(^{135}\) Although OPLAN 5027 is the only source available, it is the only official document that explicitly mentions the possibility of a counterinvasion against the North. It has been the primary operational plan for the combined forces for the last 37 years and the South Korean military’s recent reform has been concentrated on supplanting the USFK (United States Forces Korea)’s capability instead of developing a brand new force structure. Hence it does not seem unreasonable to guess that the South Korean doctrine would resemble the OPLAN 5027 to a certain degree.\(^{136}\)

\(^{135}\) Globalsecurity.org provides the most detailed analysis in the OPLAN 5027 up to date. According to its analysis, the plan proceeds as following: during Phase 1, U.S.-South Korean forces would conduct a forward defense aimed at protecting Seoul. Their campaign would be dominated by combined-arms ground battles waged with infantry, artillery, and armor. The U.S. air and naval forces would conduct close air support, interdiction, and deep strike missions. After Phase 1, U.S.-South Korean operations in Phase 2 would probably focus on seizing key terrain, inflicting additional casualties on enemy forces, and rebuffing further attacks. Phase 3, to start when the U.S. ground buildup was complete and the South Korean forces were replenished, would be a powerful counteroffensive aimed at destroying the North Korean military power. For Globalsecurity.org’s analysis, see www.globalsecurity.org/military/ops/oplan-5027.htm (accessed on August 21st, 2011) For additional discussions of the OPLAN, see Hwang, Kim Jong-il, Gonporil Ssaoolida (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats), 37–42; Kang, Hangukeui Anbojunryakgwa Gukbanggaehyuk (Korea’s Security Strategy and Defense Reform), 24.,Sisa Journal, December 22nd, 2010.

\(^{136}\) Roh Moo-hyun administration’s Gukbanggaehyuk 2020 (Defense Reform 2020) was focused on “developing an autonomous force…capable of protecting itself without the allied support.” The USFK’s primary functions such as
Second, a pursuit followed by an armored offensive is reasonable from the military viewpoint as well. A pursuit is an effective mean to destroy the enemy forces and exploit the victory, and the risks involved in a retreat present a considerable advantage to the pursuer. An excessive pursuit should be avoided to minimize the dangers of an enemy ambush or an overextension of the lines of communication (LOC.) But South Korean advantage in C4ISR would lessen the chances of a North Korean ambush while South Korea’s well-developed economy and transportation capability would support the logistics. Qualitatively advanced and mobile armored forces will strengthen the lethality of the South Korean pursuit even further.

Third, a need for a rapid end would make armored breakthrough a reasonable option. The public would demand a quick conclusion while they would not welcome the idea of the North Korean threat existing even after the devastating war. Also, although the South Korean economy is far superior to the North, the war’s effect on South Korea’s trade-central economy would not be minimal. These dynamics all require a quick victory as the ideal outcome, and a successful blitzkrieg would be deemed an optimal option for that objective.

Fourth, this paper presents these assumptions as one way of providing favorable conditions to the KPA. South Korea might have a better chance of victory if it wears down the North Koreans in a war of attrition, considering South Korea’s economic and population advantage. But if a full-power armored assault can succeed as well, that would mean that North Korea would have no means to stall the South Korean counterinvasion.

Based on this setting, the South Korean campaign objective during the counterinvasion campaign would be to 1) inflict maximum damage against the KPA offensive while minimizing its own damage, 2) inflict maximum damage against the retreating KPA during the pursuit, and finally, 3) to break through the North Korean defense at the MDL or at the South Korean territory. Through a campaign analysis, the following sections will analyze if these objectives could be fulfilled.

C4ISR and air power have been the center of the reform. For an overall discussion on the South Korea’s recent military reform, see Kang, *Hangukeui Anbojunryakgwa Gukbanggaehyuk (Korea’s Security Strategy and Defense Reform).* Ch.4-6.


138 South Korea’s exports and imports accounted for 82.2% of its GDP, the highest figure among the G20.(data as of 2009) Donga Ilbo, July 4th, 2010.
(2) Phase 1. North Korean Invasion

*Combat Dynamics*

The field has already reached a consensus that a fully mobilized armored blitzkrieg would be North Korea’s most likely (or the only) option of invasion.\(^{139}\) Considering North Korea’s inability to fight a long war, North Korea is very likely to pursue a quick victory based on a Soviet-style armored assault. However, such attempt is likely to fail even without the U.S. intervention. A number of studies have already elaborated this process, so this paper will focus on highlighting the recent developments underdiscussed in the past literatures that would affect the result.\(^{140}\)

The KPA will initiate the process by secretly advancing the 2\(^{nd}\) Corps toward the Western Front for a surprise attack. The attack is likely to begin by a barrage of artillery attacks from the 802 and Gangdong Artillery Corps in order to stun the defense of the ROK 3\(^{rd}\) Army (TROKA) guarding the Western Front and to breach a hole for the armored elements to exploit. The infantry will follow the armored assault while the 8\(^{th}\) Special Operations Corps would attempt an infiltration behind the defense line to create havoc and sever the South Korean lines of communication.

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\(^{140}\) The most recent works analyzing a Korean campaigns include Hamm, Suh, and Michishita, *Bukhan Gunsamunjeesiui Jaejomyung (The Military of North Korea: A New Look)*; Hwang, *Kim Jong-il, Gonporul Ssooolida (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats)*; Suh, *Power, Interest, and Identity in Military Alliances*. Suh’s work is the only English-written publication that comprehends the recent changes in the conventional balance. His co-work with Hamm published in 2006 is considered one of the most comprehensive works on the peninsula’s military balance, covering the history of arms race to North Korea’s asymmetrical force development.
However, as many already have concluded, a North Korean assault is less likely to succeed in breaking through the South Korean defense. Force-to-space constraints will neutralize the North Korean numerical advantage while the mountainous terrain would create a “kill zone” along the attack corridor for the South Korean air force and the artillery to exploit. South Korean forces’ striking advantage in quality would force the North Korean attack forces to suffer a

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disadvantageous exchange ratio while the South Koreans would maintain their dense defense. North Korean forces will be constantly exposed to air power as well. Even if the North Korean air force could survive the initial phase of the war, the established literatures in the field agree that NKAF would not be able to cross the DMZ to stall the South Korean air power.\textsuperscript{142} According to the field’s consensus, the fear of North Korean SOF is exaggerated as well.\textsuperscript{143} Antonov AN-2 lightweight transport aircraft is often hyped as their primary mean of infiltration, but those aircrafts are highly vulnerable to anti-air systems and South Korean surveillance would not have much trouble in detecting them. In fact, an infiltration attempt from the North Korean special forces is no longer deemed a realistic threat.\textsuperscript{144} As a result, the North Korean blitzkrieg is likely to fail in breaking through the South Korean defense.

The recent developments that the latest studies did not cover strengthen the South Koreans advantage even further. The development and deployment of 484 K1-A1 tanks sealed the superiority of the South Korean tank forces as the model’s quality is evaluated to match the latest models of M1. It would be unrealistic to think that North Korea’s T-54/55 and T-62 would stand a chance against South Korea’s 1,500 3\textsuperscript{rd} Generation MBT (K1 and K1-A1).\textsuperscript{145} South Korea is now one of the five countries that possess more than 1,000 3\textsuperscript{rd} generation main battle tanks (MBT), and the historical precedents show how much advantage an advanced tank force could exploit against the outdated models.\textsuperscript{146}

\begin{footnotesize}
\begin{enumerate}
\item Hamm, Suh, and Michishita, \textit{Bukhan Gunsamunjeeui Jaejomyung (The Military of North Korea: A New Look)}, 5; Hamm, \textit{Arming the Two Koreas}, 84-85.
\item The 1\textsuperscript{st} generation tanks consist of the medium tanks designed and produced directly after World War II later repurposed as main battle tanks (M48, T-54). The 2\textsuperscript{nd} generation tanks refer to the tanks equipped with 105mm-115mm gun, enhanced night-fighting capabilities and in most cases NBC protection (M60, T-62, T-72). The 3\textsuperscript{rd} generation of main battle tanks has improved digital computerized fire control systems and more advanced composite armor, mostly equipped with 120mm-125mm gun (M1 Abrams, T-80, K1, K1A1).
\item Not to mention the Gulf War, such precedents were already evident as early as the Second World War. The German Tiger I is claimed to recorded a ratio of 5.74 kills to each loss, with 9,850 tank kills for a loss of 1,715. It is important to note that the number of Tiger I lost is higher than those produced (1,347), as the Wehrmacht included tanks that had undergone heavy repair in the total loss. Fabio Prado, \textit{Tiger I Tank}, \url{http://www.fprado.com/armorsite/tiger1.htm} accessed on July 30th, 2011; Michael Green and James D. Brown, \textit{Tiger Tanks at War}, 1st ed. (Zenith Press, 2008).
\end{enumerate}
\end{footnotesize}
If positioned in a defensive position with a better C4ISR, the advantage becomes even more significant. According to Epstein’s simulation, even a M-60A1 would enjoy as much as 17.4:1 exchange ratio against T-62 (whose WEI/WUV score is similar) if obstacles and a concealed position are provided,\(^{147}\) not to note that South Korea’s K1 and K1A1 tank both clearly surpasses the quality of M-60 while North Korea’s tank forces are mainly composed of T-55 and T-62. Suh’s dynamic analysis shows that the North Korean tank forces will be annihilated within D+10 if they engage in head-to-head tank warfare. This analysis was written in 2006, even before the majority of K1A1 was deployed.\(^{148}\)

The recent expansion of the South Korean artillery forces would be an important factor as well. The development of the K-9 self propelled howitzer and the acquisition of ATACMS capable MLRS would be effective countermeasures against the North Korean advance, striking the massed enemy forces with a barrage of area-affect munitions. The entire South Korean artillery force almost doubled in numbers since the last decade, weakening the effectiveness of North Korean artillery attacks through rapid counterbattery missions.

Even more significant is the difference in the air power further widened by the acquisition of 39 F-15K Eagle.\(^{149}\) This change would virtually end the North Korean air force’s combat effectiveness in the air battle. Hamm and Suh argued in 2006 that the South Korean air force would gain complete air superiority within D+5, and added that “...once F-15 is delivered, it would put an end to all the questions involving the air control in the Korean theatre.”\(^{150}\) In the most recent campaign analysis of the Korean theatre (published in 2009), Hwang Il-do, one of the most renowned journalists in the North Korean security affairs, went even further, claiming “...North Korean air force would not be able to conduct an operation 24 hours after the war’s outbreak,” claiming that the South will gain full air control on D+3 at the latest.\(^{151}\)

Formal Analysis

\(^{147}\) Epstein, *Conventional Force Reductions*. 70.


\(^{149}\) 20 more is to be delivered this year. Chosun Ilbo, August 8th, 2010.


\(^{151}\) Hwang, *Kim Jong-il, Gonporul Ssooalida (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats)*, 48–51.
To substantiate the argument, this paper simulated the process of the North Korean offensive based on the Attrition-FEBA Expansion Model devised by Richard Kugler and Barry Posen and the Adaptive Dynamic Model by Joshua Epstein. In contrast to the static bean-counts, these formal models estimate the campaign’s outcomes by simulating the dynamics of the warfare.

While evaluating the both sides’ prospective for victory based on these models, this paper focuses more on the amount of casualties that both sides would suffer before they move onto the subsequent phases of the counterinvasion.

The principal difference between the two models lies in the functional dependence of FEBA movement. In one case, movement is assumed as a function of the ratio of engaged forces in the sectors of main effort and largely determined by unit type and doctrine. In the other, movement is assumed to be driven by the willingness of the attacker and defender to suffer attrition in order to prosecute the offensive or to hold ground. In both cases, the defensive line in non-breakthrough-effort sectors is withdrawn to prevent the formation of a salient.

Both models are known to be the representative formal models in estimating the war outcome, but the application of a model does not ensure accuracy by itself as all wars are unique. To pursue accuracy in a formal analysis, the analysis should be based on a deep understanding in both side’s capabilities and intentions, which would provide adequate parameters in attrition rates, force exchange ratio, advance rates, arrival time, force multipliers, and so forth. These parameters should not be maintained considering the ever-changing nature of warfare. The application of these models must be prepared by an intensive study of the campaign’s likely courses of actions and the base parameters should be modified accordingly as the campaign proceeds within and among the suggested phases.

This paper has derived the parameters from historical analyses of the past counterinvasion campaigns and qualitative assessments on the current North and South Korean forces, while deriving related numbers from other analyses on armored warfare. These parameters are based on the assumption that North Korea’s objective is to break through the South Korean defense

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within D+60 while willing to suffer quite high attrition rates.\textsuperscript{154} (For the list of assumptions and parameters applied during this phase, see List 1.)

Then, what kind of conditions would construct a culminating point of attack for the North Korean advance?\textsuperscript{155} This analysis sets three conditions for the North Koreans to admit the failure of its offensive. First, based on the force-to-space constraint, I assume that the attacker would admit the offensive’s failure when it can no longer maintain 2 ADE per 25km breakthrough sector and 1 ADE per 25 km non-breakthrough sector.\textsuperscript{156} Based on the Kugler-Posen model, the attacker concedes failure when its force availability curve cannot meet such force needs. As a favorable assumption to the North Koreans, I assumed that the KPA will succeed in amassing its entire ground forces of 63.19 ADE at the front on the D-Day without being detected. (The North Korean reserves of 9.91 ADE will arrive at the front on D+20.) Although a non-viable assumption nowhere close to reality, this will be add to the analysis’ soundness arguing the eventual success of South Korean counterinvasion.

Second, I assume that the KPA will stop its offensive when the force level falls below 40% of its initial strength. In historical precedents the attacker gave up the offensive even with a higher

\textsuperscript{154} The threshold of 60 days is derived from the analysis in North Korean economic conditions and previous campaign analyses of the North Korean invasion. This threshold could be subject to a sensitivity analysis but is rather unnecessary as in all scenarios North Korea fails to sustain the warfare past 60 days. For the discussion on this threshold, see Starr, “Fuel Shortage Limit N.Korea,” 12 ;.Beldecos and Heginbotham, “The Conventional Military Balance in Korea,” 4.

\textsuperscript{155} “Culminating Point of Attack” is a concept introduced by Clausewitz, defined as “a point at which the forces remaining are just sufficient to maintain a defensive, and to wait for peace.” Beyond that point the scale turns and there is a reaction; the violence of such a reaction is commonly much greater than the force of the blow. It is considered unwise to extend the offensive after the force reaches the culminating point, although a clear measurement of the point is difficult hence there are a number of precedents that the commanders ignored the culmination and continued the offensive, only to face a clear defeat. North Korea’s assault against the Pusan Perimeter is considered as one of those cases that the commander extended the attack beyond the culmination point. The North Korean forces at the perimeter were already outnumbered by the UN forces when the offensive began. For details on the concept, see Clausewitz, \textit{On War}, Book 2. Chapter 5. On the battles of the Pusan Perimeter, see Uzial W. Ent, \textit{Fighting on the Brink: Defense of the Pusan Perimeter} (Turner Pub Co, 1998).

\textsuperscript{156} In this analysis the ground battles are assumed to happen only at the breakthrough sectors. This assumption may seem unrealistic as there will be some combats at the 140km wide non-breakthrough sectors as well. From the precedents of the later stages of the Korean War, we could guess that there will be numerous battles between the infantry battles to gain better positions. But I exclude these battles from my analysis for two reasons. First, such battles only happened at the final two years of the Korean War where an additional territorial gain before the peace talks was the primary objective, not an effective breakthrough against the enemy. Second, a triumph at the non-breakthrough sectors matters less in this campaign as each attack corridors are mostly isolated to each other, not conducive to envelopment from the near non-breakthrough sectors. Third, considering the North Korean disadvantage in the exchange ratio, attritions at the non-breakthrough sectors is more likely to be at their disadvantage while a significant tactical gain is unlikely. According to a computer simulation expanding the attrition to a front-wide scale only accelerates the North Korean attrition while not contributing to the breakthrough. Hence excluding this factor would be a favorable condition to the North and add conservatism to the analysis.
force level, but I loosened the threshold in favor of the North Koreans given their need for a quick victory. This provides a favorable assumption to the North Koreans, as they would be willing to suffer more casualties if necessary.

Third, based on its economic constraints, the KPA would have to finish its breakthrough within 60 days. This figure is driven from several reports on the North Korean capability to fight a long war. Even the 60 days threshold is quite favorable to the KPA, as the logistics problem would impede the North Korean effort from the very first day of the war. North Korean officers testify that North Korean forces are so short on resources that they might have to exploit gas from the South Korean gas stations at the initial stage of the war.158

For the South Koreans, I assumed that their objective is to maintain the force level above the threshold of 1 ADE per 25km at the breakthrough and non-breakthrough sectors. To add more favorable assumptions to the North Koreans, I assumed that the South Korean reserves (estimated strength of 11.37 ADE) are not mobilized before D+20. The reservist buildup schedule is unavailable to the public, but this figure is quite conservative considering the theatre’s small size and the South Korean population’s concentration around Seoul. These factors would reduce the time for mobilization and reinforcement, while the conscription experience and annual reservist training would lessen the post-mobilization training period.160

Also, 47km (estimated length of the Munsan Corridor from DMZ to Seoul) will be the maximum distance of retreat for the South Koreans. This paper assumes that South Korean forces will automatically begin their counteroffensive at all costs when their aggregate retreat

157 In the Operation Zitadelle, more than 2/3 of the German forces were available for action when Hitler called off the attack. Among 780,000 men and 2,928 tanks mobilized, the German loss was around 257,000 men and 1,043 tanks. For a detailed analysis in the German losses at the Operation Zitadelle and the Battle of Kursk, see David M. Glantz and Jonathan M. House, The Battle of Kursk (University Press of Kansas, 2004), 117, 276.

158 Lee, Bukhangunaenun Gunbbangi Upda (The North Korean Military does not have Breadbiscuits), 87.

159 Approximately 55% of the South Korean population resides within the Greater Seoul Area. For the studies on NATO and Soviet mobilization schedule, see Posen, Inadvertent Escalation, 85–101; Epstein, Conventional Force Reductions, Appendix C. Irving Heymont, Review and Analysis of Recent Mobilizations and Deployments of US Army Reserve components (Research Analysis Corp, 1972).

160 The South Korean reservists receive their annual training at the units they served as a conscripted force, which would facilitate their assimilation into the fighting force.
distance reaches 47 km.\textsuperscript{161} In that case, the campaign rules out the first scenario (the North Korean retreat) and moves on the second one (North Korea’s defense at the South territory).

To add more favorable assumptions to the North Koreans, this paper assumes that 20% of the South Korean force strength does not participate in this phase, guarding the rear against the possible North Korean air/sea infiltration.\textsuperscript{162} Also, I assume that 30% of the front forces will not be mobilized until D+3 due to North Korea’s suppression efforts during the surprise. To summarize, South Korea’s initial force strength at the D-Day is 24.05 ADE among the entire force strength of 42.94 ADE. Moreover, I do not add any force multiplier for the South Koreans at this phase for their C4ISR advantage or defensive fortifications.\textsuperscript{163}

Based on these objectives and threshold for victory and defeat, how would the campaign proceed? Although an unrealistic assumption, I assume that North Korean surprise would succeed and would have an impact for the first three days of the war.\textsuperscript{164} Based on this combat dynamics the base parameters favor the North Koreans in several aspects during this time period. For a quick breakthrough the North Korean forces are assumed to take as much as 15% daily attrition rates in the breakthrough sector for the first three days of the war.\textsuperscript{165} But in return, a 1:1 exchange rate is assigned for the attackers during this period, usually an unrealistic parameter in favor of the attacker against a qualitatively superior defender.

Also, the North Korean forces are assumed to advance 5 km per day until D+3. While the number may seem minimal, even a 5 km advance rate is an astounding figure in the Korean theatre. At the later phase of the Korean War even an advance of 0.4 km was considered routine.

\textsuperscript{161} Although in this paper’s simulation the North Korean forces fail to advance 47 km even in quite favorable assumptions. For the progress of the North Korean advance, see Appendix.

\textsuperscript{162} This figure is based on the approximate strength of the South Korean 2nd Operational Command which is in charge of the rear area. Although at the actual campaign a considerable portion of the 2nd Command will be sent to the front to reinforce the defense.

\textsuperscript{163} In contrast, Masaki adds 140% force multiplier to the South Korean forces for their defense fortifications. Masaki, “The Korean Question.” \textsuperscript{8}.

\textsuperscript{164} Due to persistent surveillance a North Korean surprise is deemed almost an impossible scenario. For detailed analysis in the possibility of North Korean surprise, see Kang, \textit{Hangukeui Anbojunyakgwga Gukbanggaehyuk (Korea’s Security Strategy and Defense Reform)}, 55–57. Masaki, “The Korean Question,” 25–31.

\textsuperscript{165} This figure is thrice the maximum level of attrition the Chinese PLA suffered in the Korean War Beldecos and Heginbotham, “The Conventional Military Balance in Korea,” 7.
At the routes defended by a fortification, records tell that the advance rate was close to zero due to relentless daily counteroffensives and rough terrains hindering the advance. 166

After the first three days, the surprise loses its effect and the base parameters change in favor of the South Korean defense. A daily attrition rate of 10 percent is assigned to the North Korean forces at the breakthrough sectors while suffering a 2.5:1 force-to-force exchange ratio with an advance rate of 1 km per day. Given the necessity to breach the South Korean defenses as quick as possible, the high attrition tolerance assumed in this analysis favors the North and builds conservatism into the simulation. As for the force-to-force exchange ratio during the North Korean offensive, this figure seems even favorable to the attackers considering to the historical analysis in the Korean War and other historical cases. 167 The exchange rate during the Chinese offensive against the UN forces ranged from 3:1 to 10:1, and the Arabs suffered 3:1 exchange ratio against the Israeli forces with arguably a narrower gap in quality and a more favorable terrain compared to the Korean theatre. 168

The North Korean surprise is assumed to hinder the South Korean close air support (CAS) as it would involve a barrage of artillery and missile fires on the airfields. 169 I assign 0.25 vehicle kill per sortie for the first three days of the war. 170 After D+3, the South Korean air force is assigned a kill rate of 0.4 per sortie. Throughout the phase the South Korean air force executes 2 daily sorties while suffering a 4% daily attrition. The North Korean CAS assets maintain 0.25 kill per sortie with 1 daily sortie rate and 5% attrition rate throughout the phase. Assuming the probable South Korean air control, I also assume that the North Korean fighters cease to participate in the CAS mission after D+3. From D+4, North Korean CAS is conducted by its helicopter forces. It is reasonable to assume that North Korean attrition rate would increase as helicopters are more

166 For details on the advance rates during the Korean War, see Appleman, South to the Naktong, North to the Yalu (June-November 1950). Walter G. Hermes, Truce Tent and Fighting Front: United States Army in the Korean War (University Press of the Pacific, 2005); Hamm, Suh, and Michishita, Bukhan Gunsamunjeui Jaejomyung (The Military of North Korea: A New Look), 5:376–377.

167 For comparable cases on exchange ratios, see Chung, Hankuk Junjaeng (Korean War), 58; Posen, Inadvertent Escalation, 119–120.


169 However, Suh’s simulation on the North Korean barrage suggests that the public fear against the North Korean asymmetrical attack is overly exaggerated due to their limitations in accuracy and South Korea’s effective counterbattery operations. Suh, Power, Interest, and Identity in Military Alliances, Ch.2. and Appendix D.

170 On the calculation of CAS effectiveness, see Posen, Inadvertent Escalation, 107–110.
vulnerable to anti-air fires. However I maintain the 5% attrition to grant a favorable assumption to the North Koreans. In fact, the North Korean CAS capability is so limited that 5% or even a 10% daily attrition makes virtually no difference throughout the entire campaign.

For each vehicles killed, I assumed a loss of 81.88 WUV score (0.0016 ADE), also a score assigned to a 152mm towed artillery.\textsuperscript{171} These scores vary from mortars (39.36) to T-62 tanks (113), but I picked the 152mm artillery based on their large numbers and visual/tactical significance to each side’s CAS assets.\textsuperscript{172}

Based on these parameters, the simulation supports the field’s consensus that the North Korean offensive is very likely to fail while suffering heavy casualties despite all the aforementioned favorable assumptions for the KPA. Due to the narrow theatre and few approach avenues both sides would have no trouble in fulfilling the force needs to populate the front as required by the Kugler-Posen Model. However, North Korea’s force level will be outnumbered by the South Korean forces on D+22 and will fall below the 40% threshold by D+31 according to the simulation. Given the assumption that KPA would not retreat until it loses 60% of its entire forces, the estimated loss for the KPA in this phase would reach a stunning number of 46.98 ADE. The remaining force level is estimated to be 26.28 ADE, excluding the additional mobilization from the North Korean territory. A likely estimate for the North Korean advance would be 43km, stopping around Changdong, 4km above Seoul.

\textsuperscript{171} On calculations of WEI/WUV scores and ADE, see Epstein, \textit{Conventional Force Reductions}, Ch.3.

\textsuperscript{172} Exact number of the North Korean 152mm towed artillery is unknown (Data on the quantity of specific models are unavailable in the unclassified sources,) but the number is estimated to exceed at least 2,000, while being visually significant as well. The weapon system is believed to play a key role in the initial artillery barrage and subsequent armored warfare, and at the same time it would also be an easy target to the South Korean air force due to its limited mobility. Furthermore, the system’s WEI/WUV score is located at the approximate median of the North Korean armored force’s WEI/WUV score distribution (Although a precise median cannot be calculated to the lack of data on each system’s quantity.) Based on these reasons, it would not be too much unreasonable to assign the 152mm artillery’s WEI/WUV score to the lost vehicles. Furthermore, this assumption adds conservatism to the analysis as the damage could be much bigger in the actual combat, assuming that the South Korean air force would focus their fire on the most lethal weapon systems such as tanks and self-propelled artillery. Salience of this assumption could be discussed in further studies. (One alternative to this assumption would be to calculate an expected value of the entire North Korean vehicles).
Assumptions Summary (Phase 1. The North Korean offensive):

- North Korean full deployment at the front without prior detection
- No North Korean build-up delay for post-mobilization training

\(^{173}\) For the detailed results of the simulation, see Appendix.
- No South Korean credit for greater command and support efforts

- North Korean Objective: 1) Advancement of 47km by D+60, 2) Maintenance of 2 ADE per 25km in breakthrough sectors (1 ADE per 25km in non breakthrough sectors), 3) Maintenance of force strength above the 40% threshold

- South Korean Objective: 1) Limiting the North Korean advance to 47km (South Korean counteroffensive begins when the aggregate withdrawal reaches 47km), 2) Maintenance of 1 ADE per 25km

- Initial Force Deployment:

  -1 ADE per 25km for South Korea;
  -North Korea puts 1 ADE per 25 km in non-breakthrough sectors, 2 ADE per 25km in breakthrough sectors.
  (Initial Force Need: 10 ADE for South Korea, 14.4 ADE for North Korea)

- Buildup:
  - D+4: South Korean Reinforcement of 10.3 ADE
  - D+20: South Korean/North Korean Reserve Mobilization (SK: 11.67 ADE, NK: 9.91 ADE)

- D+1 to D+3: North Korean Surprise
  - Daily North Korean attrition in the breakthrough sectors: 15 percent
  - Exchange Rate: (North Korea: South Korea) 1:1
  - North Korean advance rate in breakthrough sectors: 5 km/day\(^{174}\)

- After D+4:
  - Daily North Korean attrition in the breakthrough sectors: 10 percent
  - Exchange Rate: (North Korea: South Korea) 2.5:1
  - North Korean advance rate in breakthrough sectors: 1 km/day\(^{175}\)

- Defender’s maximum distance of withdrawal: 47km
- Defender’s threshold attrition rate at the breakthrough sector\(^{176}\): 20 percent\(^{177}\)

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### List 1. Combat Assumptions during the North Korean Offensive

South Korean casualties would be considerable, but their loss would be less significant compared to the ruinous North Korean casualties. South Korean forces would possess sufficient forces to meet the force need curve throughout the phase due to the reinforcements on D+3 and

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\(^{174}\) This figure is assigned as W(1) (defender’s rate of withdrawal on D+1) in the Epstein Model’s application.

\(^{175}\) This figure is assigned as W(4) (defender’s rate of withdrawal on D+4) in the Epstein Model’s application.

\(^{176}\) When the defender’s attrition exceeds this parameter withdrawal begins.

\(^{177}\) Considering the South Korean need for a firm forward defense, the South Koreans would be willing to sustain even higher attrition. On the other hand, this figure matters less in this simulation as the South Korean forces never reach this threshold due to their advantage in force-to-force exchange ratios.
the reserve mobilization on D+20. At the point of North Korean forces’ retreat, the South’s casualty would reach 9.6 ADE while the remaining force level is estimated to be 36.37 ADE.

To summarize, it is highly probable that the North Korean attempt for a breakthrough would end with a devastating defeat. The size of this defeat is shown in the ratio of the remaining forces, as this phase began with a ratio of 2.64:1 frontwide force strength in ADE score but at the end the ratio changes to 1:1.38. According to the simulation the North Korean forces would face a disastrous defeat, losing a stunning figure of 46.98 ADE. This figure approximately accounts for 67% of the North Korean standing army (excluding the reserves), which could mean the combined loss of 687,000 troops, 2,300 battle tanks, 5,600 artillery tubes, 3,400 multiple rocket launchers and so forth. This devastating loss is not the kind of damage that can be easily replenished even by the most advanced industrial economies, and this loss is very likely to be the key factor in North Korea’s low chance of defense once the South begins its counteroffensive.

This simulation’s sensitivity analysis adds salience to these findings. The North Korean offensive is likely to fail even if the simulation assigns a plethora of unrealistic parameters in the North’s favor. Even a 1.25:1 force exchange ratio in favor of the North Koreans is insufficient to force the South Korean force need to exceed the force availability. The KPA would still meet the 40% threshold on D+30 and the remaining South Korean strength would be in parity with the North Koreans (26.11 ADE vs. 26.19 ADE.) This unrealistic parameter does not alter the chance of South Korean defense, but it could affect the subsequent phases of the counterinvasion as it

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178 This simulation result is in accordance with the recently published analysis of the North Korean armored assault while reflecting the recent strengthening of the South Korean forces. Masaki (1994) presented three scenarios based on differing exchange rates (1:1.64, 1:2, 1:2.3) and concluded that the South Korean defense would succeed in delaying the North Korean breakthrough until the reserve mobilization and the U.S. reinforcement. Beldecos and Heginbotham’s (1995) simulation suggested that South Korea and the United States defense would be sufficient to thwart the North Korean assault with even a 1:1.5 exchange ratio resulting in the allied victory, predicting a stalemate north of Seoul. O’Hanlon (1998) agreed with Beldecos and Heginbotham, arguing that the ROK-US alliance would make out as well as the NATO did in the European context. After a decade the works began to explicitly analyze the prospect of South Korea’s independent defense. Simulation by Hamm and Suh (2006), Suh (2007) concluded that even an undetected North Korean assault with and exchange rate of 1:1.75 would be insufficient to breach the South Korean defense without the American support. In the latest publication related to the subject, Hwang (2009) considered the North Korean breakthrough as “no longer a possibility” and focused on the North Korean asymmetric threats. The South Korean victory in this simulation suggests that South Korea’s force effectiveness has grown even further.

179 These figures are derived from Epstein and Masaki’s ADE calculation.

180 A force exchange rate favorable to the North Koreans would increase the gap in the two force’s numerical disparity. However, the narrow terrain requires only a limited number of forces to populate the front. Therefore, North Korea’s attrition forces the KPA to meet the 40% threshold even before the South Korean force needs surpass the force availability in the Kugler-Posen model.
decreases the South Korean forces available for pursuit and counteroffensive. However, this problem is resolved if South Korea chooses to mobilize the 2nd Operational Command at the rear and if an adequate force multiplier is applied for South Korea's command and support advantage.

North Koreans might be able to take Seoul if they lower their daily attrition rate and continue their advance until the KPA reaches Seoul. According to a sensitivity analysis, the KPA could reach Seoul before falling below the 40% threshold if they limit their daily attrition within 8% and maintain their advance rate of 1 km per day after the end of the initial surprise. However, this sensitivity analysis lacks reality as it overlooks the possibility of South Korea taking the initiative to defend Seoul at all costs. If Seoul is in danger the South Koreans would launch a fierce counterattack in order to impose additional attrition to the KPA, and the KPA would be forced to withdraw (instead of advancing) unless it is willing to raise its daily attrition threshold. If the threshold is raised, the KPA's force level would fall below the 40% threshold before it reaches Seoul. If the KPA refuses to modify the threshold, they would not be able to advance toward Seoul before being thwarted by the South Korean defense. To summarize, even the sensitivity analyses in North Korea's favor emphasizes the prospect of a successful South Korean defense.

Assuming the end of the North Korean offensive, the course of campaign differs according to North Korea's choice of its defense posture. As noted, this paper presents two scenarios depending on whether the North retreats to the military demarcation line or maintains its position in the South Korean territory.

(3) Scenario A. Phase 2. North Korean Retreat and South Korean Pursuit

*Combat Dynamics*

In this scenario, North Korean troops are assumed to start their retreat toward their current defense line above the DMZ after the offensive’s failure. Their objective in this phase would be to retreat into their fortifications above the DMZ while minimizing casualties. In contrast, South

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181 Based on this paper's simulation on the subsequent phases, at least 29.40 ADE is required for South Korea in order to succeed in the counteroffensive. The assumptions on the following phases will be provided in List 2, 3, and 4.

182 If we apply the Epstein Model, the KPA's advance rate will drop as it lowers the attrition rate threshold.
Korea’s objective would be to pursue the KPA and inflict maximum damage before they reach the military demarcation line.

Limiting the force casualty during retreat is not an easy task; in fact, many military classics define it as one of the most difficult ones.\(^{183}\) Redeploying the front forces to the rear will cause havoc at the narrow corridor, and the KPA’s rear will be exposed to South Korean armor and area-affect artillery barrages while the South Korean forces will release their full offensive potential with less worries of a KPA counterattack. These factors are very likely to amplify the South Korean advantage in the casualty exchange ratio even further.

Also, considering that North Koreans will deploy their armored forces in the front during their offensive, the armored forces will be at the rear when the retreat starts and thereby would be the first targets of the South Korean pursuit. Loss of these force elements would be a body blow to the North Korean capability to sustain the war.

Among all, the most devastating threat against the North Koreans would be the South Korean air force’s BAI against the retreating forces. It is almost certain that the South Koreans would gain full control of the air by this phase of war, and they would attack the North Koreans without being impeded. North Korean forces’ MANPADS and mobile anti-air weapons system are outdated, and their limited effects would be further limited when they are retreating.

Then, how would the KPA minimize its damages during this phase? The ideal case for the retreating forces is to retreat as quickly as possible, while hindering the South Korean movement by signaling that there would be an ambush in the pursuit route like the winter of 1950. But considering the likely combat dynamics, it would be difficult for the North Koreans to fulfill those conditions.

First, it would be difficult for the North Koreans to retreat in their full speed. They would have to avoid open corridors and daytime movements in order to minimize the South Korean battlefield air interdiction, and they would have lost considerable portion of their vehicles during their offensive. Furthermore, the Korean theatre’s mountainous terrain and the KPA’s heavy equipment would impede the movement. One option is to abandon the heavy equipment, but it

would weaken the KPA force strength even further.\(^\text{184}\) Also, the limited capabilities of the KPA engineer element would become an issue when the retreating forces would have to cross the Han and Imjin River during the retreat.\(^\text{185}\)

Second, deploying rearguards to impede South Korean pursuit may save the entire forces from a total collapse, but this option is not without its limitations. South Korea’s advantage in C4ISR will limit the effects of the rearguard’s ambush. Deploying rearguards in the corridors would slow down the South Korean pursuit, but the retreating forces will still be exposed to BAI and the rearguard is likely to be annihilated in a few days considering the force exchange ratio between the South and North Korean forces and the lack of fortification. Moreover, logistics to the rearguards would be virtually cut off by the South Korean air force’s air interdiction. Even if the North Koreans deploy 1 ADE per 25km for rearguard, these units will be destroyed in 5 to 7 days if the South Korean counteroffensive is willing to accept 10% attrition per day with an exchange ratio ranging from 1:1.5 to 1:1.7. Loss of these rearguards will cost 4.4 ADE for the North Koreans, approximately 17% of their remaining troop strength. Loss of these rearguard units will reduce the North Korean forces even further that would hinder the North Korean defense efforts at the next phase of war. Considering that North Korea would have approximately 26 ADE at the end of the first phase, even a loss of 2 to 3 ADE would do serious damage to the following defensive.

Even assuming that the North Korean forces maintain their command structure during the retreat, it would take at least a few days for them to complete the withdrawal. Until then, they will be exposed to the South Korean forces’ ground pursuit and air attacks.

*Formal Analysis*

Then, how many casualties would the North Koreans suffer during the phase of retreat? In this formal analysis, I calculate the amount of BAI damage that South Koreans could inflict to the North Koreans. This paper excluded South Korea’s ground pursuit campaign for three reasons:

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\(^{184}\) After the devastating defeat at the Hyunri, the South Korean forces had to detonate their heavy equipment in order to speed up the retreat while preventing the PLA from taking the equipment. Chung calls it “probably the most embarrassing moment of the South Korean army’s history.” Chung, *Hankuk Junjaeng (Korean War)*, 179–181.

\(^{185}\) The former KPA officers say that the lack of fording equipment was always a serious issue for the North Koreans. On the North Korean engineer forces, see Bermudez Jr., *The Armed Forces of North Korea*; Lee, *Bukhangunaemun Gunbbangi Upda (The North Korean Military does not have Breadbiscuits)*, 197–198.
first, this treatment would give favorable conditions to the North Koreans in order to increase the analysis’ resonance. Second, focusing on BAI would be an opportunity to assess the South Korean air power that has been relatively underdiscussed in previous studies.

Based on Posen’s method of BAI calculation, this paper calculates the potential North Korean casualties by combining the South Korean air force’s number of air-to-surface attack capable aircraft and helicopters, daily sortie rates, mission capability rate, kills per sortie, and attrition rates per sortie. For each vehicle kill, an average WUV score per vehicle is subtracted from the KPA’s ADE calculation.\(^{186}\)

I assume that 350 fighters and helicopters in total would be capable of BAI for the South Koreans. This figure assumes that South Korea has not taken significant efforts to replenish its air force damaged during the previous phase. But in reality, South Korea would be able to repair quite a number of BAI assets during the North Korean offensive which would take about a month. Posen assigned 0.5 kills per sortie, 2 sorties per day, and daily attrition rates of 0.05 for the NATO air forces against the Warsaw Pact, and I have modified these parameters for my analysis. (For the summary of assumptions, see List 2.)

The South Korean assets are assigned 0.5 kills per sortie. The BAI mission would be hindered by the mountainous terrain that will provide cover for the retreating North Korean forces, but the absence of North Korean anti-air operation during retreat would contribute to a higher kill rate. It should also be noted that the recent technological developments in the fighter aircraft could enhance the BAI effectiveness even further. The development of the LANTIRN (Low Altitude Navigation and Targeting Infrared for Night) system is believed to have made a revolutionary difference in the air-to-surface mission effectiveness.\(^ {187}\) Combined with the laser-guided

\(^{186}\) Posen, *Inadvertent Escalation.* 102-103.

\(^{187}\) South Korea’s F-16 and F-15K are all equipped with the LANTIRN system while even the most advanced North Korean fighters lack a system of an equivalent function (The system was unavailable to the NATO as well when Posen made his estimate.) LANTIRN system significantly increases the combat effectiveness of these aircraft, allowing them to fly at low altitudes, at night and under-the-weather to attack ground targets with a variety of precision-guided and unguided weapons. LANTIRN consists of a navigation pod and a targeting pod integrated and mounted externally beneath the aircraft. The AN/AAQ-13 navigation pod provides high-speed penetration and precision attack on tactical targets at night and in adverse weather. The AN/AAQ-14 targeting pod contains a high-resolution, forward-looking infrared sensor (which displays an infrared image of the target to the pilot), a laser designator-rangefinder for precise delivery of laser-guided munitions, a missile boresight correlator for automatic lock-on of AGM-65D imaging infrared Maverick missiles, and software for automatic target tracking. For a detailed
munitions and other precision-guided ordnance, the South Korean fighters would impose catastrophic damage on the retreating North Korean forces. \(^{188}\) While this paper will maintain 0.5 as the base parameter, the potential increase in the kill rates will be reflected in the sensitivity analysis.

An attrition rate of 0.02 was assigned to the South Korean air force based on the North Korean forces’ limited anti-air capability during their retreat. For the sortie rate, I applied Posen’s assumption of 2 sorties per day to my analysis as well. South Korean air forces’ sortie rate could drop if Seongnam or Kimpo airfield was damaged at the previous phase, but there is less chance that the runway would not have been repaired until this phase of the war. The sortie rates could increase even further if we take into account the LANTIRN system’s contribution to the fighter’s night operation capability. \(^{189}\)

Furthermore, I assume that it would take 5 to 7 days for the North Korean forces to complete their retreat. In the previous phase I assumed that North Korean forces would advance 42 km southward of military demarcation line. The pursuit of 1950 may be irrelevant for this comparison as the North Korean forces lost their command structure and were enveloped by the UN forces that took Seoul. But in 1951, it took 16 days for the Chinese PLA to retreat a similar distance from Chipyong-ri to Suwon. \(^{190}\) Even considering the difference between armored forces and infantrys, 5 to 7 days of the second phase seems to be a reasonable estimate even considering the rearguard campaign from the KPA.

\(^{188}\) South Korea has recently purchased a considerable stock of JDAM (Joint Direct Attack Munition) and SLAM-ER (Sto[d*ff Land Attack Missile-Expanded Response) effective for air-to-surface missions. According to Boeing’s description, the Joint Direct Attack Munition (JDAM) guidance kit is a low-cost guidance kit that converts existing unguided free-fall bombs into accurately guided "smart" bomb. The Standoff Land Attack Missile Expanded Response, or SLAM-ER, is a highly adaptable day/night, all-weather, over-the-horizon precision strike missile. Capable of hitting stationary or moving targets on land or at sea, SLAM-ER is recognized by the U.S. Navy as the most accurate weapon in its inventory. For details, see [http://boeing.com/defense-space/missiles/dam/index.htm](http://boeing.com/defense-space/missiles/dam/index.htm) and [http://boeing.com/defense-space/missiles/slam/index.htm](http://boeing.com/defense-space/missiles/slam/index.htm)  

\(^{189}\) The increased sortie rate will be simulated in the sensitivity analysis as well.  

\(^{190}\) Chung, *Hankuk Junjaeng (Korean War)*, 354.
**NK Aggregate BAI Loss**

![Graph showing NK Aggregate BAI Loss]

**Days after the North Korean Retreat**

**Figure 3. NK Aggregate BAI Loss (measured in ADE)**

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**Assumptions Summary (South Korean pursuit):**

- South Korea’s pursuit conducted only through BAI
- 5-7 days for North Korea to complete the retreat
- South Korean BAI: 0.5 Vehicle Kill per sortie, 2 sorties per day, Daily Attrition Rate 2 percent,

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**List 2. Combat Assumptions during the North Korean Retreat**

Based on these parameters, my simulation suggests that a seven-day BAI campaign would result in approximately 2,851 vehicle kills. Assuming those vehicles were all 152mm towed artillery, the North Korean loss reaches a striking 3.81 ADE. Combined with the formal analysis in the first phase, this analysis estimates that 22.47 ADE would remain for the KPA when they finish their retreat. If North Koreans deploy rearguard the number would drop even below those figures. South Korea would have approximately 36.37 ADE if excluding the casualties from the pursuit campaign on the ground.

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191 For the detailed results of the simulation, see Appendix.
192 For the basis of this assumption and further discussions, see footnote 172.
Sensitivity analysis worsens the already dire situation for the North Koreans. Assuming 1.5 kill per sortie (based on the development of air-to-surface strike capability) triples the North Korean casualty to a staggering loss of 11.43 ADE in 7 days. The aggregate loss would increase to 13.15 ADE if the South Koreans could fly 2.3 sorties per day. North Korea’s effective operation of the anti-air assets and the risk of night operations may increase the attrition rates. But even an attrition rate of 4 percent per day would not salvage the North Koreans as their loss would estimate 11.61 ADE, leaving 14.67 ADE against the South Korean forces of 36.37 ADE.

The South Korean air power’s impact becomes even more evident if these modified air-to-surface operation parameters are applied to the previous and following phases of the counterinvasion. Assigning 1.5 kill per sortie with a 2.3 sorties per day forces the North Koreans to meet the 40% threshold 9 days earlier and the KPA will be near its annihilation once it completes the 7-day retreat process. Considering these figures, a further analysis of those parameters’ salience would be necessary for a full understanding of the peninsula’s conventional balance.

(4) Scenario A. Phase 3: South Korean Counteroffensive

*Combat Dynamics*

Then the analysis moves onto the actual stage of counterinvasion: South Korea’s breakthrough battle against the North Korean defensive line. As for North Korea’s likely courses of action, this paper suggests two scenarios. First, the North Korean forces would attempt to hold their fortified lines at the MDL. Or, as the second scenario, the KPA will maintain their position at their southernmost advance point. In both scenarios the South Korean objective would be to destroy the North Korean defense.

We begin the analysis by looking at the first scenario in which the KPA retreat into their fortified position at the MDL. Despite suffering considerable damage from the South Korean air-to-surface attacks, now the North Koreans rely on the well-established defense fortifications and shorter lines of communication. This scenario’s dynamics closely resembles the first phase (North Korean invasion) as the combat involves an armored offensive against a fortified defense; the difference is that the defender is now on the offense and vice versa. Hence comparing the conventional balance during the invasion and counteroffensive phases would enhance our
understanding of the South Korean counteroffensive’s likely outcome. This paper’s simulations (and numerous works on the subject) suggested that South Korea would thwart the North Korean offensive even under the most conservative assumptions. Then, could the North Koreans to replicate the South Korean success?

Unfortunately for the North Koreans, the combat dynamics do not seem to be in favor of the North Korean defense. The qualitative analysis of the combat dynamics suggests that the North Koreans do not possess the South Korean elements of success during the initial phase of the campaign.

In this paper’s analysis of the first phase five major factors contributed to the good prospects for a successful South Korean defense: a dense defense strengthened by the force-to-space constraint, disadvantageous terrain for the attacker, superiority in air power, superiority in force quality, and advantages in the capability to fight a long war. 1) The narrow Korean theatre and limited approach avenues amplified the force-to-space constraint, neutralizing the attacker’s numerical advantage while forcing the attacker to fight a battle based on force quality. 2) Mountainous terrain and massive fortification provided a considerable force multiplier to the defender, imposing a disadvantageous force-to-force exchange ratio to the attacker. 3) Air power superiority inflicted severe damage to the ground forces and their logistics, adding to the overall effectiveness of the defense operations. 4) Clear advantages in equipment and troop readiness enabled the South Koreans to prevail in the force-to-force exchanges, forcing the enemy to suffer substantially more casualties. 5) Furthermore, the logistical advantage facilitated the entire process by maintaining the stable flow of supplies and replenishing the damaged equipment and forces, while wearing down the enemy suffering from severe resource shortages. The synergy of these dynamics factors played a key role in solidifying the South Korean chance of success in the defense phase.

For the North Koreans, however, only the terrain and the force-to-space constraint seem to be the factors that play in their favor. The KPA would be able to utilize their fortifications in the defense line while concentrating a limited number of forces against the South Korean forces that is believed to outnumber the KPA at this phase. But in the other three factors, the advantage is still with the South Koreans as mentioned in the previous sections.
A successful frontline defense depends on maintaining a favorable casualty exchange ratio while forcing the attacker to suffer high attrition rates, thereby wearing down the enemy’s endurance and momentum. But South Korea’s air superiority, advanced armored forces, and its well-developed war economy would give the South Koreans an advantage in the force exchange.

Representative dataset on the force-to-force exchange ratio provided by Posen show that defenders in general had a ratio advantage ranging from 2:1 to even 6:1.\(^{193}\) In those data, however, it should be noted that a number of attackers were considered qualitatively inferior to the defenders.\(^{194}\) A defensive position itself could present a significant force multiplier, but a clear difference in quality, logistics, C4ISR, and air power could mitigate the advantage that these defenders enjoy. During the Korean War the attacking UN forces already enjoyed a 1:2 to 1:2.5 advantage in the exchange ratio against the PLA and KPA, and as mentioned before the quality gap was considered even narrower compared to the current conventional balance between the South and North.\(^{195}\)

Moreover, at this phase, it is likely that the South Korean force strength would already outnumber the North Koreans in ADE scale. Based on the analysis of the first two phases, the force ratio between South Korea and North Korea is approximately 1:1.7 in South Korea’s favor if measured by ADE. When North Korea enjoyed a numerical advantage, their advantage faded away due to its disadvantage in force exchange ratio. But now South Korea enjoys an advantage in both number and quality of forces. This advantage leads to South Korea’s prevalence in the overall force-to-force exchange, draining the North Korean strength while meeting its force need to populate the front.

The South Korean numerical advantage in ADE score at this stage may not meet the 3:1 rule of thumb or the 1.74:1 threshold provided by Raj Gupta for a successful breakthrough.\(^{196}\) But as

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\(^{193}\) For the data on attacker vs. defender exchange ratios, see Posen, *Inadvertent Escalation*, 120. For detailed historical cases, see Dupuy and Dupuy, *The Harper Encyclopedia of Military History*.

\(^{194}\) Posen, *Inadvertent Escalation*. 120.

\(^{195}\) As noted earlier, this ratio has been estimated based on the casualty records from Appleman, *South to the Naktong, North to the Yalu* (June-November 1950); Blair Jr., *The Forgotten War*; Beldecos and Heginbotham, “The Conventional Military Balance in Korea”; Chung, *Hankuk Junjaeng (Korean War)*; Park, *Hankuk Junjaeng (Korean War)*. For the most detailed casualty records on the Korean War, see Republic of Korea Military Academy, *Hangukjunjaengsa Budo (Appendix to the History of the Korean War)*, Ch.3.

noted above, ADE does not fully consider the quality gap and the effect of C4ISR, logistics, ammunition, and several other factors in which South Korea excels. If this analysis applies 150% force multiplier to the South Koreans for their command and support advantage as Posen did to the NATO forces against the Pact, the South Korean forces would outnumber the North Koreans by 3:1 even at the breakthrough sectors.\textsuperscript{197} Applying such a multiplier to the South Koreans could be subject to a further discussion, but comparing the relative difference between the NATO vs. Pact and the C4ISR gap between South Korea and North Korea does not seem to be unreasonable.

South Korea may suffer considerable force attrition during the counteroffensive, but the South Korean capability to fight a long war would compensate for this loss. In contrast to North Korea, the South Korean military’s engineering and logistics units are capable of maintaining the stable flow of supply and ammunition even in a mountainous terrain. Considering that South Korea now has the fifth-largest car industry in the world, supplying trucks and vehicles for logistics would not be too difficult. Even if the South Korean offensive occurs in enemy territory, logistics is less likely to be a serious obstacle. The UN forces during the Korean War suffered from logistics issues as their shipments had to be transported from Japan and the United States. But now, South Korea can depend on its own industrial base and well-developed road networks.

For the North Koreans, limitations in their logistics and O&M are evident obstacles to their defense efforts. Calculation of an exchange ratio and attrition rate do not fully describe an industrial state’s war effectiveness as these parameters do not take into account the state’s effort to replenish and repair the damaged equipment. Even assuming that the North Koreans are fighting within their own territory, their O&M capability would have already met its limits due to financial constraints and resource shortages. One former KPA officer claimed that a considerable portion of the vehicles would be left unrepaired after combat due to the shortages of spare parts.\textsuperscript{198} In contrast, South Korea’s main industrial complexes on the Southeast Coast are likely

\textsuperscript{197} Based on the force-to-space constraints, this paper assumes that the attacking South Koreans deploy 2 ADE per 25 km while the North Koreans defend with 1 ADE per 25 km.

\textsuperscript{198} Lee, Bukhangunaenun Gunbbangi Upda (The North Korean Military does not have Breadbiscuits), 224.
to be unharmed throughout the entire campaign, replenishing the South Korean losses at a rapid rate.

The issue of North Korean O&M directly affects the dynamics of force exchange. The defending North Koreans may enjoy several advantages in the actual combat, but their advantage in the force exchange will be mitigated if the damaged equipment cannot be returned to action. Consequently, the exchange rate in the overall campaign would slowly begin to favor the side with a better economy as the war proceeds.

North Korea may attempt to repeat the PLA’s success of 1950 and devise a defense tactic that the South Koreans are entirely unaware of. But given their limited assets and logistics, alongside the devastating losses from the previous phases, are very likely to limit the effectiveness of a North Korean tactic regardless of its form. The frontal defense would have been weakened by the striking loss of its troops and equipment and the KPA’s endurance is likely to run out as the war proceeds.

*Formal Analysis*

This analysis has used the Adaptive Dynamic Model and Attrition-FEBA Expanded Model to assess the South Korean possibility of an armored breakthrough against the North Korean defense. Based on the assumptions I used in the previous phases, the North Korean objective is assumed to maintain 1 ADE per 25 km throughout the front, and the defense will fail when the KPA cannot sustain that force level in the corridors. Also, the North Koreans have to force the South Koreans to pull back within D+60 in order to avoid the collapse of their war economy.

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199 North Korean conventional forces do not possess an effective mean to damage the South Korean industrial complexes near Busan and Pohang due to their limitations in air power, artillery range, and infiltration capability. (The “Southeast Industrial Complex” is approximately 480 km away from the military demarcation line, well outside the North Korean 240mm rocket launchers’ maximum range of 60km.) The only realistic measure for the North Koreans to attack the Southeast complex would be to use its ballistic missile (SCUD-C, Rodong 1, Daepodong 1 and Rodong 2’s range exceeds 500 km). However, the North Korean missile forces’ accuracy (circular error probable) and lethality are under serious doubt from most military analyses. The newly developed KN-02 missile may have solved the accuracy deficiency, but the model’s range is reported to be within 120km. For a detailed analysis of the North Korean missiles, see Bruce Bennet, “The Emerging Ballistic Missile Threat: Global and Regional Ramifications” (presented at the Airpower Conference hosted by Yonsei University, Seoul, 1999); Suh, “Assessing the Military Balance in Korea,” 74–76.; Hwang, *Kim Jong-il, Gonporul Ssoaolida* (Kim Jong-il Shoots Fear Upon the Sky: An Analysis of the North Korean Asymmetric Threats), 108–109.
Therefore, in this scenario, the South Koreans must be thwarted within 23 days after the initial counteroffensive.\(^{200}\) (For the summary of assumptions, see List 3.)

The South Korean objective is to break through the defense, and the breakthrough attempt fails if the South Koreans can no longer maintain 2 ADE per 25 km at the breakthrough sectors (and 1 ADE per 25 km at the non-breakthrough sectors) or if their force level drops below 50\(%\).\(^{201}\)

For each side’s force level, I assign 36.37 ADE for the South Koreans, assuming the remaining forces from the defensive are mobilized for the offensive as well. As a favorable assumption to the North, I assume that the South Korean 2\(^{nd}\) Operation Command (estimated strength of 8.58 ADE) will remain in the South as an operational reserve. Their mobilization rate will change as shown by the sensitivity analyses to come. I also do not add any force multipliers to the South for their C4ISR advantage, but that will be subject to change as determined by the sensitivity analysis.

The remaining troop strength for the North Koreans is 22.47 ADE and this is likely to be the only forces available for mobilization as in the previous phases it was assumed that North Korea mobilizes all its standing forces and reserves. This figure alone shows how devastating a defeat the North Koreans suffered at the earlier stages of the war. In my analysis, the North Korean aggregate loss reaches a striking figure of 50.71 ADE. This number, accounting for 70\% of the aggregate sum of North Korean standing and reserve army, explains why the North Korean defense would be a difficult task by itself.

South Koreans are assumed to take a 10\% daily attrition rate at the breakthrough sectors as they advance 2 km per day. For the exchange rate, I assign a ratio of 1:1. Although it is considerably below the figures that the UN forces achieved under similar (or even worse) conditions, such a parameter is assigned to keep the analysis conservative.

For the close air support, I assume 400 South Korean fighters or helicopters in total are available for operation. This parameter is based on the assumption that South Koreans repaired a

\(^{200}\) At the previous phases I assumed 30 days for the North Korean offensive and 7 days for the North Korean retreat.\(^{201}\) I assigned 40\% threshold for the North Koreans but elevated the threshold for the South in order to give favorable assumptions to the North Koreans. On the other hand, this treatment matters less because in even the most extreme sensitivity analysis the South Korean force strength does not fall below the 50\% threshold before they achieve the breakthrough.
portion of their damaged assets from the first two phases of the campaign. The South Korean air force is then assumed to fly 2 sorties per day with 0.4 kills per sortie while taking 5% attrition per day due to the denser anti-air network in the North Korean territory.

The North Korean air capability would be nearly non-existent at this point, but I assign 0.25 kills per sortie and 1 sortie per day with 5% attrition rate for 150 assets. According to my analysis only 64 assets will remain at the end of the first phase, but I assume a portion of North Korean fighters that were unable to fly after the loss of air control will return to combat (assuming that the North Korean airfields and hangars were relatively undamaged by the South Korean attacks).

The simulation based on the Kugler-Posen Model and the Epstein Model shows that South Korea has high prospect of success in the counteroffensive. This time, the KPA fails to meet its force needs 10 days after the South Koreans launch their counteroffensive (D+48). At that point the South Koreans would still have more than 27.16 ADE to exploit the breakthrough. This triumph stands even without mobilizing the 2nd Operational Command or applying additional force multipliers for the South Korean C4ISR advantage.

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202 By the expression “damaged” this paper refers to the assets that were hit by enemy attacks but not shot down. Inclusion of these “damaged” aircraft in the overall attrition could be subject to further debate. While Epstein assigns a separate category for those damaged assets, Posen considers only the destroyed asset as a part of overall attrition. See Joshua M. Epstein, Measuring Military Power: The Soviet Air Threat to Europe (Princeton University Press, 1984); Posen, Inadvertent Escalation.

203 Higher figures could be assigned to the kill rate and sortie rate as mentioned in the previous section. But this analysis will settle with these conservative parameters.
Figure 4. Force Need-Availability Curve based on Kugler-Posen Model

Figure 5. Remaining Forces based on Epstein Model

Assumptions Summary (South Korean Counteroffensive after North Korean Retreat):
- The phase begins on D+38 (31 days for North Korean offensive, 7 days for South Korean retreat)

\(^{204}\) For the detailed results of the simulation, see Appendix.
- South Korean Objective: 1) Maintenance of 2 ADE per 25km in the breakthrough sectors (1 ADE per 25km in non-breakthrough sectors), 2) Maintenance of force strength above the 50% threshold

- North Korean Objective: 1) Thwarting the South Korean counteroffensive before D+60 (23 days after the counteroffensive), 2) Maintenance of 2 ADE per 25km

- Initial Force Deployment:
  - 1 ADE per 25km for North Korea;
  - South Korea puts 1 ADE per 25 km in non-breakthrough sectors, 2 ADE per 25km in breakthrough sectors.
  (Initial Force Need: 10 ADE for South Korea, 14.4 ADE for North Korea)

- Daily South Korean attrition in the breakthrough sectors: 10 percent
  - Exchange Rate: (North Korea: South Korea) 1:1
  - South Korean advance rate in breakthrough sectors: 2 km/day\textsuperscript{205}

- Defender's maximum distance of withdrawal: 125km (distance between Pyongyang and the front)

- Defender's threshold attrition rate at the breakthrough sector\textsuperscript{206}: 20 percent

\textit{List 3. Combat Assumptions (South Korean Counteroffensive after North Korean Retreat)}

Sensitivity analyses suggest that the South Koreans are likely to prevail even in more unfavorable conditions. Even if a 2:1 exchange ratio is assigned in favor of the North Koreans, the North Korean force availability falls below their force need 16 days after the South Korean counteroffensive, and the South would still have 21 ADE to exploit the breach. The South Korean force need exceeds the force availability a day after, but such problems can be easily solved if the South Koreans mobilize a portion of their 8.58 ADE strategic reserves at the rear. If this analysis combines a 150% C4ISR force multiplier and assumes a full mobilization of the 2\textsuperscript{nd} Operational Command, even a legendary exchange ratio of 7:1 would be insufficient for the North Koreans to thwart the South Korean counteroffensive.\textsuperscript{207}

\textbf{(5) Scenario B. Phase 2. South Korean Counteroffensive without North Korean Retreat}

\textsuperscript{205} This figure is assigned as W(1) (defender's rate of withdrawal on D+1) in the Epstein Model's application.\textsuperscript{206} When the defender's attrition exceeds this parameter the withdrawal begins. For the parameter's detailed definition and usage, see Joshua M. Epstein, \textit{The Calculus of Conventional War: Dynamic Analysis Without Lanchester Theory} (Studies in Defense Policy (Brookings Institution Press, 1985), 21–24.\textsuperscript{207} The South Koreans would suffer higher attrition, but North Korea's numerical disadvantage forces the KPA force availability to fall below the force needs required to populate the front.
Combat Dynamics

We now examine the second scenario where the KPA rejects the idea of retreat and establishes its defense line in the South Korean territory. The South Korean counteroffensive is an attempt to break this line. Once a breakthrough is achieved, the South Korean forces will cross the DMZ without much resistance and will extend its advance toward Pyongyang. Or, we could assume a situation in which South Korea cannot tolerate any more retreat and attempts a breakout offensive. Then the North Koreans will be defending against the South Korean offensive in the South Korean territory as well.

Like the first scenario, this option has its own benefits for the North Koreans. The primary benefit is that this option can prevent the losses from the retreat process. Although Epstein suggests the benefit of retreat as “trading time for space,” exposing one’s rear to the enemy within a limited distance holds tremendous risks. In the previous scenario the KPA had to lose 3.81 ADE, approximately 16% of its remaining forces in an air-to-surface campaign alone during the retreat. If the South Koreans rule out the idea of replenishment and launch a full ground pursuit campaign, the damage could be critical to the North Koreans.

Also, the peninsula’s mountainous terrain could provide a substantial advantage to the defenders even without a proper fortification. The North Korean forces in the South Korean territory may not have the time or resource to establish a major fortification which resembles their defense line at the military demarcation line. However, the mountainous terrain itself can be a considerable fortification as it provides high observation and concealed position to the defenders while becoming an obstacle to the attacker’s movement. Also, even a hastily built fortification can be quite effective in an actual combat as Epstein notes “highly flexible and effective...antitank ditches, impassable to armored vehicles, can be created as enemy tanks approach.”

This phase’s qualitative combat dynamics would be mostly similar to the previous scenario, so there would be less need for redundancy. In this section, I will thus focus on a few points that would be more evident if the North Koreans decide to maintain their position.

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208 Epstein, Conventional Force Reductions, 68.
The first point worth mentioning is the North Korean logistics issue. Sustaining a modern war depends on maintaining a stable logistics support ranging from ammunition to equipment, while a modern warfare's massive resource consumption makes the task quite difficult. The situation worsens if fighting in an enemy territory with an extended line of communication. Credible data on the North Korean transportation capability is unavailable, but the KPA's transportation capability is known to be severely limited due to severe gas shortages and poor maintenance. Once the KPA attempts to maintain its stand within the Korean territory, the already limited North Korean logistics would be exposed to constant South Korean air interdiction and ground skirmishes throughout the phase. Although the North Korean supply line may not be severed, the KPA defense would face substantial difficulty in maintaining the firepower and effectiveness it needs to fend off the South Korean counteroffensive.

Second, the South Korean CAS would be a constant hindrance to the North Korean defense. The majority of North Korean anti-air assets are immobile and stationed within their territory, thereby ineffective against the South Korean air-to-surface missions carried out within the South Korean territory. If the KPA defense cannot rely on an effective air defense, the damage from the South Korean CAS will be substantial.

The third point worth mentioning is the risk of South Korean infiltration to the North Korean rear. As noted, the Korean peninsula’s long coastline increases the risk of an enemy’s amphibious operations. South Korea’s advantage in naval forces would induce them to attempt a landing operation, probably in order to cause havoc in the North Korean territory or even to outflank the North Korean defense. Such risk would be even higher if the North Korean forces

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209 Van Creveld even argues that during the Yom Kippur War the Israeli Army ran out of ammunition after three weeks despite fighting in its own territory. On the other hand, the credibility of his claim is still under doubt as some considers his argument as a myth. For Van Creveld’s description of the war, see Creveld, *Military Lessons of the Yom Kippur War*, 47.

210 These findings are supported by the collection of interviews with the former KPA officers escaped from North Korea. According to Lee Jeong-Yeon (former officer of the KPA 1st Corps), a considerable portion of the North Korean vehicles have already passed their lifespan and most transportation vehicles normally do not participate in routine exercises due to gas shortages. Lee claims that “In winter, it is very difficult to find a single vehicle that operates without an intensive maintenance.” For these interviews and personal recollections of the KPA officers on the KPA transportation, see Lee, *Bukhanguaenun Gunbbangi Upda (The North Korean Military does not have Breadbiscuits)*, 123. Von Hippel’s simulation estimates 870 hours of maneuver per year for the trucks and general use vehicles. von Hippel, “Estimated DPRK Energy Use: Analytical Approach and Draft Updated Results,” 6.

211 According to von Hippel’s estimate, 72,403 2.5-ton trucks were in service for the North Koreans in 1990. Current figure is unavailable. von Hippel, *An Estimate of Energy Use in the Armed Forces of the Democratic People’s Republic of Korea*, 11.
are deployed deep inside the South Korean territory as their rear defense would be weaker. An amphibious operation is not an easy task as many analysts have pointed out. But if the South Korean intention is to flank the North Korean forces inside the South Korean territory, then the operation will be less difficult, as the North Koreans would not have a proper coastal defense or a naval minefield as they do in the North. Even if such operations are not carried out, a risk of a South Korean infiltration would force the North Koreans to deploy a part of their forces at the rear, thereby weakening their defense efforts at the front.

Formal Analysis

As noted, the dynamics of this offensive are quite similar to the previous section. Hence I will only change the parameters that are intertwined with the most evident differences while applying the Kugler-Posen Model and the Epstein Model.

I maintain the assumption that the North Korean requirement is to maintain 1 ADE per 25 km throughout the front and the defense fails if the KPA cannot sustain such force level in the corridors. Also, the KPA has to force the South Koreans to pull back within D+60 due to North Korea’s logistics concern. In this scenario, the North Koreans have 30 days after the South Korean initial counteroffensive. (For the summary of assumptions, see List 4.)

The South Korean objective is to break through the defense, and the breakthrough attempt fails if the South Koreans can no longer maintain 2 ADE per 25 km at the breakthrough sectors (and 1 ADE per 25km at the non-breakthrough sectors) or if their force level drops below 50%. This assumption is same as in the previous section.

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212 Historians later recalled that MacArthur’s Inchon landing (Operation Chromite) had only a “thousand to one chance of success.” Although the expression may be an exaggeration, it indicates the difficulty of an amphibious operation. Seo, 6.25 Junjaengsa (History of the Korean War), 148. For discussions on the difficulties involving a coastal operation, see Posen, “Command of the Commons”; Michael O’Hanlon, “Why China Cannot Conquer Taiwan,” International Security 25, no. 2 (2000): 51–86.

213 Conceding their widening disadvantage in an open-sea naval warfare, the North Korean navy has been concentrating their efforts on naval mine warfare, coastal defense and anti-submarine warfare since the late 80s. The North Korean navy’s weakness also implies that the North Korean special force’s sea infiltration would have less chance of success. For an overview of the North Korean navy, see The United States Defense Intelligence Agency, North Korea Handbook (Defense Intelligence Agency, 1994), Part (3-6); Bermudez Jr., The Armed Forces of North Korea, 114–122.

214 North Korea has seven more days compared to the first scenario as they do not retreat.
I also maintain the assumptions on the South Korean force level. 36.37 ADE is assigned for the South Koreans, assuming the remaining forces from the defensive are mobilized for the offensive. The 2nd Operation Command (8.58 ADE) remains as the operational reserve.

The remaining troop strength for the North Koreans is 26.28 ADE, based on the assumption that the KPA did not suffer a South Korean BAI during the retreat.

South Koreans are assumed to take a 10% daily attrition rate at the breakthrough sectors as they advance. For the exchange rate, I assign a ratio of 1:1.5 in favor of the South Koreans. I assume this figure on the basis that the North Korean force effectiveness would be worse than in the previous scenario where they retreat into the fortification closer to their own territory. This exchange rate will be modified in the sensitivity analysis as well.

Based on the weakened North Korean defense compared to the first scenario, the paper assigns a 2.5km advance rate for the South Koreans per day (in the previous scenario a 2km advance rate was assigned for the South Koreans).

On CAS, I assume 300 fighters or helicopters in total are available for action. This parameter is based on the assumption that South Koreans repaired only a portion of their damaged assets from the first phase of the campaign. The South Korean air force is then assumed to fly 2 sorties per day with 0.5 kills per sortie. The attrition rate will be lowered to 3% due to the limits of the North Korean air defense in the South Korean territory.

For the North Koreans, I assign 0.25 kills per sortie and 1 sortie per day with a 5% attrition rate for 100 assets.

A simulation based on these parameters arrives at the same conclusion as the first scenario: South Koreans are likely to break through the North Korean defense and prevail in the counterinvasion.

\footnote{However, the difference between effectiveness of pre-established fortifications and hastily built obstacles could be subject to further debate. A useful comparison could be drawn from Epstein’s simulated comparison on the effect of obstacles and prepared position in different terrains. For details, see Epstein, \textit{Conventional Force Reductions}, 70.}

\footnote{In the previous scenario I assumed 400 assets available for action, estimating that South Korea would be able to repair approximately 100 assets during the pursuit phase. There is no definitive data on South Korea’s wartime aircraft repair speed, but a difference of 50 or 100 assets does not make a too much difference in the simulation of the counteroffensive phase as the North Korean forces have already been considerably weakened in the previous phases.}

\footnote{For the categorization of “damaged” assets, see footnote 202.}
Assumptions Summary (South Korean Counteroffensive without North Korea's Retreat):

- The phase begins on D+31

- South Korean Objective: 1) Maintenance of 2 ADE per 25km in the breakthrough sectors (1 ADE per 25km in non breakthrough sectors), 2) Maintenance of force strength above the 50% threshold

218 For the detailed simulations results in table, see appendix.
North Korean Objective: 1) Thwarting the South Korean counteroffensive before D+60 (30 days after the counteroffensive), 2) Maintenance of 2 ADE per 25km

Initial Force Deployment:

-1 ADE per 25km for North Korea (Initial Force Need: 10 ADE);
-South Korea puts 1 ADE per 25km in the non-breakthrough sectors, 2 ADE per 25km in the breakthrough sectors. (Initial Force Need: 14.4 ADE)

Daily South Korean attrition in the breakthrough sectors: 10 percent

- Exchange Rate: (South Korea: North Korea) 1.5:1
- South Korean advance rate in breakthrough sectors: 2.5 km/day

Defender’s Maximum rate of Withdrawal: 167km (Distance from Seoul to Pyongyang)

Defender’s threshold attrition rate at the breakthrough sectors: 20 percent

List 4. Combat Assumptions (South Korean Counteroffensive without North Korean Retreat)

According to the simulation, the KPA fails to meet its force needs 11 days after the South Koreans launch their counteroffensive (D+42). At that point the South Koreans would still have 26.44 ADE to exploit the breach. Again, such a breakthrough is achieved even without the mobilization of 8.58 ADE rear forces and without applying an additional force multiplier.

In sensitivity analyses, the South Koreans are likely to succeed in even worse conditions. In a 1:1 exchange ratio, the North Korean force availability falls below their need 14 days after the South Korean counteroffensive, and the South would still have 23.54 ADE to exploit the breach and extend their advance. The North Koreans need an exchange ratio of 1.4:1 to force the South Koreans to fall below their force needs before the North Koreans do. However, like the first scenario, mobilization of the rear forces solves the problem for the South Koreans. If 8.58 ADE is added to the South Korean force availability, North Koreans cannot prevail with even a 4:1 exchange ratio in its favor. Application of 150% multiplier for the South Korean C4ISR advantage further increases the South Korean chance of success, as in this case a 7:1 exchange ratio is still insufficient for the KPA.

These simulation results suggest that South Korea’s counteroffensive is very likely to succeed in breaking through the North Korean defense, regardless of the defense line’s location. The

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219 This figure is assigned as W(1) (defender’s rate of withdrawal on D+1) in the Epstein Model’s application.
South Korean chance of success would be lower if my analysis assigns disadvantageous parameters for the force exchange and impose more restrictions on South Korea’s buildup and advance. Nevertheless, even if South Korea fails to break through the defense, the South Koreans would still hold advantage in the war of attrition based on the economic depth. Therefore, the South Korean prospect for the eventual victory would still be high.

V. Conclusion

In summary, this campaign analysis concludes that South Korea has a good prospect of success in its counterinvasion against North Korea. Once North Korea invades, South Korea would succeed in defending itself by maintaining the defense line, and it will inflict considerable damage on the North Koreans during the defense and North Koreans’ retreat. Finally, the analysis shows that the South Korean offensive against the North Korean defense would succeed in a breakthrough. The North Korean forces weakened in the earlier phases of the campaign are less likely to hold off the South Korean assault.

Analyzing the possibility of a counterinvasion has a number of significant implications. First, this analysis is an opportunity to reassess the degree of North Korean threat and the likelihood of a North Korean invasion. Previous analyses of North Korea’s inability to win the war revealed that the fear of North Korea was exaggerated. But North Korea’s image as an aggressor that is unafraid of high casualties maintained the South Korean public’s fear of another North Korean invasion. However, a successful South Korean counterinvasion would reveal that Pyongyang would not only fail to win, but it might not survive its own war. This finding would imply that the North Korean capability is limited and North Korea’s invasion is less likely unless the regime becomes extremely irrational to a degree of foregoing its own survival. Awareness of North Korea’s limited capability would give the allies a stronger bargaining position against North Korea’s brinkmanship diplomacy as well.220 North Korea’s blackmailing would have less effectiveness if an asymmetrical threat is its only option.

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Second, this analysis also can contribute to predicting North Korea’s future actions. If it is likely that conventional warfare would result in the end of the regime, what would be Pyongyang’s alternatives? Instead of engaging in an already hopeless conventional arms race, North Korea would elevate asymmetrical forces as the centerpiece of its grand strategy. North Korea will not give up its nuclear weapons without a substantial reward, and will continue to be persistent in its demand for a security guarantee. The North Koreans may even consider its asymmetrical forces as a deterrent against South Korea’s conventional forces. North Korea’s recent armament pattern is in accordance with this finding, as Pyongyang focused on increasing the range of its missiles while paying less attention to already dismal accuracy and lethality.221 This trend would imply that the North is more interested in developing its asymmetrical force as a “fear factor,” instead of establishing the force as an asset effective in a war against South Korea. Third, this analysis could also explain Pyongyang’s decreasing interest in the U.S. force’s withdrawal from South Korea. The withdrawal of American forces had been Pyongyang’s top priority in the Korean peace talks during the 1970s and 80s, but it is no longer an issue in the current negotiations. If the South Korean conventional forces could handle the North without the U.S. assistance, Pyongyang would see no benefit in removing the Americans. North Koreans might even (implicitly) welcome the American presence as a restraint against the South Korean pressure.222 Fourth, this study reassesses the meaning of the American presence in the region. Despite several cautions against a strategic “overstretch,” the United States’ security commitment to South Korea has been justified as a deterrent against the North Korean threat.223 However, South Korea’s ability to succeed in the counterinvasion provides South Korea with its own deterrence capability. This could mean two things: first, the United States would be able to streamline its presence in the peninsula and focus its resources on issues with higher priority. On the other hand, it could also mean that the USFK (The United States Forces Korea)’s role is being redefined – not as a deterrent against North Korea, but as a balancing force against the nearby potential regional hegemon.

221 Suh, Power, Interest, and Identity in Military Alliances, 225–229.
222 During the 2000 Summit, Kim Jong-il remarked that the U.S. force presence would “contribute” to the peninsula’s stability and peace if the U.S. forces are not used against North Korea. Kim Dae Jung Peace Center, http://www.kdipeace.com/talk_five.asp (accessed on August 24th, 2011)
1. NK and SK Force Level Changes (in ADE) during Phase 1 (North Korean Offensive)

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The simulation results noted below are based on the parameters provided in Lists 1, 2, 3, and 4. For the detailed results of the sensitivity analyses, contact the author.
1-1. NK and SK Force Need and Availability during Phase 1 (North Korean Offensive)

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225 Available forces.
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3. NK and SK Force Level Changes during the South Korean Counteroffensive (after North Korean Retreat)

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3-1. NK and SK Force Need and Availability during the South Korean Counteroffensive (after North Korean Retreat)

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4. NK and SK Force Level Changes during the South Korean Counteroffensive (without North Korean Retreat)

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4-1. NK and SK Force Need and Availability during the South Korean Counteroffensive (without North Korean Retreat)
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