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# NORTH KOREA'S NUCLEAR AND MISSILE PROGRAMS

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## Abstract

The international community has consistently underestimated North Korean nuclear and missile capabilities. How has an economically impoverished, technologically backward, and internationally isolated state been able to establish robust and increasingly competent nuclear weapons and ballistic missile programs? Has the Democratic People's Republic of Korea (DPRK) achieved this on its own, as it proudly claims? Or has it been predominantly reliant on foreign sources and if so, to whom and in what ways? This brief synthesizes what we know about the development of North Korean nuclear and missile capabilities, which together makes up the country's strategic weapons complex. These industries have made rapid and concerted progress up the global innovation ladder over the past few decades. Indeed, this highly secretive apparatus is probably the most innovative, dynamic, technologically advanced, and privileged segment of the North Korean economy. The barriers to dismantling North Korea's nuclear program are substantial, and ultimately depend on strategic choices in Pyongyang. Will the DPRK continue to focus on developing the next generation of strategic weapons as negotiations stall out, or will they shift resources to other economic activities? Nuclear negotiations must consider the deeper implications of the sprawling nuclear and missile industrial complex: how to bring greater transparency to this infrastructure and assure it is rolled back.

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In 2017, North Korea undertook its sixth nuclear tests since 2006, and tested a number of missiles that appeared to have inter-continental range. After pausing this activity around the time of the North-South and U.S. summits, testing of new missile platforms resumed in 2019 and has continued into 2020.

How has an economically impoverished, technologically backward, and internationally isolated state been able to establish robust nuclear weapons and ballistic missile programs? And how do we approach North Korea's weapons of mass destruction (WMD) "complex" now that it is well-institutionalized? Drawing on a history of the development of North Korea's weapons programs, we argue that these questions need to be understood not only through standard security paradigms but through an industrial policy and organizational lens.

As with other developing countries with nuclear ambitions—from Pakistan and India, to Libya, Iraq and Syria—North Korea's nuclear and missile development has rested on emulation: importing, absorbing and developing pre-existing stocks of foreign technology and developing complementary local capabilities to assure they are successfully absorbed.

It is often thought that official support from the Soviet Union/Russia and/or China was instrumental, and there are points at which these relationships proved crucial. Yet the record also suggests that these two patrons were wary of North Korean ambitions, and that their assistance was either indirect or achieved through unofficial or even illicit channels, including through Iran and Pakistan, as well as aggressive use of open sources of information.

What makes the North Korean case so unusual is the surprising combination of low levels of economic development with an extraordinary development of capabilities. The effectiveness of North Korea's strategic weapons innovation system ultimately rests on the steady accretion of domestic capabilities under an authoritarian mobilization model. This highly centralized, state-led and top-down "big engineering" approach consists of several core elements:

- ◆ Top leadership prioritizes the program, and the state mobilizes and concentrates the country's science, technology, and heavy industrial resources on a select—but in North Korea's case ever-widening—number of programs.
- ◆ The nuclear and ballistic missile scientific community and defense industrial complex are tightly integrated with the country's civilian and military leadership.
- ◆ Leadership places priority on research institutions and trading entities tasked with securing technology and needed inputs from abroad through both official, informal and illicit channels.
- ◆ The regime invests in a wide-ranging defense industrial infrastructure that runs from basic research and development (R&D) to applied R&D, product

development, testing, linked industries devoted to the production of relevant inputs, manufacture of components and subassemblies and final output. Crucially, there is a close affinity between the leadership's focus on heavy industry and its nuclear and military ambitions.

*Even the poorest, most backward, and most isolated states can engage in the development of potent defense innovation capabilities if its leadership is willing to prioritize the effort, build complementary domestic capability, and exploit the many holes in the non-proliferation architecture.*



## Institutional Structure

How decisions get made in North Korea remains an issue of ongoing debate. Yet two features of the system are imminently clear. First, it has been highly centralized around the three Kims—Kim Il Sung (1948-1994), Kim Jong Il (1994-2011) and Kim Jong Un (2011-present)—who have typically held the top positions in the party, the state apparatus, and the military. This facilitates a key feature of the authoritarian mobilization model: the ability of the leadership to prioritize and coordinate activity across institutions that may be located in the party, state, or military.

Second, the system is state socialist, meaning that all units involved in the research, development, production, and operation of the defense-industrial complex fall under the direct control of the party-state. Although the regime is adept at operating in foreign markets, there are no North Korean private actors to incentivize. The principal-agent problems and potential inefficiencies of such command-and-control systems are well-known, but as the Soviet and Chinese innovation systems show, they are adept at mobilizing organizational resources around military modernization.

## Ingredients of North Korea's Success

The story of how the DPRK built a nuclear weapons and intercontinental ballistic missile capability goes against all geo-strategic, economic, and technological odds. Indeed, it is a test case for the role of politics and institutions—showing how even the poorest, most backward, and most isolated states can engage in the development of potent defense innovation capabilities if its leadership is willing to prioritize the effort, build complementary domestic capability, and exploit the many holes in the non-proliferation architecture.



Figure 1. Kim Jong Un watches the launch of a Pukguksong-2 intermediate-range ballistic missile with Kim Jong Sik (2nd left), Ri Pyong Chol (3rd left) and Jang Chang Ha (far right) in May 2017. (Credit: Korean Central News Agency)

#### What are the ingredients of North Korea's relative success?

- ◆ A unified and single-minded leadership with long time-horizons that is able to mobilize the entire resources of the country for an extended period to pursue its strategic goal regardless of economic and social costs at home and isolation abroad. This is especially the case under Kim Jong Un, who has shown laser-like focus and dedication to the development of strategic weapons capabilities.
- ◆ Significant access to foreign technology and knowledge, especially in the formative stages of research and development, and the continuing ability to acquire critical foreign technologies at later phases. This requires a well-connected and well-funded international network of suppliers and collaborators as well as an effective intelligence collection system.
- ◆ A well-trained and experienced group of scientists and engineers across the full range of scientific, technological, and engineering disciplines needed for nuclear weapons and ballistic missiles. On this dimension, North Korea appears to differ most sharply from the less comprehensive efforts of Libya, Iraq, Syria, and even Iran. A key feature of the North Korean nuclear and missile programs is

the particularly deep bench of dedicated scientific talent invested in the problem, housed at universities, research institutes and dedicated production facilities.

- ◆ An effective systems integration capability that is able to manage the diverse and complex design, research, development, and engineering processes involved in the absorption and reverse engineering of foreign technologies and marrying this with domestically developed technologies. Whatever its broader inefficiencies and inequities, the state-socialist system appears suited to this task, as both the Soviet and Chinese systems also demonstrate.
- ◆ An institutional culture willing to take risks, learn from mistakes, be flexible and adaptive, and to learn while doing. These characteristics may seem at odds with the highly ideological, risk-averse, and tightly regimented norms that appear to characterize the North Korean political system. But such clichés mislead, as the system has proved highly flexible and adaptive at the top.

## Can North Korea's Program Be Stopped?

The barriers to dismantling North Korea's nuclear program are substantial. Pyongyang has proven reluctant to negotiate, apparently quite comfortable with the deterrent it has achieved. But the issues moving forward are not limited to the perennial bargaining problems that confront the denuclearization effort. The North Korean military-industrial complex has also become a mainstay of the regime itself, enjoying an increasingly privileged status and representation at the highest levels of the state, party, and military apparatuses.

Given that North Korea has already developed a nuclear deterrent and has a substantial WMD complex, it is unlikely that the U.S. will be able to negotiate an agreement in which the nuclear program is effectively reversed. Rather, negotiations will need to focus on interim steps that cap certain capabilities. A natural starting point is to focus on limiting the production of fissile material at Yongbyon, moving from there to consideration of other possible sites. Limiting missile testing is another possible track. Even this modest proposal will require a strategic decision on the part of Pyongyang to shift resources away from the WMD complex, towards other economic activities, as well as a more open discussion of the concessions the U.S. will offer in return. But focusing solely on existing capabilities rather than the broader WMD complex underestimates the extent of the problem, and, as a result, will generate overly ambitious negotiating objectives.

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