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When the Umbrella Shakes: Allied Reactions to Doubts about U.S. Extended Deterrence—The Republic of Korea's Critical Case

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Abstract

When a nuclear patron's commitment becomes uncertain, how do protected, non-nuclear allies react—and why? This article advances and tests a mechanism of allied reactions under doubt using the Republic of Korea (hereafter used interchangeably as South Korea, but the official name is *'the Republic of Korea [ROK]'*) as a critical case of a nuclear umbrella under stress. I theorize how exogenous "doubt shocks" (e.g., adversary ICBM range to the U.S. homeland, volatile presidential signaling) shift allied behavior across reassurance-seeking, institutional deepening, conventional substitution, and nuclear hedge rhetoric. Competing hypotheses are evaluated: a dissuasion-dominant model (U.S. signals primarily restrain allied proliferation), an institutional-assurance model (consultation mechanisms offset presidential ambiguity), and a domestic-politics model (elite competition drives outcomes). Theory-guided process tracing leverages four shocks (1998, 2006, 2017-18, 2025), elite discourse, policy moves (EDSCG/NCG), public opinion, and a brief Japan shadow case. Findings: as doubt rises, Washington's assurance increasingly targets allied dissuasion, not adversary deterrence; institutionalization partially mutes doubt; and domestic politics conditions response intensity. The policy implication is twofold: an assurance architecture that codifies scenario-based consultation, predictable strategic asset presence, and integrated denial-punishment ladders—measures that stabilize credibility without inviting allied nuclearization; and, should credibility erode beyond repair, a proactively managed recalibration of deterrence responsibilities within the alliance as the alternative to unmanaged proliferation.

Keywords: Extended Deterrence, Strategic Dissuasion, Credibility Gap, Nuclear Proliferation

Introduction

Extended nuclear deterrence is a pillar of U.S. alliance policy, but an increasingly fraught one. Codified early in the Cold War then exported broadly across U.S.-led security alliances, extended deterrence has served two strategic goals: deter adversary attack on allies and dissuade allies from acquiring nuclear weapons (Gavin 2012, 76-77). Over time, however, questions have grown about the credibility of this proposition, particularly where the adversary has nuclear weapons and the willingness of the patron to escalate is in doubt. This issue has arisen with new intensity since 2025 in the case of the ROK.

The ROK faces a growing, multidomain nuclear threat from North Korea that includes tactical nuclear weapons, submarine-launched missiles, and an openly announced preemptive use doctrine (Choe 2024). Donald J. Trump's return to the US presidency has reintroduced uncertainty about Washington's alliance commitments. Whereas previous US administrations had consistently reaffirmed extended deterrence in explicit joint declarations and in detailed force posture statements, current U.S. declaratory policy is that any North Korean nuclear attack would face regime–ending retaliation; it is not a blanket promise of first use in every contingency. Recent U.S.–ROK statements affirm that any DPRK nuclear attack would be met with a 'swift, overwhelming, and decisive response.' Trump's previous administration featured rhetorical ambivalence, threats to abrogate the alliance through troop withdrawal, and demands for exorbitant cost sharing; his second administration has to date maintained that posture without replacing credible assurance language. The result is a noticeable diminution of deterrent credibility as subjectively experienced by the ROK's elites and the public.

This credibility gap presents a theoretically significant problem. Deterrence theory, most famously articulated by Thomas Schelling, holds that extended deterrence is inherently more difficult than direct deterrence, since it requires convincing an adversary of the patron's willingness to undertake existential risk on behalf of someone else

(Schelling 1966, 34-91). Daryl Press has further argued that past behavior is a poor indicator of credibility; rather, adversaries and allies alike respond to real-time indicators of political resolve, capabilities, and signals (Press 2005, 29-31). In the Korean case, these indicators point increasingly to strategic ambiguity rather than resolve. From an alliance politics perspective, this shift represents a skewed version of Glenn Snyder's abandonment–entrapment dilemma, in which the client state must confront a persistent prospect of abandonment without the corresponding influence over the patron's escalation decisions (Snyder 1997, 180-185).

The result is a disjuncture between official declaratory statements (threat of regime–ending retaliation if the DPRK uses nuclear weapons) and allied perceptions of U.S. reliability. While the U.S. continues to invoke the nuclear umbrella in general terms, South Korean public faith in the U.S. defense commitment has been eviscerated. Current polling from the Asan Institute in 2025 shows a record 76.2 percent of South Koreans now favor the acquisition of indigenous nuclear weapons—the highest figure since the institute began tracking the question in 2010—while confidence that the United States would actually use nuclear weapons in South Korea's defense has fallen below half, to 48.9 percent (Asan Institute for Policy Studies 2025). This growing public consensus in South Korea has paralleled an elite-level worry that U.S. strategic forces would not, in a moment of crisis, be mobilized in the defense of Seoul by a leadership committed to transactional burden sharing over existential deterrence. For many in South Korea, the "moment of truth" imagined in the deterrence literature—the test of whether extended deterrence is credible at the moment it is most needed—is no longer a thought experiment. Compounding this perception of abandonment has been the strategic insufficiency of South Korea's three-axis system: Kill Chain (preemptive strike), Korea Air and Missile Defense (KAMD), and Korea Massive Punishment and Retaliation (KMPR), all of which are sufficiently sophisticated in design but practically limited in application to a nuclearized adversary. Kill Chain relies on early detection and rapid

decapitation; KAMD lacks the capacity to counter saturation or maneuverable reentry vehicles; and KMPR is operationally implausible against North Korea's hardened, redundant command structures (Bowers and Hiim 2021, 7–39). In deterrence terms, they offer denial and a measure of conventional punishment, but no punishment credible against a nuclear-armed adversary—a critical asymmetry.

South Korea's "three-axis" construct—Kill Chain (preemptive counter-strike), Korea Air and Missile Defense (KAMD), and Korea Massive Punishment and Retaliation (KMPR)—was designed as an integrated suite of primarily denial-oriented capabilities. In brief, Kill Chain aims to detect and disrupt imminent attacks; KAMD seeks to intercept incoming missiles; and KMPR threatens rapid conventional retaliation against critical targets without relying on nuclear weapons. (In deterrence terms used here, denial reduces the adversary's ability to achieve objectives; punishment threatens costs the adversary cannot accept.)

Against a nuclear-armed DPRK fielding larger salvos, maneuvering re-entry vehicles, mobile launchers and decoys, and hardened or redundant command structures, however, the three-axis suite is necessary but insufficient on its own. Without visible integration with punishment options—U.S. or allied capabilities that credibly threaten costs beyond what denial alone can impose—the credibility gap persists and periodically fuels nuclear-hedge rhetoric in Seoul.

While this structural weakness exists, the United States continues to cling to a public policy of denuclearization of the Korean Peninsula, even though U.S. intelligence estimates internally have long assessed North Korea's nuclear status as irreversible. The primary reason why the United States maintains this position, then, cannot be explained in terms of strategic oversight, but must instead reflect a world in which alliance cohesion and normative legitimacy—of the Non-Proliferation Treaty (NPT)—are the central objectives of the United States. As Elbridge Colby has argued, a nuclear South Korea presents its primary strategic threat not to the United States, but to the nonproliferation

regime and the U.S. role within it (Colby 2021, 236-238). Put differently, the result is a disjuncture between official declaratory statements (threat of regime-ending retaliation if the DPRK uses nuclear weapons) and allied perceptions of U.S. reliability.

This article asks a broader question: How do non-nuclear allies, who enjoy extended deterrence, react—and why—when their nuclear coverage is suddenly thrown into doubt? In the case of South Korea, where U.S. assurances have wavered amid North Korea's growing arsenal, I examine what strategies Seoul has pursued to safeguard its security. This central research question prompts a broader reconsideration of extended deterrence theory in situations of asymmetric alliance structures, especially when strategic ambiguity—not resolve—characterizes patron behavior.

The article proceeds in six sections. Section 1 introduces the research question—how non-nuclear allies react under doubt—and the paper's contribution. Section 2 sets out the research design and theoretical framework, defines key concepts (deterrence vs. assurance/dissuasion), and derives competing hypotheses about allied reactions. Section 3 examines the transplantation of the umbrella from NATO to South Korea and assesses the doctrinal and institutional asymmetries of its Korean manifestation. Section 4 traces how extended deterrence has functioned as an instrument of strategic dissuasion in the Korean alliance. Section 5 analyzes South Korea's reactions across four shocks (1998, 2006, 2017–18, 2025)—with a brief Japan shadow comparison—and adjudicates the hypotheses under Trump 2.0, closing with a postscript that carries the record through mid-2026. Section 6 concludes with implications for an assurance architecture and alliance burden-sharing. By revisiting the foundational logic of the nuclear umbrella and evaluating its evolution under contemporary strategic stress, this article contributes to a reevaluation of how credibility is produced, experienced, and eventually withdrawn in alliance structures shaped by nuclear asymmetry and shifting political resolve.

Extended deterrence is a patron's threat to retaliate—potentially

with nuclear weapons—against an adversary that attacks an ally; assurance (or dissuasion) is the patron's effort to keep the ally non-nuclear by reassuring its security. Credibility refers to the ally's belief that the patron would actually fight if the ally were attacked. Drawing on Schelling and the alliance literature, extended deterrence is intrinsically harder than direct deterrence and becomes most fragile when adversaries can strike the patron's homeland.

When coverage is thrown into doubt, allies may respond in different ways. I therefore propose two competing hypotheses:

H1 (Hedging / Autonomy). If an ally loses confidence in the patron's nuclear guarantee, it is likely to emphasize self-help. This takes the form of building indigenous military capacity—such as missile defense, long-range strike, and survivability measures—and, at the political level, considering but not pursuing nuclear weapons. Requests for reassurance may still be made, but they are secondary to the pursuit of greater autonomy.

H2 (Alliance Deepening). If an ally has serious doubts but still expects the patron to defend, it will seek to strengthen alliance dependence. This response involves doubling down on alliance commitments, pressing for renewed U.S. assurances, and reinforcing institutional mechanisms such as the EDSCG or NCG. In this scenario, hedging remains limited, and the nuclear option may be mentioned only in passing but is explicitly rejected, with no pursuit of an independent deterrent.

Predictions: H1 corresponds to greater autonomous capacity-building and sustained nuclear hedge talk; H2 corresponds to repeated alliance assurances and institutional deepening, with hedging and nuclear talk limited or fading. Section 5 evaluates these hypotheses across four shocks (1998, 2006, 2017–18, 2025) and a brief Japan shadow case.

Methodology and Research Design

This section examines the credibility and role of South Korean nuclear extended deterrence given the changing systemic and strategic

environment associated with the return of the Trump administration in 2025. Does the U.S. nuclear umbrella over South Korea still credibly deter adversary aggression or has it become a tool of strategic dissuasion—maintained not to defend but to dissuade the ROK from seeking a nuclear capability of its own? This section presents the research design used to evaluate this question, describes the theoretical basis of the analysis, justifies the methodological approach, and outlines empirical sources and case logic.

The central question I aim to answer is: To what extent is the U.S. extended nuclear deterrent credible to South Korea under conditions of adversary nuclear asymmetry and declining patron reassurance in Trump 2.0? My hypothesis is that the U.S. nuclear umbrella, originally designed to furnish deterrent assurance to otherwise non-nuclear allies, has long been strategically decoupled from any deterrent function in the Korean context and survives mainly as an instrument of strategic dissuasion – that is, to preclude South Korea's own nuclear armament. (South Korea is treated as the critical case study. I analyze four pivotal "shocks" when its nuclear umbrella's credibility came into question – the 1998 Taepodong missile test, North Korea's 2006 nuclear test, the 2017–18 U.S.–DPRK summit diplomacy, and the June 2025 U.S.–Israel strikes on Iran's nuclear facilities – and I document how South Korea reacted in each instance through reassurance-seeking, alliance institutionalization, hedging measures, or flirtation with an independent nuclear option.) This assumption draws from the classical canon of deterrence theory but breaks from the assumption that deterrence and dissuasion are mutually reinforcing, by proposing that even as deterrence credibility is corroded away, dissuasion logic might still prevail – particularly in cases of alliance asymmetry, threat divergence, and political ambiguity.

South Korea is a theoretically and empirically rich case for assessing extended deterrence. South Korea is a non-nuclear, technologically advanced U.S. ally whose main security concern has subjected it to increasingly explicit nuclear threats (Panda 2020). North Korea has

developed tactical nuclear weapons and diversified delivery platforms (including nascent submarine-launched missiles) backed by a doctrine of early nuclear use, significantly altering regional deterrence dynamics. The ROK-U.S. alliance is deeply institutionalized and historically close. Legally and normatively, South Korea remains tied to the NPT. Substantively, public discourse in the ROK has shifted markedly in favor of indigenous nuclear armament. These factors make South Korea the critical case of a nuclear umbrella under stress: if the nuclear umbrella is seen as non-credible here, it is almost certain to face analogous or greater difficulties in other asymmetric alliance contexts.

This study draws on three interrelated bodies of theory: (1) classical and contemporary deterrence theory; (2) alliance politics and the abandonment–entrapment dilemma; and (3) the concept of strategic dissuasion, which this article develops as a novel analytical lens. Firstly, Thomas Schelling emphasized that deterrence hinges on the threat that leaves something to chance, compelling an adversary to believe that escalation cannot be controlled once initiated (Schelling 1960, 187–203; 1966, 92–125). However, extended deterrence is structurally less credible than direct deterrence because it involves third-party risk. As Press has argued, states assess credibility not based on historical record but on contemporaneous assessments of interest alignment and resolve (Press 2005, 21-45). Secondly, Glenn Snyder's concept of the alliance security dilemma offers a second analytical foundation (Snyder 1997, 180-185). Alliances must balance two opposing risks: abandonment, where the patron fails to uphold commitments, and entrapment, where the patron is dragged into unwanted wars. In asymmetrical alliances, smaller states tend to fear abandonment, while larger states fear entrapment. This framework is particularly relevant to the ROK-U.S. alliance, where South Korea's threat perception is acute and growing, while the U.S. has signaled ambivalence. Thirdly, this article introduces strategic dissuasion as a parallel function of extended deterrence. While deterrence aims to prevent adversary aggression, dissuasion seeks to prevent allied defection— particularly the pursuit of nuclear sovereignty

(Crawford 2009, 277-303). This logic helps explain why the nuclear umbrella may persist as a performative structure, serving to suppress allied nuclearization despite declining credibility in the eyes of both adversaries and allies. By isolating strategic dissuasion as a distinct logic, the article contributes to alliance theory by decoupling assurance from action and credibility from commitment. It posits that an umbrella may survive as a dissuasive artifact even as its deterrent function collapses.

The article is designed as a qualitative, historical–interpretive study based on process-tracing methodology. Process tracing is well suited to inquiries that seek to uncover causal mechanisms as well as to evaluate the internal logic of institutional settings (George and Bennett 2005, 205–232). The research retraces the historical evolution of the nuclear umbrella as deterrent and dissuasive practice, tracking its trajectory from Cold War Europe to the Korean Peninsula and its transformation under the stewardship of different U.S. administrations. The inquiry also carries out elite discourse analysis on how U.S. and South Korean leaders have defined extended deterrence, especially under political leadership that departs from the orthodoxy of alliance politics (Allison and others 2022). Data include presidential speeches and remarks, summit statements, defense white papers, and strategic posture analyses. In particular, the study tracks changes in reassurance signaling—presence, absence, and ambiguity—and examines how these may have coincided with changes in threat perception and domestic readiness to rearm with nuclear weapons. Finally, the study draws on historical institutional analysis, exploring how past institutional legacies foreclose contemporary pathways (Fioretos 2011). It treats the nuclear umbrella as an institution with embedded strategic logics and functions, exploring how its strategic rationale may have been at odds with its operational value, and how these legacies structure contemporary security thinking.

NATO's Nuclear Umbrella Transplanted to Korea – Asymmetries and Credibility Gaps

Extended Deterrence Transplanted from NATO to Korea

The "nuclear umbrella" was transplanted from NATO to Asia. The idea of a U.S. nuclear umbrella shielding partners and allies originated in Cold War Europe, with the United States promising Allied NATO states that it would respond to a Soviet attack on them with a nuclear strike on the Soviet Union. The U.S. subsequently imported this structure into Asia. South Korea came under de facto U.S. nuclear protection at the close of the Korean War, with the 1953 Mutual Defense Treaty anchoring the commitment, and from 1958 American nuclear weapons were deployed on ROK soil as a tangible demonstration of extended deterrence (Kristensen and Norris 2017, 349–351). Although the ROK-U.S. Mutual Defense Treaty of 1953 lacked an explicit nuclear guarantee, in practice the United States applied its postwar doctrine of massive retaliation to the Korean Peninsula. U.S. tactical nuclear arms (from nuclear artillery to warheads for Honest John rockets) were forward-deployed in South Korea as in Europe throughout the Cold War, albeit under exclusive American control. By the late 1960s, the United States stationed hundreds of warheads in the ROK, paralleling its NATO posture if on a smaller scale. This NATO-style institutional "transplant" (i.e., nuclear umbrella) occurred, however, in a very different strategic and institutional context. Unlike in Europe – where a multilateral alliance managed collective nuclear defense – in Korea the arrangement was strictly bilateral. Seoul was a protectorate of U.S. extended deterrence, but had little visibility or say in nuclear planning. Indeed, South Korean forces benefited from the protection of U.S. nuclear forces, yet decision-making remained wholly in Washington (Trachtenberg 2012). The umbrella's tangible and physical presence in Korea ended with the Cold War: as part of President George H.W. Bush's 1991 Presidential Nuclear Initiatives, the United States unilaterally withdrew all its remaining tactical nuclear weapons from South Korea

(Kristensen and Norris 2017, 355–356). Since then, the U.S. promise to defend South Korea with nuclear forces has been maintained through offshore capabilities (e.g., strategic bombers and submarines) and declaratory commitments, but without any permanent nuclear assets on Korean territory. This contrasts sharply with Europe, where even after the Cold War the U.S. kept a modest arsenal of B61 gravity bombs forward-deployed in NATO states. In short, the U.S. "nuclear umbrella" was indeed transplanted from NATO to Korea – but absent NATO's integrated framework, it took on a far more unilateral character in the ROK setting.

Doctrinal and Strategic Asymmetries: Europe vs. the Korean Peninsula

From the beginning, Europe and Korea's systems of extended deterrence differed in doctrinal and strategic terms. NATO in the 1960s evolved a strategy of flexible response that combined conventional and nuclear options along a graduated deterrence ladder. Nuclear use – from tactical warheads up through strategic strikes – was integrated into alliance doctrine and extensively exercised, debated and war gamed among allies (Kim and Simón 2024). NATO solidified an elaborate playbook for nuclear escalation (e.g., the use of theater nuclear forces to offset Soviet conventional superiority, as in the 1950s "massive retaliation" era, later tempered by flexible response). Doctrinal thinking on nuclear use in Korea remained much less elaborate. In the Korean War time frame, the basic scenario was relatively binary: if war resumed on the peninsula (notably through Chinese intervention as in 1950), U.S. commanders would consider early use of tactical nuclear strikes to blunt northern aggression. But there was no multinational forum for refining such plans with input from South Korean allies, nor any need for fine-grained escalation control in an alliance context – the U.S. alone would decide if/when/how to use nuclear weapons in Korea. This strategic asymmetry has continued into the post-Cold War era. Europe's nuclear umbrella was directed at a peer superpower (the USSR/Russia) and later

extended to new missions such as crisis management, whereas the Korean umbrella is directed at a regional adversary (North Korea) with a relatively small if growing nuclear arsenal. The scale and scope of the threat differs: NATO faced thousands of Soviet warheads, and large Warsaw Pact armies which made it vital to fully integrate nuclear doctrine into alliance strategy. Meanwhile in South Korea, the existential nuclear threat remains a localized threat of renewed North Korean attack (conventional or nuclear) – but now with a significant new factor: Pyongyang's ability to hit the U.S. homeland with ICBMs. The latter raises a "decoupling" dynamic reminiscent of Cold War Europe: just as NATO states feared that Washington might reconsider a nuclear response once the USSR could hit American cities, so South Korean officials today fear that a nuclear-armed North Korea could "spare the US" while holding the peninsula. Indeed, South Korean analysts recall speculation during the Trump administration that Washington could strike a grand bargain for Pyongyang to dismantle ICBMs (which threaten the U.S.) while leaving in place short- and medium-range missiles that threaten South Korea – which would decouple U.S. security from that of its ally. Such fears underscore a core doctrinal asymmetry: NATO's doctrine evolved to ensure the indivisibility of allied security (famously, that the United States would treat an attack on Europe as an attack on itself), whereas in the Korean case, a tactical doctrine for indivisibility has been elusive, with more fundamental doubts over whether the United States would really risk catastrophe at home in order to honor its nuclear guarantee abroad. The lack of a NATO-style joint doctrine has made those doubts all the more acute. While NATO declared as an alliance that a nuclear attack on any ally would trigger nuclear retaliation (backed by mechanisms to make that credible), U.S. declaratory policy for South Korea has been vaguer. Typically, U.S. leaders reaffirm that any North Korean nuclear attack would be met with a 'swift, overwhelming, and decisive response,' i.e., regime–ending retaliation — a declaratory stance that stops short of a blanket first–use promise in non–nuclear contingencies. Yet given the lack of South

Korean participation in such formulation, these commitments can look less like alliance doctrine and more like unilateral U.S. promises.

Missing Elements: Nuclear Sharing, Dual-Key Arrangements, and Integrated Planning

The nuclear deterrence arrangements of NATO and the ROK-U.S. alliance differ on a number of modalities. Significantly, nuclear sharing is the bedrock of the North Atlantic Alliance's nuclear posture and translates into meaningful consultation between Allied members. The United States' European allies—with the exception of France, which remains outside the NPG and maintains a fully independent deterrent—are deeply engaged in nuclear planning through their participation in the Nuclear Planning Group (NPG), some of them host U.S. nuclear weapons on their soil, and Belgium, Germany, Italy, and the Netherlands combine these two elements with Dual Capable Aircraft (DCA) enabling these non-nuclear allies to have a meaningful stake in potential nuclear use from their soil. While the United States remains the final authority over the use of its nuclear forces, the Alliance has developed arrangements to provide for use in defense of its allies. These arrangements, such as nuclear consultation, are aimed at steering Allies away from pursuing nuclear weapons through Allied buy-in to nuclear strategy and a significant bench of delivery candidates. These stakeholders are part of the robustness of the Alliance's collective nuclear deterrence as it influences the credibility of the deterrent itself, of course, but also the Alliance's cohesion (Roehrig 2017).

The ROK-U.S. alliance, meanwhile, has been characterized by a conspicuous lack of South Korean involvement in nuclear strategy and decision making. During the Cold War, the American nuclear weapons deployed to the Korean Peninsula were under sole U.S. control. South Korea had neither custodianship of the nuclear weapons based in the ROK nor formal decision-making authority over the use of these weapons. To this day when most of the U.S. nuclear forces are based outside of the Korean Peninsula, South Korea still lacks a permanent,

NATO-style nuclear consultation mechanism. Only in the 2010s did dedicated institutions for nuclear and extended deterrence consultations emerge, beginning with the Extended Deterrence Policy Committee (EDPC) in 2010 and culminating in the higher-level, vice-ministerial Extended Deterrence Strategy and Consultation Group (EDSCG) established in 2016. And yet, South Korean officials regularly found themselves being briefed about U.S. strategic intent instead of actively cooperating to develop a joint nuclear policy, drawing frequent criticism and remaining a source of frustration in South Korea (Roehrig 2017).

In 2023, a major advance was made with the establishment of the ROK–U.S. Nuclear Consultative Group (NCG), as stipulated in the Washington Declaration (The White House 2023; Shin 2023). Loosely modelled after NATO's NPG, the new body is intended to give South Korea more insight into U.S. nuclear planning and a clearer role in contingency planning. Nonetheless, the restrictions are still large. The NCG functions on a bilateral basis, as opposed to NATO's multilateralism, and it is primarily for information exchange and consultation rather than joint operational control. The United States maintains ultimate decision-making authority, particularly in wartime. In South Korea, the media and analysts have frequently identified the NCG's lack of meaningful decision-making power for Seoul in comparison with NATO's NPG. Importantly, there are no dual-key arrangements on the Korean Peninsula. South Korea, unlike some NATO countries, does not host U.S. nuclear weapons that would require joint approval to employ. Furthermore, the U.S. has pledged to consult Seoul prior to using nuclear weapons in a Korean contingency, but it is not a binding obligation and falls well short of NATO's robust mechanisms of joint control. The ROK-U.S. alliance therefore lacks the dense nuclear command architecture that underpins NATO's extended deterrence posture in Europe (NATO 2022). As a result, South Korea remains a well-informed audience—not a direct participant—in nuclear deterrence, directly leading to persistent concerns over the credibility of U.S. security guarantees.

A Non-Nuclear Ally and the Credibility Gap

As a non-nuclear ally, South Korea has also contributed to perceptions of U.S. deterrent credibility. U.S. embassy reporting from Seoul in 1974 cited growing South Korean doubts about the durability of U.S. commitments in the face of North Korean threats—doubts that shaped allied deterrence decisions for much of the Cold War (Burr 2017). President Park Chung-hee sought a domestic nuclear program, which Washington quashed. Similar patterns emerged in every instance U.S. security assurance credibility appeared to come into question. Unlike their European or Japanese counterparts, South Korea has neither a domestic nuclear deterrent nor a formal role in allied nuclear operations. The credibility gap is rooted in asymmetries: First, asymmetry of stakes—North Korea threatens Seoul, while deterring U.S. intervention by threatening American cities. Recent surveys find that fewer than half of South Koreans believe Washington would actually use nuclear weapons in their defense (Asan Institute for Policy Studies 2025). Second, asymmetry of information—While NATO consultations give European allies insight into scenarios that builds confidence, South Korea had until recently limited insight. Third, asymmetry of decision-making power—the ultimate decision to employ nuclear weapons belongs only to the U.S. President. Extended deterrence, in short, is not only about capabilities; it is also about perception, credibility, and trust—and when that trust erodes, allies start thinking about more self-sufficient strategies. The Trump administration compounded the credibility problem. During Trump's first term (2017–2021), he approached U.S. alliances in a transactional and erratic manner. Trump's surprise pledge at the June 2018 Singapore Summit to suspend U.S.–ROK military exercises – calling them 'provocative' – caught Seoul off-guard, undercutting alliance readiness. South Korea's Blue House cautiously stated it needed 'to find out the precise meaning' of Trump's announcement – a diplomatic show of alarm that highlighted Seoul's fear of being sidelined. This unprecedented concession to Pyongyang reinforced South Korean concerns about alliance decoupling. In Trump's second

term, these patterns have continued. Allies describe a Trump 2.0 administration intent on great power competition with China and burden-shifting. There is concern Trump might use extended deterrence as a bargaining chip. The worst-case scenario for South Koreans is a bilateral deal in which North Korea dismantles ICBMs threatening America while retaining shorter-range nuclear threats against South Korea. South Korean lawmakers have suggested that if Washington will not maintain the umbrella, Seoul may have to consider developing its own nuclear arsenal (Bandow 2025).

The Trump 2.0 administration has kept up formal alliance mechanisms like the NCG, but the spirit of reassurance has all but evaporated. Trump's perceived indifference toward U.S. allies, "America First" rhetoric, and occasional words of admiration for Kim Jong-un undermine deterrence credibility. Extended deterrence remains Seoul's preferred policy for now, but security experts are openly canvassing other options—ranging from the redeployment of U.S. tactical nuclear weapons to an independent nuclear arsenal (Jaffery 2025). The alliance now faces a double burden that risks credibility: old doctrinal, institutional, and capability-related structural asymmetries, heightened by the kinds of political fluctuations that make managing those asymmetries less tenable. As the ROK-U.S. alliance moves ahead, it faces the urgent task of finding ways to reconcile these gaps—appropriating NATO's experience wherever applicable—or else risk an unraveling of the very deterrence it seeks to uphold.

Extended Deterrence as Strategic Dissuasion in the Korean Alliance

Extended Deterrence as an Instrument of Nonproliferation

In US terms, deterrence and reassurance on the Korean Peninsula have been two sides of the same coin. North Korea is the obvious reason that deterrence has been the traditional justification for American

extended deterrence on the peninsula. Perhaps less appreciated, however, has been the fact that American extended deterrence has always had two purposes with North Korea representing only one of those two purposes: (i) to deter North Korean aggression and to defend against such aggression if deterrence fails; and (ii) to assure South Korea that America's security commitments are sturdy, reliable, and credible enough so that it is unwise to develop an independent nuclear deterrent. America has just often been more preoccupied with preventing South Korea from placing itself on a trajectory toward acquiring nuclear weapons than in responding to the threat that North Korea poses (Sukin 2020).

America's extended deterrence on the Korean Peninsula has repeatedly served to soothe South Korea's leaders, many of whom might have decided to break from the Western camp and develop an independent nuclear deterrent of its own. From America's perspective, preventing nuclear proliferation in Northeast Asia and preserving the sanctity of the Non-Proliferation Treaty has taken precedence over the security challenge posed by Pyongyang itself. This is not by accident, since the underlying logic of American extended deterrence on the Korean Peninsula has always privileged nonproliferation since it aligns with Washington's longstanding commitment to nonproliferation, South Korea's dependence on the alliance, and long held concerns in Washington that leaders in Seoul might hedge against America's security assurances.

A case in point of the constraints imposed by extended deterrence on South Korea occurred in the 1970s. After a U.S.-initiated troop withdrawal and the Nixon Doctrine's call for greater self-reliance by America's allies, President Park Chung Hee embarked on a nuclear weapons program. By late 1974, U.S. intelligence assessments had concluded that South Korea–not North Korea–was the country closest to a nuclear capability. Park had also ignored U.S. protests in his purchase of a plutonium reprocessing plant from France with civilian, but unmistakably military, purposes. Washington was aghast: U.S.

decision makers were deeply committed to nonproliferation and viewed the nuclear weapons program as an affront to American dominance over the alliance and its credibility (Burr 2017).

To counter South Korea's nuclear ambitions, behind the scenes, Washington pressured France and Canada to cancel or indefinitely delay their nuclear technology agreements with Seoul, helping build an international consensus against the transfer of sensitive nuclear technology—especially in the aftermath of the India nuclear test of 1974 (FRUS 2011). At the same time, U.S. diplomats, according to declassified cables, brandished carrots, offering to further peaceful nuclear research cooperation if South Korea abandoned its plans to reprocess plutonium. The American position was straightforward: South Korea could enjoy the fruits of civilian nuclear technology under the U.S. nuclear umbrella, but its pursuit of nuclear weapons for military purposes would undercut the bilateral alliance. Facing coordinated American pressure, President Park quietly restated South Korea's commitment to the NPT, even as he dropped hints that Seoul reserved the right to restart research if American nuclear guarantees eroded. Behind closed doors, U.S. strategists derived broader lessons from this near-crisis over nuclear proliferation, doubling down on the idea that extended deterrence was directly connected to nonproliferation by assuring allies they would be protected. Washington thus viewed its alliances as a backstop to the "nuclear jungle"—or regional proliferation spiral—that could ensue if South Korea or Japan lost faith in American security and guarantees. In turn, the U.S.-ROK alliance has consistently served as an organizing principle for U.S. policymakers to forestall a nuclear proliferation domino in East Asia.

Post-Cold War Continuity: Assurance over Credibility

The post-Cold War years marked a turning point in U.S.-ROK deterrence, when President Bush withdrew tactical nuclear weapons from South Korea in 1991. Yet Washington was also careful to couple this move with strengthened conventional forces and demonstrative

security assurances, to signal continued resolve and maintain South Korea's confidence in U.S. commitment. This strategy preserved the core bargain between extended deterrence and nonproliferation, while encouraging South Korean restraint even as North Korea moved in the opposite direction. As the North Korean nuclear threat emerged in the mid-1990s and worsened in the 2000s, South Korea's reliance on the U.S. nuclear umbrella was tested anew. North Korea's first nuclear test in 2006, and a series of further nuclear and missile advances, meant growing anxiety in Seoul about whether the United States would risk "trading Seattle for Seoul" in an extreme scenario – the credibility dilemma of extended deterrence.

After the 1998 Taepodong-1 missile flew over Japan, Tokyo reacted with shock – Japan's parliament unanimously condemned Pyongyang, froze normalization talks, and cut off food aid. That launch also spurred Japan to join the U.S. in developing ballistic missile defenses, marking a historic shift in Japanese security policy. Similarly, following North Korea's first nuclear test in 2006, Japan accelerated deployment of Patriot-3 missile interceptors around Tokyo (operational by 2007), doubling down on alliance defenses while still forgoing any indigenous nuclear armament.

Yet rather than entertain an indigenous nuclear arsenal, successive ROK governments largely doubled down on the alliance guarantee, while pressing Washington for ever-stronger assurances. For example, in the aftermath of North Korea's second nuclear test (2009), the U.S. and ROK presidents issued an unprecedented Joint Vision Statement in June 2009 strongly reaffirming America's "nuclear umbrella" over South Korea (The White House 2009). Such declaratory commitments were aimed as much at the South Korean public and elites as at Pyongyang. The U.S. extended deterrence pledge – now typically phrased as covering the "full range of U.S. capabilities, including nuclear"– became a core element of alliance communiqués and summit statements. In effect, the worse the North Korean threat became, the more the solution was framed in terms of more alliance cooperation.

This strategy was carefully designed to dissuade South Korea from seeking its own deterrent. U.S. diplomatic cables and memoirs from this period suggest a constant subtext: American envoys routinely lobbied South Korean officials and politicians to reject calls for nuclear armament. They consistently sent a message that any move down that path would endanger regional stability and the ROK-U.S. alliance itself.

South Korean leaders, for their part, remained publicly committed to non-nuclear status, but not without periodic expressions of frustration. Notably, ROK defense strategists began advocating for enhanced conventional strike and missile defense capabilities – the so-called "Kill Chain" and Korea Air and Missile Defense – as partial substitutes for the nuclear deterrent they were forbidden to acquire. The U.S. supported these efforts, again with an eye to undercut any argument that Seoul needed nuclear weapons. Therefore, if advanced conventional means and U.S. strategic forces together could neutralize the North Korean threat, the case for a South Korean bomb would remain off the table. In general, U.S. extended deterrence policy in Korea had evolved to stress "strategic dissuasion," not only against the North, but also, crucially, against the South. The objective of deterring the North and the objective of dissuading the South became one in American strategic logic, and were defined in terms of convincing Pyongyang the war would not be worth the price and convincing Seoul that developing its own nuclear weapons would be both unnecessary and counterproductive.

The Trump Era and "Trump 2.0": Tensions in the Umbrella

Donald Trump's election posed the biggest test to U.S. extended deterrence policy in the postwar period. As an unconventional and at times erratic candidate, Trump had openly questioned the value of U.S. alliances and gone so far as to suggest publicly that Japan and South Korea might need to develop their own nuclear weapons in order to relieve the United States of their defense burdens (Sanger and Haberman 2016). Trump's comments raised the specter of abandonment by a United States that was unwilling to defend it, or worse yet, actively

seeking to push its ally to arm itself with nuclear weapons in order to relieve its excessive burden of nuclear protection. Others in the U.S. administration, from National Security Advisor H.R. McMaster to Vice President Pence, repeated the same line to roll back any indication that Washington might ever accept a proliferation-accepting policy.

In practice, this equated to applying boiler-plate alliance reassurance playbooks. When South Korean conservatives made the case to return US tactical nuclear weapons to the peninsula in 2017–18, citing North Korea's advancing nuclear and missile capabilities, Washington demurred, concerned that reintroducing such weapons would constrain diplomacy with North Korea and that they would bolster arguments that Seoul and Washington had moved South Korea onto a covert nuclear course. Washington sought to close the trust gap with new deployments of strategic bombers and more consultation mechanisms. Even as the Trump administration pursued a surprise direct meeting with Kim Jong Un, the US administration continued to dissuade South Korea from developing nuclear weapons of its own. The two governments had set up the ROK-US Extended Deterrence Strategy and Consultation Group (EDSCG) in late 2016. It became an important vehicle through which South Korea could "show its homework" and through which Washington could show that it remained engaged (Kim and Simón 2024).

The prospect of a second Trump administration is already being factored into strategic calculations in Seoul. By mid-2024, prominent voices in Seoul's security debate were arguing that South Korea could no longer blindly depend on the U.S. nuclear umbrella and should keep an indigenous nuclear option in reserve as a fallback (Bennett 2024). Then Defense Minister Shin Won-sik cautioned in 2024 that South Korea acquiring its own bomb might "rupture its alliance with the U.S. and shock financial markets" (Korea Times 2024). Preemptively heading off such pressures, the Biden administration and Seoul sought to further institutionalize extended deterrence consultations—an adaptation analysts had urged from the very start of Biden's term (Dalton 2021). In the April 2023 Washington Declaration establishing a top-level

US-ROK Nuclear Consultative Group (NCG), South Korea "reaffirmed its longstanding commitment" to the NPT, under which it voluntarily forswears developing nuclear weapons, and the US committed to enhancing cooperative decision-making on nuclear contingencies (The White House 2023).

By 2025, it is apparent that the main utility of U.S. nuclear extended deterrence for the ROK is to dissuade South Korea from developing its own nuclear weapons. Yet, this subtext is obvious to any informed observer of South Korea's entire nuclear history to date. Deterring North Korea remains the official point of extended deterrence but measures to bolster deterrence have overwhelmingly had the effect of assuring Seoul of the United States' commitment. President Yoon's explicit acknowledgment of this and his subsequently retracted remarks that the ROK could host U.S. nuclear weapons or build a nuclear arsenal itself made clear what had already become evident: that there was and is an increasing feeling in South Korea that U.S. extended deterrence and B-52 flyovers were no longer enough (Choe 2024). North Korea was doing what North Korea does while U.S. guarantees to South Korea remained inert and needed to be met in a joint, collaborative way. In short, South Korea's policy makers see extended deterrence as above all reassurance and inhibition: "don't worry," in this case, meant first and foremost "don't build your own bombs" (Sukin 2020). While North Korea continues to engage in provocations and nuclear weapons development, the growing doubt among South Koreans regarding the U.S. security commitment is a critical issue. The ultimate fear is that if there is insufficient reassurance, South Korea will decide to develop its own nuclear weapons. From this perspective, South Korea developing its own nuclear weapons itself constitutes a bigger risk than slightly perturbing North Korea —or China — by making U.S. nuclear commitments more visible.

U.S. extended nuclear deterrence to South Korea in 2025 functions on two interrelated but separate levels: deterrence of North Korea and reassurance of Seoul, ensuring that South Korea does not "go nuclear."

This latter reassurance function is not as simple as direct deterrence of one's potential enemy and relies on acts of strategic dissuasion. Thus, reassurance-centered deterrence efforts have included B-52 bomber flyovers and presidential statements of commitment meant in part to ensure Seoul stays confident enough in Washington's nuclear umbrella to not pursue its own independent nuclear weapons program. But the larger and more credible North Korea's nuclear arsenal has grown, and the more unpredictable U.S. politics has become, the harder these contradictory objectives have become to sustain. In sum, American extended deterrence toward South Korea reveals a nuclear age paradox: to prevent nuclear proliferation, nuclear states sometimes promise to use their weapons for others. The American commitment to defend Seoul with nuclear force if necessary has been credible enough to prevent South Korea from developing its own nuclear arsenal. The nuclear umbrella represents a deliberate trade-off: South Korea forgoes nuclear weapons while the United States guarantees South Korea will not face nuclear aggression alone. Ultimately, credibility to the ally may matter more than credibility to the enemy (Murdock and others 2010).

Extended Deterrence Credibility under Trump 2.0

Trump 2.0's Reshaping of the U.S.-South Korea Security Alliance

Former President Donald Trump's second administration has significantly disrupted U.S. alliance management, especially regarding U.S. extended deterrence commitments to South Korea. During the 2024 campaign and in early 2025, Trump repeatedly assailed allies for freeloading off the United States by failing to contribute their fair share to their defense and called South Korea a "money machine" that should be paying the United States significantly more for U.S. military support. He even demanded, with no apparent basis, that the ROK pay $10 billion a year—roughly nine times the amount Seoul had just agreed to pay for 2026 under the twelfth Special Measures Agreement (Kang

2024). His rhetoric echoes Trump's stated concerns with alliances during his first term, when the former commander-in-chief dismissed Seoul's contributions as trivial and threatened to pull U.S. forces absent increased payments. And Trump's challenges have only escalated—from cost-sharing questions to the central alliance security commitments themselves. On the campaign trail in 2016, Trump suggested Seoul could develop its own nuclear weapons—directly undermining U.S. nonproliferation policy (Roberts 2024, 13). His unilateral move to suspend joint U.S.-ROK military exercises in 2018–2019 as "tremendously expensive" further raised concerns in Seoul about American reliability and willingness to defend South Korea.

Early moves in 2025 deepened South Korean anxieties. Defense Secretary Pete Hegseth's conspicuous omission of South Korea from his first Indo-Pacific tour, which took him to Japan and the Philippines, was read in Seoul as a diplomatic snub—though it also reflected the leadership vacuum then prevailing in Seoul (Cha 2025). More alarmingly, Hegseth's written confirmation testimony referred to North Korea's "status as a nuclear power," appearing to accept Pyongyang's nuclear arsenal as permanent. South Korea's Foreign Ministry swiftly objected, insisting that North Korea "can never be recognized as a nuclear-armed state" and that denuclearization remains a principle consistently upheld by Seoul, Washington, and the international community (Korea Herald 2025). Despite these unsettling signals, the Trump administration maintained some formal assurances of extended deterrence, though many observers noted the gap between official statements and Trump's personal rhetoric. A February 15, 2025 trilateral statement issued with Seoul and Tokyo in Munich reiterated ironclad U.S. commitments to the defense of both allies, backed by American military strength "including its nuclear capabilities," alongside a pledge to pursue the complete denuclearization of the DPRK (U.S. Department of State 2025). Working-level defense dialogues also continued, including the 26th Korea-U.S. Integrated Defense Dialogue in May 2025 (USFK 2025).

Notably, U.S. officials agreed to maintain the Nuclear Consultative Group established under President Biden in 2023, even as the group's meeting rhythm slowed markedly. Simultaneously, Trump's team has pressured Seoul to expand the alliance's scope beyond the Korean Peninsula, particularly regarding China, raising concerns that U.S. protection might become conditional on South Korea's alignment with broader American interests. This transactional approach has sparked unprecedented discussions in Seoul. Following Trump's 2024 election victory, prominent strategist Cheong Seong-chang argued that "the reelection of Trump is an opportunity for South Korea to create its own nuclear weapons," reflecting growing sentiment that the U.S. nuclear umbrella now carries a negotiable price (Bandow 2025). Some analysts have even proposed an "Extended Deterrence Cost-Sharing Agreement" where Seoul would substantially increase host-nation support in exchange for concrete nuclear assurances, potentially including nuclear-sharing arrangements or rotational deployment of U.S. tactical nuclear assets.

Rhetoric vs. Policy: Alliance Reassurance and Strategic Posture in 2025

In 2025, the U.S.–South Korea alliance is characterized by a widening gulf between U.S. official policy assurances and President Trump's erratic rhetoric, creating increased anxiety in Seoul over the reliability of American security guarantees. U.S. official statements—notably, the February 2025 Munich trilateral declaration issued with Seoul and Tokyo—continue to affirm ironclad commitments to the defense of South Korea and Japan, backed by American military strength "including its nuclear capabilities" (U.S. Department of State 2025). But South Korean policymakers increasingly see those scripted public U.S. commitments as inadequate. Even though there is a modicum of continuity in Washington's extended deterrence policy, including through American national security appointees who stress deterrence, the alliance's credibility is beset by Trump's personal

distrust of multilateral commitments and his transactional view of alliances.

The Trump administration's Indo-Pacific strategy, still in development, is geared toward counterbalancing China's rise and therefore continues to regard forward-deployed U.S. alliances in Asia as having geostrategic value. Yet, ambiguity and contradictions remain in U.S. deterrence policy, troubling Seoul. By mid-2025 the Trump administration has yet to release a new Nuclear Posture Review (NPR) and early signals suggest the administration is internally divided over the future role of nuclear weapons in U.S. strategy. Trump's first-term NPR in 2018 had advocated flexible, tailored deterrence options backed by supplemental low-yield capabilities. But in 2025 Trump has also hinted at a possible pivot to arms control, musing publicly in early 2025 about the prospect of denuclearization talks with Russia and China and suggesting the three powers could ultimately halve their military budgets, a break from prior policy (Miller and Price 2025).

For South Korea, this pivot cuts both ways. Genuine arms control progress would reduce nuclear threats over the long run; but prematurely capping or drawing down U.S. nuclear arms could degrade deterrence over the short run. South Koreans are reminded of the madcap diplomacy Trump conducted with his enemies last time around: during his first term, Trump's summit-centric diplomacy with Kim Jong-un resulted in the suspension of joint drills and talk of a peace declaration, often without consulting his allies. In 2025, a swirl of rumors about rekindled backchannel communications and possible summits with North Korea have stoked fears in Seoul of again being left in the lurch by U.S.–North Korea diplomacy.

The risk of being sidelined in US–North Korea talks is compounded by South Korea's own political turmoil: in the absence of a president (a successor, Lee Jae-myung, would not be elected until June 2025) Seoul lacks both the bandwidth and the diplomatic intermediaries that might help inform Washington's strategy. South Korean strategists insist that Trump's penchant for personal dealmaking with authoritarian leaders —

Kim Jong-un, Vladimir Putin, and Xi Jinping — injects its own uncertainty into extended deterrence—a concern analysts had flagged even before the second term began (Grossman 2024). For South Koreans, deterrence is not just a balance of military capabilities, but the perception that the US would be willing to use those capabilities on its ally's behalf. Each time Trump praises Kim, or questions the logic of defending faraway allies, South Koreans sense just a fractional diminution of that willingness.

Trump's disinclination toward multilateralism has also translated into a freeze on the kind of trilateral cooperation that had warmed so fast under his U.S. predecessor. In August 2023, President Biden hosted a historic Camp David summit of U.S.-Japan-South Korea cooperation, generating new trilateral security coordination mechanisms. Trump 2.0, by contrast, has little evident appetite for institutionalizing such trilateral mechanisms. Nor is Trump too attracted to the classic U.S. extended deterrence playbook of building allied confidence in U.S. security commitment by bringing them into multilateral fora such as NATO's Nuclear Planning Group or Northeast Asia's hitherto moribund six-party talks to seek nuclear disarmament. Without the U.S. acting as a strong advocate of multilateral reassurance, South Korea loses an important diplomatic buffer from surprising and fast-changing U.S. policy shifts. Seoul has few "allies versus adversaries" contests that bolster its confidence in being on the "good" side and is drawn to bargain from a position of weakness on a bilateral basis, prone to negotiating according to the whims and preferences of Trump.

As analysts had warned even before the second term began, Trump's transactional approach—including toward allies—raises doubts about the reliability of U.S. treaty commitments (Grossman 2024). Even as U.S. military and diplomatic officials maintain working-level cooperation, the political signals from the top have introduced unprecedented ambiguity into ROK-U.S. extended deterrence relations. This uncertainty has prompted South Korean officials and strategists to question whether the alliance can still be relied upon as a credible bulwark against North

Korean threats, whether Seoul must therefore contemplate alternative security options for the future.

South Korean Reactions: Elite Debate and Erosion of Public Trust

US policy changes have prompted a wholesale reappraisal in South Korea of its security dependence on the United States. Elite and public opinion alike indicate, consistently since 2025, growing contradictions and doubts over US credibility, as well as an increasing inclination towards autonomous options. South Korean policymakers are faced with a "quiet crisis" of alliance confidence that had begun under Trump's first term but grew in magnitude under Trump 2.0 (Cha 2025). At the same time, hawkish South Korean voices have become more active in speaking about contingencies, with some advocating that South Korea ought to obtain nuclear armaments of its own. While the Washington Declaration and Nuclear Consultative Group (NCG) set up in 2023 were ostensibly meant to tamp down such talk, Trump 2.0's equivocality has reanimated domestic debates over nuclear self-reliance. In early 2025 alone, several National Assembly members have suggested revisiting the question of US tactical nuclear weapons redeployment, or even going so far as to pursue an independent nuclear weapons program in case US guarantees remain untrustworthy (Jaffery 2025).

Although South Korean officials oppose NPT violations on record, they stress "realistic" hedging, ranging from accelerated development of conventional long-range strike capabilities to hypothetical consideration of indigenous nuclear weapons. South Korea's security elite is doubling down on alliance ties in public while quietly considering "Plan B" options in private. Public opinion has already shifted in this regard, underscoring eroded confidence in U.S. guarantees. South Koreans have witnessed a series of events that call into question Washington's reliability: Obama's Syria "red line," Trump's threats to abandon allies, and Afghanistan's chaotic collapse in the face of a Taliban advance (Grossman 2024).

This paper now examines the June 2025 U.S.–Israel airstrikes on

Iran's nuclear facilities as an instructive analog. Pyongyang drew clear lessons: those strikes validated North Korea's belief that only a robust nuclear arsenal deters U.S.-led attacks. Conversely, South Korean strategists saw a cautionary tale: a U.S. ally (Israel) openly attacked a proliferator's facilities, implying that if Seoul were ever to pursue nuclear weapons, it might invite similar preventive strikes by adversaries. This new analysis underscores how the Iran strikes simultaneously bolstered North Korea's justifications and warned South Korea of the risks of nuclear hedging.

The upshot is a public more open to the case that "Korea cannot always depend on others for its national security." In effect, both public opinion and elite opinion now share a conditional view of the alliance: if the U.S. fails to make good on its commitment, South Korea must take extreme measures. The widespread presence of such contingencies reflects a collective anxiety that Trump 2.0 is the event that has concretized the "decoupling" fear, not only at the technical level but also at the political level. Will Trump keep faith in his security promises if he no longer sees the alliance as a profitable venture? (Cha 2025)

Seoul has responded with damage control contingency planning, seeking constant high-level meetings to lock down pockets of commitment. Korean diplomats have quietly engaged Congressional leaders and Pentagon officials as "alliance guardrails" from dramatic White House moves. However, Yoon's impeachment (finalized April 4, 2025) created a leadership vacuum just as Trump began a raft of protectionist measures, including a 25% tariff on Korean imports. Seoul was left essentially leaderless and hamstrung, unable to conclude successful negotiations over either tariffs or security (Kim and others 2025). The South Korean authorities have also launched an information campaign highlighting continued military cooperation in an attempt to reassure the public, while U.S. officials have sought to speak directly to the South Korean public. American officials in Seoul, for example, have publicly reiterated Washington's pledge to defend Korea. But sceptics point out that such reassurances count for little so long as President Trump does not himself articulate a clear affirmation of U.S. extended deterrence commitments,

while continuing to emphasize trade surpluses, burden-sharing and defense cost sharing—that in other words, defending South Korea is not an end in itself but a hostage to other aims.

A Fundamental Departure from Traditional Assurance Behavior

Trump 2.0's assurance behavior for extended deterrence marks a fundamental departure from the traditional, post-1950s U.S. approach to extended deterrence. Traditional "assurance behavior" has included regular high-level verbal affirmations, integrated military planning, and displays of attention to allies' perceptions of the threat. Since the Cold War, U.S. presidents routinely sent senior officials to Seoul during heightened tensions, often issued joint statements including strong assurance terminology—such as "ironclad" or "extended deterrence"—and refrained from conflating security commitments with economic or political issues. Indeed, security assurances were never conditioned on transactional concessions even amid contentious issues such as trade disputes throughout the 1990s. Meanwhile, such mechanisms as the Extended Deterrence Strategy and Consultation Group (EDSCG) and the regular deployment of strategic assets—such as the B-52 bomber and nuclear submarine—have further coordinated the deterrence posture and attempted to assure Seoul and deter Pyongyang (Lee and Choi 2024). Trump 2.0 has made sharp departures. Whereas Jimmy Carter's late-1970s proposal to withdraw troops was based on strategic and human rights reasons, Trump has suggested pointblank that he would withdraw troops and security guarantees unless allies "pay"—literally. Analysts have interpreted the shift as a reformulation of alliances as a form of "defense welfare": in other words, it is something that can be cut the moment costs exceed benefits, calling into question the psychological basis for the alliance.

Strategically, Trump's policy is a combination of passivity and unpredictability that all but vitiates credibility. On the one hand, Trump is passive about the growth of the North Korean nuclear threat. He has expressed satisfaction that North Korea has been quiet, so long as the

regime refrains from long-range missile tests—nuclear developments apparently do not move the deterrence needle for Trump. On the other, Trump's erratic and impulsive decision-making neuters credibility: his abrupt cancellation of military exercises in 2018, and his potential impulsive deal with Kim Jong-un over the heads of American generals in 2025, illustrate the point. Deterrence relies primarily on credibility. Credibility requires the qualities of resolve and predictability. On both counts, Trump's credibility is lacking. Credibility is a matter of perception. U.S. allies increasingly worry that Trump would not trade American cities for Seoul in a nuclear crisis, amplifying classic decoupling fears. Trump's pendulum diplomacy could hardly help but trigger this reaction. Trump's mercurial North Korea policy oscillates from threats of "fire and fury" to praising personal correspondence—further exacerbating uncertainty and emboldening adversaries to test boundaries (Panda 2025).

Another important distinction with Trump 2.0 is the decay of normative commitments. In the past, U.S. assurances have been based not only on military capabilities, but also on a broad sense of moral and treaty obligation, and a commitment to shared democratic values. Trump has been more open in dismissing those values-based rationales and is explicit in framing alliances in a purely transactional manner. This decay was starkly highlighted by Russia's 2022 invasion of Ukraine, when candidate Trump suggested that he would withhold support to NATO allies caught in the crossfire as a bargaining chip. While there has not yet been an analogous conflict in Asia, Trump's demonstrated equivocation over Ukraine is deeply troubling to Seoul, which now fears that it would encounter future American foot-dragging in an analogous Asian conflict. South Koreans now openly question whether Trump would truly risk American cities defending Seoul, and whether they would be on the losing end of a "blood for FDI" arrangement with the United States.

Analysts and students of deterrence have long argued that trust and perception are key variables in extended deterrence. Extended

deterrence is not only about capabilities; it is inescapably about perception, credibility, and trust—and when trust erodes, allies begin looking for more self-reliant options (Rodgers 2025). This is an apt description of South Korea's strategic predicament under Trump 2.0. The erosion of trust precipitated by Trump's transactionalism is forcing Seoul to reconsider its reliance on U.S. extended deterrence and actively consider self-reliant alternatives that have until now been unneeded.

Donald Trump's transactional diplomacy toward South Korea is a significant contributor to the weakening credibility of the U.S.-ROK alliance. In contrast to the past, another traditional ally is doubting U.S. security guarantees. The combined effects of disparaging alliances in public, diluting strategic reassurances, and cozying up to authoritarian adversaries have congealed into the perception in Seoul that U.S. extended deterrence can no longer be automatically assumed to hold. From Seoul's perspective, the strategic onus will be on getting through the remainder of the Trump Administration without making a Nixon-goes-to-China exit from its longstanding position as a non-nuclear state—a formidable challenge that will test both the foreign policy aptitude of the ROK leadership and the resilience of the U.S.-ROK alliance.

Postscript: The Alliance Recalibrated, June 2025–July 2026

This article's empirical narrative closes in mid-2025, at the height of the credibility crisis it describes. The twelve months that followed moved quickly, and they merit a brief accounting here because they bear directly on the argument. The election of Lee Jae-myung on June 3, 2025 ended Seoul's leadership vacuum, and the new government moved with striking speed to stabilize relations with Washington on terms that were openly transactional. A framework agreement announced on July 30, 2025 lowered the threatened U.S. reciprocal tariff from 25 to 15 percent in exchange for commitments eventually totaling $350 billion in U.S.-bound investment—$150 billion of it earmarked for rebuilding American shipbuilding—alongside $100 billion in energy

purchases. At their first summit on August 25, 2025, Trump and Lee traded warm words while leaving the hardest questions of "alliance modernization," including defense cost sharing, U.S. Forces Korea troop levels, and the future role of USFK beyond the peninsula, unresolved (Congressional Research Service 2025).

The Gyeongju summit of October 29, 2025 and the Joint Fact Sheet issued on November 14 sealed the new bargain. The United States reaffirmed extended deterrence backed by the full range of its capabilities, including nuclear; endorsed South Korea's construction of nuclear-powered attack submarines; and committed to support ROK civil uranium enrichment and spent-fuel reprocessing—concessions no previous administration had been willing to contemplate. Seoul, in turn, committed to raise defense spending to 3.5 percent of GDP, to purchase $25 billion in American military equipment by 2030, and to assume "a leading role in the conventional defense of the Korean Peninsula" (The White House 2025). The 57th Security Consultative Meeting, held in Seoul on November 4, 2025, translated the bargain into alliance machinery: its communiqué reaffirmed nuclear-backed extended deterrence and the work of the Nuclear Consultative Group, and—significantly—set verification of the future combined command's full operational capability for 2026, accelerating the long-deferred transition of wartime operational control (U.S. Department of War 2025a).

In the terms of this article, late 2025 is best read as the monetization of the dissuasion bargain. Where earlier administrations purchased South Korean nuclear restraint with declaratory reassurance and consultative mechanisms, the second Trump administration priced the umbrella explicitly—in tariffs, investment, procurement, and burden shifting—and paid for continued restraint in kind, with capability concessions that deliberately raise Seoul's nuclear latency while keeping it inside the NPT. President Lee has paired this hedging with unusually explicit renunciation, ruling out both an indigenous arsenal and the redeployment of U.S. tactical nuclear weapons and calling the denuclearization of the peninsula "a fundamental principle" (Congressional Research

Service 2026). The emerging pattern is therefore neither pure H1 nor pure H2 but a hedged deepening: alliance institutionalization at the surface, with the material foundations of autonomy—naval propulsion reactors, fuel-cycle access, conventional primacy, operational control—accumulating underneath (Hersman 2026).

Washington's declaratory trajectory has meanwhile validated this article's warning about creeping de facto acceptance of North Korea's arsenal. The National Security Strategy released in December 2025 dropped the denuclearization of North Korea—an objective present in every published U.S. strategy since the early 2000s—without replacement (South China Morning Post 2025). The National Defense Strategy of January 2026 went further, stating that South Korea is capable of taking "primary responsibility for deterring North Korea" with critical but more limited American support (U.S. Department of War 2026). It is difficult to miss how closely this formulation tracks the division of labor proposed in the conclusion below, with one crucial difference: the new strategy assigns Seoul conventional primacy while reserving the nuclear tier exclusively to the United States—precisely the configuration whose long-run credibility this article questions. The Nuclear Consultative Group has continued to meet—its fifth session convened in December 2025, eleven months after the fourth, with a sixth following in Seoul in June 2026—each reaffirming the nuclear umbrella even as assurance slipped down the new posture's list of priorities (U.S. Department of War 2025b).

Pyongyang and Beijing have hardened the environment in which any recalibration must operate. Kim Jong Un told the Supreme People's Assembly in September 2025 that North Korea's nuclear status is irreversible and that he would sit down with Washington only if it dropped what he called its "absurd obsession" with denuclearization (CNN 2025); the following month he unveiled the Hwasong-20, billed as the North's most powerful intercontinental ballistic missile (NBC News 2025). Xi Jinping's June 2026 visit to Pyongyang—his first since 2019—signaled deepening strategic alignment and raised the price of

any future U.S.-DPRK bargain (AEI 2026), while China's first publicly demonstrated submarine-launched ballistic missile test into the Pacific, on July 6, 2026, dramatized the two-peer strain now stretching the American umbrella across the region (CSIS 2026). Trump's repeated overtures to Kim have so far gone unanswered, and no summit had materialized as of this writing (Panda 2025). The pattern documented across this article's four shocks thus persists into a fifth iteration: dissuasion is outliving deterrence, but its currency has shifted from declaratory reassurance to negotiated capability—a shift whose long-term stability the proposals of the concluding section are intended to secure.

Conclusion

This study has examined the evolution, credibility, and future of U.S. extended nuclear deterrence in South Korea at a critical inflection point in 2025–2026. The analysis reveals that the nuclear umbrella, while nominally serving to deter North Korean aggression, has increasingly functioned as a mechanism of strategic dissuasion—restraining South Korea from pursuing its own nuclear weapons rather than providing credible protection against Pyongyang's growing nuclear threat. The Trump 2.0 administration has accelerated this credibility crisis through its transactional approach to alliances, inconsistent reassurance signaling, and strategic ambiguity that has fundamentally departed from traditional U.S. assurance behavior.

The historical analysis demonstrates that extended deterrence on the Korean Peninsula was never a simple transplant of the NATO model. From its inception, U.S. nuclear protection of South Korea lacked the institutionalized consultation mechanisms, nuclear sharing arrangements, and joint planning that characterized European extended deterrence. This asymmetry has become increasingly problematic as North Korea's nuclear capabilities have advanced, creating a

"decoupling" fear reminiscent of Cold War Europe but with fewer safeguards against abandonment.

The credibility gap in extended deterrence stems from three interrelated factors. First, the structural asymmetry between U.S. and South Korean interests and capabilities has widened as North Korea has developed the means to directly threaten the American homeland, raising questions about whether the U.S. would risk Los Angeles for Seoul. Second, the absence of institutionalized nuclear cooperation—unlike NATO's nuclear planning group and shared nuclear assets—has left South Korea with limited voice and visibility in deterrence planning. Third, the Trump administration's explicit transactional framing of alliances as conditional bargains rather than enduring security commitments has introduced unprecedented ambiguity into alliance dynamics.

By 2025, I find that U.S. extended deterrence in Korea operates primarily as a tool of strategic dissuasion—more focused on preventing South Korean nuclear proliferation than credibly deterring North Korea. This strategic dissuasion function has been the consistent thread throughout the alliance's history, from Washington's forceful suppression of Park Chung Hee's nuclear program in the 1970s to contemporary efforts to mollify South Korean nuclear ambitions through consultation mechanisms and bomber flyovers. The paradox is that as the deterrent credibility toward North Korea has deteriorated, the dissuasive pressure on South Korea has intensified.

Trump 2.0's approach represents a fundamental departure from traditional U.S. assurance behavior. Where previous administrations treated security guarantees as sacrosanct—separate from economic disputes or burden-sharing negotiations—Trump has explicitly conditioned security on payment, transforming alliances into what analysts call "defense welfare." His combination of passivity toward North Korean nuclear advances and impulsive, unpredictable decision-making has further eroded the credibility requirements of resolve and predictability essential to effective deterrence. This deterioration

in trust has prompted South Korean officials and public alike to seriously reconsider nuclear self-reliance, with more than three-quarters of South Koreans now favoring indigenous nuclear weapons.

Looking forward, the alliance faces what I have termed a "Zeitenwende" or turning point in extended deterrence—one that demands a strategic recalibration of deterrence responsibilities. The traditional hegemonic model of one-sided U.S. nuclear guarantees appears increasingly untenable in a world where North Korea can directly threaten the U.S. homeland while advancing tactical nuclear capabilities aimed at South Korea. I propose a new strategic division of labor: South Korea would gradually assume primary responsibility for deterring North Korean nuclear aggression through indigenous capabilities, while the United States refocuses its nuclear posture on broader strategic competition with China.

This approach recognizes that credible deterrence is enhanced when it is local and directly vested. Rather than adhering to a rigid nonproliferation orthodoxy that may ultimately fail to prevent South Korean nuclear acquisition, the alliance could proactively manage a transition toward what I call "extended deterrence 2.0"—a framework where allied nuclear capabilities are mutually reinforcing rather than mutually exclusive. South Korea's nuclear deterrent would focus exclusively on North Korean threats, coordinated with but distinct from U.S. strategic forces oriented toward great-power deterrence.

Such a division would address both the credibility problem of extended deterrence and the insecurity driving South Korean nuclear ambitions. It would transform the current dilemma into a strategic opportunity—strengthening rather than fracturing the alliance by acknowledging South Korea's maturation as a security partner and the reality that nuclear threats are most credibly deterred by those who face them most directly. Through coordinated planning, transparent communication, and shared strategic objectives, the allies could develop a synergistic deterrence architecture more resilient to political fluctuations and better adapted to 21st-century strategic challenges.

This recalibration would not signal American disengagement or alliance dissolution, but rather a more sustainable burden-sharing arrangement. The U.S.-ROK alliance would evolve from a patron-client relationship toward a more balanced partnership where both parties contribute to deterrence in complementary spheres. By proactively managing South Korea's nuclear trajectory within the alliance framework, the partners could strengthen deterrence credibility while preserving alliance cohesion—turning what might otherwise become a crisis of confidence into a strategic reinvention.

In conclusion, U.S. extended deterrence on the Korean Peninsula stands at a crossroads in 2026. The traditional nuclear umbrella model faces unprecedented credibility challenges, yet the strategic dissuasion function remains critically important. By recognizing the limitations of the current arrangement and embracing a more equitable division of deterrence responsibilities, the U.S.-ROK alliance can adapt to evolving threats while maintaining its core purpose. The future of extended deterrence may well depend on whether policymakers can overcome rigid orthodoxies and embrace a more flexible, coordinated approach to nuclear security in Northeast Asia.

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Explaining South Korea's Nuclear Debate beyond the North Korean Threat: China's Rise, Demography, and Multipolarity

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Abstract

South Korea's nuclear debate has transformed from a marginal discourse into a mainstream question. This article argues that Seoul's renewed interest in nuclear weapons is best understood against the backdrop of a new security environment, not the North Korean threat alone. A convergence of three broader structural forces encourages the proponents of a national nuclear arsenal: the rise of China as a potential regional hegemon, South Korea's demographic collapse, and the transition from a U.S.-led unipolar system to a multipolar one. China's growing coercive capabilities and the erosion of South Korea's conventional military manpower are making the nuclear option increasingly attractive to Korean elites and the public alike. The article further contends that Washington's changing interests amid intensifying great-power competition and its declining leverage over South Korea create a permissive environment for nuclear ambitions. While a national nuclear deterrent remains improbable in the near term, Seoul's movement toward nuclear latency, and ultimately toward a military nuclear program, appears increasingly plausible.

Keywords: China's rise, Demographic crisis, Multipolarity, North Korea, South Korea's nuclear debate

Introduction

South Korea has seen, in recent years, the remarkable emergence of an intense debate over nuclear military strategy. In January 2023, President Yoon Suk-yeol broke a taboo by warning the country might need its own nuclear arsenal (Kim 2023). Soon after, the Mayor of Seoul, Oh Se-hoon, an influential personality in Korean politics, expressed a similar opinion (Shin 2023). So did Defense Minister Kim Yong-hyun in September 2024 (Gallo and Lee 2024). During the recent presidential campaign, Kim Moon-soo, the defeated candidate from the People Power Party, had vowed to pursue nuclear latency (J. H. Park 2025). The transition to a Democratic government has not ended the nuclear debate, as the new foreign minister, Cho Hyun, quickly called for a national nuclear-powered submarine and a revision of the ROK-U.S. Nuclear Cooperation Agreement (M. Park 2025). This became reality at the October 2025 Gyeongju summit: the United States officially approved South Korea's acquisition of nuclear-powered submarines and pledged support for Seoul's eventual engagement in uranium enrichment and spent-fuel reprocessing for peaceful purposes (S. Kim 2025a).

Public discussions about a military nuclear program were traditionally limited to fringe voices. The topic is now openly addressed in the media and academia, and three-quarters of the population appears to favor developing nuclear weapons (Shin 2024). Koreans' overwhelming sympathy for the nuclear option is transpartisan, with even the firmly pro-American segments of public opinion favoring an independent deterrent (Chung 2024). The nuclear option's popularity holds even when the public takes into account potential costs, such as international sanctions (Lee and Kang 2025). As Victor Cha put it, "if a pro-nuclear consensus took hold among elites, it could all move quickly, because public support is already there" (quoted in Andersen 2025).

Nevertheless, the issue remains poorly studied and ill-understood. International observers often assume it is a mere passing trend, and that a modicum of U.S. intervention would suffice to extinguish it. The

current debate "frames the issue exclusively as an alliance management problem that can be solved by the United States activating the correct combination of carrots and sticks. But this unilateral focus on Washington underestimates the degree to which the region is moving towards multipolarity" and "discounts a broader range of security and status concerns" beyond North Korea (Hynd 2025, 55). Indeed, as this paper argues, the debate over a national nuclear arsenal does not exist in a vacuum, but amid a confluence of the North Korean threat, the demographic crisis, the rise of China, and decreasing American staying power that pushes towards the nuclear option (D. Lee 2025; ROK Forum for Nuclear Strategy 2025).

An independent nuclear arsenal is not the only option competing in the marketplace of ideas. Some would prefer nuclear latency, which would stop short of fielding a working nuclear deterrent. Others are in favor of the redeployment of U.S. nuclear weapons on the Peninsula, an option both less costly and less controversial. However, this piece only addresses the nuclear deterrent option, as it is the one that is most intensely discussed in Seoul and would be the most consequential for the future of Korean and regional security (Phillips 2024; Lami Kim 2024). Also, it focuses only on the issue of developing nuclear weapons, not on the specifics of how many or how they would be deployed. At any rate, delivery platforms are a relative non-issue, since Seoul already possesses a variety of them: ground-, sea-, and air-launched cruise missiles, ballistic missiles (including submarine-launched ballistic missiles), and fighter aircraft that could quickly be repurposed for nuclear delivery.

In this paper, I contextualize the South Korean nuclear debate in light of the many challenges facing South Korea's strategists. Recent developments present the country with both new threats and new opportunities that encourage the nuclear option. The article first describes Seoul's long history of considering the nuclear option and examines the traditional incentives to develop a nuclear arsenal. Historically, North Korea was the key reason to envision a national deterrent. However,

two new challenges are now weighing on Seoul's threat perception. The rise of China's military capabilities and assertiveness has become a growing motive in the debate. South Korean experts and leaders are increasingly concerned about the risk of Chinese regional hegemony and the potential loss of autonomy that would ensue. They see a nuclear arsenal as a possible answer to prevent the country's subjugation to Chinese domination. The demographic crisis is also a growing concern. Many fear that the population decline will make it impossible to maintain Korea's current military force posture, thereby inviting foreign aggression. Therefore, demography has become a significant incentive to develop nuclear weapons, serving as a compensatory measure. In the third part, the article examines the widespread assumption that the United States has sufficient leverage to prevent South Korea from developing nuclear weapons. Indeed, some observers now expect Washington to accommodate Seoul's demands because it needs South Korea's participation to prevail in its intense security competition with China. Also, in a multipolar world, the United States has less relative power and bandwidth to pressure Seoul. Meanwhile, South Korea possesses more bargaining power than it did during the unipolar moment, thanks to America's focus on great power competition, and Korean strategists are also well aware of this.

I. The Nuclear Debate in the Past

Since its founding, North Korea has posed a continuous threat to South Korea's security and survival. This danger falls into two major categories: the long-standing possibility of a conventional invasion and the more recent and rising nuclear threat.

For decades, South Korea's foremost concern was the prospect of a surprise, large-scale invasion reminiscent of the outbreak of the Korean War in 1950. North Korea continues to maintain one of the world's largest standing armies, with perhaps up to 1.2 million personnel. Much of this force is stationed along the Demilitarized Zone, potentially enabling a massive offensive with little warning time (Motin 2020).

North Korea recently gained combat experience in the war in Ukraine and will likely benefit from significant Russian support in technologies and weapons to increase the threat level further (Yoon 2025). Beyond the threat of invasion, Pyongyang has a history of using smaller-scale or terrorist attacks to unsettle the South. Notable examples include the USS Pueblo incident and the assassination attempt on President Park Chung-hee in 1968, the axe murder incident in 1976, the 1983 Rangoon bombing, the sinking of the ROKS Cheonan in 2010, and the shelling of Yeonpyeong Island later that same year.

While these conventional dangers remain, North Korea's nuclear and missile programs have profoundly transformed the inter-Korean balance. Since 2006, Pyongyang has conducted six nuclear tests and has accumulated enough fissile material for a significant number of warheads. Parallel to this, North Korea has rapidly advanced its missile technology, fielding weapons ranging from short-range systems that threaten all of South Korea to intermediate-range missiles that place Japan and U.S. bases in the Pacific at risk and intercontinental ballistic missiles capable of striking the American homeland. To secure its nuclear strike capability, North Korea is now actively developing and building nuclear-powered strategic ballistic missile submarines. Therefore, while the specter of a conventional attack remains ever-present, it is now joined by the unprecedented menace of nuclear weapons. One could imagine scenarios of nuclear coercion or even a conventional invasion preceded by a nuclear strike to debilitate the South. Together, these threats from the North force South Korea to uphold constant military readiness and a strong deterrence posture.

South Korea's first president, Syngman Rhee, lamented his country's lack of nuclear weapons as early as 1954 (U.S. News & World Report 1954). South Korea's interest in developing nuclear weapons grew during the 1970s, when fears of abandonment by the United States loomed large. In the aftermath of the Nixon Doctrine of reduced military commitment on continental Asia (1969) and the withdrawal from Vietnam (1973), Seoul secretly launched a nuclear program in

1974. It sought to acquire a French reprocessing plant capable of producing weapons-grade plutonium. When Washington discovered the plan, President Gerald Ford's administration threatened to terminate the U.S.-Korea security alliance and forced the deal to collapse. Under this pressure, South Korea abandoned its nascent weapons program and ratified the Nuclear Non-Proliferation Treaty in 1975.

Still, the matter resurfaced only a few years later. In 1981, when North Korea broke ground on a plutonium reactor, South Korea again considered acquiring its own nuclear weapons. Although the program was less ambitious than the attempt in the 1970s, President Ronald Reagan insisted it be canceled. He reassured South Korean President Chun Doo-hwan that U.S. troops would remain on the Peninsula indefinitely, which persuaded Seoul to abandon the endeavor (Kim 2001; see also Min 2025). In 1991, President George H. W. Bush withdrew all American tactical nuclear weapons from South Korea, and both Koreas signed the Joint Declaration on the Denuclearization of the Korean Peninsula, pledging not to test, produce, or deploy nuclear arms. Seoul took the agreement seriously, but Pyongyang soon violated it, continuing clandestine nuclear weapons development.

By the 2010s, North Korea's accelerating nuclear program reignited debates in Seoul. After the sinking of the ROK Navy corvette Cheonan and the shelling of Yeonpyeong Island in 2010, public opinion polls began showing rising support for an independent deterrent (Kim, Kang, and Ham 2021). North Korea's third nuclear test in 2013 and the subsequent development of long-range missiles further deepened anxieties. As of today, South Korean authorities believe that North Korea could be producing up to 20 new nuclear warheads per year (AFP 2026).

To deter Pyongyang, successive South Korean governments have reaffirmed the strength of the U.S. alliance, pursued expanded missile defense, conventional strike capabilities, and closer strategic coordination with Washington. Specifically, South Korea came up with its "three-axis system" to compensate for its lack of a nuclear deterrent: (1) Kill Chain

(a pre-emptive strike capability), (2) Korea Air and Missile Defense, and (3) Massive Punishment and Retaliation (Park 2024). The hope is that the ability to strike North Korean command and control and weapons, intercept incoming attacks, and inflict harm on the North Korean state after a nuclear attack will suffice to deter Pyongyang. The issue sharpened again after the 2016–2018 sequence, when Pyongyang tested more advanced nuclear devices and intercontinental ballistic missiles, and war with the United States appeared on the table. Calls grew within South Korea's political establishment for either the return of U.S. tactical nuclear weapons or the development of an indigenous program (Cheong 2023).

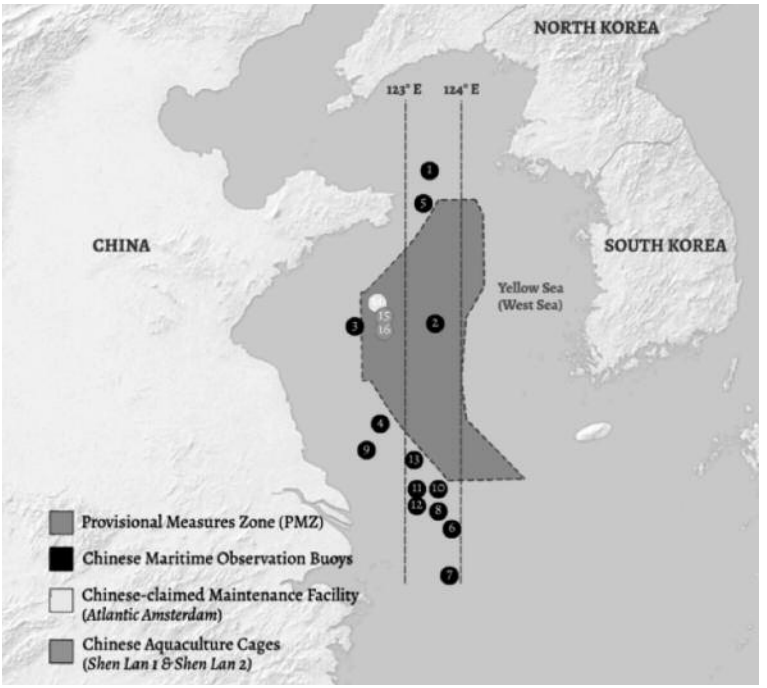
II. China's Rising Threat

Throughout the last three decades, China has modernized its military at a breakneck speed. Its armed forces are now overwhelmingly more potent than those of any of its Asian neighbors, its navy rivals the U.S. Navy, and its nuclear arsenal is growing in both numbers and quality. Not only that, but Beijing has made it abundantly clear that it is dissatisfied with its current borders and the regional status quo.

China's growing power provides South Korea with new incentives to pursue nuclear weapons for three key reasons. First, Beijing's long-term ambition of asserting regional hegemony threatens Seoul's foreign policy independence. A hegemonic China would impose its interests and preferences on Korea, which would likely mean the end of the country's alliance with the United States (Lind 2018). Second, the rise of China poses a threat to South Korea's territorial integrity. Disputes persist over the delimitation of the Yellow Sea's continental shelf and over maritime features such as Gageo Reef and Ieodo Islet. In 2013, China expanded its air defense identification zone to cover Ieodo and wants South Korean naval and coast guard forces to cease operating west of the 124th meridian (Map 1) (Jung 2021; Mastro 2023). Moreover, the Chinese navy and air force have already achieved a clear-cut superiority over the Yellow Sea, where South Korea is

outmatched and outgunned, and on the defensive (Seok 2025). The background noise within China about potential claims to Korean territory further worries Koreans (Committee on Foreign Relations 2012; Lee 2017).

Map 1. China-South Korea Provisional Measures Zone



Source: Jennifer Jun and Victor Cha, "Chinese Buoys Near the South Korea-China PMZ" [CSIS Beyond Parallel], December 15, 2025, https://beyondparallel.csis.org/chinese-buoys-near-the-south-korea-china-pmz/.

In Seoul, concerns about China's rise and assertiveness grew in the mid-2010s, but the Park Geun-hye administration (2013–2017) was still committed to improving relations. The deployment of THAAD (Terminal High Altitude Area Defense), an American anti-ballistic missile defense system, in 2016–2017 led to a sharp deterioration in Sino-Korean relations, probably the most serious bilateral crisis since diplomatic normalization in 1992. Beijing rejected South Korean and U.S. claims

that the system was directed solely at North Korea, arguing instead that its radar undermined China's strategic deterrent. It retaliated with a series of unofficial economic sanctions, an early instance in which China came to be perceived as a threat, at least economically, in recent Korean political discourse.

Under President Moon Jae-in (2017–2022), a consensus emerged that China posed a security threat and that Korea should both reinforce its deterrence capabilities and enhance the U.S. alliance. From 2021, Korean officials and documents began expressing concerns about the situation in the Taiwan Strait, which irritated Beijing (Pacheco Pardo et al. 2025). In recent years, China has installed several floating structures in violation of existing agreements in the Provisional Measures Zone in the Yellow Sea, raising concern in South Korea, as they could potentially serve military purposes (Choe 2025; Kwak 2025). In February 2025, South Korea's navy inaugurated a task fleet command at the Jeju Naval Base, a move intended to protect the country's approaches and southern sea lines of communication against growing Chinese pressure (J. N. Park 2025). To justify South Korea's willingness to secure nuclear-powered submarines, President Lee Jae Myung mentioned the threat of Chinese submarines (Kang 2025). On the popular level, too, a large majority of South Koreans have a negative view of Beijing, and over 85% favor siding with the United States over China (Asan Institute for Policy Studies 2025). The perceived Chinese security threat has led many to support joining the US-led Quadrilateral Security Dialogue (Quad) (Fang, Lee, and Li 2024). Symptomatically, growing anti-China sentiment among young South Koreans is leading to a decline in their interest in their western neighbor; fewer students are now taking courses on China, and the number of students studying in China is also declining (Song 2024).

Traditionally, the intense economic relations between Beijing and Seoul encouraged Korea to accommodate China's rise and avoid angering it. Yet, even the alleviating factor of the trade relationship is waning. In December 2023, the Ministry of Trade, Industry, and Energy

announced its '3050 Strategy Initiative,' which aims to secure South Korea's supply chains and reduce raw materials dependence on China to less than 50 percent by 2030. Declining trade complementarity will likely further reduce the moderating effect that trade could have on both Seoul and Beijing (Chung 2025; Easley 2025; Jin 2023).

The war in Ukraine has further underscored the vulnerability of smaller states situated near revisionist great powers dissatisfied with existing borders, a point duly noted in Seoul. Should the United States ever become unable to offset Chinese influence, South Korea could find itself exposed to Beijing's hegemonic ambitions without effective protection. China's growing power brings another danger. For proponents of an independent nuclear deterrent, North Korea could possibly take advantage of a crisis over Taiwan to coerce or even attack the South, as the United States might be too absorbed by the Chinese threat to support Seoul (J. Y. Kim 2025; Richey 2026). Indeed, many in the Korean public associate the rise of China with the risk that the United States will become less able and willing to use military force to defend Seoul (Kim and Jeong 2025).

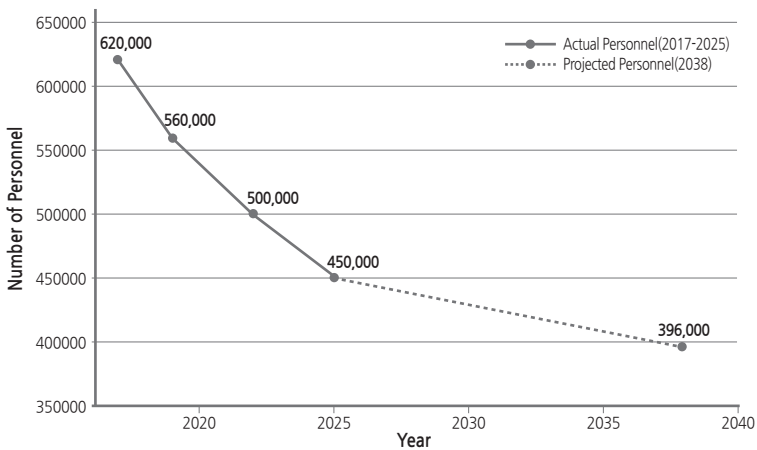
III. The Demographic Disaster

Another key concern among proponents of a nuclear deterrent is that the ongoing demographic collapse renders conventional deterrence and defense increasingly precarious (D. Lee 2025). In 2024, South Korea's total fertility rate stood at a mere 0.75, the lowest among OECD member states (for comparison, France and the United States stood at around 1.6). While the current population of South Korea is 51.2 million, it may fall to 36.22 million by 2072. Worse, the demographic crisis has decreased and will continue to decrease the number of troops able to defend the country.

The military estimates it should have at least 500,000 troops to maintain a strong deterrence posture. The number of conscripts (around half of the total force) could fall from 330,000 soldiers in 2020 to 240,000 by 2036 and 186,000 by 2039. Indeed, in 20 years, only

around 125,000 men will be available for conscription. In 2017, South Korea had 620,000 military personnel, and in 2019, 560,000. This number had decreased to 500,000 in 2022 and to 450,000 in 2025. Some estimates project the ROK military will have only 396,000 personnel by 2038. The army has been especially affected, as its soldiers decreased from 300,000 to 200,000 between 2019 and 2025. Therefore, unsurprisingly, the number of division-level units has decreased from 59 in 2006 to 42 in 2025, with 17 units being disbanded or consolidated. Most worrisome, combat units in the Gangwon and northern Gyeonggi Provinces were particularly targeted for disbandment. In response, in May 2024, President Yoon made the demographic crisis a national emergency. Still, there is no easy or quick fix, and the lack of personnel will be felt for the next few decades, regardless of government efforts and potential future improvements in the fertility rate (Lee 2021; J.

Figure 1. Decline in South Korean Military Personnel



Sources: Chung Min Lee, "South Korea's Military Needs Bold Reforms to Overcome a Shrinking Population," Carnegie, June 29, 2021, https://web.archive.org/web/20221019023429/https://carnegieendowment.org/2021/06/29/south-korea-s-military-needs-bold-reforms-to-overcome-shrinking-population-pub-84822; Jeong-hyeon Lee, "Gukgun byeongryeok 45man-myeong-euro jureo… sadangeup isang sip-chil-gae budae sarajyeo [Military Personnel Down to 450,000… 17 Units at or above Division Level Disappear]," Yonhap, August 10, 2025, https://www.yna.co.kr/view/AKR20250801020500504. Graph generated by Gemini (2026).

H. Lee 2025; Sharma and Roy 2024). As an expert on the problem notes, "by the 2040s, even maintaining 350,000 troops will be difficult, and that is why we need to establish an optimized manpower structure system … as soon as possible" (quoted in Yeung and Bae 2025).

The danger posed by the demographic crisis to the inter-Korean balance is obvious. Many doubt official North Korean figures on demographics, as several sources point towards a lower fertility rate than claimed. Moreover, the poor state of public health in the country likely diminishes the number of people effectively able to fight (Jung 2025; J. Lee 2025; Ward 2023). Still, since North Korea's fertility rate is higher than South Korea's, over time, the North could slowly close the population gap, thereby altering the balance of power on the Peninsula in its favor. While Pyongyang already has a significant superiority in troop numbers, this gap could grow wider if it maintains its current rate of mobilization (North Korea also conscripts women, which the South does not).

Some would counterargue that South Korea's shrinking population is not an insurmountable threat, and that a smaller but technologically dominant military can still maintain a robust conventional defense. That is the hope behind the 'Defense Innovation 4.0' strategy: to shift from a labor-intensive military to a capital-intensive one, with fewer soldiers and significantly more advanced, expensive technology. Therefore, each soldier becomes capable of performing the work that previously required an entire fireteam. Going forward, autonomous weaponry, robotics, and AI integration could rejuvenate South Korea's conventional deterrent despite North Korea's larger headcount (Yoo and Yun 2023). But, as seen in the war in Ukraine, the growth in unmanned systems has not replaced the need for humans; rather, it has shifted the need from combatants to technicians, since these systems require substantial resources for repair, maintenance, and constant software updates (Fried 2025). Until AI progress enables machines to maintain themselves autonomously, massive human effort will remain necessary to defend

Korea's borders. Moreover, all of this rests on the assumption that North Korea will remain a technological backwater for the foreseeable future. But it is clear that Pyongyang, too, is working hard to keep pace with technological developments and will do its best to either bridge the gap or find alternative strategies. Betting on South Korea's permanent technological dominance is risky.

Given all that, South Korea is likely to feel increasingly unable to sustain conventional deterrence, and, absent a nuclear arsenal, it will have to rely more and more heavily on U.S. security guarantees. The demographic and military personnel decline is all the more worrying when considering neighboring China's overwhelming population superiority and its rising regional ambitions.

IV. Multipolarity and America's Decreasing Leverage

South Korea does not possess a nuclear arsenal today because on both occasions when it attempted to develop one, the United States convinced Seoul to abandon the project. In the early 1970s, Washington withdrew 20,000 U.S. troops from South Korea and called on its Asian allies to shoulder greater responsibility for their own defense. This threatened to leave North Korea with a conventional military edge, prompting President Park Chung-hee to begin a covert nuclear program. Once Washington discovered it, it pressured South Korea to shut it down, leading South Korea to accede to the Nuclear Non-Proliferation Treaty in 1975. Following former President Yoon's remarks in early 2023, the United States and South Korea issued a declaration reaffirming America's commitment to extended nuclear deterrence. They also established a new Nuclear Consultative Group that gives Seoul a greater role in American nuclear planning. In 2024, a U.S. nuclear-armed submarine visited South Korea for the first time since 1981.

However, the United States is growing less interested in containing a potential South Korean nuclear program. Washington now sees the U.S.-ROK alliance primarily through the lens of its competition with China, a peer rival, and North Korea is no longer the foremost priority

(Work 2024). The 2025 U.S. National Security Strategy discusses many issues, but not North Korea. Although that does not imply any meaningful policy change in the short term, it is clear that Pyongyang and its nuclear weapons occupy little of the Trump administration's foreign policy bandwidth (White House 2025). But, in regard to China, South Korea matters in several ways. Korea would play a key role in keeping logistical routes to Taiwan, the Pentagon's pacing contingency, open. The large and modern ROK Navy and Air Force could even provide massive reinforcement if Seoul participated in the conflict. South Korea also helps threaten the Chinese navy in the Yellow Sea. Offensively, if Washington wanted to strike the Chinese mainland, the Korean Peninsula would be an invaluable base of operations. Defensively, it is an outpost to protect the Japanese archipelago. Without South Korea on its side, the U.S. presence in Asia would hang by a thread, and Washington would get closer to strategic defeat in the competition with Beijing (Anderson and Press 2025).

Publicly, South Korea has hinted that it would not allow the United States Forces Korea (USFK) to intervene in a Taiwan contingency (Kwon 2024). However, this position is primarily for public consumption and is intended to avoid provoking China. Indeed, contrary to a few years ago, Korean strategists increasingly believe they would be unable to remain idle in the event of a Taiwan contingency. Instead of staying aloof, Korean experts now widely expect the country to serve as a "retrograde and reconstitute" hub for U.S. forces engaged in defending Taiwan, and acknowledge the country would likely provide "rear area support" to the United States (Work 2025). Furthermore, the trend of South Korea joining and supporting U.S. political, economic, and military initiatives to counterbalance China is undeniable (Work 2024).

Looking at the broader picture, Washington must simultaneously contain two revisionist great powers in two regions of the world: Asia and Europe. Moreover, there is no shortage of crises all around the globe. The United States would have minimal bandwidth to focus on countering a South Korean nuclear program, which would be a secondary

concern. Therefore, according to a prominent Korean expert, "if our independent nuclear arsenal aligned with U.S. security interests and came to be perceived as a 'common asset' of the alliance, then the United States may accept it or even support it" (Choi 2024). Indeed, Undersecretary of Defense for Policy Elbridge Colby suggested a nuclear deterrent would be beneficial if it allowed the United States to shift its focus toward containing China (W. Kim 2024). President Trump himself has expressed sympathy for the idea in the past (Flores 2016), and insiders believe he still does (S. Kim 2025b).

Even if the United States were willing to block a future nuclear program, it is unclear whether it could still do so at a reasonable cost. The USFK is a formidable bargaining tool in Seoul's hands, as Korea could impede American strategy toward China. Seoul could also sell its support in a Taiwan contingency in exchange for U.S. acquiescence to a nuclear program. Korea's participation in a war against China matters immensely more to Washington than the potential ripple effects from a nuclear program. Moreover, South Korea is an economic and technological powerhouse, whose engagement on the U.S. side of the fence is crucial for America's vitality. Upholding nonproliferation, a norm of good international behavior, will not take precedence over great power competition. It is thus doubtful that a U.S. president would risk reining in South Korea and losing the entire Peninsula to great power competitors.

Korean experts are well aware that, historically, heavy American sanctions against proliferators have been more closely tied to political rivalry than to proliferation itself (Shim and Kim 2025). U.S. hostility toward the Iranian and North Korean nuclear programs stemmed largely from adversarial relations, not merely the pursuit of nuclear technology. By contrast, when allies such as Britain, France, Israel, and Pakistan developed nuclear weapons, Washington refrained from imposing crippling sanctions, since each was too strategically important to alienate during the Cold War. Indeed, through the AUKUS agreement, Washington is already pushing a key local ally, Australia, toward nuclear power to help contain China's influence. Although the

Non-Proliferation Treaty does not forbid technology transfer for nuclear propulsion, it marks a qualitative shift in the extent to which the United States is ready to support the military efforts of Indo-Pacific allies.

Containing nuclear proliferation is (relatively) easy under unipolarity, as the sole great power can pressure proliferators unimpeded. This is far harder under multipolarity, however, as multiple great powers have a harder time agreeing and coordinating, and proliferators can play one against the other to alleviate pressure (Gheorghe 2019). If South Korea launched a nuclear program and the United States chose to sanction and isolate it, Seoul would have the option to turn to China or even Russia for diplomatic support. Even if such a scenario is unlikely in practice, the mere possibility should deter the United States from sanctioning and abandoning Seoul.

In summary, the United States has never had so little leverage, and yet its interests have never been so aligned with Korea's. All of this is not mere theory. Proponents of a nuclear arsenal in Korea are well aware of this logic, which makes the United States both less likely and less able to block its nuclear ambitions. Pundits often emphasize that Seoul's supposed fear of diplomatic isolation and economic sanctions renders a program improbable; however, Korean security elites view these factors as manageable and are unlikely to be stopped by them, thanks to the new multipolar order and worsening great power competition. Hence, these points have become arguments in the national debate (see, for instance, Kelly and Lee 2024; Lee 2022).

V. Conclusion

The Korean nuclear debate is propelled not only by the traditional North Korean threat but also by the new combination of China's hegemonic ambitions, South Korea's demographic collapse, and the permissive environment of multipolarity. This nexus of factors ensures that the nuclear debate is here to stay and intensify for the foreseeable future. Hence, for policymakers, this suggests that the issue is highly timely; the South Korean nuclear debate is not background noise but a

pressing matter that will likely come to the forefront very soon (House 2025).

One could object that this article did not mention a common point made by opponents of a nuclear program that could scare Korean strategists: the risk of a regional 'nuclear cascade.' As the argument goes, if South Korea develops nuclear weapons, Japan may follow suit. Indeed, some in Japan's Prime Minister Sanae Takaichi's office are already toying with the idea (Kyodo News 2025). But Korean pro-nuclear experts are unfazed by such a prospect. Russia, China, and North Korea all developed nuclear weapons long ago, and Japan did not. South Korea is Japan's sole friendly neighbor. If all its rivals going nuclear did not sway Tokyo, an ROK arsenal is unlikely to be the straw that breaks the camel's back. Unlike Japan, South Korea faces a heightened threat environment where it could suffer a large-scale North Korean invasion. Meanwhile, Japan is relatively free from potential invasions, explaining why the Korean public is far more adamant about acquiring nuclear weapons than Japan's (Kim and Lee 2023). However, it remains a distinct possibility. The Soviet Union's nuclear program encouraged China, China encouraged North Korea, and North Korea is now encouraging South Korea. To that, Seong-Chang Cheong, a prominent advocate of a national nuclear deterrent, responds that a Japanese nuclear arsenal would be a net positive for Korean security. Both countries share fundamental interests, and a Japanese nuclear arsenal could play a key role in keeping Chinese aggression at bay (Lee 2024). Indeed, a growing number of Koreans are open to a Japanese nuclear deterrent, from 9% in 2022 to 35% in 2024 (Park and Jeong 2024). Therefore, this counterargument is unlikely to discourage many in Seoul. The most substantial obstacles to an independent nuclear deterrent are not political or economic but technical and military in nature (Motin 2024).

What will be Lee Jae Myung's nuclear policy? Despite the structural factors underlined here, a full-fledged nuclear weapon program appears unlikely for now, save for an unforeseen major crisis. Instead, in the coming months, Seoul will likely move toward nuclear latency, as some

in the new government have already suggested (Brunnstrom, Ali, and Park 2025). To be sure, Lee and his entourage are far less enthusiastic about a nuclear program than many on the Right. Still, he understands that steps toward a nuclear option would give negotiating leverage over Pyongyang, and make clear to North Korean leaders that excessive aggression could lead to the nuclearization of the South. Moreover, nuclear latency would increase South Korea's bargaining power vis-à-vis the United States and force China to take Seoul's interests more seriously. Lee has already moved South Korea to the edge of acquiring nuclear-propelled submarines and reprocessing capabilities. Moreover, during his recent presidential campaign, Lee consistently emphasized the value of a strong military deterrent, a stance that Democratic governments are often reluctant to take. Democratic presidents also have a history of increasing defense spending to field a military more autonomous from the United States (Kim 2021). Therefore, there is little doubt that Lee Jae Myung will continue to invest in South Korean military capabilities as a means of assurance and leverage against Pyongyang and Beijing. Whether South Korea eventually engages in developing an actual nuclear deterrent will depend on North Korean behavior, the trajectory of Chinese power, and South Korea's perceptions of American commitment and capabilities to defend the alliance.

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Fabs in Flames: The KN-09 Threat to South Korea's Economic Security

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Abstract

South Korea's economic security is anchored in its semiconductor industry, which in 2024 generated over $140 billion in exports—more than 20 percent of national trade. This critical infrastructure is concentrated in 16 fabrication facilities (fabs), operated by Samsung Electronics, SK Hynix, and DB HiTek. All are within range of North Korea's KN-09 300-mm multiple-launch rocket system (MLRS). While the KN-09 has typically been assessed in battlefield contexts, this paper evaluates its effectiveness as a single-use weapon against semiconductor fabs, as the semiconductor manufacturing ecosystem is the backbone of South Korea's economy. Using probability modeling, structural engineering data, and blast overpressure calculations, the study finds that a single salvo of 288 rockets could deliver 10-18 direct hits per fab, with sufficient force to cause partial or total structural collapse. Such an attack would not only halt production for months or years but also devastate South Korea's economy by eliminating nearly one-fifth of its exports, crippling global supply chains, and undermining investor confidence. The analysis concludes that the KN-09 represents a potential game changer for South Korean economic security, warranting urgent reconsideration of protective strategies and infrastructure designations.

Keywords: Economic Security, KN-09, North Korea, South Korea, Semiconductor Foundries

Introduction

In July 2025, the *Korea JoongAng Daily* posted an obituary of sorts:

For decades, semiconductors and automobiles have dominated Korea's exports, driving growth and defining its global trade identity. But as shifting global dynamics and mounting uncertainties over U.S. tariffs unsettle traditional trade patterns, a new industrial order is taking shape. Sectors such as shipbuilding and defense are emerging as the next engines of growth (Cho 2025).

The article went on to discuss how the market for autonomous naval vessels would grow from approximately $1.65 billion to an estimated $4.09 billion by 2034. Though these numbers seem impressive for one segment of the shipbuilding and defense sectors, they pale in comparison to the growth projections for the global AI chip segment of the semiconductor sector—a 2025 market value estimated at $94.44 billion growing to an estimated $927.78 billion by 2034 (Precedence Research 2024). It is highly likely that the traditional growth engine of semiconductors will vastly outpace, in value, any new growth engine South Korea may foster.

The semiconductor manufacturing ecosystem is the backbone of South Korea's economy. This ecosystem relies primarily on 16 integrated circuit fabrication facilities, referred to generally as fabs or foundries. Each of these foundries is built within striking distance of artillery fire from the Democratic People's Republic of Korea (hereafter North Korea), particularly its KN-09* 300-mm Multiple Launch Rocket System (MLRS). This paper explores the potential damage that a single salvo of KN-09 artillery fire can have on South Korea's semiconductor foundries, as buildings, and the potential consequences this may have on the South Korean economy. The effectiveness of the KN-09 system has been analyzed in the literature on North Korea's artillery capabilities but seemingly not as a single-use

* The designation KN-09 is a U.S. intelligence and military designation adopted by numerous agencies and many in the media, as the official North Korean name is unknown.

weapon against critical infrastructure, as is presented here. If deployed effectively, KN-09 strikes could cripple South Korea's economy, inflicting damage so severe that recovery might take years—if it is possible at all. In this way of thinking, the weapon becomes a game changer in terms of South Korean economic security.

The following analysis focuses on two elements of argument: 1) the importance of the semiconductor industry, particularly fabrication facilities, to the South Korean economy, and 2) the potential damage to fabrication facilities by KN-09 systems. The first component draws on a qualitative assessment of South Korea's semiconductor ecosystem, supported by descriptive data, while the second employs probability modeling and the Blast Parameter Calculator to estimate structural damage to fabrication facilities. The findings indicate that even a single KN-09 salvo carries a high likelihood of collapsing all major fabrication plants, an outcome that would impose profound and lasting economic hardship on South Korea.

The Importance of the Semiconductor Industry to South Korea

According to Statistics Korea's "National Business Survey (based on 1 or more employees)", there were 4,848 semiconductor companies in South Korea in 2021. These companies combined to employ 154,480 people, 50 percent of whom work in large integrated semiconductor companies such as Samsung Electronics and SK Hynix (Kim, et al. 2023, 2). In 2024, South Korean semiconductor exports amounted to $141.9 billion, approximately 20.7 percent of South Korea's unprecedented $683.8 billion in exports that year (Y.H. Jeong 2024). South Korean Customs Service data show that semiconductor industry exports from 2019-2023 averaged $140.9 billion for an average share of exports measuring 23.38 percent, with its highest export share of 25.0 percent in 2021 (H.G. Jeong 2024, 2). It should be noted that H.G. Jeong (2024, 1) divided South Korea's semiconductor industry "into six main categories and 33 subcategories, based on an analysis of 381 semiconductor-related items categorized under the Harmonized System at the 10-digit level." These six main categories were system semiconductors, memory

semiconductors, optoelectronic components and discrete devices, materials and parts, semiconductor manufacturing equipment, and silicon wafers.

Although there are thousands of companies contributing to the semiconductor ecosystem in South Korea, only three of these can be considered pillars of the domestic industry, due to their share of labor and export volumes—Samsung Electronics, SK Hynix, and DB HiTek. These three companies operate the country's 16 foundries. It is these large manufacturing facilities that produce the semiconductor chips that most people likely associate with the semiconductor industry. According to H.G. Jeong's analysis (2024, 3), semiconductors—comprised of the three main categories labeled system semiconductors, memory semiconductors, optoelectronic components and discrete devices—accounted for 66.4 percent of total semiconductor industry trade (exports and imports) and 74.5 percent of export trade in 2023. This means fabs, which produce such devices, account for the vast majority of South Korea's trade volume in the semiconductor sector and, in 2023 at least, approximately 15.4 percent of South Korea's total export trade. These numbers alone indicate the importance of fabs to the South Korean economy, but these are simply some of the relatively current numbers.

For years now, the semiconductor industry, particularly fabs, have been central to government innovation and growth plans. In May 2021, the Moon Jae In administration released the "K-Semiconductor Strategy" report outlining the vision for "constructing the world's best semiconductor supply network by the year 2030." Arguably, the most referenced aspect of this plan was the proposed strategy, strategy number one, "the stabilization of the semiconductor supply network by creating a 'K-Semiconductor Belt'" (K-Semiconductor Strategy 2021, 5). The plan called for utilizing memory production bases in Pyeongtaek, Hwaseong, Icheon, and Cheongju as technology-leading fabs (referred to jointly as a Mother Fab), where the latest technologies could be first applied and mass-produced; it also called for the construction of four new fabs

in Yongin, referred to as the "Yongin cluster." The utilization of existing foundries and the creation of four more would be integral to the completion of the K-Semiconductor Belt, which would help South Korea leap forward to become the "world's largest semiconductor nation" (ibid., 6-7). In all, the government called on companies to invest 510 trillion won, approximately $450 billion at the time of the announcement (Lim, Lee, and Kim 2021).

Less than three years later, the Yoon Suk Yeol administration announced a plan to build the world's biggest semiconductor cluster with its "Semiconductor Mega Cluster Construction Plan." The plan called for an investment of 622 trillion won, approximately $471 billion at the time, and the construction of 16 new fabs, 13 production fabs and three research fabs, in Gyeonggi Province (Semiconductor Mega Cluster Construction Plan 2024, 2; Ko 2024). To be completed by 2047, the plan called for creating three million new jobs, the production of cutting-edge memory chips, and capturing 10 percent of the global system semiconductor market. At the time, Minister of Science and ICT Lee Jong Ho called semiconductors the "backbone of the country's economy" (Ko 2024).

Eighteen months afterward, the Lee Jae Myung administration succeeded Yoon's, and it was time for campaign pledges to get a closer look. As a candidate, the new president had promised a one hundred trillion won fund to catapult South Korea to a top three artificial intelligence (AI) power. He pledged 50,000 new graphic processing units (GPUs) for a new K-cloud initiative. His technology plans included a 10 percent tax cut for domestic chip production and an easing of the 52-hour work week limit, in order to heighten competitiveness (Hwang and Choi 2025; Lee 2025).

Given the semiconductor ecosystem's sweeping contributions to South Korea's economy—spanning employment, exports, investment, and technological innovation—the importance of semiconductor manufacturing to the nation's sustained growth and economic security cannot be overstated. Nonetheless, every ecosystem must have a core, and this backbone of the economy relies on fabs. Table 1 provides a list of South

Korea's most important active foundries and their locations.

Table 1: Active foundries and their locations in South Korea

Fab Name (English)	Fab Name (Korean)	Address (Korean)	Address (English)
Samsung Line 6 Samsung S1-Line	삼성6 라인 삼성 S1 라인	경기도 용인시 기흥구 삼성로 129 (삼성전자 기흥캠퍼스)	129, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea
Samsung S3-Line Samsung S4-Line Samsung V1-Line	삼성 S3 라인 삼성 S4 라인 삼성 V1 라인	경기도 화성시 삼성로 1 (삼성전자 화성캠퍼스)	1, Samsung-ro, Hwaseong-si, Gyeonggi-do, Korea
Samsung P1 Samsung P2 Samsung V2 Samsung P3	삼성 P1 삼성 P2 (삼성 S5 라인) 삼성 V2 삼성 P3 (삼성 S6 라인)	경기도 평택시 삼성로 1 (삼성전자 평택캠퍼스)	1, Samsung-ro, Pyeongtaek-si, Gyeonggi-do, Korea
SK Hynix M10 SK Hynix M14 SK Hynix M16	SK hynix M10 팹 SK hynix M14 팹 SK hynix M16 팹	경기도 이천시 SK하이닉스로 1 (SK하이닉스 이천캠퍼스)	1, SK hynix-ro, Icheon-si, Gyeonggi-do, Korea
SK Hynix M15 SK Hynix M15X	SK hynix M15 팹 SK hynix M15X 팹	충청북도 청주시 흥덕구 SK하이닉스로 1 (SK하이닉스 청주캠퍼스)	1, SK hynix-ro, Heungdeok-gu, Cheongju-si, Chungcheong-buk-do, Korea
DB HiTek Fab 1	DB 하이텍 팹 1	경기도 부천시 원미구 DB하이텍로 1 (DB하이텍 부천캠퍼스)	1, DB HiTek-ro, Wonmi-gu, Bucheon-si, Gyeonggi-do, Korea
DB HiTek Fab 2	DB 하이텍 팹 2	충청북도 음성군 음성읍 DB하이텍로 2 (DB하이텍 음성캠퍼스)	2, DB HiTek-ro, Eumseong-eup, Eumseong-gun, Chungcheongbuk-do, Korea

The Threat

As the backbone of the South Korean economy, one must assume fabs make an enticing target for an enemy's kinetic operations—relating to actions designed to produce effects using the forces and energy of moving bodies and directed energy, including physical damage to, alteration of, or destruction of targets (Salas 2021). Currently, the greatest, non-nuclear threat to these foundries may be North Korea's KN-09 300-mm MLRS. This particular weapon has eight launchers, in two rows

of four each, mounted on the back of a 6x6 truck model, meaning it is a mobile system. The weapon made its debut in Pyongyang in October 2015, and North Korean leader Kim Jong Un attended test firing in March 2016 (Armyrecognition.com 2016). The system is locally made, and is likely based on the Chinese SY300, which it closely resembles (ibid.; Zimmerman 2018, 3). Some analysts suggest potential lineage to advanced foreign systems including the Russian BM-30 Smerch or China's A-100 MLRS, though the KN-09 as demonstrated represents a hybrid design with indigenous North Korean modifications (Missile Defense Advocacy Alliance 2026).

The U.S. Army considers this type of weapon a large-caliber rocket, as it is 200-mm or greater. Of this type of weapon the Department of the Army (2020, 3-4) writes:

In the past 20 years, large-caliber rockets have increased in range (some as much as 300+ kilometers) and now, with enhanced guidance packages, are morphing into close- and short-range ballistic missiles. Rockets can deliver high rates of fire and a variety of warheads, making them ideal weapon systems for fire support missions. The highly mobile launchers can rapidly move around the battlefield. This mobility, coupled with the rockets' short burn time, gives maneuver forces little warning. Their short range and salvo capability complicate engagement by current AMD [Air and Missile Defense] systems.

Specifically concerning North Korea, they note, "North Korea has a 300-mm multiple launch rocket system that can easily range Seoul and many U.S. forces stationed in South Korea, including those at Osan Air Base (ibid.)." Mazarr et al. (2018, 12) recognized the potential vulnerability of a foundry to this weapon when they wrote, "North Korea has many strategies it might select against militarily, politically, and economically sensitive targets. Samsung is building a $14.4 billion semiconductor fabrication facility in Pyeongtaek, within range of North Korea's KN-09 300-mm MRLs [multiple rocket launchers]...."

The capabilities of the KN-09 system are difficult to assess, as there is a lack of accessible information in the public sphere. Zimmerman (2018,

14) bound the number of deployed launcher systems between 10 and 100, while Mazarr et al. (2018, 8) estimated that North Korea possessed 36 launchers. If we use the number from Mazarr et al., which seems reasonable, if not on the low side in 2025, then North Korea would be capable of launching a salvo of 288 rockets. Other assumptions we can borrow from Zimmerman (2018, 4) include a rocket range of 190 km, a warhead weight of 150-190 kg of which 75 kg is high explosive (TNT), a lethal area of 1800 m2, a salvo duration of 50-60 seconds, a reload time of 45-60 minutes, and a CEP (Circular Error Probable) of 30-45 m, if satellite navigation systems are working properly. The CEP indicates the weapon system's precision, and in this case, estimates that 50 percent of rounds aimed at the same point will land within a radius of 30-45 m centered on that point (AirPra 2024).

As well, Zimmerman highlights several important aspects affecting the kinetic utility of the KN-09 system. He begins by noting "the major contribution of the KN-09 to the KPA's [Korean People's Army] combat capability is the ability to strike comparatively small-area targets with precision, not the ability to barrage soft (and mostly civilian) area targets" (Zimmerman 2018, 5). He further contends the system's "precision guidance can be readily neutralized by ROK and US forces, negating the precision attack capability. Even if the conflict begins from a standing start with no warning whatever, it is unlikely that the SATNAV guidance will be effective after the first KN-09 salvo (ibid., 3)." For these reasons, he concludes that "the KN-09 is not a game changer (ibid., 2)."

We should note the effectiveness of the KN-09 system as modeled in this analysis depends critically on functional SATNAV (satellite navigation) terminal guidance, which enables the reported CEP of 30-45 meters. However, South Korea and its allies possess significant counterspace capabilities that could substantially degrade the precision of such a KN-09 attack. The implication for a KN-09 attack scenario is significant: should South Korean or U.S. forces detect a massing of KN-09 launcher systems before or during an attack preparation phase, they could implement jamming or spoofing measures to degrade the satellite

navigation signals upon which the KN-09's precision depends. If SATNAV guidance is degraded, compromised, or rendered non-functional, the system would revert to ballistic (unguided) operation, which would dramatically increase the CEP from 30-45 meters to potentially 200+ meters, a degradation that would substantially reduce hit probability on the specified targets. Thus, while the modeling presented here assumes optimal conditions for the attacker, the historical record and current force posture suggest that South Korean and allied countermeasures could significantly reduce the practical effectiveness of a KN-09 salvo against precision targets such as semiconductor fabrication facilities.

Conversely, North Korea possesses its own counterspace capabilities and has demonstrated the ability to conduct GPS jamming against South Korean and international navigation systems. U.S. military intelligence assessments indicate that North Korea is likely working with Russian and Chinese sources to procure illicit technologies (Defense Intelligence Agency 2025). A U.S. Defense Intelligence Agency report specifically warned that "North Korea has demonstrated nonkinetic counterspace capabilities, including GPS and SATCOM jamming, and probably intends to deny space-based navigation and communications during a conflict" (Defense Intelligence Agency 2022, 31-32). In fact, North Korea has demonstrated active GPS jamming and spoofing capabilities since at least 2010 and has markedly escalated these efforts in recent years. In May 2024, North Korea conducted sustained GPS jamming operations targeting the Northern Limit Line in the Yellow Sea, affecting civil aviation and maritime traffic across the region (IP Defense Forum 2024). In November 2024, the International Civil Aviation Organization (ICAO) formally condemned North Korean GPS jamming as violations of the 1944 Convention on International Civil Aviation, with the organization noting "recurring" and systematic efforts to disrupt satellite-based navigation (Sokolin 2025).

Additionally, although it does not fit his assumptions of attacks on South Korean military hardware and civilian areas, Zimmerman highlights an important point about CEP. He writes, “Because the kill probability

does increase so slowly, firing multiple missiles against each target is not a useful allocation of resources unless the number of KN-09 missiles available significantly exceeds the number of targets (Zimmerman 2018, 11)." This condition of missiles significantly exceeding targets is left unexplored in the analysis by Mazarr et al. (2018), although the map on page nine of their paper indirectly links a long-range artillery salvo of 288 KN-09 rockets with the Samsung Electronics semiconductor fab in Pyeongtaek.

Currently, South Korea operates a multi-layered missile defense system to protect against aerial threats. As reported, the Korea Air and Missile Defense (KAMD) comprises several integrated tiers: at the lower tier are Patriot batteries provided by the United States, equipped with PAC 2 and PAC 3 interceptors to defend against aircraft and short-range missiles; at medium altitude (15-20 km), the M-SAM Block II (Cheongung-II) system provides extended coverage with improved radar and multi-target tracking capabilities; and at high altitude (up to 150 km), the U.S.-operated Terminal High Altitude Area Defense (THAAD) system provides upper-tier defense. Additionally, South Korea is developing the L-SAM long-range system intended to become operational in the latter part of the decade (Jung 2025; Mandal 2025; Missile Threat CSIS 2021). However, with current deployed technologies, it would be difficult to intercept a surprise KN-09 salvo, if the interceptor battery crews were not on high alert and expecting a launch.

Of course, a more comprehensive threat scenario would consider the potential coordination of a KN-09 salvo with unmanned aerial systems or low-cost decoys designed to overwhelm or distract South Korea's layered air defense network. North Korea has previously demonstrated willingness to employ unorthodox delivery systems; in 2024, it deployed hundreds of balloon-borne payloads carrying waste materials into South Korean territory, a provocative act that, while non-lethal, exposed gaps in air defense responsiveness and radar discrimination capabilities (Yun 2024).

The proliferation of low-cost unmanned systems globally has demonstrated the vulnerability of even advanced air defense networks to

saturation attacks. A mixed attack scenario combining manned aircraft decoys (such as UAVs carrying radar signatures similar to high-value targets), large-caliber rocket salvos, and possibly coordinated ballistic missile strikes would present a complex engagement challenge for KAMD operators. Research on drone swarm tactics indicates that swarms of inexpensive decoys can overwhelm air defense radars by forcing defensive engagement decisions and exhausting interceptor magazines before actual strike assets arrive (Bridley and Pastor 2022; War Wings Daily 2025). In such a scenario, air defense units would face difficult priority decisions: whether to expend precious interceptors on decoys or reserve them for confirmed kinetic threats.

Moreover, North Korea could employ low-cost reconnaissance UAVs or reconnaissance balloons to conduct post-strike battle damage assessment (BDA) and determine whether follow-up strikes were necessary, a capability that would enhance the military utility of any initial KN-09 salvo. This UAV-enabled BDA function would be particularly valuable in an economic security context, where inflicting partial damage to production lines might be sufficient to achieve strategic goals without committing additional resources. These considerations suggest that the threat posed by a KN-09 attack need not be analyzed in isolation but rather as a potential component of a more complex, multi-domain attack scenario incorporating deception, saturation, and reconnaissance capabilities.

While South Korea has invested heavily in developing a multi-layered air and missile defense system, defense analysts and military planners acknowledge fundamental limitations when defending against a sustained salvo of large-caliber rocket artillery such as the KN-09. The KAMD is architected around the assumption of discrete, detectable threats arriving at intervals that allow for sequential engagement. However, large-caliber MLRS systems are specifically designed to overcome this assumption: they deliver multiple rounds in rapid succession (a salvo of 288 rockets from 36 launchers requires approximately 50-60 seconds to complete), presenting defending air defense units with a compressed engagement window and a saturation problem.

According to Hong Min, a senior researcher at the Korea Institute for National Unification, "even with a multi-layered defense in place, many experts, including myself, believe that the system on its own would struggle to withstand a mixed, simultaneous strike from North Korea" (Jung 2025). The fundamental constraint is not technological sophistication but rather interceptor magazine capacity and radar bandwidth. Each layer of KAMD maintains a finite number of ready interceptors and a fixed rate of fire. Against a slew of decoys and a salvo of 288 rockets, each of which requires a successful intercept, the mathematics of saturation becomes decisive. A single Patriot battery, for example, may have up to eight launchers with four to sixteen missiles per launcher, depending on configuration and armament (see Armyrecognition.com 2025), so even with multiple batteries, intercepting a majority of a 288-rocket salvo would require either: (1) unprecedented pre-positioning of air defense assets in direct proximity to the target; (2) long-range early warning and interceptor employment at maximum ranges (reducing accuracy); or (3) acceptance of significant leakage through the air defense system.

The time constraint is particularly acute for large-caliber rockets. With flight times to South Korean fab locations ranging from ~60 seconds to ~140 seconds—as presented in Table 2 of this analysis—air defense crews would have less than 2.5 minutes from initial detection to engagement. In contrast, ballistic missiles with longer flight times afford more engagement opportunity. This compressed timeline, combined with the salvo's sheer volume, creates a "peacetime surprise" scenario in which even optimal air defense performance may permit significant leakage. One South Korean defense ministry official remarked: "If North Korea knew the prioritization [of air defense targets], it could adapt its attack strategy to exploit gaps, such as targeting unprotected assets" (Jung 2025).

The implication is that South Korea's KAMD, while formidable as an air defense system, is not designed to provide near-perfect defense against a sudden, large-scale salvo of unguided or semi-guided rocket artillery targeting dispersed civilian infrastructure, such as fabrication facilities, rather than concentrated military assets. The system performs best against

discrete, sequential threats and against adversaries attempting to penetrate defended airspace with aircraft or limited numbers of ballistic missiles. Against a saturation attack designed specifically to exploit air defense limitations, such as a KN-09 salvo, the system's effectiveness is substantially reduced, and significant numbers of rockets would likely impact their intended targets.

Such short flight times become particularly worrisome when considering the potential for chaos and confusion accompanying the various aforementioned attack scenarios.

Table 2: Estimated flight times of a KN-09 rocket to varying target distances

Target Distance	Minimum Time	Maximum Time
57 km	~59.8 sec	~84.9 sec
95 km	~75.7 sec	~107.5 sec
109 km	~81.2 sec	~114.2 sec
114 km	~82.3 sec	~115.2 sec
165 km	~95.3 sec	~137.3 sec

Note: Estimated minimum and maximum flight times of KN 09 rockets at varying target distances. Calculations assume a maximum altitude below 40 km, shallow launch angles of 30-45 degrees, feasible initial velocities consistent with engineering constraints, and full atmospheric drag within the bounds of estimated velocity ranges. Results were generated using ChatGPT-4o.

Complementing this fairly short flight time, other operational capabilities of the KN-09 seem more than enough to do significant damage to a foundry. Foundries come in different sizes, however, to provide some perspective "the Pyeongtaek Samsung Electronics P2 Project was aimed at adding a large-scale semiconductor production line with a gross area of 128,999 m2 to the P1 Line in Godeok Industrial Complex in Pyeongtaek (Samsung E&A)." In simple comparative terms, this means the building complex is the approximate size of 18 international football pitches, or perhaps a rectangular shape of 175 x 735 m. SK Hynix's M16 fab is reportedly "336 m long, 163 m wide and 105 m high with a foot print of about 55,000 square meters" (Clarke 2021), while Samsung Electronics' S1 line in Giheung is reportedly 13,000 pyeong, approximately

42,975 m2 (Kang 2021).

With only 16 primary fabrication facilities in South Korea, a single salvo of 288 rockets allows for 19 rockets to be directed at each target—the number of projectiles exceeds the number of targets, perhaps making the KN-09 a game changer in a critical infrastructure scenario. If we consider the frequently cited artillery dud rate of 25 percent for North Korean artillery (Anderson and Press 2025; Zimmerman 2018, 11), consider a CEP of 38 m, and provide the location of each fab building in latitude and longitude degrees, minutes, seconds (DMS) from Google Earth, a statistical analysis concludes an estimated strike probability of approximately 14.25 of 19 rockets, while 10 to 18 rockets are possible as they fall within a 95 percent interval. These calculations accommodate the independence of each rocket's failure or dud rate. They also consider that latitude and longitude DMS, with no decimal seconds, may lack accuracy of approximately 33.3 m give or take. The calculations were performed on square target areas of 128,999 m2, 60,000 m2, and 42,975 m2, as well as the rectangular SK Hynix M16 foundry, with each analysis drawing the same conclusions of 10-18 effective rounds in a salvo of 19 rockets (see tables 3 and 4).

Table 3: General hit probability calculations on a square target of varying fab sizes

Target area (m^2)	Side length (m)	CEP (m)	P(within target)	Per-shot hit probability	Expected hits (n=19)
128999	359.16	38	0.9999859	0.749989	14.25
60000	244.95	38	0.9944497	0.745837	14.17
42975	207.3	38	0.9757693	0.731827	13.9

Notes: 1) P(within target) is computed from the circular normal model using P(r < R) = 1- e-R2/(2 CEP2), where R is half the side length of a square target; 2) Per-shot hit probability multiplies P(within target) by the non-failure probability 1 - 0.25 = 0.75. Computations completed by Perplexity, Sonar LLM using a binomial probability model, combined with the circular normal (Rayleigh) distribution to estimate hit probability based on Circular Error Probability (CEP).

Table 4: Hit probability calculations on the relatively small SK Hynix M16 foundry

Item	Value
Target shape	Rectangle
Dimensions (m)	336 × 163
Target area (m²)	54768
Latitude (DMS)	37°15′01″
Longitude (DMS)	127°28′59″
Arcsecond scale (m)	lat ≒30.83, lon ≒24.64
Max rounding bias (m)	X ±12.32, Y ±15.41
CEP (m)	38
Fail rate	25%
P(within target)	0.98503
Per-shot hit probability	0.73877
Expected hits (n = 19)	14.04
Mode hits (probability)	14 (≒0.2041)

Notes: 1) Calculations per Perplexity, Sonar LLM; 2) Whole-second DMS rounding adds a uniform bias up to roughly 15 m north-south and 12 m east-west, slightly reducing hit probability versus the non-quantized case in Table 2; 3) with CEP 38 m and a 25 percent fail rate, the expected hits remain close to 14 under these quantization conditions.

The point here, to be clear, is that fabs are very large facilities and may be difficult to miss with an artillery salvo. Table 5 shows the location of each fab in latitude and longitude DMS and its distance from a hypothetical "Kaesong MLRS Cluster"—a location approximately 11 km northeast of Kaesong, North Korea and 5.8 km north of the military demarcation line in the demilitarized zone (DMZ). All fabs fall well within the reported estimated range of KN-09 rockets. Currently, South Korean officials argue against supplying Alphabet, the parent company of Google, with domestic mapping layers at a 1:5000 scale, due to security concerns of exporting data that can accurately pinpoint military facilities and critical infrastructure to foreign data servers (Byun 2025; Jacobs 2025). However, the truth is two-fold when it comes to fabs. Firstly, they are so large that a GPS location in DMS is more than enough information for artillery to hit the target, and secondly, any person with an off-the-shelf handheld

GPS locator can drive around a foundry with a laser rangefinder and calculate the GPS location in DMS seconds to two decimal places, shrinking inaccuracy from approximately 33.3 m to about 1 m. However, hitting the target is not the only aspect to be considered. Even if the shot is accurate, will it do considerable damage to the structure of a fab built with reinforced concrete walls?

Table 5: Fab locations in South Korea and their distances from the Kaesong MLRS cluster

Fab Name	Address	Latitude (DMS)	Longitude (DMS)	Distance from Kaesong MLRS Cluster
Samsung Line 6	129, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea	37.13'45"N	127.05'09"E	94 km
Samsung S1-Line		37.13'35"N	127.05'08"E	94 km
Samsung S3-Line	1, Samsung-ro, Hwaseong-si, Gyeonggi-do, Korea	37.12'54"N	127.04'22"E	95 km
Samsung S4-Line		37.13'01"N	127.04'01"E	94 km
Samsung V1-Line		37.12'54"N	127.04'22"E	95 km
Samsung P1	1, Samsung-ro, Pyeongtaek-si, Gyeonggi-do, Korea	37.02'06"N	127.03'26"E	114 km
Samsung P2		37.02'06"N	127.03'26"E	114 km
Samsung V2		37.02'06"N	127.03'26"E	114 km
Samsung P3		37.02'06"N	127.03'26"E	114 km
SK Hynix M10	1, SK hynix-ro, Icheon-si, Gyeonggi-do, Korea	37.15'01"N	127.28'59"E	109 km
SK Hynix M14		37.14'55"N	127.28'50"E	109 km
SK Hynix M16		37.15'01"N	127.28'59"E	109 km
SK Hynix M15	1, SK hynix-ro, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, Korea	36.39'17"N	127.26'01"E	165 km
SK Hynix M15X		36.39'17"N	127.26'01"E	165 km
DB HiTek Fab 1	1, DB HiTek-ro, Wonmi-gu, Bucheon-si, Gyeonggi-do, Korea	37.30'47"N	126.46'41"E	57 km
DB HiTek Fab 2	2, DB HiTek-ro, Eumseong-eup, Eumseong-gun, Chungcheongbuk-do, Korea	37.07'35"N	127.39'24"E	130 km

Notes: 1) Coordinates in DMS and distance ranges from Google Earth; 2) the Kaesong MLRS Cluster is based on a cluster of HARTS (hardened artillery sites) at the same location, as identified by the Google Earth mapping data of North Korean artillery positions known as 809291.kmz.

Fabs are impressive buildings. They are built to exacting specifications in order to create an environment where billions of transistors only a few nanometers across, an essential component of semiconductor chips, can be manufactured accurately with no impurities. According to Brian Potter (2024), with such exacting specifications in mind, "A modern semiconductor fab must thus create a world of incredible precision and predictability. Every possible effect that might disrupt the manufacturing process, no matter how small, must be screened off, any subtle deviation hunted down and eliminated." This is difficult to achieve in a cleanroom environment that must be cleaner than a hospital's surgical theater.

The cleanroom of a modern fab, where manufacturing of the wafers and chips takes place, may have more than one thousand tools. Major pieces of processing equipment may cost tens of millions of dollars (ibid.). For producing cutting-edge chips, ASML's advanced photolithography machines, also known as extreme ultraviolet (EUV) machines, are necessary and reportedly cost between $150 million and $380 million; ASML plans to produce only about 20 annually up to 2028 (AleksandarK 2024; Hivelr Business Review 2024). In 2024, ASML reportedly had the capacity to produce only five or six of their High NA EUV chipmaking machines, which are necessary to produce the most cutting edge chips available, and in that year, Intel had seemingly purchased the entire stock (Trueman 2024). Fortunately for Samsung Electronics, they were able to introduce the technology to their Hwaseong Campus in March 2025 (Nenni 2025), and SK Hynix acquired their machine for the M16 fab in September 2025 (Park 2025). SK Hynix CTO Cha Seon Yong remarked at the time of acquisition, "This installation provides critical infrastructure to realize our future technology vision (ibid.)."

From a threat perspective, it is the cleanroom with its exacting specifications and very expensive manufacturing tools that must be protected from any disruption, but these rooms are quite vulnerable to a large-caliber rocket attack. Generally, modern fabs have four levels. From bottom to top, these are the utility level, the clean subfab level, the

cleanroom level, and the interstitial and fan deck level (Potter 2024). The cleanroom level is separated from the interstitial and fan deck level by the cleanroom ceiling, which in most cases is composed of High Efficiency Particulate Air (HEPA) filters that provide one hundred percent coverage (Bhatia n.d., 9), though Ultra Low Particulate Air (ULPA) filters may be used as well. These filters are simply microfibers in a frame that may be a fairly large modular panel. The ceiling also has lighting fixtures, a rail system for front opening unified pods that safely transport wafers between tools, and other lightweight equipment. This type of ceiling would provide little resistance to an artillery rocket. The interstitial level, with its HVAC equipment and ducting, is separated from the outside world by the foundry's roof. A foundry's roof is often made of a thin concrete or steel layer supported by large steel trusses (Potter 2024) that can provide support over a wide area without requiring pillars to be built throughout the interior of the foundry. The roof is different from the foundry's foundations and walls, which are generally reinforced concrete to minimize vibration. The lack of reinforced concrete roofing makes the fab more susceptible to damage from a large-caliber rocket attack landing on a downward trajectory.

In order to estimate general structural damage from an artillery blast, a necessary variable is overpressure. Overpressure, or blast overpressure, is defined as the sharp, instantaneous rise above ambient atmospheric pressure resulting from an explosion (Navy and Marine Corps Force Health Protection Command). Zimmerman (2018, 14-15) calculates the overpressure in psi (pounds per square inch) for 75 kg TNT equivalent to estimate the damage a KN-09 rocket may cause. Here we can use calculations from the Blast Parameter Calculator to estimate structural damage to fabs in the case of a KN-09 attack (see Appendix A for limitations and caveats of Blast Parameter Calculations). Table 6 provides a reference table for overpressure and structural damage.

Table 6: Structural damage caused by various measures of overpressure

Overpressure (psi)	Structural Damage
0.15	Typical threshold for window glass breakage. Shattered glass is one of the most common damage sources even at distant ranges.
0.5 - 1	Light damage; most windows crack or blow in. Doors, weak frames, and some roof tiles may be dislodged.
1 - 2	Moderate damage; unreinforced masonry walls begin to crack, siding or light cladding can be torn off. Houses may be left structurally unsafe.
2 - 3	Serious structural damage; partial collapse of lighter buildings. Some references indicate unreinforced masonry failure around 2-3 psi, leading to heavy debris.
4 - 5	Near or complete collapse of typical homes (wood-frame). Internal walls fail, roofs lifted. Occupants at high risk of entrapment.
5 - 7	Severe destruction of residences; significant damage to steel or concrete frames (distortion, partial collapse). Utility poles snap; vehicles may be overturned.
8 - 10	Total or near-total destruction of most conventional structures. Reinforced concrete buildings heavily damaged or partially collapsed.
>10	Practically all non-hardened buildings are demolished. Large-scale structural failures, with few walls standing.
20+	Even heavily built reinforced concrete installations can be shattered or collapsed. Near-complete infrastructure devastation.

Note: From Blast Effects Information, the Blast Parameter Calculator, at eodtech.com.

The blast overpressure ranges presented in Table 6 provide structural engineers with reference points for assessing physical damage, but for purposes of assessing economic security impact, it is essential to distinguish among three qualitatively different damage outcomes: (1) temporary disruption requiring days to weeks of downtime; (2) mission kill rendering the facility inoperable for months; and (3) structural failure resulting in prolonged or permanent loss of production capacity.

Temporary Disruption (Overpressure Range: 1-3 psi): At overpressure levels between 1 and 3 psi, reinforced masonry and light steel-frame structures begin to show cracking, and some roof tiles or cladding may

be dislodged (Office of Response Restoration 2019; Olayebi and Ayanleke 2022, 32-33). In the context of a semiconductor fab, temporary disruption would involve damage to non-critical structural elements, the cleanroom ceiling (composed of HEPA filters and modular panels), and utility connections. The HVAC system, electrical distribution, and water/chemical delivery systems, all of which run through the interstitial spaces above the cleanroom, would be vulnerable to disruption at these overpressure levels. A fab experiencing temporary disruption would require days if not weeks for rapid assessment and repair of utility systems and cleanroom restoration (see Stratton 2025 for likely effects). However, the facility's core structural integrity would remain intact, allowing for return to production once utilities are restored.

Mission Kill (Overpressure Range: 3-8 psi): At overpressure levels between 3 and 8 psi, significant structural damage occurs (Office of Response Restoration 2019; Olayebi and Ayanleke 2022, 32-33). Unreinforced masonry begins to fail completely, light steel structures experience permanent deformation, roofs may be partially or completely lifted, and internal walls fail. In a semiconductor fab context, mission kill represents damage severe enough to require 2-6 months of reconstruction work. At this level, the reinforced concrete foundation and primary load-bearing walls (designed to minimize vibration) would likely survive, but the roof structure, typically composed of thinner concrete or steel supported by large steel trusses, would be severely damaged or partially collapsed. The equipment within the facility, including multi-hundred-million-dollar lithography machines and process tools, would likely experience secondary damage from falling debris, water intrusion, and loss of climate and vibration control. Recovery would require not only reconstruction of the roof and interstitial spaces but also extensive tool refurbishment, recalibration, and validation before production could resume. This category of damage is often irreversible within a 2-3 year timeframe and may trigger permanent relocation of production lines to facilities outside South Korea (see Asianometry 2025 for fab construction timeline).

Structural Failure/Total Destruction (Overpressure >8 psi): At overpressure levels exceeding 8 psi, total or near-total destruction of conventional structures occurs. Heavily built reinforced concrete buildings experience partial to complete structural collapse, and at levels exceeding 10 psi, practically all non-hardened buildings are demolished with few walls standing (Office of Response Restoration 2019; Olayebi and Ayanleke 2022, 32-33). At overpressure levels of 20+ psi, even heavily reinforced concrete installations can be shattered or collapsed. In a fab context, structural failure at these levels would destroy the facility beyond economic repair. The reinforced concrete foundation and walls might survive, but the interconnected infrastructure, thousands of square meters of cleanrooms, utility networks, process tool alignments, would be demolished. The cost of reconstruction would exceed the cost of building a new facility at a greenfield site. Just as critically, the specialized workforce trained on particular equipment types would be displaced, and the loss of institutional knowledge about process optimization and quality control may prove irreversible. Recovery timelines for such damage may extend to 5+ years (see Asianometry 2025 for fab construction timeline).

The analysis presented in this paper focuses on the probability of achieving overpressure levels in the 8-20+ psi range, which would correspond to structural failure or total destruction. However, it is important to note that even lower overpressure levels (3-8 psi, corresponding to mission kill) would produce economically devastating effects on South Korea's semiconductor capacity, as the 2-6 month production outage would disrupt global supply chains and incur losses vastly exceeding the direct reconstruction costs.

Keeping the above references for physical damage in mind, we can now consider the potential for damage from a KN-09 attack. According to the Blast Parameter Calculator (eodtech.com), a 75 kg payload on a KN-09 rocket would have an incident pressure (or peak overpressure) of 1.92 psi, if it landed approximately 46 m off target. If it missed the fab by 20 m, it would have an incident pressure of 6.87 psi. If it missed the fab by 10 m, it would have an incident pressure of 27.95 psi. If it missed by

3 m, there would be an incident pressure of 389.58 psi. A direct hit would result in an incident pressure of 2,262.40 psi. This may sound a bit abstract, and Zimmerman (2018, 15 and note 35) reminds us that the force of pressure is not hitting a single square inch and therefore must be calculated for the entire wall. So, if we use the simple formula of F = P x A (where F is force, P is pressure, and A is area), and apply this to SK Hynix's M16 fab, which we previously noted is reportedly 336 m long, 163 m wide and 105 m high, then the total force on the long wall under an incident pressure of 27.95 psi would equal 764,025 U.S. tons (or short tons). Quite obviously, the wall is so large that not every part of it is within a 10 m radius of the initial blast. However, we have already concluded that the statistical probability favors an average of 14 rockets hitting a foundry, as they are such large targets, and it is highly probable that any number of rockets between 10 and 18 will hit the target. Zimmerman (2018, 15), drawing on Cross et al., observes that the blast pressure may be localized to one side of the building and the resulting asymmetry may undermine structural integrity potentially leading to collapse.

Now imagine a direct hit, or 14 of them, on the steel or thin concrete roof of a fab, where the direct hit incident pressure is 2,262.40 psi. If the building somehow remained standing, which is highly doubtful, it is nearly certain the force of the blast would cause catastrophic damage to the interstitial level and the clean room. Certainly the vibrations and overpressure would collapse the HVAC structures in the interstitial space above the cleanroom and bring utility equipment crashing down upon the manufacturing equipment in the cleanroom. It would likely take years to reinforce or rebuild the structure of the foundry, and if the cleanroom housed ASML EUV equipment, it may take a year or more on a waiting list to replace it. Either way, it is a safe assumption that a fab being hit with such force would take a minimum of many months to recover, if not years to rebuild. It is likely the structure would collapse.

The Scenario

Before presenting possible scenarios, we should recognize that

South Korea's fabs are not considered critical infrastructure by the state, though some of their components are considered strategic technologies. The designation of strategic technologies has a firm foundation in an economic security framework. Lee (2022) states that a shift has occurred in state perspectives of economy and security in the post-2000 international order: "the importance of national security interests has been given more attention than the existing economic efficiency, and the concept of economic security has changed to focus on 'economy for security' rather than 'security for economy'." In a complementary vein, Park (2023, 3), writing for the Korea Institute for International Economic Policy, observes that although the concept of economic security remains imprecisely defined, it can be characterized by three key features: "1) resilience to business cycle shocks, 2) the ability to produce the goods and services needed if the global trade and financial system fails, or 3) resilience to embargoes." Arguably, a key element of economic security today is technological sovereignty, something South Korea's Ministry of Science and ICT (2025) seems to recognize as it begins exploring public-private partnerships for "sovereign science and technology." Therefore, it is not surprising that the Korea Institute of Industrial Technology Planning and Evaluation (2025) lists 33 strategic technologies related to semiconductors. However, quite surprisingly, despite their importance to the economy, semiconductor fabs are not designated as national core infrastructure facilities in South Korea (Ministry of Interior and Safety 2025). In other words, they are not considered critical infrastructure, and as such, they are not provided the same consideration of protection by policymakers as designated critical facilities.

This apparent gap between protected technologies and protected facilities is particularly important here, as unlike some previous analyses of KN-09 effectiveness and utility on the battlefield, this paper assumes a surprise, first strike, single strike, salvo of 288 KN-09 rockets on semiconductor foundries as economic infrastructure. It is likely these structures will have little in the way of dedicated protection from the

state, should a strike occur. It also assumes no follow-up troop movements or other indications of an impending invasion from North Korea. Under this scenario, no U.S. or South Korean military forces are targeted. Likely, no U.S. or South Korean military forces are killed or wounded, unless visiting a fab. This can be compared to the shelling by North Korean forces of Yeonpyeong Island, South Korea in November 2010. In that incident, it is reported that the Korean People's Army's 122 mm MRL batteries fired approximately 170 artillery rounds, though perhaps some rounds were from smaller 76.2 mm batteries. This fire targeted civilian and military structures and positions on the island. In response, South Korean military forces fired 80 K-9 artillery rounds in a counter-battery operation (Bermudez, Jr. 2011, 6). South Korea's was a reasoned, proportional response that did not escalate the situation. North Korea was obviously willing to absorb the retaliatory strikes.

Critics may complain that North Korea, as a rational actor, has no reason to launch an unprovoked, surprise, limited strike against South Korean infrastructure. It would be difficult to argue this point. However, there are a couple of scenarios under which a North Korean KN-09 limited strike might be conducted. The first would be a retaliatory strike for provocations by the United States or South Korea. According to reports published in September 2025, U.S. Navy SEAL Team 6 was said to have infiltrated North Korea in 2019 to plant surveillance equipment. During the failed mission, the military team reportedly killed two or three North Korean civilians that posed a danger to the covert nature of the mission (Philipps and Cole 2025). As well, alleged drone incursions into North Korea ordered by former President Yoon Suk Yeol (Shin 2025) and undertaken by South Korean civilians (Kang 2026) have been under investigation by special prosecutors in South Korea. Such provocations, with or without the loss of civilian life, may push North Korea to respond with a kinetic operation of its own. The second scenario may be a coordinated or opportunistic strike should China invade Taiwan. This author can envision the possibility of a KN-09 strike against foundries as a tactic to delay U.S. forces should China strike or invade Taiwan. The

bonus of such a coordinated or opportunistic attack in conjunction with a Chinese invasion of Taiwan is that China would come out of it with the largest chip manufacturing capacity globally, and they would owe North Korea for the help provided. Likely, if a simultaneous, or near simultaneous, attack on Taiwan and South Korea occurred by Chinese and North Korean forces respectively, U.S. policymakers would tread carefully, worried about a two-front conflict. If no military personnel of the United States or South Korea were wounded in attacks on civilian infrastructure, and no further North Korean movements were detected, it is probable a proportional response would be recommended and carried out. After all, North Korea is a nuclear armed state and South Korea has much more to lose than North Korea in an escalated conflagration, at least from a social welfare development perspective.

A flexible and proportional response from South Korea seems probable based on reported plans in place. Due to the Yeonpyeong Island shelling incident in November 2010, the United States and South Korea signed the Combined Counter-Provocation Plan in 2013 (DVIDS 2025). According to General Curtis M. Scaparrotti (2016, 10), the plan "improves our ability to respond to North Korean provocations as an Alliance, while managing the risks of miscalculation and escalation," while calling for "strong, yet measured responses [to] set the conditions for diplomatic efforts to work." In 2015, U.S. and South Korean military leaders signed OPLAN 5015. Although the plan reportedly "called for a prompt response to a North Korean attack with a preventive strike on the North's core military facilities and weapons as well as its top leaders," it seemingly "focused not on a full-blown war but on limited warfare" and is also known "to encompass plans against asymmetric aggression such as TBM/WMD [theater ballistic missiles/weapons of mass destruction] and cyber warfare" (Globalsecurity.org 2016). Regarding OPLAN 5015, David Maxwell, a retired U.S. Army Special Forces colonel, remarked to the National Interest (Peck 2019), "My recommendation is not to try to read too much into the plans." He added:

Military planners are by nature worst case planners but they also plan

to provide multiple options to national decision makers for responding to crisis based on the mostly likely enemy course of action to the most dangerous enemy course of action. While there is likely Option A, B and C for every contingency, often what gets executed is Option D that is developed from A, B and C and the actual assessment of enemy actions (ibid.).

OPLAN 5015 is classified and both sides agreed in 2022 to update the plan when they signed a Strategic Planning Directive (Song 2022). Nonetheless, one can deduce that a response from the Combined Forces Command of South Korean and U.S. forces would be flexible and proportional, thereby avoiding escalation and reducing the risk of a full scale war. Therefore, if North Korea were willing to absorb counter-battery or other proportional retaliatory measures, the asymmetry of economic losses would clearly favor North Korea.

Should a limited strike of KN-09 large-caliber rockets decimate South Korea's 16 foundries, the economic losses would likely be catastrophic. Nearly 20 percent and slightly more than $100 billion of exports would be wiped away instantly. The loss of foundries would ripple through the entire semiconductor industry affecting its nearly 150,000 workers. South Korea's trade balance would rapidly deteriorate and the foreign exchange rate would likely be volatile. The big three of Korean foundries—Samsung Electronics, SK Hynix, and DB HiTek—may not survive. Investors would likely flee, as the companies would need years to rebuild, with no guarantee another strike would not have the same outcome. Manufacturing competitors like TSMC, Micron, and Intel would likely absorb displaced clients and capture additional market share. A contraction of South Korean GDP would be inevitable. Capital investment from the government and private sector in the hundreds of billions of dollars would be necessary for immediate demolition and cleanup costs and longer term rebuilding costs. Table 7 provides estimates of some potential economic losses.

Table 7: Estimates of potential economic losses

Impact Area	Short-Term Effect	Medium to Long-Term Effect
GDP	contraction	Slow recovery over 3-5 years
Exports	Collapse of $100B+ in semiconductor exports	Permanent market share loss
Employment	Massive layoffs and income shock	Structural unemployment risks
Capital Investment	Immediate destruction costs (tens of billions USD)	Rebuilding costs and debt burden
Global Competitiveness	Severe disruption	Competitors gain market share
Investor Confidence	Sharp decline	Possible downgrade and slower FDI
Technological Leadership	Innovation delays	Risk of erosion of high-tech leadership

Note: Author's analysis of potential outcomes.

Conclusion

Even if one does not believe that North Korea will launch a surprise, limited artillery attack on South Korea, the KN-09 300 mm MLRS provides capabilities that must be assessed on their ability to decimate the country's critical infrastructure, in this case, the country's semiconductor foundries. With 36 mobile launch systems being able to fire a coordinated salvo of 288 rockets a distance of 190 km with a payload of 75 kg equivalent of TNT, the KN-09 has the capability to fire 19 rockets at each of South Korea's 16 fabs. Of the 19 rockets directed at each facility, statistical analysis suggests that between 10 and 18 are likely to achieve direct impact, with a mean of approximately 14. Such impacts would be sufficient to destroy the entire structure, or at minimum cause severe structural damage requiring months or even years to repair. If such an action were to occur, significant economic damage would result, including a major loss of export revenue, a likely contraction of GDP, the loss of competitiveness in the semiconductor global marketplace for Samsung Electronics, SK Hynix, and the country of South Korea more generally. It is likely such a salvo would usher in a sharp decline in

investor confidence and drive away potential investment in the country from overseas.

The greatest single suggestion to counteract a single-salvo scenario is quite simple: stop building fabs in the range of artillery that cannot be intercepted by anti-missile systems currently deployed in South Korea. While this represents a long term strategic outlook, the fabs already built cannot be relocated, leaving them vulnerable until an effective anti artillery defense is established. Another possible solution is to place soldiers in harm's way and deploy some U.S. and South Korean military personnel at each fab, so any attack on a foundry is also an attack on a military position. This did not stop North Korea from firing on Yeonpyeong Island in 2010, but if U.S. military personnel are included, it may make a difference to North Korea's calculations regarding retaliation. At a bare minimum, South Korea should add semiconductor fabs to their list of designated critical facilities. No matter the outcome, the analysis does suggest that the KN-09 300 mm MLRS is a game changer in economic security and critical infrastructure terms, and for this reason, appropriate countermeasures should be considered and devised.

Declaration of Generative AI and AI-assisted technologies in the writing process: During the preparation of this work the author used Sonar LLM of Perplexity and ChatGPT4o of OpenAI in order to perform mathematical calculations, as noted in the text, and to enhance the author's understanding of structural engineering. After using these tools, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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Appendix A: Limitations and Caveats of Blast Parameter Calculations

The Kingery-Bulmash blast parameter model, upon which the overpressure calculations in this analysis are based via the Blast Parameter Calculator, has well-documented limitations that warrant explicit discussion. According to the foundational technical report by Kingery and Bulmash (1984), the empirical equations employed were developed from explosive test data ranging from less than 1 kg to over 400,000 kg of TNT equivalent charge weights. However, these equations exhibit reduced accuracy in the near-field region, specifically at scaled distances below $Z < 0.4$ m/kg1/3, where the extreme pressures and temperatures generated at the moment of detonation present measurement challenges (Joint Research Centre 2017, 6). Recent scholarship examining the applicability of these equations has revealed that at scaled distances approaching the explosion, the Kingery-Bulmash model may underestimate peak overpressure values compared to finite element simulations, with some studies documenting differences exceeding 27 percent (see Hussein 2025, 22).

Beyond the inherent mathematical limitations of the model itself, real-world blast environments introduce variables not fully captured by hemispherical surface-burst assumptions. Atmospheric conditions, particularly wind speed, wind direction, humidity, temperature gradients,

and atmospheric stability, can significantly alter blast wave propagation. Wind effects can asymmetrically amplify or attenuate blast waves downwind of the detonation, while temperature inversions and humidity can affect sound speed and thus the effective pressure transmission. Additionally, the Kingery-Bulmash equations were developed assuming free-field conditions in open terrain; the presence of surrounding structures, topography, and other environmental features can create complex wave interactions including reflections, diffraction, and channeling effects that amplify or reduce local overpressures in ways difficult to predict analytically (see Catovic and Kljuno 2021).

The calculations presented in this paper assume optimal SATNAV terminal guidance accuracy (CEP of 30-45 meters) and a 25 percent dud rate derived from assessments of North Korean artillery performance. However, these assumptions represent baseline conditions and do not account for dynamic countermeasures that adversaries might employ, which are addressed in "The Threat" section of this paper. Weather conditions during any hypothetical attack, particularly high winds or atmospheric instability, could reduce the precision of unguided rocket falls or jam GPS signals, potentially degrading accuracy beyond the assumed CEP parameters.

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Road to Redress: Analyzing the Civil Liberties Act of 1988 as a Model to Resolve the "Comfort Women" Issue Between Japan and South Korea

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Abstract

Historical issues have been at the center of Japan and South Korea's tense relationship over the past decade. One issue in particular that has caused considerable strain is the "comfort women" issue. This paper examines whether the Civil Liberties Act of 1988 could serve as a model to resolve the "comfort women" issue between Japan and South Korea. This paper makes the argument that the Civil Liberties Act of 1988 can be a successful model for a "comfort women" resolution by: 1) using the demands of the redress movement to establish what is required for a satisfactory resolution; 2) demonstrating why Japan's past resolution attempts failed to meet the requirements of a satisfactory resolution; 3) explaining why the Civil Liberties Act of 1988 successfully resolved similar redress demands; and 4) showing how lessons from the Civil Liberties Act of 1988's success can set the framework for a successful resolution to the "comfort women" issue between Japan and South Korea.

Keywords: "comfort women," Japan-South Korea relations, reparations, government apologies

Introduction

More than eighty years since the conclusion of the Pacific War, the "comfort women" issue still haunts East Asia and the Pacific. "Comfort women" is a euphemism for the women across Asian and Pacific nations who were forced to provide sex to Japanese troops during the Pacific War. Although the "comfort women" issue is largely viewed as an East Asian matter, a notable occurrence was the passage of House Resolution 121 in the US House of Representatives in 2007. Resolution 121 was a clear, public rebuke aimed at Japan's government over its inability to settle the "comfort women" issue (H.R. Res. 121 2007). A leading sponsor of Resolution 121 was Representative Mike Honda of California. In an interview with NPR about Resolution 121, Representative Honda was asked why the House demanded that the Japanese government apologize. Honda answered that the goal was to get Japan to take "historical responsibility," and he elaborated on how the US took historical responsibility for Japanese American internment when it passed the Civil Liberties Act of 1988 (*NPR* 2007).

This paper seeks to answer the following question: can the Civil Liberties Act of 1988 (hereafter CLA) serve as a model for resolving the "comfort women" issue between Japan and South Korea? To answer this question, this paper will: 1) present the components it believes are required to form a satisfactory resolution to the "comfort women" issue based on the demands from the redress movement; 2) illustrate why Japan's past resolution attempts fell short of those requirements; 3) show how the CLA had to address similar redress demands to Japan for the "comfort women" issue; and 4) demonstrate how lessons from the CLA's success can set a framework for a successful resolution to the "comfort women" issue between Japan and South Korea. Ultimately, this paper argues that a "comfort women" redress based on the CLA could form a successful resolution.

Before the analysis, three clarifications are needed. First, this paper will specifically address the "comfort women" issue between Japan and

South Korea. The "comfort women" system involved women from several Asian and Pacific countries. However, South Korean women constituted the majority of "comfort women" (Min 2021, 1, 81-82; Soh 2008, xi-xii, 1; Soh 2003, 212). A second clarification is that this paper will only discuss the Japanese American portions of the CLA. The CLA also included redress for inhabitants of the Aleutian Islands. This paper focuses only on the Japanese American portions because the context, experience, and redress measures for the Aleuts differed slightly, Japanese Americans were the majority of internment victims, and because much of the lobbying and debate over redress for internment revolved around the Japanese American experience. The third clarification is that this paper is not attempting to compare the injustices of Japanese American internment and the "comfort women" system. Rather, this paper is taking the CLA—a widely regarded example of a well-executed government resolution to a historical injustice—and exploring what lessons can be applied to a possible resolution to the "comfort women" issue between Japan and South Korea.

Answering this question is significant for several reasons. First, given the rising age of surviving "comfort women," it is important to quickly identify a model or at least possible strategies that will achieve an acceptable resolution. Second, Japan-South Korea relations play—and will continue to play—an important role in global geopolitics as North Korea continues its aggressive behavior and China continues to exert itself as a superpower. Failure to resolve the "comfort women" issue has caused real strife in Japan-South Korea relations with potentially significant consequences for regional security and power (Stangarone 2020; *BBC* 2019). Furthermore, as the US continues to focus on East Asia and balancing against China, it will need Japan and South Korea to cooperate on the best terms. Third, while much scholarship and advocacy regarding the "comfort women" issue has thoroughly documented the "comfort women" system and echoed Resolution 121's condemnation of the Japanese government, few attempts have been made to find resolutions to the "comfort women" issue.

What is a Satisfactory Resolution?

Satisfactory government resolutions to historical injustices have come in various forms. Historian Robert Weyeneth (2001, 12-20, 24) points out that governments have built memorials, issued apologies, paid compensation, created truth commissions, set aside commemoration days, and renamed locations or entities. Ultimately, what constitutes a "satisfactory" resolution should be determined by the circumstances of the specific injustice and its redress movement. For the "comfort women" issue, the redress movement has consisted of the surviving "comfort women," their advocacy groups, and some scholars. Additionally, the redress movement has been consistently aided by various UN entities and occasionally the South Korean government. As early as 1990—before Kim Hak-sun's testimony that is often credited with kick-starting the modern redress movement—advocacy groups demanded the Japanese government conduct a public inquiry into the "comfort women" system, take responsibility, apologize, provide compensation to the "comfort women," and create educational measures and memorials that appropriately address the "comfort women" issue (AWF, n.d.; Soh 2008, 63; Saito 2017, 79). These demands were reaffirmed by the UN Commission on Human Rights Special Rapporteur on Violence Against Women, Its Causes and Consequences, Radhika Coomaraswamy, in the findings of her 1995 investigation into the "comfort women" issue and the Japanese government's attempted resolutions, as well as by the Center for Research and Documentation on Japan's War Responsibility—a research and advocacy organization for victims of Japan's military during the Pacific War (Coomaraswamy 1996, 16-17, 31-32; Hayashi 2008, 129). Finally, in her article "Resolving the Japan-Korea 'Comfort Women' Conflict: The Most Effective vs. The Most Likely Solution," scholar Grace Kang argues that the "ideal" solution to the "comfort women" issue would be Japan utilizing a victim-centered approach to acknowledge the Japanese government's responsibility for the "comfort women" system,

pay government-funded compensation, and implement educational measures (Kang 2021, 44-47).

The redress movement has consistently agreed that the first required component for a satisfactory resolution is a proper apology from the Japanese government. What is considered a "proper apology" has been the subject of much discussion among social scientists; and again, no single definition exists. However, a few components appear repeatedly in the literature on apologies and in the redress movement's demands. First, it is a virtually unanimous opinion that an apology must use the word "apologize" or a close synonym that shows remorse (Blatz, Schumann, and Ross 2009, 221; Weyeneth 2001, 12; Harris, Grainger, and Mullany 2006, 721-722). Second, the apologizer must specify the injustice for which they are apologizing (Blatz, Schumann, and Ross 2009, 221; Harris, Grainger, and Mullany 2006, 726-730). Using the word "apologize" and identifying the specific injustice being apologized for helps achieve the third component: the apologizer must acknowledge their responsibility for the injustice (Blatz, Schumann, and Ross 2009, 221; Weyeneth 2001, 17; Harris, Grainger, and Mullany 2006, 721-722, 728-729). Fourth, the apologizer must show they have repaired or show a willingness to repair the situation through changed behavior, monetary compensation, educational measures, punishing the individuals responsible for the injustice, etc. (Blatz, Schumann, and Ross 2009, 221; Weyeneth 2001, 18, 20; Harris, Grainger, and Mullany 2006, 721; Coomaraswamy 1996, 16-17, 31-32).

Besides these four components, who does the apologizing is crucial. While this is key to "comfort women" apologies, it is relevant to government apologies in general. An apology by a national legislature—especially in a parliamentary system—is a much stronger display of a country's remorse than the statement of an individual leader. Apologies issued through legislative resolutions must pass through several stages of debates and votes. Thus, a legislature issues an apology only after the majority of its elected members hear arguments for and against the apology and decide the apology is necessary. Likewise, a future

retraction of that apology must also pass through multiple stages of debates and votes. In contrast, individual politicians can issue apologies as they see fit, individual views may not coincide with the view of the majority of their constituents or colleagues, and apologies from individuals are more easily undercut by inflammatory statements from other individuals and themselves. Abe Shinzo was a prime example of this. During his first tenure as Japan's prime minister, Abe said of "comfort women," "The fact is, there is no evidence to prove there was coercion [in forcing women into the 'comfort women' system]," as well as "testimony to the effect that there had been a hunt for comfort women is a complete fabrication" (*NBC News* 2007; Fackler 2007). Yet, Abe also said soon after that "There probably was not anyone who followed that path because they wanted to follow it…In the broad sense, there was coercion" (Fackler 2007). Such flip-flopping is much less likely in an apology issued by a national legislature. As a result, an apology issued by the Diet will accordingly carry greater sincerity and will be more likely to survive succeeding governments.

After delivering a proper apology, the next requirement for a satisfactory resolution to the "comfort women" issue is Japanese government-funded compensation. As historian Robert Weyeneth (2001, 18) put it, compensation gives apologies "a distinctly material form." Without compensation, victims and their support groups are more likely to question the sincerity of a government's apology (2001, 18, 29, 31-32). However, Weyeneth (2001, 31-32) also notes that compensation without an apology can be viewed as meaningless by victims. Sociologist Hiro Saito showed that both these sentiments are shared by the "comfort women" redress movement. In the chapter titled "Apologies and Denunciations, 1989-1996" in his book *The History Problem: The Politics of War Commemoration in East Asia*, Saito (2017, 81) quotes former "comfort woman" Kim Hak-sun's and Japan Socialist Party chairman Tanabe Makoto's condemnations of Japan's refusal to offer compensation. Saito quotes Kim as saying "Simply apologizing means nothing. I would like the Japanese government to fulfill its

responsibility for compensation," and he quotes chairman Tanabe as saying "Apology without compensation is hypocrisy. Compensation without apology is strategic calculus" (2017, 81). Thus, the redress movement has clearly demanded both an apology and government-funded compensation are required for a satisfactory resolution.

Along with a proper apology and government-funded compensation, the "comfort women" redress movement has consistently demanded educational measures appropriately addressing the "comfort women" system (AWF, n.d.; Coomaraswamy 1996, 17). Like compensation, education measures provide an opportunity for the Japanese government to prove changed behavior and sincerity. Much of the discussion surrounding educational measures has centered on Japanese history textbooks and "comfort women" memorials (AWF, n.d.; Coomaraswamy 1996, 17; Kang 2021, 20, 30-31; Saito 2017, 97-100). However, this paper proposes that "educational measures" can be expanded to include the support of the existing Women's Active Museum on War and Peace and the Asian Women's Fund Digital Museum or the establishment of grants for "comfort women" research projects.

Finally, a variety of actors including the redress movement and former South Korean President Moon Jae-in's administration have stated that a "victim-centered approach" must be used while forming the resolution of a historical injustice (ROKMOFA 2018, 3, 21; Kang 2021, 35). What does "victim-centered approach" mean? According to a Moon administration report criticizing the 2015 Agreement, a victim-centered approach "requires that a remedy and reparation should be made with the victims at the center," as opposed to a resolution like the 2015 Agreement that was "reached through give-and-take negotiations as if it were a common diplomatic issue" (ROKMOFA 2018, 21, 24). Ultimately, a victim-centered approach is important because it forces the apologizing government to remember that a resolution's first priority is to address the injustice suffered by victims and not political expediency.

Why Japan's Past Resolution Attempts Were Not Satisfactory

Japan's past resolution attempts include several apologies from high-level officials as well as the Agreement on the Settlement of Problems Concerning Property and Claims and on Economic Cooperation (hereafter the "1965 Agreement"), the Asian Women's Fund, and the 2015 Agreement. The first resolution attempt was the 1965 Agreement which re-established relations between Japan and South Korea. The Japanese government believes the 1965 Agreement provided compensation for Pacific War-related issues and colonization and legally protects Japan from new claims for compensation (JMOFA, n.d.). However, the 1965 Agreement is not a satisfactory resolution because it contained no apology and it is unclear whether the agreement covered "comfort women" and other Pacific War injustices. When it comes to defining the scope of the 1965 Agreement, Section One of Article Two states:

> The Contracting Parties confirm that [the] problem concerning property, rights and interests of the two Contracting Parties and their nationals (including juridical persons) and concerning claims between the Contracting Parties and their nationals, including those provided for in Article IV, paragraph (a) of the Treaty of Peace with Japan signed at the city of San Francisco on September 8, 1951, is settled completely and finally (Agreement on the Settlement of Problems Concerning Property and Claims and on Economic Cooperation 1965, 260).

Interpreting this passage has been difficult and contentious. The minutes section of the 1965 Agreement clarifies that "it is understood that 'property, rights and interests' means all kinds of substantial rights which are recognized under law to be of property value" (1965, 290). Thus, some argue that the 1965 Agreement only covered property claims, not other claims such as war crimes like the "comfort women"

system (Coomaraswamy 1996, 20; Min 2021, 46). However, because the section went on to say "*and* [emphasis added] concerning claims between the Contracting Parties and their nationals" in addition to "property, rights and interests," one could also argue that the 1965 Agreement does in fact cover all claims regarding the Pacific War (Agreement on the Settlement of Problems Concerning Property and Claims and on Economic Cooperation 1965, 260). Ultimately, the redress movement remains unconvinced that redress was provided through the 1965 Agreement.

The second attempt at a resolution for the "comfort women" issue between Japan and South Korea was the Kono Statement, which was given by Chief Cabinet Secretary Kono Yohei on August 4, 1993. The Kono Statement was the result of a Japanese government study of the "comfort women" issue sparked by the emergence of the redress movement (Soh 2008, 44; 2003, 219; Saito 2017, 81; Kang 2021, 17). Of the four required components for a proper apology discussed earlier, the Kono Statement arguably contains all four. By stating "the Government of Japan would like to take this opportunity once again to extend its sincere apologies and remorse to all those, irrespective of place of origin, who suffered immeasurable pain and incurable physical and psychological wounds as comfort women," the Kono Statement showed remorse and specified the injustice for which it was apologizing (Kono 1993). The Kono Statement mostly acknowledges the Japanese government's responsibility for the "comfort women" system by noting that "comfort women" were "recruited against their own will, through coaxing, coercion, etc.," but its couching of the government's involvement as "directly or indirectly" simultaneously hampers the idea of fully accepting responsibility (Kono 1993). Finally, the Kono Statement promised changed behavior by stating the Japanese government was "determin[ed] never to repeat the same mistake by forever engraving such issues in our memories through the study and teaching of history" (Kono 1993). However, the Kono Statement was not accompanied by Japanese government-funded compensation or concrete educational

measures addressing the "comfort women." While former "comfort women" and advocacy groups were already demanding compensation and educational measures at this time, former South Korean president Kim Young-sam did not demand compensation from Japan (AWF, n.d.; ROKMOFA 2018, 5). Japan's government responded to the South Korean government's demand of only apologizing and acknowledging responsibility for the "comfort women" system rather than the survivors' and advocacy groups' demands of an apology, compensation, educational measures, and punishment of appropriate individuals. Thus, the Kono Statement did not resolve the "comfort women" issue.

Two years after the Kono Statement, the Japanese government attempted to resolve the "comfort women" issue through the Asian Women's Fund. As C. Sarah Soh notes, the Asian Women's Fund was established in 1995 with four missions: to provide monetary compensation and apologies for "comfort women," to fund healthcare services for "comfort women," to further research the "comfort women" issue, and to support other "comfort women"-related projects (Soh 2003, 223; AWF, n.d.). The Asian Women's Fund sent reparations to the "comfort women" consisting of private donations from Japanese nationals (Soh 2003, 222-223; 2008, 44; Min 2021, 169, 218; JMOFA, n.d.; AWF, n.d.). These private donations totaled somewhere between ¥448-600 million—roughly ¥2,000,000 or $18,800 per "comfort woman" (Soh 2003, 222; Min 2021, 218; JMOFA, n.d.; AWF, n.d.). The Japanese government, meanwhile, covered the operational costs of the Asian Women's Fund and provided ¥700-830 million to cover the fees for "comfort women's" health care services (Min 2021, 218; AWF, n.d.; Soh 2003, 222). Accompanying the money delivered to "comfort women" who accepted the payments were apology letters from the prime minister and the Asian Women's Fund's president (AWF, n.d.).

Overall, the Asian Women's Fund received mixed to negative responses in South Korea and internationally. Seven "comfort women" initially accepted the Asian Women's Fund's payments and letters (Soh 2003, 228; Min 2021, 219; AWF, n.d.). However, the majority of South

Korean "comfort women" did not accept the payments and letters, and the Korean Council—the primary "comfort women" advocacy group—publicly criticized the Asian Women's Fund. The chief criticism of the Asian Women's Fund was that because the monetary compensation came from private Japanese citizens' donations, Japan's government continued to "evade" its legal responsibility to provide compensation (Coomaraswamy 1996, 17; Soh 2003, 218, 228; Saito 2017, 92-93). In fact, the Korean Council objected to the Asian Women's Fund to such a degree that it urged "comfort women" not to take the Asian Women's Fund's payments and "refused to even meet with [Asian Women's Fund] staff members" (Min 2021, 219; Soh 2003, 228-229). Furthermore, the Korean Council worked with President Kim Dae-jung's administration to pay ₩31,500,000 ($20,000-$26,000) to each of the "comfort women" who had not accepted the Asian Women's Fund's payments in exchange for their promise not to accept the Asian Women's Fund's payments in the future (Min 2021, 219-220; Soh 2003, 228-229; AWF, n.d.). As it turns out, however, 54 "comfort women" who received the South Korean government's payments also accepted the Asian Women's Fund's payments, bringing the total number of South Korean "comfort women" who received Asian Women's Fund payments to 61 (JMOFA, n.d.; Min 2021, 220).[1] Given the increasing resistance to the Asian Women's Fund in South Korea, the Asian Women's Fund suspended its South Korean operations in 1999 (AWF, n.d.).

The most recent attempt to resolve the "comfort women" issue between Japan and South Korea was the 2015 Agreement (Announcement by Foreign Ministers of Republic of Korea and Japan at the Joint Press Availability 2015). The 2015 Agreement was negotiated between the governments of Prime Minister Abe Shinzo and President Park Geun-hye. On Japan's side of the 2015 Agreement, the Japanese

1 Min puts the total number of "comfort women" who accepted the Asian Women's Fund's money at sixty-eight, but I have chosen to go with the figure published by the Japanese government. It should also be noted the Japanese government's number is lower than Min's, so this is not an attempt to inflate the success of the Asian Women's Fund.

government issued another apology. At the press conference announcing the 2015 Agreement, Japan's Minister of Foreign Affairs Kishida Fumio stated:

> The issue of "comfort women" was a matter which, with the involvement of the military authorities of the day, severely injured the honor and dignity of many women. In this regard, the Government of Japan painfully acknowledges its responsibility.
>
> Prime Minister Abe, in his capacity as Prime Minister of Japan, expresses anew sincere apologies and remorse from the bottom of his heart to all those who suffered immeasurable pain and incurable physical and psychological wounds as "comfort women" (Announcement by Foreign Ministers of Republic of Korea and Japan at the Joint Press Availability 2015, 2).

In addition to the apology, the Japanese government agreed to make a one-time payment of one billion yen ($8,800,000-$9,500,000) to the South Korean government and the Reconciliation and Healing Foundation to be used to directly compensate "comfort women" (Announcement by Foreign Ministers of Republic of Korea and Japan at the Joint Press Availability 2015, 2; Choi 2018; Min 2021, 223). Professor Pyong Gap Min asserts that "comfort women" received $85,000 and deceased "comfort women's" family members received $18,000.

On the other side of the 2015 Agreement (Announcement by Foreign Ministers of Republic of Korea and Japan at the Joint Press Availability 2015), South Korea first pledged to consider the "comfort women" issue "finally and irreversibly resolved" once Japan apologized and made its payment and promised to "make efforts to appropriately address the concern" of "comfort women" statues (2015, 3-4). Action on the "comfort women" statues would also help with the third and final obligation for South Korea (which also applied to Japan): ending public criticism of each other's governments "in international forums,

including at the United Nations" (2015, 3-4).

Despite Kishida and Abe's apology and the provision of Japanese government funds for compensation, the 2015 Agreement was short-lived for three reasons. First, the deal lacked broad approval from the moment it was initially announced. Some representatives in South Korea's Parliament went as far as to call the Agreement "traitorous" and demanded the resignation of South Korea's Foreign Minister (Soble and Sang-Hun 2015). This may have been dramatic partisanship to a degree. However, significant opposition to the deal was also expressed through opinion polls. The newspaper *Korea JoongAng Daily* reported the results of a poll of 1,000 South Koreans that found 58% of the respondents disagreed that the 2015 Agreement resolved the "comfort women" issue, and 54% said they were not "content" with the deal (*Korea JoongAng Daily* 2016). Second, the 2015 Agreement was not accepted by the Korean Council (Min 2021, 223). Similar to their response to the Asian Women's Fund, the Korean Council tried to persuade "comfort women" not to accept Japan's payments, and they secured funds to pay the "comfort women" instead (Min 2021, 223-224). Third, the 2015 Agreement was short-lived because President Park's successor, Moon Jae-in, opposed the deal. Moon established a task force to investigate the 2015 Agreement's negotiation, and the task force ultimately concluded that the 2015 Agreement was unsatisfactory because the Park administration's emphasis on the "comfort women" issue jeopardized relations with Japan, the negotiations were not transparent, and the 2015 Agreement did not follow a "victim-centered approach" (ROKMOFA 2018, 3-4, 21-25; Jung 2017).

In sum, the Japanese government made attempts to resolve the "comfort women" issue, but none were satisfactory to the redress movement. Now that we understand what past Japanese attempts at resolution looked like and why they were unsuccessful, we can examine the CLA and determine if it could serve as a model for successful redress for the "comfort women" issue between Japan and South Korea.

Why the CLA was a Satisfactory Resolution

At the start of the 1980s, the US Congress and Reagan's administration were confronted by increasingly firm demands for redress for Japanese Americans' internment during World War II. In their book *Achieving the Impossible Dream: How Japanese Americans Obtained Redress*, scholars Mitchell T. Maki, Harry H. L. Kitano, and Megan Berthold show that starting in 1970, the Japanese American Citizens League—the largest Japanese American advocacy group—officially demanded that Congress pass "legislation to provide tax-free monetary 'reparations' to Japanese Americans (or their heirs) who were excluded and incarcerated during World War II and a $400 million fund for community projects" (1999, 64). Maki, Kitano, and Berthold describe how the internment redress movement grew in strength throughout the 1970s and persistently pursued redress for internment before Congress established the Commission on Wartime Relocation and Internment of Civilians (hereafter "the Commission") to investigate internment and provide recommendations for resolution (Maki, Kitano, and Berthold 1999, 64-83, 96; CWRIC 1982, 1). The Commission held 11 hearings where hundreds of people including "evacuees, former government officials, public figures, interested citizens, and historians and other professionals," testified to their experiences, research findings, or opinions concerning internment and possible redress (CWRIC 1982, 1; Maki, Kitano, and Berthold 1999, 99). Ultimately, the Commission recommended that Congress pass a resolution that: 1) acknowledges internment was an injustice and the US government's responsibility for that injustice; 2) contains a proper apology; 3) provides government-funded compensation to the victims; and 4) establishes an education fund for future studies on internment (CWRIC 1983, 8-10). Additionally, the Commission (1983, 8) recommended that President Reagan issue pardons for internment-related criminal convictions. Thus, we see that both the US and Japanese governments were faced with similar demands from their respective redress movements: a proper apology

from the national legislature, government-funded compensation, and educational measures.

Next, like "comfort women" redress proponents, supporters of the CLA had to contend with the argument that compensation and apologies had already been delivered. The most cited example of prior legislation that already provided compensation to internees was the Japanese American Evacuation Claims Act of 1948. The Commission described the Japanese American Evacuation Claims Act of 1948 as a law that only allowed people who were interned the "right to claim from the government 'damage to or loss of real or personal property,' not compensated by insurance, which occurred as 'a reasonable and natural consequence of the evacuation or exclusion'" (CWRIC 1982, 118). Altogether, the Commission (1982, 118) determined that the Japanese American Evacuation Claims Act of 1948 paid out $37,000,000 in compensation out of $148,000,000 in claimed damages.

Furthermore, scholars point out additional forms of partial redress besides the Japanese American Evacuation Claims Act of 1948. For example, Maki, Kitano, and Berthold discuss the Supreme Court's ruling in Honda v. Clark (1967) which "permitted approximately 4,100 Japanese Americans to recover bank deposits from the Yokohama Specie Bank Ltd… seized by the US government at the outset of World War II" (Maki, Kitano, and Berthold 1999, 60). Additionally, Maki, Kitano, and Berthold mention that Nixon signed a law in 1972 that gave interned individuals credit towards Social Security contributions (Maki, Kitano, and Berthold 1999, 67). Finally, in 1976, President Ford terminated Executive Order 9066—the executive order that started internment—and issued an apology (Maki, Kitano, and Berthold 1999, 70-71; Hatamiya 1993, 135). Thus, opponents of the CLA could point to several examples of redress already being delivered.

And point they did. For example, during the debate in the Senate over the CLA, Senator Strom Thurmond cited both the Japanese American Evacuation Claims Act of 1948 and President Ford's termination of and apology for Executive Order 9066, concluding "that these actions by

our Government have resolved this matter" (100 Cong. Rec. 1988, 7625). Likewise, Senator Malcolm Wallop pointed to the "undeniable facts" that the US government already atoned for internment by paying $37,000,000 in compensation via the Japanese American Evacuation Claims Act of 1948 and President Ford's apology (100 Cong. Rec. 1988, 7615). Senator Chic Hecht proposed an amendment (which was not adopted) to remove the monetary compensation in the CLA because he argued monetary compensation had already been provided via the Japanese American Evacuation Claims Act of 1948 (100 Cong. Rec. 1988, 7543). Additionally, Senator Hecht (1988, 7543) argued that compensation was financially irresponsible due to the $136 billion federal deficit. Finally, Senator Jesse Helms argued that "if [the Japanese American Evacuation Claims Act of 1948] was inadequate, those inadequacies can and should be determined and resolved by the courts—not in a political carnival in an election year by the Congress" (100 Cong. Rec. 1988, 7612). Clearly, there were numerous Congresspeople who believed redress had already been achieved.

These arguments that the US government already apologized and compensated Japanese Americans for internment did not stop Congress from passing the CLA, however, and even President Reagan signed the CLA into law despite his own Justice Department's public opposition. Why? Leslie Hatamiya's *Righting a Wrong: Japanese Americans and the Passage of the Civil Liberties Act of 1988* offers some insight. Hatamiya argues that Democratic leadership, the Nikkei Congressmen's efforts, the absence of a formidable opposition lobby, and the law's compatibility with some conservative values best explain why the CLA was passed by Congress (1993, 32-35, 48-49, 51, 81, 99, 100-120, 149-152). In addition, Hatamiya (1993, 1, 81) mentions in passing that the mission of the CLA was to "redress the loss of constitutional right, not compensate for any personal property losses" and "reconfirm[ing] all citizens' constitutional civil rights and civil liberties." I largely agree with all these sentiments, but I will tweak the final point. Yes, most prior redress measures focused on the economic injustices of internment. However,

President Ford's apology and revocation of Executive Order 9066 clearly sought to redress internment's unconstitutionality, and it still did not end the demand for redress. I believe the reason why the internment redress movement demanded a resolution that ultimately became the CLA was because prior redress measures were simply too piecemeal, too limited, and thus too inadequate. In sum, I agree with Hatamiya's analysis, but based on my reading of the Congressional Record, I emphasize that the key component to the CLA's passage was that proponents of redress successfully rebutted the argument that prior redress measures were adequate.

The argument that the CLA was needed because prior redress was too limited started with the Commission's findings and report. For example, in Chapter Four of its report Personal Justice Denied, the Commission noted that the Japanese American Evacuation Claims Act of 1948 only dealt with material losses—specifically property losses—at the time of evacuation. As the Commission declared:

> There were many kinds of injury the Evacuation Claims Act made no attempt to compensate: the stigma placed on people who fell under the evacuation and relocation orders; the deprivation of liberty suffered during detention in the assembly and relocation centers; the psychological impact of evacuation and relocation; the loss of earnings or profits; physical injury or death during detention; and losses from resettlement outside the camps (CWRIC 1982, 118).

Thus, the Commission found the Japanese American Evacuation Claims Act of 1948 too limited to be adequate redress.

This argument proved to resonate with many Congresspeople when it came time to pass the Civil Liberties Act of 1988. For example, Senator Inouye argued that "the individual payments acknowledge the unjust deprivation of liberty, the infliction of mental and physical suffering, and the stigma of being branded disloyal, losses not compensable under the Japanese Evacuation Claims Act of 1948" (100 Cong. Rec. 1988, 7543). Inouye's remarks about the stigma of internment and

discrimination of Japanese Americans was particularly powerful for other Congresspeople because Inouye was Japanese American and transparent about his experience with racial discrimination. In addition to Senator Inouye, Senator Dennis DeConcini argued that the Japanese American Evacuation Claims Act of 1948 was insufficient because it "only provided compensation for 75 percent or the total value of approved real and personal property losses or $2,500—whichever was less. The act did not allow for loss of liberty, income or pain and suffering. It even placed an elaborate proof of loss on the injured parties" (100 Cong. Rec. 1988, 7624). Thus, Senator DeConcini also believed prior redress measures were too limited.

Several Democratic House members agreed. For example, Representative Ronald Dellums stated he supported the CLA despite earlier redress measures because "later legislation, such as the [Japanese American] Evacuation Claims Act, did not come close to repaying the massive economic hardships imposed upon Japanese Americans" (100 Cong. Rec. 1987, 24287). Likewise, Representative Sidney Yates supported the CLA on the grounds that prior redress measures only redressed a "pittance of the actual losses that took place against those who had been placed in the camps" (100 Cong. Rec. 1987, 242302). Thus, numerous Democratic members of Congress were clearly convinced that redress had not been sufficiently attained by prior measures.

Moreover, this framing proved persuasive for several conservative members of Congress. Senator Orrin Hatch offered his support for the CLA despite prior redress measures by stating, "Despite various court rulings since [internment], it is clear that these citizens were denied their constitutional right to due process. The bill that we are acting upon today is truly an important step in correcting that denial of due process, and I intend to support its final passage" (100 Cong. Rec. 1988, 7619). Thus, Senator Hatch believed that a violation of civil rights required additional redress not provided in prior measures. Additionally, Representative Hamilton Fish supported the CLA and stated "It is important to emphasize that this $20,000 payment per person is not

reimbursement for the loss of property or employment. Rather…these individuals are being partially compensated for the violation of their civil rights" (100 Cong. Rec. 1987, 24280). Thus, Representative Fish clearly identified the limited nature of prior redress measures and explained why the CLA needed to be passed. Overall, it appears that stressing the limited nature of prior redress was another important strategy in gaining Congressional support for the CLA.

As we see, the CLA can serve as a strong model for a resolution to the "comfort women" issue between Japan and South Korea because it not only contained the required components for a satisfactory resolution (a proper apology, government-funded compensation, educational measures, and a victim-centered approach), but it also overcame similar obstacles facing the "comfort women" redress movement today (arguments that the government already apologized for the issue and already provided legal redress). Now, we can examine how the CLA specifically addressed the demands of the redress movement.

The CLA's text had three main parts: an apology from Congress, a plan for paying reparations to surviving victims of internment, and the announcement of a "public education fund" to ensure that internment would never be forgotten or repeated (Civil Liberties Act of 1988 1988, 903-916). Additionally, Congress's use of the Commission's hearings and its determination to address each of the redress movement's core demands can be considered a fourth component—a victim-centered approach. Recalling the four required components for a proper apology, Congress's apology contained all four. First, Congress conveyed remorse by saying it "apologizes on behalf of the Nation" (1988, 904). Second, Congress specified the "grave injustice" it was apologizing for: "the evacuation, relocation, and internment of civilians during World War II" (1988, 903). Third, Congress took responsibility by stating that internment was "carried out without adequate security reasons…and motivated largely by racial prejudice, wartime hysteria, and *a failure of political leadership*" [emphasis added] (1988, 903-904). Fourth, Congress provided a tangible example of planned changed behavior by

paying compensation and establishing a public education fund dedicated to studying Japanese American internment (1988, 908-909). In addition to a proper apology, the CLA also paid government-funded compensation to surviving internees. Specifically, the CLA provided $20,000 to surviving internees and $20,000 to the spouse, children, or parents of deceased internees (1988, 906-907). Finally, the CLA included educational measures which showed a commitment to changed behavior. The CLA created a "public education fund" to:

> sponsor research and public educational activities, and to publish and distribute the hearings, findings, and recommendations of the Commission [on Wartime Relocation and Internment of Civilians], so that the events surrounding the evacuation, relocation, and internment of United States citizens and permanent resident aliens of Japanese ancestry will be remembered, and so that the causes and circumstances of this and similar events may be illuminated and understood (Civil Liberties Act of 1988 1988, 903, 908).

In addition to this fund, the CLA mandated that all relevant documents from the Commission and Congress were to be preserved and made publicly available (1988, 909).

Can the CLA Set a Framework for a "Comfort Women" Resolution?

A bill modeled after the CLA could serve as a feasible model to resolve the "comfort women" issue between Japan and South Korea because it would check the four boxes required for a satisfactory resolution to the redress movement's demands. First, a resolution modeled after the CLA would include an apology passed by members of the Diet. Numerous individual officials have issued apologies in the past claiming to speak for the Japanese government, but the Diet has never passed its own apology. An apology that contains the four

required components for a proper apology, is passed by the Diet, and is approved by the prime minister would undeniably show that the Japanese government is remorseful for the "comfort women" system. Again, the groundwork has already been laid for this apology, most notably through the Kono Statement.

Second, a resolution modeled after the CLA would provide direct monetary compensation to former "comfort women" from the Japanese government. In the Asian Women's Fund, Japan was able to work with foreign governments and former "comfort women" to arrange direct payments, albeit consisting of private donations. In the 2015 Agreement, the Japanese government directly provided money to compensate the "comfort women," but the money was paid to a separate foundation in South Korea. Thus, the Japanese government has demonstrated it can provide government funds for compensation and that it can organize direct payments; it just needs to put the two together in the same resolution.

The third reason the CLA provides a feasible model for a resolution to the "comfort women" issue is the educational component. In the CLA, an education fund was established "to sponsor research and public educational activities, and to publish and distribute the hearings, findings, and recommendations of the Commission [on Wartime Relocation and Internment of Civilians]" (Civil Liberties Act of 1988 1988, 908). Again, possible models and groundwork have already been established for a similar organization in Japan to deal with the "comfort women" issue. For example, there is already an online museum dedicated to the "comfort women" issue and the Asian Women's Fund (AWF, n.d.). This website not only provides information on the "comfort women" system, but it also serves as an archive by providing digital versions of documents related to the "comfort women" system/issue. Additionally, there is the Women's Active Museum on War and Peace located in Japan which is dedicated to the "comfort women" issue (Min 2021, 214). The Japanese government could fulfill the educational component of a CLA-based resolution by creating its own museum on the "comfort women" issue, or it could publicly support these already existing museums through

financial contributions or organizing visits (in the Women's Active Museum's case) for government officials.

The fourth and final reason a "comfort women" resolution modeled after the CLA would be successful is that it would provide the Japanese government the opportunity to use a victim-centered approach. It is important that former "comfort women" and their advocates are given ample opportunity to participate in the formation of a new redress measure because—as we saw with criticism of the 2015 Agreement—victim participation is considered crucial to reaching redress today. The Japanese government could carry out another investigation or hold a public hearing for former "comfort women" and their advocates to give testimony (if they choose) prior to passing a resolution modeled after the CLA. This hearing could resemble a shorter version of the Commission on Wartime Relocation and Internment of Civilians' hearings. The Japanese government conducted some investigations prior to the issuing of the Kono Statement and the establishment of the Asian Women's Fund, so it would not be starting from scratch in terms of implementing an investigation or report on the "comfort women" issue (Saito 2017, 81, 90-91; AWF, n.d.).

Despite these reasons why the CLA provides a model to resolve the "comfort women" issue between Japan and South Korea, some may question whether their contexts are too incompatible. For example, skeptics may reject the use of the CLA as a model for resolving the "comfort women" issue by saying that the CLA was an entirely domestic measure where the US Congress negotiated with itself whereas a resolution to the "comfort women" issue requires Japan to negotiate with South Korea. I believe the contexts are still compatible for two reasons. First, I do not believe resolving the "comfort women" issue is a matter of the Japanese and South Korean governments negotiating; they already negotiated two attempted resolutions that ultimately failed for two reasons. One, the South Korean government has inadequately represented the redress movement's demands for a satisfactory resolution. The 1965 Agreement is considered by the redress movement

to have not addressed the "comfort women" issue. The Kono Statement was not accompanied by compensation because President Kim Young-sam stated the South Korean government would not demand it (AWF, n.d.; ROKMOFA 2018, 5). Finally, a Moon administration-appointed task force condemned President Park's negotiating of the 2015 Agreement for not using a victim-centered approach (ROKMOFA 2018, 3-4, 21-25). Since the South Korean government has demanded less from Japan than the redress movement to resolve the issue, the Japanese government naturally chose to meet the South Korean government's demands rather than the redress movement's. In contrast, a resolution based on the CLA would employ a "victim-centered" approach where the redress movement's demands are the focus of resolution. Two, the CLA is still a feasible model to resolve the "comfort women" issue because it would force the Japanese Diet—just like the US Congress in the 1980s with the issue of internment—to debate amongst itself and ultimately realize their responsibility for the "comfort women" issue and the inadequacies of past resolution attempts. Just as the CLA forced Congress to realize the Japanese American Evacuation Claims Act of 1948, President Ford's apology and revocation of Executive Order 9066, and several other redress measures had failed to resolve the injustice of internment, a similarly modeled resolution would force the Diet to realize why the 1965 Agreement, the Kono Statement, the Asian Women's Fund, and the 2015 Agreement all fell short. The second reason the contexts are still compatible is that because Koreans were subjects of the Japanese empire when the "comfort women" system was created, there is an argument that a resolution like the CLA, which addressed a domestic injustice, is appropriate.

Conclusion

So, can the Civil Liberties Act of 1988 serve as a model for resolving the "comfort women" issue between Japan and South Korea? I be-

lieve it can. The "comfort women" redress movement has consistently maintained that a proper apology from the Japanese government, government-funded compensation, educational measures, and a victim-centered approach are required for a satisfactory resolution. While Japan's government has made several attempts to resolve the issue with South Korea, these attempts fell short because none of them met all the required components of a satisfactory resolution. The 1965 Agreement contained no apology, and it is unclear whether the deal actually covered the "comfort women" system. While the Kono Statement did contain an apology, it did not contain government-funded compensation or concrete plans for educational measures. The Asian Women's Fund was ultimately unsuccessful in South Korea mainly because the compensation it provided only consisted of donations from regular citizens, not Japanese government funds. Additionally, the apologies from Japanese prime ministers included in the letters sent to the "comfort women" were ambiguous as to whether they reflected the prime minister's personal feelings rather than the government's feelings. Finally, the 2015 Agreement was scrapped because it failed to follow a victim-centered approach.

In the 1980s, the US government faced similar demands to provide redress for Japanese American internment. After a series of hearings where victims of internment testified about their experiences, the Congressionally appointed Commission on Wartime Relocation and Internment of Civilians recommended that the US government offer a proper apology, pay government-funded compensation, pardon internment-related criminal convictions, and implement internment-related educational measures. Congress eventually passed the CLA which met all those requirements.

Thus, the CLA can serve as a model to resolve the "comfort women" issue between Japan and South Korea. A resolution modeled after the CLA that must be approved by the legislature and signed by the chief executive clearly shows a government's remorse and acceptance of responsibility. Furthermore, such a resolution should include a public

hearing for "comfort women" and advocates to testify or submit records, provide state-funded monetary compensation, and establish educational measures for the study and/or memorialization of the "comfort women." A resolution that contains all these components should theoretically end criticisms that the Japanese government has not taken responsibility, listened to or worked with its former victims, and paid government-funded compensation.

More than thirty years since the "comfort women" redress movement emerged, redress has still not been achieved between Japan and South Korea. With so few South Korean "comfort women" still living, time is of the essence to reach an appropriate resolution, and I believe a resolution modeled after the Civil Liberties Act of 1988 presents a successful framework to resolve the "comfort women" issue between Japan and South Korea.

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Research Note: AI-Supported Thesis Development: A Practice Report on Implementing Prompt Engineering for Graduate Student Support in an East Asian Studies Program

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Abstract

This practice report details an innovative pedagogical intervention developed to address a persistent challenge in graduate education: supporting students in developing the theoretical framework for their master's theses. In the summer semester 2025, the East Asian Economy and Society (EcoS) program at the University of Vienna created the EcoS Prompt Generator (EPG), a low-barrier tool leveraging artificial intelligence (AI)[1] through optimized prompt engineering. Rather than training AI systems or committing to specific platforms, the project focused on developing individually customized prompt templates that students can use with any AI system of their choice. Early findings suggest improvements in submission quality, greater student autonomy, and more effective use of faculty supervision time. The intervention thoughtfully addresses practical, ethical, and data protection concerns while maintaining rigorous academic standards. This scalable model provides transferable insights for other graduate programs seeking to responsibly integrate AI tools into their thesis supervision processes.

1 Throughout this practice report, we employ the umbrella term "artificial intelligence" or "AI" in a deliberately broad and pragmatic manner, primarily to enhance readability. In most instances, our discussion centers on the use of large language models (LLMs), which, strictly speaking, represent only one subset of AI technologies. Unless otherwise specified, references to AI should therefore be understood as denoting those text based, conversational systems that currently dominate educational and public discourse, while acknowledging that the underlying concept of AI is considerably wider.

Introduction and Context

Graduation rates serve as a key indicator of a graduate program's performance. In our experience, master's theses consistently constitute the main bottleneck in degree completion once all coursework has been finalized. Developing and writing a thesis of at least 35,000 words that adheres to rigorous academic standards poses a considerable challenge for students with limited prior experience in academic writing. We found that the theoretical section, in particular—consisting of a precise and relevant research question, a purposeful literature review, and a cohesive analytical framework to address the research question—represents the primary impediment. This is further compounded by limited faculty resources and supervision capacity, as well as the varied methodological backgrounds of incoming students, as is to be expected in area studies programs, including East Asian Studies.

The MA program in East Asian Economy and Society (EcoS) at the University of Vienna exemplifies these pressures. The program is deliberately small, admitting around 25 students annually, and is supported by a lean core faculty comprising one full professor and one assistant professor, who are also the sole faculty members overseeing master's theses. As of July 2025, the program was supervising over 60 ongoing master's theses, some of which originated as far back as 2019. These theses cover a wide array of topics within contemporary East Asian political economy. Regular internal student surveys have consistently indicated that the thesis—particularly its theoretical development—represents the primary obstacle to degree completion. Many students successfully complete their coursework but struggle with the autonomous research required for thesis writing. This issue also applies to term papers written in seminars, though to a lesser extent. Within this context, expectations for independent, theory driven work converge with limited supervisory resources and a diverse student body, creating a structural dynamic where thesis completion can be protracted even for highly motivated students.

This practice report documents our solution: the systematic integration of AI-supported feedback through optimized and customized prompt engineering. In contrast to approaches involving the training of custom AI models or commitments to specific platforms, our solution emphasizes developing high-quality prompts specifically tailored for the EcoS program, usable with any AI system. This design choice not only ensures operational effectiveness but also addresses technical sustainability, data protection concerns, and institutional flexibility, all while equipping students with transferable skills.

The Challenge: Theoretical Framework Development

Identified Obstacles

Student surveys and faculty observations revealed four critical hurdles in thesis development:

- Formulating appropriate research questions
- Justifying research relevance using appropriate evidence
- Conducting targeted analyses of relevant scholarly literature
- Constructing sound and sufficiently concrete analytical frameworks

Students entering the program typically possess strong data-collection skills but often have limited experience in developing original research frameworks. Their prior training generally focuses on answering predetermined questions using established, and often pre-supplied, approaches, rather than on formulating and structuring their own inquiries. The EcoS student body includes both European and non-European students, resulting in varied educational backgrounds and different expectations regarding academic writing. A core didactic objective of the EcoS master's program is to develop the transferable competence of independently constructing theoretical frameworks, a skill that remains highly relevant across various professional contexts.

Previous Interventions

The program had already invested resources to address these challenges. Its two-year English-language curriculum was restructured to include dedicated research methods courses: two exercise courses supporting the development of term papers and one research seminar to lay the groundwork for students' master's theses. Requirements were made transparent through detailed assessment rubrics and nine component-specific checklists. Ten instructional videos, explaining each stage of theoretical framework development, were produced and made publicly available on YouTube, accumulating over 4,250 views by July 2025.

Despite these efforts, significant room for improvement remained. Individual supervision revealed that while passive engagement with videos offered some utility, it was insufficient for many students to develop the required competencies. Although more intensive direct supervision could remedy this, it would necessitate additional qualified staff—an unfeasible solution due to resource constraints.

The Solution: Prompt Engineering for AI-Supported Feedback

Design Principles

We identified AI as a cost-neutral, continuously available dialogue partner capable of providing concrete feedback on key aspects of students' work. Our intention and guiding principle were to complement and enhance personal supervision rather than replace it. By lowering the barrier for repeated inquiries and improving the quality of materials submitted to supervisors, the intervention aimed to increase supervisory efficiency while strengthening student autonomy. Accordingly, the use of AI remains voluntary, serving as a supplementary resource for students alongside direct supervisor feedback.

Our initial idea of training an AI system with hundreds of structured

examples of faculty feedback proved to be suboptimal for several reasons. Most importantly, the AI frequently failed to adequately grasp the underlying reasoning behind the feedback, resulting in inconsistent output and unreliable feedback. Furthermore, platform dependency introduced concerns regarding technological obsolescence, long-term sustainability, and associated costs. Lastly, integrating previous student submissions and faculty feedback presented data protection challenges due to international data storage regulations. Political considerations related to platform ownership further complicated this approach.

Collaborating with students in the summer 2025 course, "Methods in East Asian Studies: The Use of AI for Thesis Development," we determined that developing standardized AI prompts through prompt engineering would be the optimal solution. This method refines queries posed to AI systems, thereby ensuring high-quality, academically sound responses. Crucially, it is platform-agnostic, enabling students to use any preferred AI system—open-source, proprietary, local, or cloud-based. This approach is also sustainable, acknowledging the rapid evolution of large language models and the impracticality of committing to a single model long-term. Ultimately, this design ensures operational effectiveness, addresses technical, legal, and political concerns, and cultivates transferable digital-literacy skills.

Implementation

The project was centered on a dedicated course in the summer semester 2025, taught by Professor Rüdiger Frank with the assistance of Hubert Pawlowski. A guest lecture by an EcoS alumnus, who is involved in AI implementation within the Austrian federal government, enriched the course by offering a practical perspective on real-world opportunities and challenges of AI-integrated work processes.

The EcoS Prompt Generator (EPG)[2], a simple and publicly accessible

2 Accessible with instructions at *https://ecos.univie.ac.at/studies/ecos-students/ecos-prompt-generator, or directly at https://ecos-univie.github.io/ai*

HTML webpage hosted on GitHub, serves as the intervention's centerpiece. Corresponding to the current theoretical development stage of their thesis, students select from four options: (1) Topic and Research Question, (2) Relevance of the Research Question, (3) Literature Review Structure, (4) Literature Review and Analytical Framework. A fifth option allows them to check formal aspects of their submissions to ensure consistency. For each phase, the tool provides optimized prompts that integrate established assessment criteria, checklists, and explanatory materials. For instance, for the development of research topics and the formulation of a corresponding research question, students receive detailed prompts that encode geographic requirements—including the mandate for theses to cover at least two East Asian countries or to address a regional issue—structural criteria, causality considerations, and feasibility parameters.

Crucially, the EPG does not directly interact with AI systems. Instead, it generates prompts for students to copy and paste into their preferred AI platform. This design ensures student control over their data, prevents institutional liability for AI outputs, and maintains platform agnosticism. The tool underwent three development iterations based on systematic user feedback, demonstrating its capacity for continuous improvement.

Results and Initial Experiences

Observed Outcomes

Initial evidence indicates that the intervention is effectively achieving its core objectives. The quality of student submissions has demonstrably improved, with students consistently presenting more thoroughly developed concepts during supervision meetings. Students also report increased confidence in their independent work and appreciate the ability to refine their ideas multiple times before formal submission. Furthermore, the threshold for seeking clarification has decreased, as

students more frequently engage with course materials, facilitated by the AI's feedback.

Consequently, faculty supervision has become both more efficient and more valuable. Instead of reiterating foundational concepts, supervisors can now focus on substantive methodological guidance and disciplinary input. The AI effectively acts as an initial filter, identifying obvious problems prior to faculty review. In addition, students demonstrate a stronger understanding of academic standards and assessment criteria through their AI-mediated revisions.

Significantly, faculty supervision can identify AI-generated errors, thereby ensuring the maintenance of academic quality standards. The human supervisor retains final authority, preventing AI limitations from affecting thesis quality. This design operationalizes a central principle: AI functions as a support tool, not a decision-maker.

Student Engagement

Student adoption has been encouraging. Students use the EPG regularly and particularly appreciate the immediate feedback as well as the non-judgmental nature of AI interactions. Several students have reported that iterating with AI helps them articulate ideas more clearly before presenting them to faculty. Platform agnosticism, which allows students to use the AI systems they are most familiar with, further supports uptake.

Moreover, students view prompt engineering as a valuable transferable skill, recognizing its broad relevance and professional development advantages extending beyond thesis writing and academic support. Learning to structure effective prompts improves students' critical thinking regarding their own research, because the process of encoding their questions for AI consumption requires a more systematic reflection on underlying assumptions and research design.

The iterative nature of AI-mediated feedback appears particularly beneficial for students who are not native English speakers. This includes East Asian students writing in a second or third language, as

well as other students for whom English is not a first language. They report that refining their research questions through multiple AI interactions—free from time pressure or the fear of judgment—enhances both their conceptual development and their academic English expression. In this way, the AI functions as a patient interlocutor for both substantive reasoning and language practice.

Impact on Supervision Workflow

Faculty supervision patterns have shifted noticeably. Preliminary meetings now frequently focus on substantive methodological questions rather than basic structural issues. Students arrive with more concrete proposals that have already undergone initial refinement through AI feedback. These advancements enable supervisors to engage at a higher analytical level, providing the kind of disciplinary expertise and nuanced guidance that represents irreplaceable human contribution.

The time savings for faculty, while not yet systematically quantified, appear substantial. Anecdotal evidence suggests a significant reduction in the number of preliminary meetings needed before a research question receives approval. Students self-screen more effectively before requesting formal supervision time. This efficiency gain could potentially enable supervisors to manage larger student cohorts without compromising the quality of supervision.

Importantly, faculty retain full control over academic standards and remain the ultimate approval authority. The EPG explicitly frames AI feedback as a preliminary assessment subject to final faculty judgment. Students are made aware that AI approval does not guarantee faculty approval, although it significantly increases its likelihood given the improved quality of submissions. This hierarchy preserves academic quality while leveraging AI's capacity for immediate, tireless feedback on fundamental compliance criteria.

Transferable Insights for Practice

Key Success Factors

Several design choices seem critical to the intervention's success:

- **Platform Independence:** An agnostic approach to AI systems ensures technical sustainability, addresses data protection concerns, and respects diverse student preferences. Focusing on prompt design rather than AI training creates a more robust and transferable solution.
- **Transparency:** Embedding assessment criteria into prompts clarifies expectations for students, while ensuring AI feedback aligns with faculty standards. This approach transforms implicit evaluation norms into explicit, actionable guidance.
- **Human Oversight:** Retaining faculty as final authority upholds academic standards and allows for the correction of AI errors. The AI functions as a supportive tool for preliminary review rather than an autonomous evaluator—a crucial distinction for academic integrity.
- **Iterative Development:** Systematic user feedback and rapid iteration cycles drove continuous improvements in prompt quality and user experience. Three development iterations within a single semester demonstrate the approach's flexibility.
- **Skill Development Focus:** Framing prompt engineering as a transferable competency adds professional development value that extends beyond immediate thesis support, thereby enhancing student buy-in and delivering long-term benefits.

Scalability and Adaptation

The model demonstrates substantial scalability potential. The EPG infrastructure requires minimal technical resources—essentially a simple web interface for prompt delivery. While initial faculty time is necessary for prompt development, this investment yields reusable assets that can be refined incrementally. Once operational, the system demands minimal

maintenance, with only periodic updates needed to align with evolving AI capabilities and student needs.

Adapting this framework to other disciplines appears straightforward. The core principle of encoding disciplinary standards and assessment criteria within AI prompts is broadly applicable. While EcoS-specific criteria include regional coverage requirements and familiarity with East Asian sources, other area studies programs could easily tailor the framework to their particular geographic or thematic focuses. Although discipline-specific content would necessitate customization, the underlying technical infrastructure and pedagogical approach are directly transferable. The project has been made available across the University of Vienna to facilitate such adaptations.

Addressing Concerns

The intervention directly addresses common concerns about the use of AI in education. Mandatory faculty oversight preserves academic integrity, while platform agnosticism ensures technical sustainability. Data protection is handled by keeping information under student control and avoiding institutional AI contracts. Moreover, this approach enhances equity by providing all students access to the same high-quality feedback, regardless of their personal resources or their willingness and comfort in initiating faculty contact.

The approach also explicitly acknowledges AI limitations. The AI output generated through the prompts frames the feedback as a preliminary assessment rather than a definitive judgment, reminding students of the potential shortcomings of AI and encouraging them to question AI-generated suggestions. This method cultivates a healthy skepticism while leveraging the AI's utility. Specific disclaimers warn students that AI assessments can be inconsistent and may overlook important nuances requiring human judgment.

The tool's design mitigates concerns about over-reliance on AI. Given that the EPG only provides feedback on students' original submissions rather than generating content, students must develop their

initial concepts independently. This design prevents the tool from becoming a substitute for genuine intellectual engagement. Instead, it functions as a mirror, helping students reflect on and clarify their own work.

Implementation Considerations for Other Institutions

Institutions considering similar interventions should attend to several key factors. First, clear learning objectives are essential. Effective prompts embed explicit assessment criteria developed from years of pedagogical experience; without such criteria, prompt quality suffers. Programs should begin by defining the standards for high-quality work in their specific context before attempting to integrate them into prompts.

Second, faculty buy-in is critical. The intervention's success depends to a considerable extent on the faculty's understanding and endorsement of the embedded criteria. Successful implementation requires collaboration between discipline experts and those proficient in AI applications. Neither group can develop effective prompts alone—disciplinary expertise ensures academic rigor, while AI literacy guarantees technical efficacy.

Third, iteration and feedback cycles are invaluable. The EPG improved significantly through three development rounds based on systematic user input. Programs should plan for continuous refinement rather than expect immediate perfection. Student feedback is particularly important for identifying unclear instructions or unhelpful AI responses. Incorporating mechanisms for improvement into the implementation plan enhances long-term effectiveness.

Fourth, technical simplicity offers distinct advantages. The EPG's straightforward web interface requires minimal maintenance and presents few barriers to adoption. While more sophisticated approaches might offer a marginally better user experience, they would demand greater technical resources and introduce more potential points of failure. For most academic contexts, simple and robust trumps complex and fragile.

Future Directions and Research Opportunities

The initial implementation suggests several productive directions for future development and research. First, a key priority is the continuous refinement of existing components based on accumulated experience. This can be achieved by enhancing each prompt through analysis of student usage patterns, faculty feedback on submission quality, and identification of recurring conceptual gaps. The system's modular design allows for targeted improvements to individual components without disrupting its overall function.

Second, systematic evaluation is needed to substantiate the anecdotal evidence of the tool's effectiveness. A controlled comparison between student cohorts who use the EPG and those who do not could quantify its impacts on submission quality, revision cycles, time to completion, and student confidence. Such evidence would both validate the approach and identify areas for refinement. Additionally, a qualitative analysis of how students integrate AI feedback into their development process would illuminate the mechanisms through which the tool influences learning.

Third, tracking long-term outcomes is essential for assessing whether AI-supported thesis development affects degree completion rates and time-to-degree—the ultimate metrics of program effectiveness. The documented backlog of protracted thesis projects provides baseline data against which to compare future cohorts. If the intervention can demonstrably accelerate completion without compromising quality, the case for broader adoption will be considerably strengthened.

Fourth, investigating the tool's differential effects across student groups could inform crucial equity considerations. Do students with less initial preparation benefit more from AI feedback? Does platform agnosticism genuinely enhance access, or do resource constraints limit some students' AI options? Do non-native speakers experience particular advantages from the associated language practice opportunities? Such analysis can guide future efforts to maximize the intervention's equity-enhancing potential.

Fifth, adapting the model for other disciplines and institutional contexts would test its generalizability. While its fundamental principles appear broadly applicable, each field has distinct epistemologies and methodological traditions that define high-quality thesis work. Area studies programs beyond East Asian Studies—such as Latin American, African, or Middle Eastern Studies—face similar challenges in balancing regional expertise with transferable research skills. Documenting how different programs successfully adapt the approach would build a knowledge base to support wider adoption.

Finally, as AI capabilities evolve, prompt engineering best practices will also shift. Maintaining the EPG's effectiveness requires ongoing attention to developments in AI technology and periodic prompt revisions. This maintenance burden appears modest—perhaps requiring a review once per semester—but institutions should plan for sustained engagement rather than a one-time implementation. Building a community of practice among users facing similar challenges could distribute the burden of staying current with technical developments.

Conclusion

This practice report details a pragmatic, ethical, and scalable method for integrating AI support into graduate thesis supervision. By prioritizing prompt engineering over AI training or platform dependencies, the initiative ensures technical sustainability, data protection compliance, and pedagogical effectiveness. Initial findings indicate improvements in student work quality, enhanced supervision efficiency, and valuable skill development.

The model presents several advantages over alternative approaches. Its platform independence guarantees longevity amidst rapid AI advancements. Student data control addresses privacy concerns, while human oversight upholds academic standards. The focus on skill development offers lasting professional value, and low technical

requirements facilitate easy adoption and adaptation.

Future development will focus on refining the five existing prompt components—Topic and Research Question, Relevance of the Research Question, Literature Review Structure, Literature Review and Analytical Framework, and Formal Aspects—based on accumulated experience. It will also systematically evaluate the impact on completion rates and time-to-degree. The project has already proven viable and attracted interest from other programs, highlighting its potential as a blueprint for responsible AI integration in higher education.

The EcoS Prompt Generator demonstrates how educational institutions can leverage AI capabilities while simultaneously addressing legitimate concerns about sustainability, privacy, and academic integrity. Though developed within an East Asian Studies context, its principles are widely applicable to area studies and social science programs facing similar supervision challenges. Rather than viewing AI as a disruptive threat or an uncritical solution, this approach considers it a tool whose effectiveness depends on thoughtful integration into established pedagogical frameworks. As AI technologies continue to evolve, such frameworks—emphasizing human oversight, student agency, and explicit values—provide sustainable paths forward for their educational deployment.

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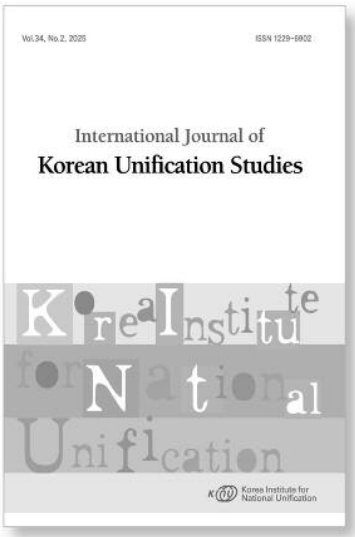

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