UNIVERSITY OF CALIFORNIA

Decoding China's Technology and Industrial Policy: Seven Terms You Need to Know

Barry Naughton, Siwen Xiao, Yaosheng Xu

Summary

China's technology and industrial policy programs have grown in scope and intensity since 2020, but the vocabulary used to describe them is vague and often misleading. This policy brief decodes seven essential terms and shows that they have concrete and complementary meanings. When understood in concert, they reveal the establishment of a large-scale, government-directed program of mission-oriented research, development, and application. Together these terms outline a substantial expansion of the Chinese government's direct role in organizing economic activity, and hint at some of the limits of that expansion.

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Introduction

In 2020, China significantly altered its industrial policies to fully integrate the objectives of security and self-reliance. This pivot introduced broad concepts like "dual circulation" and "new development paradigm," which took years to be fleshed out with concrete policies. However, by 2022–23, the evolution of a panoply of concepts, policy instruments, organizations, and objectives was basically complete. Although many of these policies and institutions are secret, enough information has emerged to make a general but comprehensive understanding possible.

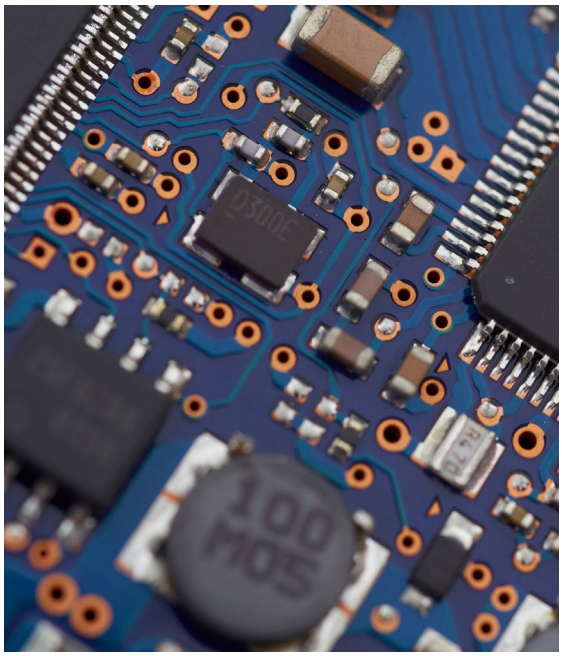
This brief defines seven key terms that achieved clarity and prominence by late 2023. Our analysis includes one standalone and three pairs of terms which reflect China's post-2020 policy evolution towards a security-focused high-tech industrial agenda, blending technology and industrial policies into a unified "techno-industrial" economic policy. Each of these terms has undergone official vetting and approval, and are publicized by official media outlets. While it is possible to trace the intellectual origins of these terms, doing so is beyond the scope of this policy brief.

This brief begins with two terms that reflect China's technological ambition and resources: "key core technologies" and "national strategic science and technology (S&T) forces." It then explores two terms related to innovation management and focused on integrating discoveries into the real economy: "new-style whole-of-nation system" and "innovation consortium." The next two terms broadly define industrial strategy: "modernized industrial system" and "new industrialization." By late 2023, these terms had become central to Chinese policy discourse. Though their public definitions are tightly controlled and highly abstract, they signify concrete strategies and efforts by policymakers.

However, everything reaches a limit, including industrial policy. The broader health of the economy can be harmed by depriving low-priority sectors of resources. In this context, the seventh term, "new productivity boosters," has been introduced to emphasize the need for a balanced industrial policy attentive to the needs of the entire economy. Other recently introduced cautionary phrases underscore the importance of moderation and highlight the existence of different views that may seek to correct an overemphasis on security.

I. Key Core Technologies 关键核心技术

"Key core technologies" are the priority areas where China is investing at the beginning of—or upstream in—the innovation chain. Xi Jinping has repeatedly stressed the need to "control key and core technologies in our own hands." Pursuit of "key" technologies is thus central to China's technology and industrial policies.[1] Although these technologies lack a public, unified catalog, there is clear evidence of a set of internal being maintained or developed developed by various important agencies, such as the Chinese Academy of Sciences (CAS) and the Ministry of Science and Technology (MOST), with significant overlap.[2] These lists have been in a state of constant evolution, which continues through the present.



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The term "core technologies" first achieved prominence in the 2006 Medium- and Long-Term Plan for Science and Technology, where it was used to refer to a few fundamental technologies that China had not mastered, and which could not be purchased from overseas. MOST was charged with drawing up a list of key technologies and products at that time.[3] Since the 2018 outbreak of the U.S.-China trade and technology war, key core technologies have shifted to highlight China's reliance on imports in crucial areas.[4] The term evolved, influenced by "bottleneck technologies," or more colorfully, "chokepoint technologies" (卡脖子技术), to include areas where an interruption in foreign supplies would cause serious disruption. The concept of key technologies, initially vague, now encompasses a broad set of specific technologies essential to manufacturing. By 2023, this had evolved into an across-the-board call for import substitution in the technological realm.

The most complete and concrete list of bottleneck technologies was published in 2018 by *S&T Daily*—the official newspaper of MOST—delineating a subset of bottleneck technologies (see Table 1).[5] Bai Chunli, the head of CAS, revealed in 2020 the existence of an internal list of bottleneck technologies at the CAS that overlaps in a few cases with those listed by *S&T Daily*, such as lithography and high-quality steel for ball bearings.[6] Chinese sources sometimes refer to this class of technologies as "short boards"—areas where China's domestic capabilities are weak and it remains dependent on imports.[7]

TABLE 1

The First 10 Technologies in the 35 Core Technologies Listed by S&T Daily

Core Technology	
1	Lithography (for integrated circuit manufacturing)
2	Integrated circuit manufacturing
3	Self-developed computer operating systems
4	Nacelles of domestic aircraft engines
5	Tactile sensors (for industrial robots)
6	Vacuum coating machines (for OLED manufacture)
7	Radio frequency chips (for cell phones)
8	iCLIP (to study RNA-protein interactions)
9	Heavy gas turbines
10	LiDAR

However, there are whole classes of technologies that are included in key core technologies for other reasons. "Long boards," for example, are areas where China has, or is on the verge of achieving, international comparative advantage. Long boards, like electric vehicles and photovoltaics, are understandably less urgent than short boards, but still receive attention. Finally, technologies with disruptive potential where China aims for global leadership, such as brain-computer interfaces, quantum computing, and especially artificial intelligence (AI), figure prominently in these discussions. China will continue to invest in areas where it has a market or technological advantage or where China intends to "pass on the curve" by making preemptive moves in disruptive technologies.

Over the last fifteen years, the scope of "key core technologies" has significantly broadened without a definitive list, as criteria for inclusion keep expanding. At the end of 2023, the scramble to address bottlenecks was the most urgent, although the quest for continued investment in key core disruptive technologies is still strong. Efforts to better define the concept of key core technologies are underway, with MOST actively assessing a list of technologies and identifying relevant products, their manufacturing applicability, and China's distance behind the global technological frontier.[8] The list of key core technologies is ever broader and more detailed. Inevitably, that means it must cope with more contradictions.

II. National Strategic S&T Forces 国家战略科技力量

"National Strategic S&T Forces (NSSTF)" refers to four fundamental categories of elite technological capability: national laboratories, national research institutes, high-level research universities, and leading S&T enterprises. Such elite institutions are central to technological development in every country. The Chinese NSSTF agenda is distinctive in that it is explicitly designed to unify elite S&T entities under a cohesive framework to achieve priority goals. The Chinese government identifies elite members of each group to ensure the entire innovation chain is covered, and that key core technologies are supported from discovery through application. Each component of the NSSTF has a specific role. National laboratories perform basic and pre-competitive high-tech research. National research institutes, including those in CAS, address pivotal S&T challenges such as manufacturing the BeiDou Navigation Satellite System's core components. Research universities conduct basic research and train S&T talent. Leading S&T enterprises then commercialize new technologies. With these roles specified, supporting entities—such as S&T Innovation Centers—facilitate collaboration among the four NSSTF components. Innovation Centers aim to be hubs for combining S&T resources for concerted action. An example is the Zhangjiang National Comprehensive S&T Center, which provides infrastructure such as free electron laser devices and supercomputing resources to facilitate innovative activities by labs and firms.[9]

TABLE 2

The NSSTF Components, with Tasks and Examples

NSSTF Component	Tasks	Examples
National Laboratories	Basic and pre-competitive high-tech research	National Synchrotron Radiation Laboratory; Zhongguancun National Laboratory
National Research Institutes	Addressing pivotal S&T challenges	CAS; Chinese Academy of Engineering; Academy of Military Sciences
High-level Research Universities	Basic research and S&T talent training	Peking University; Tsinghua University
Leading S&T Enterprises	Technology transfer and commercialization	State-owned firms like China Aviation (AVIC) and China Electronics Technology Corporation (CETC); private firms like Huawei, Baidu, and Xiaomi

III. New-Style Whole-of-Nation System 新型举国体制

In 2019, the "new-style whole-of-nation system (NWNS)" was formally adopted as part of China's national S&T strategy by a plenum of the Communist Party Central Committee, making it the most authoritative type of policy in China.[10] The "whole-of-nation" concept refers to a high-priority, top-down organized national team (it is even used to describe China's national Olympic team). This approach has a long history in the People's Republic of China (PRC). Today's "new-style system" is meant to adapt the old idea to the present context of globalization and a predominantly market economy, with efforts to use market mechanisms under strict government guidance.

While the basic idea of the NWNS is clear, Chinese sources are careful not to reveal concrete details about the program, only referring vaguely to past successes and present departures. Nevertheless, we can discern three major differences between the new-style system and its predecessors. First, the goals are different. The original whole-of-nation system applied only to a handful of ultra-priority items, including nuclear weapons and ballistic missiles in China's "Two Bombs One Satellite" program (1962-1972). The NWNS today has shifted focus to achieving "high-level S&T self-sufficiency and empowerment" by overcoming supply chain bottlenecks and making China a leader in cutting-edge technologies. This reflects a broader innovation agenda—mirroring the expansion of key core technologies—so that it encompasses both a handful of extremely high-priority projects and a range of medium-priority items.

Second, the organizational forms of the NWNS are much more flexible than in the past, including not just tightly organized, fully top-down projects, but also more loosely organized programs, including innovation consortia. In contrast to the complete secrecy that enshrouded China's nuclear weapons program, today's technology efforts have to maintain a balance between secrecy and openness in order to access top scientists and engineers in the civilian economy and abroad.

Finally, the NWNS employs market mechanisms for resource allocation, with a diverse range of market participants acting under government guidance. These actors are knit together by contracts and long-term supply agreements, backed by explicit targets and rewards for hitting those targets. While the NWNS is less extreme than the older system, this softening allows it to be spread much more widely through the civilian economy.

TABLE 3

Key Differences Between the New and Old Whole-of-Nation System

	Old Whole-of-Nation System	New-Style Whole-of-Nation System
Background	Planned economy, internationally isolated	Market economy, deeply integrated into the global economy
Goals	National defense S&T projects; competitive sports	"Key core technologies," "High-level S&T self-sufficiency and self-empowerment"
Methods	Strictly top-down, centrally planned	Combining market mechanisms with top-down government interventions

IV. Innovation Consortia 创新联合体

The "innovation consortium" is an organizational form designed to combine resources from businesses, universities, and research institutions; accelerate research and development (R&D); and bring innovations quickly to market.[11,12] An innovation consortium is a specific type of market-driven organization under the NWNS intended to harness the synergy implicit in the NSSTF.[13] While the NWNS is frustratingly vague, detailed information exists on innovation consortia. Recognized by central or local governments, these consortia are established with a leading organization—typically an enterprise—and a coordinating body. The consortium unites entities from the beginning to the end of the innovation chain, linking them with specific technical targets, contractual obligations, and rewards.[14,15] A successful innovation consortium would free discoveries from siloed research labs and provide information on market demand and practical requirements. It would also provide resources to allow firms to ramp up production and promptly achieve economies of scale.

The innovation consortium concept achieved prominence after a 2018 speech by Xi Jinping that advocated for such consortia led by enterprises and emphasized the benefits of pooling resources from academic and research entities.[16] The concept is featured in the current Five-Year Plan and is given explicit legal recognition in the "Science and Technology Progress Law," which passed in 2021.[17] The extent of overlap between innovation consortia and the whole-of-nation system is unclear, yet "national" and "local" level consortia are both recognized. Our knowledge primarily comes from descriptions of local consortia, as illustrated in Table 4.

Innovation consortia are collaborations between research institutes or universities—sometimes both—with production enterprises.[18] For instance, the first national-level consortium established was the "3C Smart Manufacturing Innovation Consortium," which covers smart manufacturing techniques for consumer, computer, and communications (3C) devices. This consortium was spearheaded by Xiaomi, a major private Chinese tech firm known for its stylish smart phones, and includes more than 40 partners, such as Tsinghua University, the CAS Institute of Software, and China Telecom.[19] Although Xiaomi gained attention for spearheading this consortium, most innovation consortia are initiated by the central or local government with an enterprise or research institute brought on as the lead coordinating body.

Local governments, like Beijing and Jiangsu, establish consortia and support them with guidelines and pilot initiatives, offering financial support through major S&T projects for achieving contracted technology outcomes.[20,21] Hundreds of innovation consortia have been established across China since 2021. However, ambiguities remain. Consortia headed by national labs and technology innovation centers are almost never publicized. Local authorities may also subordinate national goals to local economic aims. The rapid rollout of innovation consortia raises many questions for future research.

TABLE 3

Examples of Innovation Consortia

Name of Innovation Consortium	Province	Lead Organization
Jiangsu High-performance Metal Materials Innovation Consortium	Jiangsu	Jiangsu Fasten Enterprise Group
Innovation Consortium for High-performance Chip Design	Jiangsu	China Key System & Integrated Circuit Company
Innovation Consortium for Para-aramid Fiber (Kevlar)	Ningxia	Ningxia Taihe Aramid Fiber Co.
Carbon Neutrality Technology Consortium	Zhejiang	Zhejiang Provincial Association for Science and Technology

V. Modernized Industrial System 现代化产业体系

China's "modernized industrial system," introduced at the 20th Party Congress in 2022, marks a significant step towards an all-encompassing and largely security-oriented approach to industrial policy.[22] The term refers to a complex of interrelated sectors that includes the manufacturing industry but extends beyond it, integrating the high-quality service and information sectors. The purpose is to foster a self-sufficient economy with high-tech capabilities across the board. The term "modern industrial system" has a long history in China, but the subtle shift from "modern" to "modernized" that occurred in 2022 is an important marker indicating changes initiated and driven by the government.

The concept of the modernized industrial system is essentially to replicate within China the current global network of interdependent production and services. In other words, the modernized industrial system reflects an understanding that the Chinese economy can only be truly self-sufficient if China replicates domestically the full range of specialized service providers and niche industrial producers that serve the global economy. Seen as a vision of China's future economic structure, the modernized industrial system represents China's most comprehensive and ambitious policy initiative.

The modernized industrial system can be situated in a hierarchy of techno-industrial policies designed to shape China's production structure. The modernized industrial system is at the top because it has the greatest breadth, being designed to reshape an extensive range of sectors. Immediately below it is "new industrialization," which is focused on high-tech manufacturing, and which can be said to be the highest priority within the modernized industrial system. Specific programs for individual economic sectors are the next level of specificity, and as such are aggregated into strategic emerging industries and future industries.

The modernized industrial system must be "integral, advanced, and secure."[23] "Integral" implies a whole-of-economy approach in which all sectors, from traditional to high-tech, should be retained, and no sector is left behind. "Advanced" implies that China will be at the global technology frontier, operating digitized and eco-friendly procedures that are seamlessly integrated into all sectors. "Secure" means robust economic autonomy in the face of global volatility—especially if tensions with the United States increase—with an emphasis on industrial and supply chain resilience.[24] In this sense, the modernized industrial system justifies discontinuing the use of Western enterprise management software and shifting from global to local accounting firms. It extends technology protectionism beyond goods imports.

The modernized industrial system is thus extremely broad and ambitious, but somewhat lacking in specific instruments to realize the vision. It implies that China will further strengthen its control over supply chains, develop large "supply chain architect" firms, and foster specialized producer service firms to integrate high-quality manufacturing services with advanced manufacturing. The modernized industrial system is thus a strategic endeavor to strengthen China's manufacturing sector while ensuring its security and self-reliance in the global industrial landscape.

VI. New Industrialization 新型工业化

The concept of "new industrialization" was promoted in the 20th Party Congress Report in October 2022 along with the modernized industrial system. The two are closely related, but new industrialization provides a focus within the modernized industrial system, emphasizing digitalization and smart manufacturing. The term has evolved significantly since its first official introduction in 2002, when it primarily referred to the then new idea of "informatization" of industry. Today, it has expanded to include digitalization, intelligentization—another word for automation—and decarbonization.[25]

New industrialization is thus a subset of the modernized industrial system. It is also a way to translate the broad vision of the modernized industrial system into a set of concrete priorities, namely promoting high-tech manufacturing sectors that are strong candidates for subsidies and government investment. Although the concept of new industrialization is not tethered to specific sectors, the approach naturally leads to identification of priority sectors, including aerospace and transportation.

Targeting and subsidizing high-tech manufacturing sectors is standard practice among Chinese policymakers. It is probably not accidental that the National Development and Reform Commission (NDRC) leads discussions on the modernized industrial system, which tend to be abstract and unrealistic, while the Ministry of Industry and Information Technology (MIIT) takes the lead on discussions about new industrialization with more practical details. In comparison to the NDRC, the MIIT is a far more hands-on agency with decades of experience in industrial promotion.

VII. New Productivity Boosters 新质生产力

The concept of "new productivity boosters" has become prominent since it was featured at the Economic Work Conference in December 2023. The official translation is unusual, but gives insight into the precise role of this term. A literal translation would be "new quality production forces" or "production forces of a new nature," which would be hard to differentiate from the other terms. But in fact, discussions of this term almost always describe the disruptive impact of new technologies along with the idea that "the core indicator [of the effectiveness of these forces] is an increase in total factor productivity."[26]

In other words, this new term repeats the standard obsession with advanced technology, but highlights productivity as the crucial measure of successful innovation. Of course, from an economic perspective, innovation's primary goal is always to boost productivity, and total factor productivity is a well-established method to measure this increase in productivity. Higher productivity means an economy has greater ability to provide benefits to the population. Yet productivity and economic benefit have been curiously absent from Chinese technological discourse. Belatedly, amid economic underperformance, policymakers are recognizing that higher productivity is in fact the point of innovation and technological change.
Thus, new productivity boosters signal that planners have overemphasized security and technological transformation for their own sake. The phrasing permits policymakers to reiterate their existing programs, including the modernized industrial system and new industrialization, while curbing the security aspects and restoring the economic rationale for innovation.

It is instructive to consider new productivity boosters alongside "establishing before abolishing" (先立后破), a cautionary phrase that emerged in 2021 after a painful experience during China's shift to clean energy. In 2020, eager to cut coal consumption, local officials closed coal plants prematurely, lacking sufficient green alternatives. The following year, official media carried exhortations to first establish new green energy sources before abolishing old coal-fired plants. This term's revival in late 2023 suggests awareness that newly developed high-tech sectors like electric vehicles and solar panels are not sufficient to carry the economy on their own. Traditional sectors such as real estate, steel, and coal mining must be sustained until high-tech industries are big enough to support China's economic growth. The term new productivity boosters shows the need to integrate new technologies into the economy before phasing out traditional sectors, and to redefine innovation's purpose and the criteria for evaluating new technologies.

It is unclear how far this policy adjustment will go. There is doubtless a tug of war between advocates of a security-focused, government-driven conception of technology and industrial policy, and those who advocate for a bottom-up policy that is more productivity-focused. Since 2020, the security emphasis and the shift to government guidance has been decisive, so this fresh perspective is a welcome development. While it may not signal a wholesale revision of policy or a fundamental change in direction, it does represent a subtle inflection point in China's policy trajectory.

Conclusion

The seven key terms reviewed in this brief outline China's post-2020 technology and industrial strategy, with a focus on modernity, innovation, and a national mission. While apparently similar, upon closer examination the terms reveal distinct and complementary meanings. At the upstream of the innovation chain, key core technologies define China's major tasks, while the four components of the NSSTF are mobilized through direct government orders and indirect supporting policies to achieve breakthroughs. With the goal of turning scientific discoveries into practical products, the Chinese government has adopted two overlapping organizational models. The first of these, the new-style whole-of-nation system, emphasizes the direct organizational role of the government, albeit under new conditions. The second, the innovation consortium, can sometimes fulfill the demands of the new-style whole-of-nation system, but also allows for flexibility and adaptation to local objectives.

How will these instruments transform the industrial system? The broadest vision, the modernized industrial system, emphasizes both development and security within multiple product and service chains. At a more concrete level, new industrialization provides a vision centered on high-tech manufacturing. These initiatives have steered Chinese policy in the direction of security, self-sufficiency, and the promotion of "hard" technologies, including those related to the military. This vast and comprehensive program, coupled with resource constraints and severe economic challenges, means that a previously uncontested vision has reached a kind of limit, and we see evidence of a "tug of war" between advocates of growth and security. This has injected a new note of caution into official discussion of techno-industrial policy, but it is too early to say whether any fundamental modifications of policy are likely to follow.

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Authors

Barry Naughton co-leads IGCC research Chinese science, technology, innovation, and industrial policy. He is the Sokwanlok Chair of Chinese International Affairs at the School of Global Policy and Strategy at UC San Diego, and one of the world's most highly respected economists working on China. He is an authority on the Chinese economy with an emphasis on issues relating to industry, trade, finance and China's transition to a market economy. Recent research focuses on regional economic growth in China and its relationship to foreign trade and investment. He has addressed economic reform in Chinese cities, trade and trade disputes between China and the United States and economic interactions among China, Taiwan and Hong Kong. Naughton has written the authoritative textbook "The Chinese Economy: Transitions and Growth," which has now been translated into Chinese. His groundbreaking book "Growing Out of the Plan: Chinese Economic Reform, 1978-1993" received the Ohira Memorial Prize, and he most recently translated, edited and annotated a collection of articles by the well-known Chinese economist Wu Jinglian. Naughton writes a quarterly analysis of the Chinese economy for China Leadership Monitor.

Siwen Xiao is a research associate at IGCC. Before joining IGCC, Xiao received her MIA degree specialized in International Politics and China from the School of Global Policy and Strategy (GPS) at UCSD in 2021. At GPS, she also worked as a research assistant with focuses on quantitative research, China's industrial policies, and China's S&T systems. Her current research interests include China's political economy, industrial policies, and U.S.-China relations.

Yaosheng Xu is a Research Associate at the Institute on Global Conflict and Cooperation (IGCC) at the University of California, San Diego (UCSD), where his research focuses on innovation policies, political economy, and Chinese politics. Xu received his Master's Degree in international affairs from the School of Global Policy and Strategy at UCSD.

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