TOMMY SHIH AND CAROLINE S. WAGNER

# The Trap of Securitizing Science

In response to China's rise, Western governments are acting to limit scientific collaboration—but these measures will not increase economic competitiveness and could inhibit the practice of science itself.

In recent years, science and technology have emerged as critical domains reshaping the landscape of international relations and national security. In particular, the United States and the European Union have sought to enhance the security of critical research and development and academic research in response to perceived theft and exploitation by the Chinese state and associated companies. More broadly, with the West increasingly concerned by China's rapid advance as a science and technology powerhouse, policymakers have argued that heightened protection of national research resources is a necessity. We ask whether security constraints may serve to throttle the very asset that builds economic competitiveness in the first place.

This tension is particularly evident in critical and emerging technologies, including artificial intelligence, quantum information technologies, and semiconductors. All three technologies are essential for meeting US national security objectives, defined as protecting the security of the American people, growing the economy, and defending democratic values. With China seen as the main competitor to the West—with the intent and ability to change the international order—Western policy responses have increasingly sought to limit China's access to critical research resources.

One example is the effort by the United States, Japan, and the Netherlands to restrict Chinese access to advanced chip-manufacturing technology. In order to prevent deliberate theft of these assets—and to prevent so-called unwitting collectors from transferring knowledge illicitly—US officials have stepped up oversight of scientific cooperation with actors in China. Although the US Department of Justice's China Initiative, started during the Trump administration, has ended, some of its provisions, such as those for vetting foreign researchers, have been further developed and formalized by agencies including the Department of Defense. And in August 2024, the United States allowed the US-China Agreement on Cooperation in Science and Technology to lapse, at least for the time being. The pact had supported some 45 years of exchanges between researchers in the United States and China.

These developments mark a significant departure from recent history. During the first two and a half decades of the post–Cold War era, China and the West engaged avidly in scientific and technological cooperation, transcending geopolitical rivalries. The exchange has been productive for both sides—and for the development of scientific knowledge generally. Chinese researchers, working in the West and within China, greatly enhanced the stock of knowledge. Notably, China-US cooperative research is cited more highly than work published by researchers from either country working alone, according to analysis by one of us (Wagner).

It's important to protect sensitive technologies. But perhaps too little attention is paid to the tradeoffs between scientific collaboration and its need for openness, its contribution to economic competitiveness, and the demands of security. Openness remains a critical component of a healthy research system. Friction around collaboration and

trust may harm US innovation and discovery more than security will help it. What's more, making research pay off—in the form of economic competitiveness and jobs—requires a different set of policy tools than those pointed at security.

In the 1980s, when the US economy was challenged by a rising Japan, national policymakers responded with changes to shore up the knowledge economy. They dramatically restructured R&D tax credits; overhauled antitrust policy to allow precompetitive research cooperation; and boosted government-industry cooperation with new contracting mechanisms. Industry and government partnered in support of semiconductor research through SEMATECH; patent policy gave universities bold new rights; and several other interventions bolstered economic growth. This time, we argue, the primary policy response to China's advances has been to reduce engagement around research.

We believe that legitimate security concerns can be addressed without sacrificing research openness and the myriad benefits it brings. What is needed is clarification between securitization and international cooperation: as secure as needed, as open as possible. Policymakers should recognize that security alone cannot strengthen Western economic or scientific leadership; international collaboration has become an essential ingredient to scientific and technological advancements. Moreover, security—whatever its real or perceived benefits—can be pursued to a point of excess, at which point it erodes democratic institutions and values.

## The rise of openness, and of Chinese science and technology

China's ascent as an important engine of development in science and technology can be traced to the late 1970s, in the wake of the Mao era. Upon becoming China's paramount leader in 1978, Deng Xiaoping adopted the Four Modernizations program, which prioritized development in agriculture, industry, national defense, and science and technology. At the same time, Western powers interested in improving relations with China and in nudging Beijing toward a more liberal political system viewed science and technology as low-risk cooperation. Some of these powers, including the United States, eagerly promoted openness generally—and exchange with Chinese scientists in particular.

In 1978, amid the normalization of diplomatic relations between the United States and China, presidential science advisor Frank Press led a delegation of US scientists to China. This visit resulted in the signing of the US-China Agreement on Cooperation in Science and Technology in 1979. Concurrently, President Jimmy Carter invited Chinese students to study at US universities. By 2000, about 50,000 Chinese students were enrolled in US universities, something unthinkable in the Mao years. And more came. By 2019, some 370,000 students from China were studying in US universities. Historically, many of these students remained in the United States after graduation, but today more scientists appear to be returning home.

Although official actions helped create ties between Western nations and China, they also owed much to the informal efforts of scientists taking advantage of the opportunities enabled by the drawdown of the Cold War. The dissolution of the Soviet Union, the reunification of Germany, and the increasing integration of Europe freed up a generation of scientists to work together. The resulting self-organized networks of researchers were driven by powerful norms of openness and reciprocity.

The global network that grew out of these emergent relationships proved to be constructive and attractive: there is a high correlation between a researcher's prestige and the likelihood that the researcher works at the international level. By the 2020s, international collaborations grew faster than national ones for all the large Western powers. A query of the Web of Science database shows that, in 2022, internationally coauthored papers accounted for as much as 45% of scientific articles, depending on the field.

As Chinese researchers' capacity grew, they became integral parts of the global scientific community. The effects have been profound, contributing significantly not only to China's current status as a leader in fields including artificial intelligence and quantum computing, but also to science more generally. As one measure of productivity, the share of scientific papers published by researchers in China rose from less than 2% of the global total in 1990 to 25% in 2023, according to Wagner's analysis. Authors affiliated with Chinese institutions now surpass US counterparts in both quantity and impact of research, particularly in critical technology areas.

Underpinning this output is a vast expansion of China's educational and research infrastructure. From 1991 to 2018, according to the Organisation for Economic Co-operation and Development (OECD), China's R&D spending surged from $13.1 billion to $462.6 billion, accounting for nearly a quarter of global R&D investment. In addition, the number of Chinese universities has tripled since 1990. The OECD reports that in 2020, China produced 3.6 million STEM graduates, compared to 820,000 in the United States. A nationwide network of government-funded laboratories complements Chinese industrial research efforts. It's no wonder that, by 2022, nearly half of global patent filings came from China.

Researchers in China joined a global network of collaborators working together, prompted by the demands of their subject matter and the extra attention gained from global connections. This network grew organically at exponential rates in the years after the Cold War, as knowledge creation became unfettered from political constraints. Greater efficiencies emerged. The rules of engagement for what Wagner has described as a "new invisible college" were established by

the researchers themselves—no global ministry of science set the conditions. Elite researchers sought one another out as collaborators (see, for example, the Noble Prize–winning work of French microbiologist Emmanuelle Charpentier and American biochemist Jennifer Doudna on CRISPR). The network was stunningly vibrant and productive.

## Increasing competition

The rapid advancement of China as it joined, benefitted from, contributed to, and exploited the global scientific and technological network now carries profound implications for global power dynamics. As history has shown, technological leadership shapes military capabilities, drives economic strength, and ultimately determines a nation's position in the international system. China's superiority threatens what scholars Jessica Weiss and Jeremy Wallace call the "liberal international order," which has been underpinned by Western—particularly, American—technological supremacy and the liberal values enabling it. China, in contrast, has developed energetic science and technology sectors on the basis of an autocratic government forming *strong interconnections* among the state, business, and science, in ways considered anticompetitive in the West.

US policies on research security started to intensify around the start of the China Initiative during the Trump administration. The initiative had little success in prosecuting alleged spies infiltrating US universities, corporations, and laboratories. Although the Biden administration formally abandoned the initiative, it has continued to push for increasing federal oversight of funding institutions and researchers. In January 2022, the White House issued guidelines requiring that researchers enhance their security practices in order to be eligible for government funding. Federal regulators are focused on several areas of control, including standardizing disclosure requirements for US researchers collaborating internationally, vetting collaborators, developing consequences for violation of the requirements, and imposing information-sharing rules.

European policymakers' attitudes toward China have also hardened in recent years. In 2019, the European Union labeled China a partner, competitor, and systemic rival, indicating an intention to continue collaboration in trade, science, and technology—but also to counter a strengthening China and to reduce European dependencies on the goods and services it provides. The ambition of European policy, as proposed by European Commission president Ursula von der Leyen in 2023, is *de-risking*. Although it is still unclear what this will look like in practice, its purpose is clearly to enhance Europe's capacity to supply its own needs and to prevent what von der Leyden called "forced technology or knowledge transfers" to China. In January 2024, the European Commission published a white paper proposing more robust export controls, heightened research security, more research on the dual-use potential of technologies subject to Chinese state appropriation, and enhanced assessments of risks due to outbound investments. In May, European Union member states adopted the European Council's recommendations for enhanced research security.

## Are the measures sound?

Increasingly, government actors in Western countries have reinterpreted scientific activities as security issues. As much as this is bad news for science, it is also not clear that proposed protective measures will meet other national goals, such as economic competitiveness and growth. Furthermore, it is unclear whether these measures can meaningfully address stated security threats or have any useful effect on reducing China's domestic capacity. The brief evidence regarding these policies' effects so far suggests that they will fall short of their goals.

Consider, for example, the issue of economic competitiveness. This relates to R&D in at least two ways: the first is the ability to come up with new ideas, and the second is use of these ideas to create jobs and economic activity. One of the goals of recent China-focused policies has been to *decouple* from reliance on China in order to develop internal capacity and jobs. However, the costs of decoupling from China are high. Australia offers a case in point. Australia has lately adopted a hawkish approach toward China, yet 2023 saw a record level of trade between the two countries. Interdependencies forged over three-plus decades of globalization policies cannot just be severed overnight, particularly when consumers depend on the low-cost goods China supplies.

If the goal of securitization is to preserve the ability to come up with new ideas to build economic competitiveness and excellence domestically, then rigid measures designed to protect research institutions will be counterproductive. Excellence requires access to a global pool of talent. As North American and European education systems stagnate, the demand for foreign-born STEM talent will only increase. Far from being assured by securitization, European and North American competitiveness will more likely erode without international collaboration and researcher mobility.

The same is true of scientific productivity, which will be hard to sustain amid reduced collaboration or enhanced scrutiny. Since 2018, the number of US-Chinese copublications have been falling across a variety of research areas. Surveillance of researchers and institutions has led to broader declines in international collaboration, not just collaboration with China. US-European copublication has also dropped, illustrating the difficulty in surgically eliminating "undesired" exchanges.

Furthermore, if the goal of securitization is to maintain a thriving democracy, then current measures are similarly counterproductive. Policies for greater security may undermine democratic institutions. There is already evidence that scientists of Asian and Chinese descent felt that the China Initiative

exposed them to xenophobia, racism, and ethnic profiling in scientific institutions. Not only does this undermine liberal values and unfairly target researchers, it also limits access to talent and stifles free exchange and openness, all of which are likely to sabotage competitiveness rather than bolster it.

Finally, another way that securitization risks undermining democratic institutions is through *reflexive control*—defined as "a means of conveying to a partner or an opponent specially prepared information to incline him to voluntarily make the predetermined decision desired by the initiator of the action." The China Initiative exemplifies this problematic strategy: established with the explicit goal of preventing economic espionage detrimental to national security, the program didn't designate specific actions or sectors as problematic but ended up overwhelmingly targeting people of Chinese backgrounds. It should be unsurprising, then, that the effort produced few national security–related charges or convictions, instead producing allegations of misconduct such as animal smuggling, hacking of noncritical systems, and improper research methods. Those indictments that were brought numbered about 160, according to a study published in *MIT Technology Review*. The recent legislative effort to "develop an enforcement strategy concerning nontraditional collectors, including researchers in labs, universities, and the defense industrial base, that are being used to transfer technology contrary to United States interests," if successful, is likely to augment the harmful effects of the original policy.

## A better way forward

In the rush to securitize national science and technology systems, are policymakers working at cross-purposes? As political scientist Graham Allison has argued, today's China-US tensions resemble what he calls the *Thucydides trap*: when a rising power threatens the supremacy of an incumbent, the resulting fear and overreaction can significantly raise the risk of confrontation. By extension, if securitization potentially undermines peace, it certainly undermines the capacity of national science and technology systems to advance the state of the art and the state of knowledge.

Perhaps because openness is mostly a product of everyday activities that require no state action, it is easy to forget that it has underpinned so much scientific development. Then too, the calculations of security agencies, by their nature and political mandate, tend to emphasize threats of foreign engagement and overlook the benefits. These agencies may also claim access to classified information, making it hard for university administrators, politicians, and the press to scrutinize their analyses. But it is even harder for security agencies to assess the impact of security measures on research productivity and the strength of Western science and technology systems.

This is not to say that researchers should ignore security concerns. To be effectively avoided, real security issues must be carefully defined. However, evidence from Swedish-Chinese research collaborations suggests that the challenges attending cross-border collaborations are typically in the gray areas of discretionary responsibilities, not legal compliance.

We hope that two new initiatives at the National Science Foundation (NSF) can help develop a better sense of which activities and conditions are truly problematic. Safeguarding the integrity and security of US research while keeping fundamental research open and collaborative is a goal of NSF's Safeguarding the Entire Community of the US Research Ecosystem, or SECURE, program. NSF's Research on Research Security Program aims to explore the challenges and identify critical areas of concern. The European Commission is aiming to create a similar initiative to develop a center of expertise on research security. These activities can help close the gap by offering clear boundaries and defining genuine risks and responses appropriate to research actors and environments.

To accomplish their goal of balancing security concerns against the benefits of openness, these centers must have political independence so that their analysts are able to carefully consider the tradeoffs between security and knowledge creation.

At the most basic level, security measures must be aligned with ways in which science and technology thrive: an emergent system created by links among researchers. Knowledge is openly shared and often cocreated, flowing readily to those who can absorb it. Absorbing new knowledge is usually fair game: it is neither illegal nor inappropriate, and all parties can use similar strategies to increase their capacity to absorb scientific information and scientific thought. Securing specific parts of the research system is only one part of the transformation that is needed to become smarter, faster, and more efficient at putting knowledge to use.

In other words, to retain thriving research and innovation systems, democratic states must learn to live with the advantages and disadvantages of openness. With this in mind, governments must clearly communicate what law enforcement, the intelligence community, and the research sector should expect. And, as they have in the past, governments should adopt a suite of deliberate policy strategies to achieve economic security, jobs, and competitiveness. Strategic ambiguity may have its uses in international relations, but science, dependent as it is on emergent networks of trust, cannot thrive when scientists and the conduct of science itself are objects of suspicion.

***Tommy Shih*** *is an associate professor at Lund University and an advisor to the Swedish Foundation for International Cooperation in Research and Higher Education as well as other international funding agencies.* ***Caroline S. Wagner*** *is a professor at Ohio State University.*