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China Refocuses Its Science and Technology Ecosystem on Innovation and Security

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The government of China (GOC) is overhauling its science and technology (S&T) ecosystem in ways that are sharpening geostrategic rivalry and impacting the risk portfolios that research security professionals manage. This overhaul aims to integrate basic science in priority fields with state-led mobilization of capital and S&T assets to enhance China's global influence as an innovation hub and advance policy goals such as self-reliance, "economic strength, defense strength, comprehensive national power, enhancing human welfare, and promoting global development."[1] Its features include:

- A new theoretical frame to drive S&T policy and practice
- Greater centralization of administrative control over research
  - A Central Science and Technology Commission, and rescoped roles for state S&T organs such as the Ministry of Science and Technology (MOST) and National Natural Science Foundation of China (NSFC)
  - Reforms to sponsored research, publication, and merit review systems to improve quality and integrity
- Deepening ideological control
- An expanding framework of laws and regulations
- Cascading policy and financial support at the national, provincial, and local levels for priority disciplines and technologies
  - Emphasis on targeted R&D
  - Major state investments in national labs, big science infrastructure projects, and national champion firms
  - Innovation clusters to promote national self-reliance and global leadership
  - Tighter integration between academic research, industry, and the military
  - Reforms to stimulate state and market-based financing for innovation
- Greater attention to IP and technology transfer
- Expanded workforce training and talent recruitment
- "New type research universities" (新型研究型大学) and promotion of a China-centric ecosystem of open international platforms subject to GOC control
- Greater secrecy and obfuscation

SUMMARY

The government of China (GOC) is overhauling its science and technology (S&T) ecosystem in ways that are sharpening geostrategic rivalry and impacting the risk portfolios that research security professionals manage. Drawing on authoritative Chinese-language policy documents, this advisory highlights several features of that overhaul to enhance situational awareness for the US research community.

The Theory That Drives S&T Policy and Practice in the People's Republic of China (PRC)

S&T Will Catapult China Ahead of Other Nations

In 2023, General Secretary Xi Jinping unveiled his theory of new productive forces, which aims to "promote industrial innovation through scientific and technological innovation, especially disruptive and cutting-edge technologies."[2] This theory guides Xi's push to escape the gravity of China's sagging economic model, its extreme debt, declining factor productivity, slowing growth, and aging demographics. Xi is gambling that S&T can catapult China to the forefront of a new industrial revolution, leaving behind fading powers like the United States. Access to foreign research and overcoming controls on "chokehold" foreign technologies are vital to success.

S&T IS A BATTLEFIELD

The GOC is reaching for S&T dominance. In April 2025, Xi proclaimed that "technological revolution and great power competition [are] intertwined, making high-technology fields the forefront and main battlefield of international competition, profoundly reshaping the global order and development pattern." He has vowed to "seize the commanding heights of technological competition and future development" and has ramped up state investment in S&T and centralization of control by the Chinese Communist Party (CCP) over it.[3]

The Party and the State Must Lead Science

CENTRALIZATION OF CONTROL

The GOC regards its extraordinary capacity to mobilize and direct the allocation of S&T assets toward the achievement of national targets as a hallmark of its superior system of governance. As a June 5, 2025, report explained, "If traditional scientific research is likened to 'single-soldier combat,' then 'organized scientific research' is more like an elite force—with clear goals, division of labor and cooperation, and concentrated efforts to 'fight hard battles,' aimed at national strategic needs and the world's scientific and technological frontiers."[4]

In 2023, the party established a Central Science and Technology Commission (CSTC) to exercise unified leadership over China's S&T agenda and enforce performance accountability. The CSTC's responsibilities include strategic planning, harmonizing governmental effort, promoting innovation, and coordinating the fusion of military and civilian S&T.[5] Provincial and municipal level governments have established corresponding S&T commissions, comprising a chain for integrated policy transmission and implementation.

The government S&T organs that many international observers know best, the Ministry of Science and Technology (MOST) and the National Natural Science Foundation of China (NSFC), report to the CSTC. In fact, MOST now operates as the CSTC's executive arm and public face (see table 1). Laudable initiatives by MOST and the NSFC to strengthen basic research, improve the quality and integrity of PRC science, and encourage international collaboration are therefore in service to

TABLE 1 ▸ CHIEF RESPONSIBILITIES OF THE CENTRAL SCIENCE AND TECHNOLOGY COMMISSION AND THE MINISTRY OF SCIENCE AND TECHNOLOGY

Central Science and Technology Commission (CSTC)	Ministry of Science and Technology (MOST)
National Strategic Planning of S&T Policy, including: • Establishing national priorities in S&T • Coordinating strategic development of national S&T infrastructure, including national labs • Authoring S&T development plans • Coordinating with other agencies to promote S&T reform	Implementation of Policy determined by the CSTC, including: • Managing CSTC administrative duties • Deploying government funds in key areas • Constructing national labs • Integrating industry and academia • Supervising regional S&T policy implementation • Building supervision and evaluation systems for S&T policy • Evaluating research integrity • Promoting international collaboration • Issuing S&T awards

and inseparable from the CSTC's overall mission to indigenize innovation, promote self-reliance, and enhance national power. As if to underscore this point, on May 29, 2025, PRC state media revived a 2016 quote from Xi Jinping: "Science and technology are tools of the state on which a country's strength depends, on which enterprises win, and on which the people's livelihood depends."[6]

DEEPENING OF CONTROL

The GOC genuinely welcomes international research collaboration, but on its terms, under its supervision, and in furtherance of its objectives and interests. To increase discipline, party organs have taken a more direct hand in the governance of the academic and corporate sectors. For instance, in 2023 the president of the Chinese Academy of Social Sciences announced that "CASS is a scientific research institution, but first of all, it is a political organization, and politics is the first attribute and the first requirement."[7] The following year, party committees at a number of leading universities, including Tsinghua, absorbed their corresponding university presidents' offices, which direct routine academic and administrative affairs. In a practice known as "one structure, two signboards," the latter retain a nominally distinct identity, in part for foreign consumption, that eases international exchanges by preserving a veneer of institutional autonomy. In the commercial sphere, since 2018, all publicly listed firms in China must have an internal party cell, and many have strong CCP representation in their management committees, though frequently the composition of this representation is not disclosed.[8]

IDEOLOGY AND POLITICS ARE ALWAYS IN COMMAND

In China, the Ministry of Education requires the integration of CCP ideology and politics across the STEM curriculum so that researchers clearly understand what the party expects of them.[9] Many researchers find this a burdensome distraction; others see opportunities to manifest a synthesis between their research and regime loyalty. To assist them, teaching guides have proliferated

with titles like *A Collection of Case Studies for Teaching Ideology and Politics in Internal Medicine Courses*.[10] Similar volumes address disciplines such as environmental science, biology, and electronic information engineering. In short, no corner of S&T in China stands apart from the mandate to serve the party and the nation.

A MORE RESTRICTIVE LEGAL ENVIRONMENT

The regulatory environment for research in China is changing in tandem with party S&T policy and geopolitical circumstances. One should not rely on legal advice or assurances from research partners in China; commitments, whether informal or contractual, may create legal liability or be unenforceable if they are at variance with evolving policy and regulatory instruments. In light of these risks, research security programs are advised to track developments in these areas and seek qualified, independent risk assessments.

The GOC asserts rigorous controls over data transfers through its sweeping 2021 Data Security Law (DSL), 2016 Cybersecurity Law (CSL), and 2021 Personal Information Protection Law (PIPL). This triplet of tools constitutes the basis of the PRC's data and cybersecurity governance regime. The DSL is of particular importance in the S&T domain, as it requires data generated in the PRC to be stored locally, classified based on its relevance to national security, and strictly regulated regarding potential cross-border data flows. This regulation effectively allows the government to restrict the outward flow of S&T information from domestic enterprises and research institutions at its own discretion, while also giving legal justification to access data generated or used by foreign entities operating within the PRC.[11]

On the other hand, the CSL requires that foreign companies operating in the PRC, for instance, must go through and pass a mandated cybersecurity review, the result of which may be determined at the discretion of authorities for reasons including "[endangerment of] national security, national honor, and national interests." This process can effectively give domestic entities a competitive advantage, as was the case in 2023 with the American semiconductor company Micron, which was determined to have failed a cybersecurity review and subsequently barred from selling certain products in the PRC. Despite legal justification via the CSL, analysts believe that authorities' targeting of Micron was instead motivated by the desire to inflict tit-for-tat measures in response to US export controls and to lessen competition for domestic semiconductor firms.[12]

In 2023, the GOC also updated its 2014 Counterespionage Law to expand the definition of espionage to include not only "state secrets" but also "[any] documents, data, materials, and items related to national security and interests." As with the DSL and CSL, the use of this ambiguous terminology gives the GOC significant latitude to act on motives that may include stifling foreign competition. To date, the revised Counterespionage Law has been cited in several high-profile cases that have led to raids by GOC authorities on multinational corporations operating in the PRC. Foreign scholars and business executives have been charged with violations of this law and imprisoned, and because the law applies extraterritorially, they can be punished for activities that occurred outside of China. In a 2025 case, a Japanese woman was arrested in China and sentenced to six years in prison for activity that had occurred more than a decade earlier in Japan.[13] Similarly, Hong Kong's National Security Law applies extraterritorially and criminalizes activities, including acts of free expression, that are nevertheless lawful in the foreign jurisdictions in which they occur.[14] Such extraterritorial reach may expose foreign scholars to legal liability.

Leaping Forward

CHINA'S S&T EXCELLENCE IS SURGING

From 2012 to 2023, China's gross domestic expenditure on R&D (GERD) increased by 224 percent, as compared to 120 percent for the United States.[15] The results warrant respect. Despite external attempts to slow China's progress, the GOC has achieved global preeminence in some of the high technology sectors enumerated in its Made in China 2025 plan, and increased self-reliance and competitiveness in many of the others.[16] It owes this success to a combination of determined leadership, immense investments in human capital and infrastructure, and strategic use of international collaboration, discriminatory market practices, subsidies, forced technology transfer, misappropriation and theft of intellectual property, and cultivation of national champions.

China's progress in academic science has been even more impressive. The GOC expects universities to demonstrate initiative and creativity in meeting their key performance indicators and by some measures they are performing brilliantly.[17] Ten of the fifteen universities that published the most papers in the top 10 percent of their fields are in China, including Zhejiang University, which ranked second behind Harvard and nurtured much of the talent behind DeepSeek.[18] Between February 2024 and January 2025, twelve of the fifteen top academic institutions in the world measured by research output in the 145 prestigious journals tracked by the Nature Index in the natural and health sciences were in China.[19] According to the index, "Leading institutions outside China are struggling to keep their position."[20]

China's portfolio of world-class innovation clusters and big science infrastructure projects is surging, such as Suzhou's BioBAY and Beijing's High Energy Photon Source. The GOC is positioning these sites as new global centers for science and magnets for collaboration. If the community of foreign researchers involved with them expands, then research security programs will need to adapt and keep pace.

FORGING INNOVATION CHAINS

The GOC is now pursuing a results-driven vision of S&T development that increases support for basic science while focusing on targeted fields over free exploration. Breaking precedent, it has not released its current *Five-Year Plan for S&T Innovation* to the public, but other documents suggest where some of its current civilian S&T priorities may lie, namely eight major emerging industries (new generation information technology, new energy, new materials, high-end equipment, new energy vehicles, green environmental protection, civil aviation, and marine engineering equipment) and nine future industries (metaverse, brain-computer interfaces, quantum information, humanoid robotics, generative AI, biomanufacturing, future display technologies, future networking technologies, and new energy storage).[21]

At every level of government, the GOC is sponsoring financing vehicles, innovation clusters and consortia with the aims of seamlessly connecting universities, national labs, firms, the military, and investors, and spurring regional economic development.[22] By linking China's burgeoning S&T workforce with its investment community, industrial base, and domestic market, the government hopes to unlock synergies between knowledge production, market competition, and private and public capital to unleash innovation and technological diffusion at unprecedented speeds and scales. Realizing this ambition faces many obstacles, but the GOC is channeling immense amounts of resources and political effort into success. Taking a page from its industrial playbook, and consistent with its official policy of "dual circulation," it invites international collaboration in S&T to accelerate progress, plug gaps, and achieve self-reliance and global leadership while nurturing the dependence of others upon it.

INTELLECTUAL PROPERTY AND TECHNOLOGY TRANSFER

The GOC's intensifying effort to connect academia to the marketplace and create full-stack innovation chains may generate fresh challenges for the management of intellectual property.[23] PRC universities lead the world in patent filings by a wide margin, but the fraction of transferred academic patents has long been stuck at below 5 percent, compared to 54 percent in the United States.[24] To increase their tech-transfer rates, they are establishing technology transfer offices, publishing commercialization handbooks for faculty, and backing startups and spin-offs.[25] They are also revising their evaluation criteria for hiring and advancement to favor patent quality over quantity and allowing inventors to receive larger shares of generated revenues.

While salutary in many respects, these reforms could exacerbate pressures for partners in China to assert improper or disputed claims to valuable IP generated in international collaborations, particularly early career researchers, who experience the greatest strain to produce and have the highest rates in China of commercialization of university patents.[26] In addition, they may incentivize unscrupulous students and scholars to return from abroad with misappropriated IP in order to advance their careers in a hypercompetitive market. Also, as they plunge into commerce, universities and faculty who collaborate internationally more commonly have contractual relationships with, and equity, IP, or management stakes in, ventures with PRC defense or security firms and sanctioned entities that invite scrutiny by research security programs.[27]

WORKFORCE AND TALENT PROGRAMS

The GOC's accelerated S&T ambitions have put a spotlight on workforce constraints. The Ministry of Education annually adds and subtracts major courses of study from the national high school and college curricula to meet projected needs for skilled workers in key industries. Examples of new undergraduate majors introduced in 2025 include integrated circuit science and engineering, industrial software, chemical and pharmaceutical engineering, carbon neutralization science and engineering, and medical device and equipment engineering.[28] A multiyear effort led by the Ministry of Education to reimagine engineering, medical science, agricultural science, and the liberal arts (the "four news") and promote cross-disciplinary integration to improve talent training and industrial and economic innovation is underway. Nevertheless, the quality of China's STEM graduates remains uneven, many lack the applied skills employers desire, and despite high graduate unemployment, priority industries face shortfalls of qualified candidates.

The GOC has turned to talent programs for part of the solution. It sponsors numerous such programs at the national, provincial, and municipal levels, many of which offer tiered eligibility requirements and levels of support for gifted researchers from early to advanced stages of their careers. The overwhelming majority of talent program participants come from inside China, but those recruited from abroad or with overseas educational and professional experience, especially at elite levels, are prized for their international networks, records of research and leadership, and ability to transfer foreign knowledge.[29] PRC media regularly celebrate the return of accomplished scientists, but 83 percent of PRC students who obtain US PhDs in science and engineering remain in the United States.[30] If their return rate increases because the climate in the United States grows unwelcoming and opportunities for educational and professional advancement and relative US competitiveness decline, then the risks of unauthorized knowledge transfer by exiting individuals may multiply.

Overseas talent programs are adapting to stay ahead of efforts to combat them. Increasingly, they resemble job recruitment or head-hunting

programs. Initial outreach may arrive from professional colleagues, private contractors, classmates, or covert intelligence operatives. The Enlightenment Program (启明计划), which succeeded the infamous Thousand Talents Program (千人计划) and is administered by the Ministry of Industry and Information Technology, and the Torch Program (火炬计划), administered by MOST, are prime examples. For an exalted elite, in a category by themselves, leadership opportunities, research support, and facilities unmatched anywhere else in the world are available.[31] Likewise, the quality of China's infrastructure, funding environment, and talent are attracting eminent foreigners, including Nobel Prize winners Gérard Mourou and Giorgio Parisi. In 2025, Parisi joined a branch institute of Beihang University, a Seven Sons school deeply tied to China's military aerospace sector. He was quoted as saying that he would endeavor to "promote more scientific cooperation between Beihang University and Italy, as well as with the rest of Europe."[32] Just as export controls must contend with the problem of transshipment, US institutions should assess the research security postures of third country partners that could function as indirect connector nodes to high-risk entities in China.

It is difficult to overstate the prominence of overseas study in PRC science. As of 2023, 70 percent of the departmental leaders in MOST's national key projects had studied abroad, as had 81.4 percent of the academicians promoted that year to the Chinese Academy of Sciences and the Chinese Academy of Engineering.[33] But the next generation of scientific leaders may look different. In 2025, the Chinese Academy of Engineering opened a dedicated appointment track for experts from the private sector and recommended that 30 percent of all candidates going forward should come from the "front lines of corporate research."[34] This year's Government Work Report also calls for the creation of a three-year action plan for strengthening education (with an emphasis on S&T fields) that encompasses not only domestic universities but also secondary and vocational schools. Furthermore, a set of 2023 State Council measures specifies that over half of national S&T R&D projects should be led by practitioners under the age of forty.[35]

NEW TYPE UNIVERSITIES AND SERVICES

The GOC's quest to accelerate innovation is driving experimentation in the higher education sector. For example, a class of "new type universities 新型研究型大学" has emerged that may soon challenge the dominance of legacy academic institutions. These institutions include Westlake University, Fuyao Technology University, and the Eastern Institute for Advanced Study, which are quasi-private research institutions backed by local governments and some of China's wealthiest businesspeople.[36] The Shenzhen Institutes of Advanced Technology is a joint venture between the Chinese Academy of Sciences, the Shenzhen city government, and the Chinese University of Hong Kong. All four tout entrepreneurial cultures, are building state-of-the-art facilities, and are recruiting faculty globally in a range of strategically significant scientific disciplines.

The GOC is furthermore keen to raise the country's profile in international science by creating prestige journals, league tables, open data banks and scientific computing platforms, research support services (e.g., gene sequencing and prototyping), AI models, and dissemination platforms to rival incumbent Western providers. As with all such assets in China, these are subject to GOC governance, supervision, and exploitation. Resources used by foreign researchers should be assessed for ethical, alignment, integrity, cybersecurity, privacy, IP, and regulatory risks. Research security professionals who employ bibliometry and scientometry in their workflows will want to ensure that their analysis captures research that shifts to, and appears only in, China-based outlets.

SECRECY

China's increasing obfuscation of its S&T activities poses challenges to research security analysts. Many types of statistics, announcements, and other information that were once routinely published are no longer accessible, and PRC commercial data and publication platforms have curtailed the products they offer foreign clients. For example, S&T policies such as the current *Medium & Long-Range Plan for National S&T Development (2021–2035)*, the 2023 *General Program for the Construction of a Regional S&T Innovation System*, and the *14th Five-Year Plan for S&T Innovation* have never been made public. In a similar vein, certain GOC contracting and funding portals scrub their records after a short posting period, which eliminates documentary evidence tying individual researchers and units of ostensibly civilian PRC universities to military programs.

In addition, the CSTC, which now crowns the S&T ecosystem, has no public website and its full composition is a closely guarded secret; only three members have been officially named: Ding Xuexiang, who chairs it and is a member of the CCP's seven-member Politburo Standing Committee, and Yin Hejun and Lin Xin, who serve as director and vice director of its general office and are also concurrently minister and vice minister of MOST. In January 2025, MOST replaced the public names of most of its internal departments with numbers that obscure their responsibilities (e.g., from Strategic Planning Department to Department 1). These moves belie the sincerity of the GOC's public embrace of open science.

Conclusion

The GOC is running hard to achieve global leadership in S&T and it regards international collaboration as an accelerant. In view of its ambitions and the intensifying nation-state rivalry attending them, staying abreast of new developments in China's S&T ecosystem at the macro and micro levels is essential to navigating the rewards and risks of collaboration with partners there. The landscape is dynamic, and NSF SECURE Analytics will continue to track and report out on it as a service to the US research community.

APPENDIX 1: KEY TERMINOLOGY

CCP Central Committee: The highest organ within the Chinese Communist Party's governance structure (except for when the Party's National Congress is in session); can be interpreted as being analogous to a company's Board of Directors.

Central Science and Technology Commission (CSTC): A commission established in 2023 that sits directly under the CCP Central Committee; in charge of setting national goals and other benchmarks in S&T.

Civil-Military Fusion: A strategy of the CCP that aims for greater coordination between civilian industry and the PRC People's Liberation Army (PLA) for the purpose of applying advanced technologies and the defense industrial base toward the buildup of the PRC's military.

Counterespionage Law: A 2014 PRC law that defines and prohibits activities related to espionage. The 2023 revision of the law expanded its definition of espionage to include not only "state secrets" but also "[any] documents, data, materials, and items related to national security and interests."

Cybersecurity Law (CSL): A 2016 PRC law that establishes the principle of cyberspace sovereignty within the PRC and defines security obligations of operators and services providers.

Data Security Law (DSL): A 2021 PRC law that mandates cybersecurity reviews to be conducted for cross-border data transfers and defines data security as a matter of national security.

Dual Circulation: A development paradigm formally introduced in the 14th Five-Year Plan stipulating that China should move away from export-led growth by boosting domestic consumption while simultaneously spurring domestic innovation by prioritizing indigenous development of key technologies, thereby reducing its dependence on others and making others dependent on it.

Five-Year Plan (FYP): An economic policy planning document released every five years by the CCP Central Committee laying out national goals over a five-year span.

Government Work Report: Annual planning document delivered by the PRC's Premier at the yearly National People's Congress; summarizes the entire government's accomplishments in the previous year and sets new goals and priorities for the coming year.

Made in China 2025: An industrial policy and strategic plan integrated into the 13th and 14th FYPs that sought to move China up the value chain of manufacturing and advance the country's innovative capabilities by the year 2025.

Ministry of Science and Technology (MOST): The cabinet-level department that is broadly responsible for policymaking in the S&T domain.

New Productive Forces: Refers to a political theory, first articulated by Xi Jinping in 2023, and used by the CCP to describe innovative technologies and advanced manufacturing as key to a new paradigm for economic growth in the 2020s and beyond.

Personal Information Protection Law (PIPL): A 2021 PRC law designed to protect personal information and data of individuals; also addresses the transfer of personal data outside of the PRC.

Seven Sons: The informal designation for a group of seven universities with deep ties to China's defense industrial base. They are among China's best schools for engineering and applied sciences and collaborate prolifically internationally. They are: Beihang University, Beijing Institute of Technology, Harbin Engineering University, Harbin Institute of Technology, Nanjing University of Aeronautics and Astronautics, Nanjing University of Science and Technology, and Northwestern Polytechnical University.

ENDNOTES

1. Xi Jinping, "Strengthen Basic Research to Achieve High-Level Science and Technology Self-Reliance" 加强基础研究 实现高水平科技自立自强, *Qiushi*, July 31, 2023, https://www.gov.cn/yaowen/liebiao/202307/content_6895642.htm; Xi Jinping, "Forge Ahead Towards the Grand Goal of Building a Technological Powerhouse" 朝着建成科技强国的宏伟目标奋勇前进, *Qiushi*, April 1, 2025, http://www.qstheory.cn/20250330/f377de1042cc451bb9840b495d33c731/c.html.

2. "The General Secretary Stressed the Development of New Productive Forces" 关于发展新质生产力, 总书记这样强调, *Qiushi*, March 8, 2024, http://www.qstheory.cn/laigao/ycjx/2024-03/08/c_1130086855.htm.

3. Xi Jinping, "Forge Ahead Towards the Grand Goal of Building a Technological Powerhouse" 朝着建成科技强国的宏伟目标奋勇前进, *Qiushi*, April 1, 2025, http://www.qstheory.cn/20250330/f377de1042cc451bb9840b495d33c731/c.html; Xi Jinping, "Hold High the Great Banner of Socialism with Chinese Characteristics and Strive in Unity for the Comprehensive Construction of a Modernized Socialist Country—Report at the Twentieth National Congress of the Communist Party of China 高举中国特色社会主义伟大旗帜 为全面建设社会主义现代化国家而团结奋斗—在中国共产党第二十次全国代表大会上的报告," Xinhua, October 25, 2022, https://www.gov.cn/xinwen/2022-10/25/content_5721685.htm.

4. "From 'Single Soldier Combat' to 'Organized Scientific Research'" 从'单兵作战' 到 '有组织科研', *Guangming Daily*, June 5, 2025, 8, https://epaper.gmw.cn/gmrb/html/2025-06/05/nw.D110000gmrb_20250605_3-08.htm.

5. General Office of the State Council, *Central Committee and State Council Publish "Party and State Institutional Reform Plan"* 中共中央 国务院印发 '党和国家机构改革方案, March 16, 2023, https://www.gov.cn/zhengce/2023-03/16/content_5747072.htm; General Office of the State Council, *State Council Institutional Reform Plan* 国务院机构改革方案, March 10, 2023, https://www.gov.cn/xinwen/2023-03/11/content_5745977.htm.

6. "Xi Says: 'Let Researchers Be Free from Distractions and Focus on Their Research'" 习语: '让科研人员心无旁骛, 潜心钻研,' *People's Daily App*, May 29, 2025, https://www.peopleapp.com/column/30049208680-500006287819.

7. "Run the Chinese Academy of Social Sciences According to the Requirements of General Secretary Xi Jinping and the CPC Central Committee" 按照习近平总书记和党中央要求办好中国社会科学院, Party Construction, vol. 5, May 2023, 9, https://www.cssn.cn/skgz/202305/t20230504_5625964.shtml; "Top China Think Tank Shuts Down Research Centre After Questions Of Party Loyalty," *South China Morning Post*, April 7, 2025, https://www.scmp.com/print/news/china/politics/article/3305501/top-china-think-tank-shuts-down-research-centre-after-questions-party-loyalty.

8. Code of Corporate Governance for Listed Companies, art. 5, promulgated September 30, 2018, https://www.gov.cn/zhengce/zhengceku/2018-12/31/content_5442732.htm.

9. Ministry of Education, *Guidelines for Ideological and Political Construction in the Higher Education Curriculum* 高等学校课程思政建设指导纲要, May 28, 2020, https://www.gov.cn/zhengce/zhengceku/2020-06/06/content_5517606.htm.

10. A Collection of Case Studies for Teaching Ideology and Politics in Internal Medicine Courses 内科学课程思政教学案例集 (Xi'an: World Book Press Xi'an Ltd., 2023).

11. *China's National Security Laws: Implications Beyond Borders*, Center for Naval Analysis, December 4, 2023, https://www.cna.org/quick-looks/2023/China-national-security-laws-implications-beyond-borders.pdf.

12. Graham Webster, "Targeting U.S. Chip Firm Micron, China's Cybersecurity Reviews Continue to Evolve," *DigiChina*, April 7, 2023. https://digichina.stanford.edu/work/targeting-u-s-chip-firm-micron-chinas-cybersecurity-reviews-continue-to-evolve/.

13. Jun Tsuruta, "China's Chilling Anti-Espionage Law," *The Diplomat*, February 3, 2025, https://thediplomat.com/2025/02/chinas-chilling-anti-espionage-law/.

14. *2024 Report to Congress of the U.S.-China Economic and Security Review Commission*, November 2024, 695. https://www.uscc.gov/annual-report/2024-annual-report-congress.

15. Measured in units of national currency and current prices. Main Science and Technology

Indicators Database, OECD Data Explorer, March 2025 edition, https://data-explorer.oecd.org.

16. Camille Boullenois, Malcolm Black, and Daniel H. Rosen, *Was Made in China 2025 Successful?* Rhodium Group, May 5, 2025, https://rhg.com/research/was-made-in-china-2025-successful/; US-China Economic & Security Review Commission, *Hearing on "Made in China 2025—Who is Winning?,"* February 6, 2025, https://www.uscc.gov/hearings/made-china-2025-who-winning.

17. "Xi Jinping: Strengthening the Role of Education in Supporting Science and Technology and Talents to Create a Lively Situation Where Talents Emerge in Large Numbers and People Are Fully Utilized" 习近平: 强化教育对科技和人才支撑作用 形成人才辈出人尽其才才尽其用生动局面, *Xinhua*, March 6, 2025, http://www.news.cn/politics/leaders/20250306/113f7599b0fe403db734ec66411082a2/c.html.

18. CWTS Leiden Ranking, October 9, 2024, https://www.leidenranking.com/ranking/2024/list.

19. Institution Tables (February 1, 2024–January 31, 2025), *Nature Index*, https://www.nature.com/nature-index/institution-outputs.

20. Bec Crew, "*Nature Index* 2024 Research Leaders: Chinese Institutions Dominate the Top Spots," *Nature Index*. 2025, https://www.nature.com/nature-index/news/nature-index-research-leaders-chinese-institutions-dominate.

21. Ministry of Industry and Information Technology, Ministry of Science and Technology, National Energy Administration, National Standardization Management Committee, *New Industry Standardization Pilot Project Implementation Plan (2023–2035)* 新产业标准化领航工程实施方案, August 3, 2023, https://www.gov.cn/zhengce/zhengceku/202308/content_6899527.htm.

22. For example, the Ministry of Science and Technology, the People's Bank of China, the China Securities Regulatory Commission, the Ministry of Finance, and other organs jointly issued "Several Policy Measures to Accelerate the Construction of a Science and Technology Financial System to Strongly Support High-Level Science and Technology Self-Reliance," 加快构建科技金融体制 有力支撑高水平科技自立自强的若干政策举措 , May 13, 2025, https://www.gov.cn/zhengce/zhengceku/202505/content_7023765.htm; also the Ministry of Science and Technology and Ministry of Finance, "Interim Measures for the Management of National Key Research and Development Plans" 国家重点研发计划管理暂行办法, March 31, 2024, https://www.most.gov.cn/xxgk/xinxifenlei/fdzdgknr/fgzc/gfxwj/gfxwj2024/202404/t20240422_190406.html.

23. *Guidebook to S&T Achievement Transformation Work* 科技成果转化工作指南 (Beijing: Beijing Institute of Technology Press, 2021); William C. Hannas and Didi Tatlow, *China's Quest for Foreign Technology: Beyond Espionage* (London: Routledge, 2021); Tobias Junerfält, *China's Technology Transfer Ecosystem: Key Actors and the Case of China Electronics Technology Group Corporation*, Stockholm: Swedish Defence Research Agency, September 2024, https://www.foi.se/en/foi/reports/report-summary.html?reportNo=FOI-R--5641--SE.

24. Ding Ma, Zhishan Cai, and Chengkai Zhu, "Technology Transfer Efficiency of Universities in China: A Three-Stage Framework Based on the Dynamic Network Slacks-Based Measurement Model," *Technology in Society*, vol. 70, August 2022, 1, https://doi.org/10.1016/j.techsoc.2022.102031.

25. *Tsinghua University S&T Achievements Transformation Service Handbook: An Inventor's Guide* 清华大学科技成果转化服务手册 (Beijing: Tsinghua University Technology Transfer Institute, 2020).

26. Jiafeng Gu, "Commercialization of Academic Patents in Chinese Universities: Antecedents and Spatial Spillovers," *Heliyon*, vol. 9(3), 2023*, 7, https://doi.org/10.1016/j.heliyon.2023.e14601*.

27. Coby Goldberg, *Open Gates: Technology Transfer from Chinese Universities to the Defense Industries through Joint Ventures*, C4ADS, 2021, https://c4ads.org/issue-briefs/open-gates/.

28. Ministry of Education, *Catalog of Undergraduate Majors in General Institutions of Higher Education (2025)* 普通高等学校本科专业目录, April 2025, http://www.moe.gov.cn/srcsite/A08/moe_1034/s4930/202504/t20250422_1188239.html.

29. National Academies of Sciences, Engineering, and Medicine, *International Talent Programs in the Changing Global Environment*, (Washington, DC: National Academies Press, 2024), 139-152. Examples of leading PRC talent programs include the Overseas Excellent Youth Fellowship Program (海外优青科学基金项目) administered by the National Natural Science Foundation of China, which recruits young researchers to return to China; the Great Wall Program (长城计划) administered by the State Assets Supervision and Administration Commission, which focuses on recruiting PhDs with industry or applied science backgrounds; the Changjiang Scholars Program (长江学者奖励计划) administered by the Ministry of Education, which focuses on traditional academics; the Kunlun Initiative (昆仑英才行动) administered by the Ministry of Social Affairs, which focuses on recruiting young overseas talent for scientific, educational, and industrial fields; and the Ruijin Program (瑞金计划) administered by the People's Bank of China, which focuses on recruiting finance professionals and entrepreneurs. Together they constitute the links in a full-stack innovation chain.

30. Specifically, 83 percent of science and engineering PhD recipients from China in 2017–2019 remained in the US as of 2023. *Most U.S.-Trained Science and Engineering Doctorate Recipients on Temporary Visas Remain in the United States*, NSF 25-325, US National Science Foundation, 2025, https://ncses.nsf.gov/pubs/nsf25325.

31. "China's 'Goddess Scientist' Who Left for US Ivy League Job Is Coming Home to Set Up Medical Academy—To the Delight of the Nation," *South China Morning Post*, November 2, 2022, https://www.scmp.com/news/people-culture/china-personalities/article/3198127/chinas-goddess-scientist-who-left-us-ivy-league-job-coming-home-set-medical-academy-delight-nation.

32. "Nobel Physicist Giorgio Parisi Takes Up Complexity Sciences Post in China," *South China Morning Post*, May 18, 2025, https://www.scmp.com/news/china/science/article/3310801/nobel-physicist-giorgio-parisi-takes-complexity-sciences-post-china.

33. *The Development of Chinese Students Studying Abroad (2023–2024)* 中国留学发展报告蓝皮书 (Beijing: Center for China & Globalization, 2024), http://www.ccg.org.cn/archives/84288.

34. Chinese Academy of Engineering, "Letter from the Chinese Academy of Engineering Concerning the 2025 Nomination of Candidates by Organizing Academic Societies" 中国工程院关于组织学术团体提名2025 年院士候选人的函, April 25, 2025, https://www.cae.cn/cae/html/main/col245/2025-04/24/20250424164033377579714_1.html.

35. General Office of the State Council, "The General Office of the CPC Central Committee and the General Office of the State Council Issued the 'Several Measures on Further Strengthening the Training and Employment of Young Scientific and Technological Talents," 中共中央办公厅 国务院办公厅印发 '关于进一步加强青年科技人才培养和使用的若干措施', August 27, 2023, https://www.gov.cn/yaowen/liebiao/202308/content_6900452.htm. Archived: https://archive.ph/1r64L.

36. Mandy Zuo and He Huifeng, "Why China's Super-Rich Are Spending Billions to Set Up Universities," *South China Morning Post*, February 9, 2025, https://www.scmp.com/economy/china-economy/article/3297788/why-chinas-super-rich-are-spending-billions-set-universities.

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