

# Innovation Capacity in the People's Republic of China

## Report summary

*Frida Lampinen & Anders Schröder*

**In the past decade, innovation capacity has become a focal point in discussions on great power rivalry and geopolitical influence. Several international studies suggest that China may be surpassing the United States in innovation performance. A recent FOI report explores what it means to be ahead or behind in innovation. We find that quantitative comparisons of innovation capacity primarily measure invention, which, although critical, is by itself insufficient to produce economic, political or military power benefits. This may lead decision makers to overlook ways to support the organic momentum of innovation processes. Such an oversight could impede the realization of a state's full innovation power potential, which our study suggest may currently be the case in China. Xi Jinping has grand strategic ambitions, but national policies only partially play on the Chinese system's strengths. This indicates that the characteristics that have allowed China to advance in innovation—including its large population, market, and prominent enterprises — may be less consequential in a changed economic, demographic, and regulatory environment.**

**I**NNOVATION IS A multifaceted concept generally referring to the creation of new, or novel combinations of, knowledge. Broadly speaking, innovation carries positive connotations and is known to support economic growth and national power. In 2016, the Chinese Communist Party (CCP) adopted a strategy that places innovation at the core of national development and proclaims the People's Republic of China (PRC) will be a world-leading science and technology (S&T) superpower by 2050. Until recently, many international observers considered China a copycat incapable of innovation. However, in the past couple of years, several quantitative assessments have found support for the notion of the PRC as an S&T powerhouse.

Perspectives on innovation feature heavily in discussions on strategic competition between the United States and China. But what do observers really mean when they state that one is more innovative than the

other? Precise definitions are necessary to develop, implement, and evaluate policies effectively. In a recent FOI report, we examine what an understanding of innovation as a multi-step process implies for the efficacy of S&T governance in China and elsewhere. Depending on a nation's economic, political, and cultural factors, as well as contextual factors, different government measures to encourage the adoption and diffusion of innovations may be needed.

### **TAKING STOCK OF THE INNOVATION ASSESSMENT LITERATURE**

For a comprehensive understanding of innovation capacity, we propose an analytical model that views innovation as a process with four distinct steps. Each step is necessary, but on its own insufficient, for an innovation to produce social, economic or political effects, such as economic growth or enhanced war-

This memo is a summary of the FOI report *Innovation Capacity in the People's Republic of China*, FOI-R--5771--SE (June, 2025). Please refer to the full report for discussions on methodology, source materials, and references.

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fighting capability. Our model is based on insights from a broad innovation literature review, drawing particular inspiration from the work of Horowitz and Pindyck (2023). The four steps, illustrated above, are as follows:

1. *Invention* is the creation of a new idea or technology, or the use of an existing idea or technology in a new way to solve a problem.
2. *Incubation* is the process of an invention's gaining status and influence throughout an organisation.
3. *Implementation* is the process by which the invention is adopted and applied throughout the organisation.
4. *Diffusion* is the spread of the invention to other organisations or parts of the economy.

To better understand what international observers mean when stating that China is catching up to the West in S&T innovation, we apply this model to three recent quantitative reports: the Australia Strategic Policy Institute (ASPI)'s *Critical Technology Tracker*, the Information Technology and Innovation Foundation (ITIF)'s *Wake Up, America*, and Rand Corporation's *Comparative Analysis of US and PRC Efforts to Advance Critical Military Technology*. We find that the reports primarily measure invention capacity, for example in number of patents. ITIF also measures diffusion capacity. Very few of the variables measure incubation or implementation.

Since a state's capacity for invention does not necessarily correlate with its capacity to absorb, implement, and diffuse new technologies, a process perspective allows a more nuanced understanding of how inventions create, or fail to create, long-term innovation effects in a given context. In other words, invention metrics may lead us to under- or overestimate an actor's innovation capacity; in this case, that of China.

### S&T INNOVATION IN THE PRC: STRATEGIC AMBITIONS MEET SYSTEMIC FACILITATORS

It is important that we accurately understand the PRC's state-level capacity for S&T innovation because this is central to the CCP's strategic thinking on global power politics. The CCP values innovation as the means to fulfil three strategic goals: economic development, military power, and global political influence. To reclaim China's global power status, lost in the 19th century partly due to technological inferiority, the CCP has dedicated much effort to S&T policymaking and technological learning since the founding of the People's Republic in 1949, with a significant upgrade of ambition in the mid-2000s. The S&T policies of Xi Jinping largely build upon previous initiatives, but distinctive for Xi's leadership is that innovation is presented as the general solution to all sorts of social, environmental, financial, and security challenges.

International assessments, such as the studies mentioned above, appear to confirm that the CCP's efforts have brought good results. In addition to massive resource allocation and political prioritization, we argue that China's progress towards reaching S&T prominence was made possible by three systemic features that provide theoretically favourable conditions for innovation: positive population-level attitudes towards S&T, benefits of scale, and market competitiveness.

### INVENTION WITH CHINESE CHARACTERISTICS

Given the level of political priority afforded to innovation in combination with the systemic facilitators, it would be reasonable to assume that Chinese innovation capacity is set to continuously increase for the foreseeable future. However, analysis of national-level S&T policies under Xi Jinping indicates that policy focus on invention far outstrips the attention paid to incubation, implementation, and diffusion. Even though the innovation system exhibits characteristics that benefit the later steps of the innovation process, national-level policies do not appear make any particular use of these strengths. Chinese S&T personnel is undoubtedly incredibly

*inventive*, however, there are few policy measures in place to support the transformation of inventions into innovations generating economic, military, and international political power effects.

Instead, the driving force in Chinese innovation processes is domestic market interests. This has been the case since the 1990s, yet the market's ability to absorb new inventions may be reduced in coming years amid a changed economic, demographic, geopolitical, and domestic regulatory environment. Additionally, the PRC's innovation trajectory is challenged by the ability of innovation actors to adhere to the party line. Official CCP rhetoric portrays the strategic competition with the U.S.-led West as a confrontation of political systems and seizes every opportunity to use innovation as proof of the superiority of Chinese socialism. Thus, the stakes for success are high and China's innovation performances will be consequential for how the party frames its political legitimacy in the next decades.

### POLICY IMPLICATIONS

For international peer competitors, the PRC's uneven policy attention across the innovation process brings attention to the challenges that governments face in formulating innovation policy that plays on and reinforces the country's systemic strengths. A process model

perspective suggests that, in the context of national power and strategic competition, a state's national innovation capacity is only as strong as its weakest innovation stage. Broad initiatives to create an institutional, economic, and political environment that benefit technological learning and risk-taking entrepreneurship in general are of course important. Still, a processual perspective suggests that policymakers should consider the strengths and weaknesses posed by the characteristics of the innovation system not only in invention, but also in incubation, implementation, and diffusion. As such, it is questionable whether trying to outcompete China in the *invention* arena is the optimal course of action for most peer competitors, who might instead consider pooling efforts towards encouraging effective and accessible ways to introduce, adopt, and spread inventions from external sources throughout the domestic economy.

We suggest that future research may apply the analytical framework to other countries, examine the gap between the PRC's innovation policy and its action, and develop new variables for measuring incubation, implementation and diffusion in the innovation assessment literature. Such variables may include political and economic factors, cultural factors and contextual factors. ■

*Frida Lampinen* is a junior analyst at the FOI Division of Defence Analysis working with East Asian security issues.

*Anders Schröder* is an analyst at the FOI Division of Defence Analysis whose research focuses on innovation and S&T studies.

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