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Abstract

China presents a compelling case for the study of industrial policy, but its conceptual foundations remain underexplored in the academic literature. In this article we propose a schematic framework to analyze China's industrial policy. Based on a systematic review of Chinese-language sources, we show how industrial policies in China concentrate on technology linkages between different industry types that the government defines. Future industries are high-tech fields of strategic importance with immature markets. Once scientific advances in these fields lead to commercially viable products, future industries become emerging industries. The development of emerging industries is shaped by China's large base of traditional industries. Firms in traditional industries adopt emerging high-tech, which allows them to upgrade and to expand their international competitiveness. In turn, traditional industries provide an initial market for firms in emerging industries, helping them to scale up and shaping the trajectory of the underlying technologies. By concentrating state support on the linkages between these industry types, industrial policies in China aim to accelerate mutually reinforcing cycles of scientific innovation, technology commercialization, and technology diffusion. Implementation schemes grant favored firms preferential access to state-controlled production factors, but also aim to match suppliers with buyers, talent with firms, and firms with R&D institutes. Our case studies on China's electric vehicle, textiles and apparel, and advanced semiconductor industry illustrate how this framework can be applied to analyze China's industrial policy in specific sectors.

JEL Codes: L52, O25, O53, O38

Keywords: Industrial policy, Economic development, Innovation policy, Industrialization, Asia

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1 Introduction

Industrial policy has seen a resurgence in economics in recent years (Aiginger and Rodrik, 2020; Juhász et al., 2024). China offers one of the most compelling cases for study. On the one hand, China has nurtured a range of competitive high-tech industries that are increasingly expanding abroad. On the other hand, the country struggles with depressed demand, destructive competition among sub-national governments, and pushback from its trading partners. Systematic study of China's industrial policy, however, is still in its infancy, which is surprising given how ubiquitous the topic has become in policy circles (DiPippo et al., 2022). As Juhász et al. (2024) point out: "...the literature on Chinese industrial policy is scant relative to its scale and notoriety, ...". Most observers are familiar with specific government initiatives such as the Strategic Emerging Industries, Made in China 2025, and China's pursuit of "technology self-reliance". Although recent studies have also made headway in evaluating the effectiveness of various industrial policy instruments on firm-level outcomes (Li and Branstetter, 2024; Fang et al., 2025), we agree with Juhàsz et al. that economic research on China's industrial policy has considerable untapped potential. There is much to be learned from the Chinese case, both from its successes and its failures. We also believe that one important reason for this untapped potential is the byzantine nature of China's industrial policy design. National industrial policy schemes are often buried under abstract slogans such as "bridging short boards" or the "new-type whole-of-nation system", and they often cross-reference complementary policies or are extensions of preceding policy initiatives. Drawing on interviews with Chinese firm managers and consultants, Branstetter et al. (2023) note that Chinese firms often hire specialized personnel to navigate the dense web of subsidy programs. For outside observers, this complexity is likely even more difficult to grasp. Moreover, the language barrier and limited access to data often necessitate collaboration with China-based researchers. For non-Chinese economic researchers and policymakers alike, the need for a guiding framework on how to approach this topic is evident.

This article proposes such a framework. Based on a systematic review Chinese-language sources, we analyze the design of China's industrial policies, looking specifically at the logic behind the formulation of policy priorities, and the way in which priorities map into an increasingly complex system of national implementation programs. A central finding is that China's industrial policies concentrate on technological linkages between different industry types that the government defines. State-funded R&D is strongly mission-oriented and tied to *future industries*, defined as high-tech fields with significant strategic and commercial potential. Once scientific advances within future industries culminate into a commercially viable product, future industries become *emerging industries*. While some emerging industries serve final consumers, most are concentrated in intermediate inputs, and co-evolve with China's base of *traditional industries*. Firms in traditional industries adopt emerging technologies, which allows them to upgrade, preserving and expanding their international competitiveness. Traditional industries in turn provide initial demand for the technologies of emerging industries. The technological accumulation achieved in emerging industries then feeds back into the development of future industries (e.g., quantum computing builds on technological accumulation in new-generation ICT, humanoid robots on technological accumulation in industrial robotics etc.). By amplifying synergies between the three industry types, the government intends to accelerate mutually reinforcing cycles of scientific advances, technology incubation, and technology absorption, counteracting China's persistent diffusion deficit (Ding, 2024).

A second insight is that implementation schemes are designed to coordinate resources along the entire chain of related activities: from applied research and technology incubation, product demonstration and SME support schemes, to production scaling and supply-chain formation and governance. Firm-level support may take two forms: Favored firms may receive preferential access to multiple sources of government-controlled production factors, including capital, land, data, energy, and raw materials. In addition, the Chinese state increasingly acts as a matchmaker that incentivizes collaboration between entities operating within industrial ecosystems: SMEs and lead firms, firms and R&D institutes, domestic firms and overseas partners. The three case studies we include illustrate how the system works in practice. The case of the EV industry stands for the continued emphasis on emerging industries. Attempts in recent years to upgrade the textile industry illustrates the linkages between emerging industries and traditional industries. Finally, the case of advanced semiconductors demonstrates how the government intends to foster supply chain resilience through reinforcing cycles of scientific innovation and technology incubation.

The study draws on the insights of an emerging literature on industrial policy within the economics discipline (Aiginger and Rodrik, 2020; Juhász et al., 2024; Juhász and Steinwender, 2024; Lane, 2025). For the construction of our framework we borrow from the definition of Juhász et al. (2024), according to which industrial policy typically includes the articulation of specific priorities–whether sectoral, cross-sectoral or regional–as well as the appropriate mechanisms for channeling the private sector's activities into the intended direction. Since we study the Chinese case in particular, we also draw on insights from China's policy process which has emphasized local policy experimentation (Heilmann, 2008), the dynamics between political centralization and economic decentralization (Xu, 2011), and its institutionalized nature (Chen and Naughton, 2016). While these insights serve as a basis for the analysis, our work mostly contributes to the literature on the conceptual evolution of China's industrial policy framework. Previous studies have shown how the threat of foreign competition amid WTO accession increased the bargaining power of Chinese agencies in favor of more active state guidance (Tan, 2021), how this eventually led to a technology-focused industrial policy regime (Chen and Naughton, 2016), and how structural change during the late 2000s triggered debates about the relationship between high-tech industries and low-end manufacturing (Lei, 2022; Wang, 2021). Our study conceptualizes the system of interrelated priorities and implementation schemes that eventually crystallized out of this evolution. Specifically, we highlight how China's industrial policies aim to generate synergies between different industry types, and how they increasingly focus on fostering collaboration between relevant entities within industrial ecosystems. We also demonstrate the practical functioning of the system by including case studies on the EV, textile, and semiconductor industry. It is important to note that we do not conduct any causal evaluation of the discussed implementation programs. The aim of this study is to provide a structured approach to disentangling various streams of China's industrial policies, to reveal their function within China's broader industrial policy regime, and ultimately, to inspire ideas for future research.

The rest of the article is structured as follows: In Section 2, we introduce our research design. Section 3 reviews some of the essential principles of China's industrial policies. Section 4 is the main section of the paper and presents our conceptual framework, including a deep dive into the historical evolution of each component. Section 5 applies the framework to analyze China's industrial policies in electric vehicles, textiles and apparel, and advanced semiconductors. Section 6 concludes with a discussion and offers ideas for further research.

2 Research Design

Following Juhász et al. (2024), we define industrial policies as "those government policies that explicitly target the transformation of the structure of economic activity in pursuit of some public goal". This could be economic growth, productivity, national security, or a combination thereof. As the authors maintain, this definition is broad enough to include a wide range of policies such as digital policies, innovation policies and place-based policies, but usually entail two dimensions: First is the formulation of sectoral, cross-sectoral or regional priorities along the lines of "I support A and not B". Designing industrial policies around these priorities should enable the achievement of the public goal. Second, industrial policies typically include incentives for private actors to follow the government's intended structural change. In other words, the government needs to correctly identify both market and system failures that hinder private actors from aligning their activities with formulated priorities and design the appropriate mechanisms to mitigate them. The two dimensions represent the main building blocks of our framework.

We then study the case of China through the lens of these two dimensions by making extensive use of Chinese-language sources. Our starting point for the analysis is the year 2006, which is generally understood to be the year in which China returned to techno-industrial policy (Chen and Naughton, 2016).We first conduct a systematic review of major Chinese industrial policy initiatives issued by the central agencies which are most relevant for industrial policy[1]. They are the State Council, the National Development and Reform Commission, the Ministry of Science and Technology, and the Ministry of Industry and Information Technology (Heilmann, 2016). We also consider the views of China's most influential academic economists and their frequent co-authors, drawing on the Policy Influence Index maintained by the Beijing-based research firm Trivium China. The Policy Influence Index is a quantitative ranking of over 700 economic policy advisors based on their formal affiliations, the number of times they have briefed the top-level political leadership, and their participation in panel discussions and public events (see for instance: McMahon and Sun (2024)). Finally, we review publications from important think tanks including the Chinese Academy of Social Sciences and Beijing University's National School of Development, as well as from a few hand-picked news magazines focused on economics, and science and innovation[2]. Specific policy initiatives only make it into the framework once we verified their importance via the Reading China Better database, a comprehensive and continuously updated dataset of Chinese policy documents maintained by Leiden University in the Netherlands. Reading China Better systematically collects and classifies regulatory and strategic documents issued at both central and local levels of the Chinese government, including State Council directives, ministerial regulations, and provincial implementation guidelines, as well as selected non-authoritative sources such as articles in Qiushi, Xi Jinping's speeches, and People's Daily front pages. In particular, the database provides statistics

[1]We focus mainly on the central government's industrial policy rather than autonomous local initiatives. This is important since the objective functions of both are different. Local officials care about their prospects of being promoted which does include following central priorities, but must also safeguard employment and social cohesion. We only talk about localities when it comes to local implementation of central initiatives and policy experimentation.

[2]These include: 21st century Business Herald, Science & Technology Daily, Economic Reference Daily, China Economic Net, Caixin, Guangming Daily, Legal Daily, the Shanghai Securities Journal and ScienceNet.

for specific keywords that a researcher can search through a query.

3 Background: Principles of China's Industrial Policy

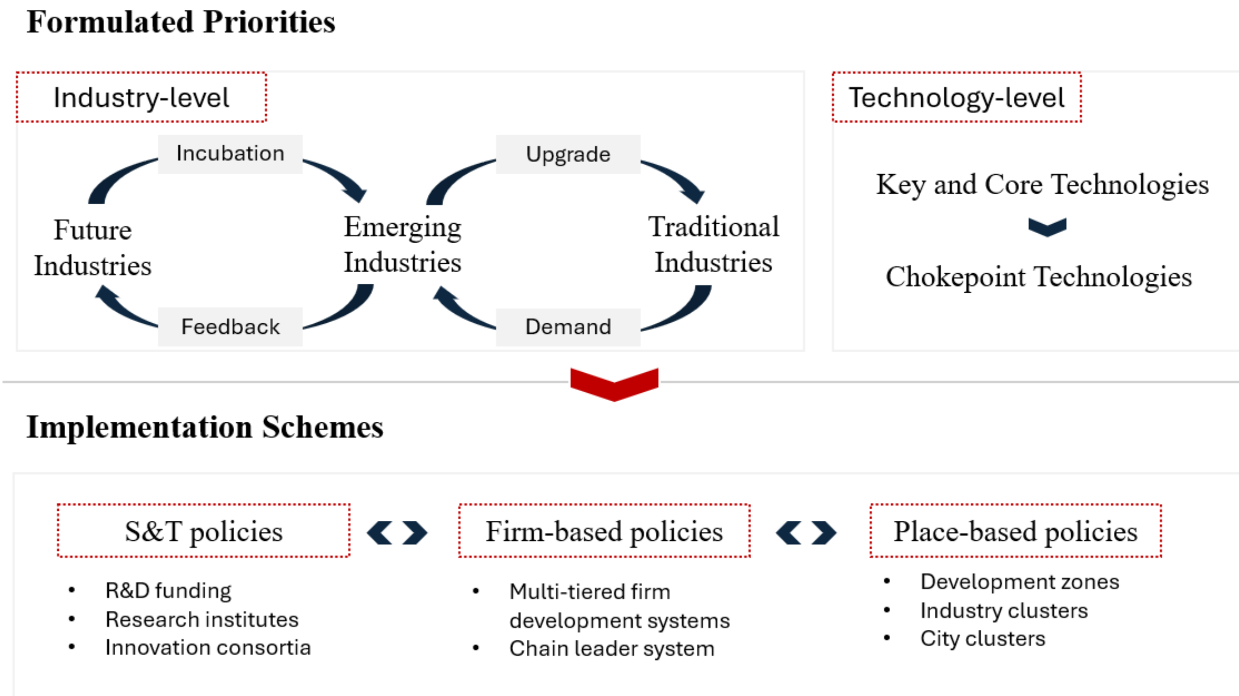
Before presenting our framework, it is useful to review two fundamental principles that guide policymakers in Beijing in their approach to industrial policy. First, there is a general agreement that China's industrial policy preserves an iron-focus on innovation and high-tech industrial upgrading, the origins of which date back to 2006 when the the government published a 15-year plan to develop the nation's capabilities in "indigenous innovation" (State Council, 2006). The plan grew out of the realization that the previous model of offering market access in return for technology transfer had exhausted its potential. Continued feuds with foreign firms over intellectual property and standards had revealed to Chinese policymakers that without creating independent IP rights and leadership in standards, China's future development would remain below its potential. (Cao et al., 2006). When Xi Jinping took office in 2012, innovation merged with a resurgence of nationalism. While this merger is a partial outcome of the Zeitgeist of the time, Xi's personal ideological belief equally play an important role. For instance, during the 1990s, Xi authored commentaries praising Yan Fu, a 19th century Chinese thinker known for regarding the combination of science and patriotism as essential to save China from imperialist encroachment (Torigian, 2022). China's Innovation-Driven Development strategy - published in 2016 - further views innovation as a combined effort of all "innovation entities" (创新主体) including firms, R&D institutes, higher education and regional clusters. The strategy also frames innovation as a matter of national security, devoting a whole chapter to "military-civil fusion" (军民融合) and warning of foreign-controlled technology chokepoints. The literature has given different names to this innovation-centered industrial policy, e.g. "techno-industrial policy" (Chen and Naughton, 2016) and "techno-nationalism" (Lei, 2023), but the essence is that growth stems from autonomous development and commercialization of high-end technologies, replacing capital accumulation and the absorption and imitation of foreign technologies. The strong overlap between industrial policies and innovation policies means that industrial policy priorities are typically formulated at the industry and the technology level.

A second principle concerns the way in which industrial policies are implemented. The Chinese government has come to view markets as complementary to state guidance rather than as inherently conflictual. The extent to which this principle has become embedded in policymaking may best be exemplified by the 15th Five-Year Plan, released in October 2025, which mentions the "combination of efficient markets (有效市场) and a proactive government (有为政府)" among the fundamental principles that must be followed, placing it on par in importance with "comprehensive party guidance" and "high-quality development". Again, some of this can be traced back to Xi Jinping's ideological principles. In introductions he wrote to Marxist classics during the late 1990s, he emphasized the need for markets to function as a method for realizing socialism rather than regarding them as purely capitalist instruments. Markets, however, should be subordinated to the guiding role of the state so that China can avoid the blind pursuit of profits, which he regards as the major drawback of capitalist systems (Torigian, 2022). A version of this has been official policy since 2013, but the exact wording – "efficient markets" and "proactive government" – points to the growing influence of New Structural Economics, an economic school of thought developed by the influential economist Justin Lin, founder of Peking University's National School of Development and former Chief Economist of the World Bank. Lin ranks eighth in the Policy Influence Index, but first when considering economists focused specifically on industrial policy. During its formulation at the World Bank in 2012, New Structural Economics was presented as the third school of development economics and as an alternative to the Washington Consensus (Lin, 2012). Chinese-language publications assert that it is guided by Marxist dialectical materialism and historical materialism (Lin et al., 2025). In brief, New Structural Economics posits that industrial policy should align with the comparative advantage of a country, which is endogenous to the country's endowment structure. The surplus that firms in comparative-advantage-conforming industries generate can then be reinvested to upgrade the country's endowment structure, diversifying the economy away from labor- and resource-intensive activities Lin (2012). The role of a "proactive government" is to facilitate the shift from a mere factor advantage to a competitive advantage by providing infrastructure, reducing transaction costs, and compensating entrepreneurs for information externalities, as discussed in Hausmann and Rodrik (2003). "Efficient markets" ensure that the most competitive firms succeed. Applied to China's socialist market economy, this means that the government guides the allocation of the economy's production factors, which it aligns with industry- and technology-level priorities, while amplifying competitive pressures at the firm level wherever possible. Among the production factors, state-owned banks, government equity funds, and subsidies guide the flow of capital. The government also controls the allocation of land, which is universally owned by the state. State-owned enterprises guide the allocation of energy, critical infrastructure, and raw materials. In addition, the state runs an elaborate system of research laboratories and is a crucial supporter of firm-based R&D activities. Implementation schemes are designed to let firms compete for state-controlled resources in a tournament-like system. Winning firms unlock preferential access to resources from multiple sources at once.

4 A Framework of China's Industrial Policy

Figure 1 presents our framework of China's industrial policy. The upper half of the figure illustrates the interplay between different industrial policy priorities which the government explicitly supports. Within industry priorities, future industries arise out of scientific advances, and function as engines of frontier innovation. They typically encompass products (and services) that have not yet reached market readiness, such as quantum computers, humanoid robots, or gene editing. Industry and R&D institutes collaborate in developing the underlying technologies, and once the products are commercially viable, future industries turn into emerging industries. Demand for emerging industries may come from final consumers or producers, depending on the position of related products in the value chain. For final goods, the government stimulates demand through purchase incentives and the provision of activity-specific infrastructure. Most emerging industries, however, cover intermediate goods and therefore have predominantly industrial applications. In such cases, traditional industries serve as the main source of demand, while the technologies developed in emerging industries upgrade traditional industries. By concentrating state support on technological linkages between the different industry types, China's industrial policies aim to accelerate mutually reinforcing cycles of technology incubation, adoption, and diffusion. Industry-level priorities are then complemented by priorities at the level of specific technologies. Technology priorities may at times constitute a subset of industry priorities, but more often they are tied to

Figure 1: A Framework of China's industrial policy



Source: Authors.

economic and national security concerns. Technology priorities are commonly captured under the notion of "key and core technologies", referring to highly complex and strategically important technologies that often have systemic significance or underpin the development of emerging industries. A particular subset of these are chokepoint technologies, which are defined as those key and core technologies that are under the control geopolitical rivals and for which no viable substitutes exist.

Once industrial policy priorities are set, relevant ministries design implementation schemes, which are represented in the lower half of the framework. Implementation schemes coordinate state-controlled resources between innovation entities, including firms, universities and research institutes. They can be divided into Science and Technology (S&T) policies, firm-based policies and place-based policies. S&T policies are built around mission-oriented national R&D programs. To carry out projects under the programs, the government curates innovation consortia where universities, public research institutes and firms collaborate on the incubation of new technologies. Firm-based policies include government certification programs that tailor state support to the development stage of a firm, and can loosely be translated labeled "multi-tiered firm development systems". Certified firms ought to be the forerunners in the commercialization and the adoption of emerging technologies. Certification implies preferential access to production factors which includes access to state-controlled R&D infrastructure and inclusion into innovation consortia, out of which IP rights can result. For the sake of supply chain resilience in critical sectors, the government also promotes the chain leader system, in which a government entity-either a public official or a state-owned enterprise-collaborates with a lead firm to allocate resources to technological linkages where China is vulnerable to supply chain disruptions. To facilitate the circulation of technologies from scientific innovation to commercialization to diffusion and back to scientific innovation, governments at each level deploy place-based policies. Both zones and clusters act as a means to coordinate infrastructure investment, which includes not only physical and energy infrastructure, but also digital infrastructure such as 5G networks and industry-specific service platforms.

4.1 Formulated Priorities

Having presented the outlines of our framework we now deep dive into each of its components, starting with formulated priorities. To illustrate the thought process behind each component, we specifically touch upon the historical logic behind their formulation.

4.1.1 The Industry Level

The central role of emerging high-tech industries Emerging high-tech industries continue to be at the core of China's development strategy and of the goal to upgrade the country's industrial structure. The origins of this go back to 2010, when the government launched the Strategic Emerging Industries initiative. Strategic emerging industries are loosely defined as high-tech industries in their nascent stage, either with a limited international market and few foreign competitors, or with some form of broader strategic significance. If China moved decisively into this untapped potential, it could reap the benefits of first-mover advantage, leapfrog global competitors, and seize the commanding heights of future technological progress. As the original document states, strategic emerging industries offer the potential for "novel competitive advantages" (State Council, 2010). Initially conceived to guide the allocation of funds from China's post-crisis stimulus package, the Strategic Emerging Industries program became the component upon which much of China's industrial policy framework has subsequently been built. The list of emerging industries has changed only marginally since 2010, and the official 2023 version includes: new-generation ICT, new energy, new materials, biotechnology, high-end equipment, new energy vehicles, green and environmental protection, aerospace, and marine engineering equipment (State Council, 2023a).

The Strategic Emerging Industries initiative represents one of the earliest manifestations of China's techno-industrial policy framework, and it carries the imprint of its bureaucratic incubator. During the 2000s, the National Development and Reform Commission (NDRC) was the most influential industrial policy agency, and it acted as the lead agency in the formulation of the Strategic Emerging Industries initiative (Chen and Naughton, 2016). The emphasis on leapfrogging and first-mover advantage reflected the then-dominant economics-driven thinking, in which industrial policy would be reconcilable with China's comparative advantage. This is in line with the competence focus of the NDRC. Originally designed to regulate overcapacity after the Asian financial crisis and to curb "destructive competition", the NDRC acts as China's macro-planning agency, and most of its staff has an economics background (Wang, 2021). Influential economists such as Justin Lin praised the Strategic Emerging Industries initiative as an obvious choice for comparative-advantage-following industrial polic[3].

To put the initiative into context, it is useful to highlight the difference between China's approach to industrial policy and the approach taken a few decades earlier by East Asian economies, particularly Japan, South Korea and Taiwan. The latter three invested into industries with well-

[3] See, for instance, Lin's 2016 Caixin interview: https://video.caixin.com/2016-03-06/100916055.html

established existing markets; steel, machinery, automobiles in Japan, chemicals, steel, and shipbuilding in South Korea, and consumer electronics and semiconductor fabrication in Taiwan. The integration into global value chains often preceded the structural change that led to the step-wise upgrading of their industrial structure. In some cases, most notable semiconductors in Taiwan and precision machinery in Japan, the competitive advantage derived from the occupying niches in an ecosystem led by multinationals with headquarters in advanced economies. The Strategic Emerging Industries initiative by contrast was designed to be more ambitious. It explicitly aims to overcome China's reliance on catch-up growth and on the import of foreign technology. Instead of occupying a niche in global value chains, China should build up the capabilities to actively shape the structure of global value chains. Bringing forth her own set of lead firms was seen as a necessary condition to achieve this.

In this sense, it is important to underline the long-term thinking behind the policy. While the Strategic Emerging Industries initiative sought to offer a shortcut to the tedious uphill battle that typically comes with catch-up growth, the policy itself defines a long-term objective for competitiveness. Central agencies often invoke history to illustrate the point. Germany and the United States caught up with Britain in the 19th century by taking advantage of the emerging industries of the period: steel, chemicals, the internal combustion engine, and electricity. Former emerging industries then became the long-term pillar industries of the German and American economies. China has a unique opportunity to do the same (Shen and Jiang, 2024; Zhao, 2025). The implementation of the Strategic Emerging Industries initiative is therefore a work in progress and is as important to China's industrial policy today as it was in 2010. Every five-year plan has since reiterated its centrality. In recent years, the term "emerging industries" (新兴产业) has become more common in policy communication. The strategic aspects are now mostly defined at the technology level (see Section 4.1.2).

Linkages between emerging high-tech industries and traditional industries The central government views the development of emerging high-tech industries not in isolation from the rest of the economy, but as complementary to the upgrading of traditional industries. Because emerging high-tech industries, such as the strategic emerging industries, are industries in their nascent stage, they are characterized by a high degree of uncertainty in the trajectory of their underlying core technologies. For instance, Chinese policymakers considered several scenarios for the future of new energy vehicles, including battery-electric vehicles, plug-in hybrid electric vehicles, and fuel-cell vehicles. EV batteries themselves could be of several types, depending on the mineral resources used in their fabrication State Council (2012). Alongside the technology trajectory, market demand and the particular nature of their industrial organization also exhibited a high degree of uncertainty. For products within the strategic emerging industries that target final consumers, demand-promotion policies can kick-start the industry, but the sources of demand for upstream industries, such as energy-saving equipment and robotics, are less obvious and often stem from industry itself.

Debates about the relationship between emerging and traditional industries date back to the early 2010s. As the focus shifted to emerging industries, the question arose as to what role China's large base of traditional industries should play in the country's economic future, especially as rising wages and land scarcity in the coastal provinces threatened to erode the factor advantages that had enabled China's economic rise in the first place. During the mid-2000s, local governments embarked on campaigns to eliminate what the NDRC, in its industry catalogues, defined as "outdated capacity" (落后产能). Lei (2023) reveals how local officials often invoked the bird-cage logic promoted by former statesman Chen Yun. According to this logic, the economy is a bird in a cage whose size is determined by the government. Local policy should replace the old bird with a new bird at appropriate intervals to ensure that production factors are utilized in the most efficient way. In other words, the dominant thinking within the state bureaucracy was that industrial policies should guide the replacement of traditional, low-end industrial activities with emerging high-tech industries. Exit industries, i.e. industries in which China was losing its previous comparative advantage, ought to be relocated either to China's interior provinces or to foreign countries along the newly inaugurated Belt and Road Initiative (Lin, 2015).

An alternative paradigm arose with the establishment of the Ministry of Industry and Information Technology (MIIT) in 2008. Tasked with coordinating China's industrial policy at the sectoral level, the MIIT represents the more technocratic aspect of China's industrial policy design. Many of its staff were drawn from large firms or had backgrounds in industry and trade associations. Compared to the NDRC, the MIIT also employed a significantly higher share of engineers relative to economists (Wang, 2021). A major addition introduced by the MIIT to China's industrial policy discourse is the notion of the "industrial chain" (产业链) (Wang, 2024), a policy paradigm that conceptualizes industrial development in terms of technological linkages across supply- and value-chain segments, across industry types, and across regions. Aligned with this paradigm, the MIIT viewed traditional industries as complementary to the development of strategic emerging industries. In a 2011 speech, then-Minister of Industry and Information Technology Miao Wei stated that "most strategic emerging industries cannot be developed out of thin air but must rely on the technological accumulation, manufacturing capabilities, and industrial organization that have formed within traditional industries" (Miao, 2011). Traditional industries should shape the market and the technology trajectory for emerging industries with a high degree of upstreamness, such as ICT, high-end manufacturing equipment, environmental protection equipment, new materials, and biotechnology. Modernized traditional industries, in turn, should form the country's industrial backbone rather than being abandoned. The shift was justified by a growing competitiveness rationale. In another speech in 2015, Miao Wei further stated that "the simultaneous re-shoring of high-end manufacturing in advanced economies and the competition from emerging economies for middle- and low-end manufacturing is creating a 'two-way squeeze' on China. [···] Manufacturing is the main driver of technological innovation and the fundamental guarantee for a nation's growing competitiveness" (Miao, 2015).

Made in China 2025 (中国智造 2025, henceforth MiC2025), launched in 2015, formalized the new paradigm. The MIIT acted as the intellectual incubator and the program drew heavily on Germany's 2013 "Industrie 4.0" (Li, 2018). It absorbed the seven strategic emerging industries into its list of targeted industries but added aerospace equipment, agricultural machinery, marine engineering equipment and advanced railway transportation equipment (State Council, 2016a). Policy debates in the U.S. and the EU paid much attention to the *sectoral* priorities, but MiC2025 focuses to an equal extent on *cross-sectoral* priorities. Industrial policies should guide the technological upgrading of traditional industries through the adoption of emerging high-end technologies, rather than forcing their exit. Firms may choose the desired type of upgrading according to their industry and their capabilities. Process upgrading may include the introduction of automation equipment, energy-saving and environmental protection equipment, and ICT solutions into firms' operations, or the use of advanced materials and biotechnology to improve resource efficiency. Firms in traditional industries may also utilize new materials to introduce new product varieties, or digital control systems to improve product quality. ICT and high-end manufacturing equipment may improve firms' capabilities in higher-value-added segments of the value chain, and firms in traditional industries may leverage their existing capabilities to move into (emerging) high-tech industries. Whatever the type of technological upgrading, the intuition is that sectoral and cross-sectoral industrial policies should reinforce each other: incentives for traditional firms to upgrade should not only benefit the targeted firms, but should also increase the market size for firms in emerging industries, which has knock-on effects on innovation and enables economies of scale. State support for innovative firms in emerging industries, in turn, spills over into traditional industries. Traditional industries therefore serve as a critical enabler of China's technological ascent, and the Chinese leadership has continuously reiterated their importance ever since the launch of MiC2025. For example, at the 20th Central Financial and Economic Affairs Commission meeting in May 2023, President Xi Jinping underscored the imperative of "upgrading and transforming China's traditional industries rather than simply exiting them" (State Council, 2023b).

Linkages between scientific innovation and emerging high-tech industries Linkages between emerging high-tech industries and traditional manufacturing were at the core of the strategy to accelerate cycles of technological development and technology diffusion. Yet, in order to continuously fuel technological development with new and more radical impulses, the government also regards the development of emerging industries as deeply intertwined with scientific innovation. Early success stories in emerging industries were still largely based on foreign know-how. For instance, China became a dominant player in electric vehicles toward the end of the 2010s, but the domestic battery industry and China's automobile supplier base grew on technologies absorbed from abroad during the early 2000s. ATL, the predecessor of China's EV battery champion CATL, and BYD licensed technology from U.S. companies to produce batteries for consumer electronics and later leveraged these capabilities to expand into EV batteries (Whitfield and Wuttke, 2026). The railway industry is another example. China emerged as a global leader in the production of rolling stock, but absorbed technology from abroad through joint ventures with leading railway producers such as Bombardier, Siemens, and Alstom. In many upstream sectors in which China did not manage to leapfrog ahead, the substitution of foreign firms in supply chains proved difficult. As of 2025, China remains reliant on imports for high-end CNC machine tools, new materials, aerospace equipment, semiconductor manufacturing equipment, biomedicine, and high-performance medical devices (Boullenois et al., 2025).

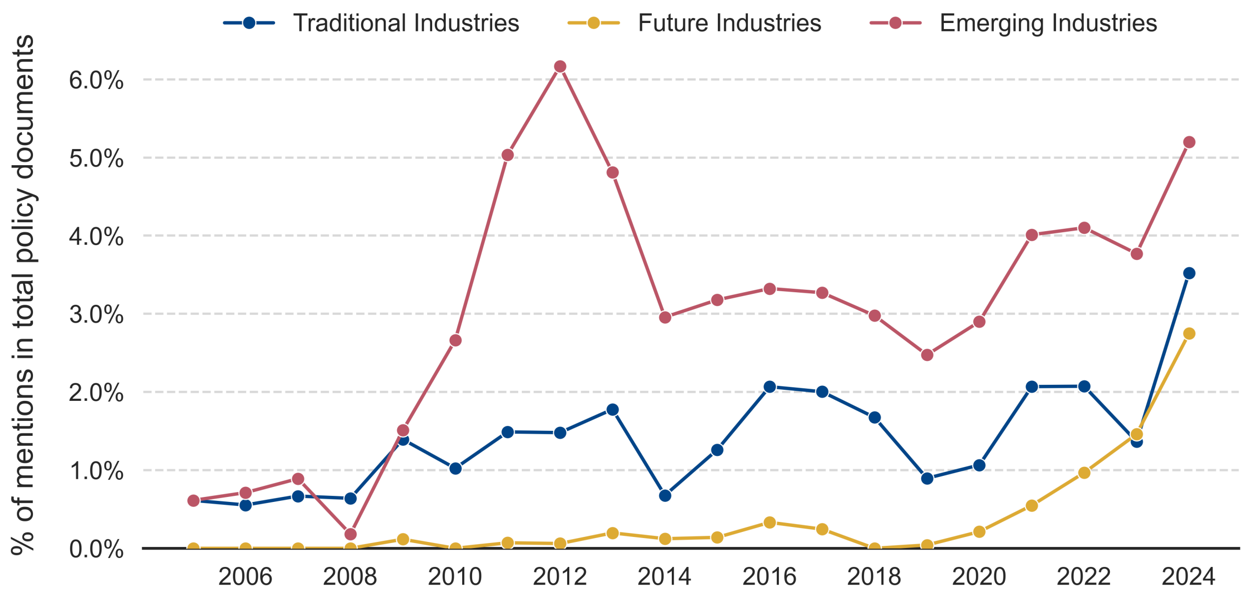
Against this backdrop, it became important for China to increase its capacity for "original innovation" (原始创新), moving beyond innovation based on technologies incubated elsewhere. A major bottleneck was the limited role that basic research played, and still plays, in China's R&D portfolio. Innovation occurred through applied and developmental research in firms, a type of R&D activity that is generally more incremental. While shares of basic research in total R&D expenditures above 20% are common among developed nations, China's share of basic research stood at a mere 6.% in 2024 (NBS, 2025). Given the country's scale, this is still enough to put China at the top of the world's highly cited papers, although home bias in citations raises concerns about the quality of the research (Qiu et al., 2025). Another bottleneck was that scientific progress and industrial innovation occurred in silos, separated from each other in the "two layers" (两张皮) of higher education and industry. A U.S.-style system in which universities create fertile ground for entrepreneurial activity is missing. If scientific innovation is going from zero to one (从 0 到 1) and scaling up is going from one to N (从 1 到 N), the connection between the two remained weak.

Reform of the S&T system had already been part of both MiC2025 and the Innovation-Driven Development Strategy in 2016, but its urgency increased when geopolitical frictions with the United States intensified. U.S. government sanctions on ZTE and Huawei between 2017 and 2019 exposed China's vulnerability to foreign-controlled technology chokepoints. While the globalization of financial exchange and goods production steadily progressed after the end of the first Cold War, central nodes such as the U.S. were able to gain relatively greater coercive power over financial and production networks than less connected nodes (Farrell and Newman, 2019), a finding that the first Trump administration – and later the Biden administration – applied to its China strategy (Farrell and Newman, 2023). The emergence of a new U.S. export-control regime targeting key nodes in supply-chain segments on which China's industrial development depended added fuel to S&T system reform. At a symposium with scientists in September 2020, Xi Jinping announced that, as the world faces "changes unseen in a century" (百年未有之大变局), China's scientific capabilities lagged behind those of developed nations, particularly in original innovation. Some key and core technologies remained under the control of foreign powers (Xi, 2020). Geopolitical tensions strengthened the leadership's resolve to achieve independence in this area.

An important element of this is industry-university-research collaboration (产学研合作), a theme that had already appeared in policy communication by the early 2010s but shifted to a higher priority after 2018. From 2020 onward, the government moved this under the umbrella of the "deep integration of the innovation chain and the industrial chain" (创新链与产业链的深度融合), which is intended to close the gap between scientific progress and industrial development. Much inspiration came from the U.S. DARPA system, which incubated many technologies that form the backbone of today's U.S. high-tech firms. Chinese policy contributions also drew on the incubation of semiconductor technology through U.S. Bell Labs and the commercialization of mRNA technology through BioNTech, CureVac, and Moderna (He et al., 2025).

This culminated in the addition of a new industry category to China's industrial policy priorities as part of the 14th Five-Year Plan in 2020: "future industries" (未来产业). Future industries often appear in policy communication in the same sentence as emerging industries, and both refer to industries in their nascent stage. The conceptual difference between the two is subtle. Unlike emerging industries, future industries are industries for which technologies are still in their incubation phase and for which no business models yet exist. They have the potential to become emerging industries one day, but the creation of commercializable products still requires major scientific breakthroughs. As of 2024, the MIIT defines ten future industries: humanoid robots, quantum computing, new-generation display technology, brain–computer interfaces, 6G network equipment, ultra-large-scale intelligent computing centers, third-generation internet, high-end cultural and tourism equipment, advanced and high-efficiency aviation equipment, and deep-resource exploration and development equipment (MIIT et al., 2024). Once the technologies underlying future industries mature, pathways for emerging industries crystallize. Firms involved in related innovation define business cases, and the industry moves from incubation to the pilot stage, in

Figure 2: Mentions of industry priorities in Chinese policy communication



Source: Reading China Better

Note: Documents are sourced from the State Council, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Science and Technology, the Ministry of Education, the Ministry of Finance, the State-owned Assets Supervision and Administration Commission, and the State Administration for Market Regulation. A document counts as "mention" when the keyword appears at least once in the main text.

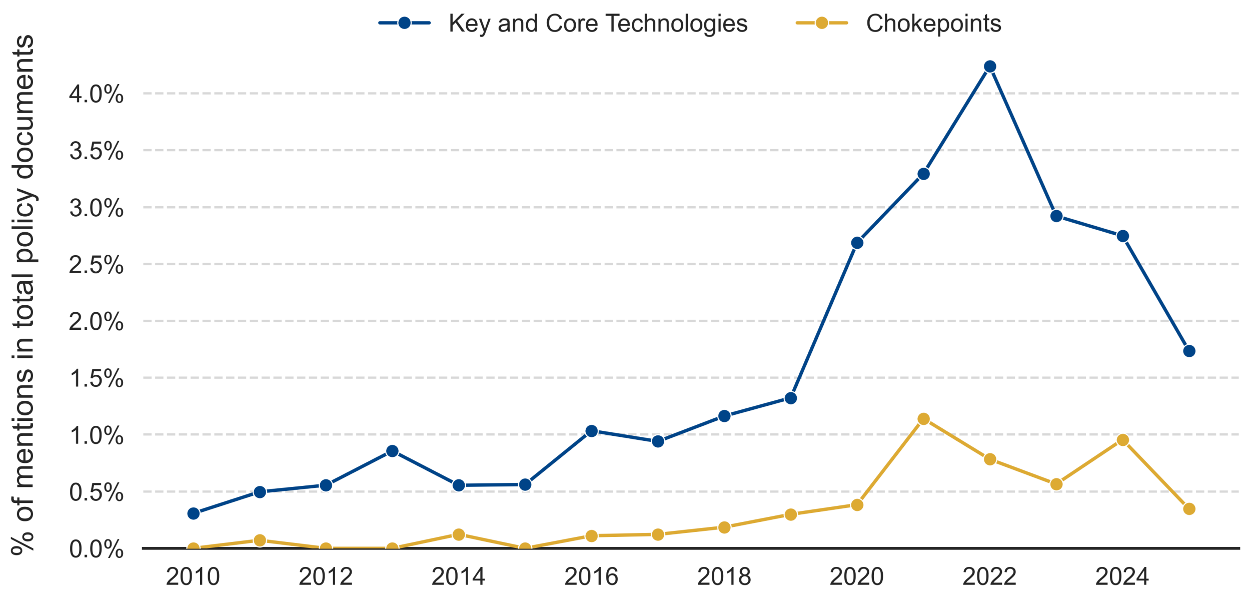
which the government or firms set up demonstration projects (Shen and Jiang, 2024). Investment in scientific advances in future industries ensures that China is able to grasp first-mover advantages that open up in the future and that no country can leapfrog ahead of China.

Linking emerging, future, and traditional industries is central to China's vision of a "modernized industrial system" (现代化产业体系): one in which scientific advances feed smoothly into technology incubation and are then channeled into mutually reinforcing cycles between emerging and traditional sectors. Figure 3 shows that policy references to all three categories have increased since 2020. In Section 4.2, we show that, consistent with this vision, industrial policy is shifting away from selectively supporting large firms with strong technological capabilities and toward facilitating technology flows across a closed-loop process: from basic research and applied research to incubation, piloting and demonstration, SME scaling, and the internationalization of lead firms.

4.1.2 The Technology Level

Linkages between scientific and industrial innovation also support the advancement of priorities defined at the level of specific technologies. Technology priorities are typically summarized under the collective term "key and core technologies" (关键核心技术). Key and core technologies refer both to the core technologies underlying future and emerging industries (EV batteries, reusable rockets, quantum control systems), but also to mature technologies that the Chinese leadership views as critical to economic sovereignty, or which have some dual-use applications (such as industrial software, or satellite navigation systems). A subset of these are labeled technology "chokepoints" (卡

Figure 3: Mentions of industry priorities in Chinese policy communication



Source: Reading China Better

Note: Documents are sourced from the State Council, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Science and Technology, the Ministry of Education, the Ministry of Finance, the State-owned Assets Supervision and Administration Commission, and the State Administration for Market Regulation. A document counts as ”mention” when the keyword appears at least once in the main text.

脖子). Chokepoint technologies are those key and core technologies for which domestic buyers are dependent on geopolitical rivals or on countries subject to the influence of a geopolitical rival and for which no substitute exists, implying a high risk of disruption if China would be cut off from the source. Figure 3 shows the extent to which the technology increased after 2020.

China's Innovation-Driven Development Strategy launched in 2016 already mentions technology chokepoints as priority areas. The economic and national security motif behind them integrates into President Xi's concept of ”comprehensive national security” (总体国家安全), first introduced in 2014 (State Council, 2014), and which views security not only in terms of defense capabilities but also in terms of economic, technological and political security. After the escalation of the U.S.-China technology rivalry after 2020, and particularly after the export controls of October 2022 on advanced semiconductor manufacturing equipment, technological and economic security moved to the top of the priority list. From 2020 onward, terms such as ”supply chain security” (供应链安全) and ”technology self-reliance” (科技自力更生) became more prominent in policy communication. The new emphasis became manifest in a new guiding principle dubbed ”integrating development and security” (统筹发展与安全). According to this paradigm, economic and technology development need to be pursued in parallel with supply chain resilience (Xi, 2023). China's 15th FYP launched in October 2025 mentions the integration of development and security is mentioned as a guiding principle.

As a result of the geopolitical tensions innovation policy shifted to a more mission-oriented approach. In 2023, this manifested itself in the overhaul of the central bureaucracy. A new Commission above the ministerial level and chaired by Vice Prime Minister Ding Xuexiang was created, and the Ministry of Science and Technology (MOST), which traditionally supervised high-tech development zones and the implementation of R&D projects, assumed the role of a strategy and coordination agency. The new mission-oriented approach is the core of China's geopolitical strategy to "bridge short boards" (补短板) and "forge long boards" (锻长板). Short boards represent the defensive aspect of the strategy, and means that state support should focus on supply chain linkages where vulnerabilities are most imminent, i.e. technology chokepoints that are most at risk of being triggered. To break through the chokepoints the Chinese government promotes the "new-type whole-of-nation system" (新型举国体制) to innovation, a term which first entered the discourse in 2019 and was eventually enshrined into the 14th FYP in 2020. In reference to the whole-of-nation system, authoritative sources often invoke the ability to "concentrate power to do great things" (集中力量办大事). Both terms refer to Mao era slogans used in the run-up of China's success in developing nuclear weapons and ballistic missiles through centralized pooling of resources. The reference to the Mao era communicates that innovation entities should work together for a common goal as the nation faces an existential threat from foreign powers. The novelty is the "new-type". Contrary to the Mao era system, firms, not administrative units, are the bearers of technological progress, but they interact with universities, research laboratories and are embedded within regional clusters.

By contrast, forging long boards means focusing state support on domains where China already possesses technological depth, manufacturing scale, or related competitive advantages. The aim is to reinforce the nation's comparative advantages in global value chains or in dual-use technologies. China should cultivate "trump cards" (杀手锏, literary 'assassins mace'), asymmetric capabilities where technological breakthroughs can yield disproportionate security benefits. Practically this implies concentrated support for industries and supply chains in which China is already a world leader, i.e. rolling stock, solar PVs, rare earth refining and electric vehicles. This means R&D support for the core technologies underlying leading industries, but also the dedicated creation of synergies with technologies of other leading industries to create new products and services. The reinforcement of agglomeration effects within industries clusters plays an important part in the long board approach.

4.2 Implementation Schemes

In the previous section, we showed how China's industrial policies aim to both generate complementarities between different industry types, and to achieve breakthroughs in strategically important technologies. We now illustrate how the government designs programs that implement these priorities. Most of the implementation schemes we discuss were created in isolation, and often resulted out of local policy experimentation (Heilmann, 2008). Over time, the central leadership integrated relevant policy initiatives into a web of interlocking S&T policies, firm-based policies and place-based policies.

4.2.1 S&T Policies

Given the reform of China's S&T system, it is no surprise that S&T policies play an out-sized role in the nation's approach to industrial policy. We define S&T policies as those industrial policies that affect R&D, scientific innovation, knowledge flows and technology transfer along the lines of industrial policy priorities. This naturally includes collaboration between firms and R&D institutes, but since firms are market entities, we treat firm-based policies separately in the next subsection.

R&D Funding Much of the funding for fundamental research is allocated to universities through projects supervised by the National Natural Science Foundation of China, with fewer direct implications for industry. Applied research in line with industrial policy priorities is instead carried out under the banner of large-scale mission-oriented R&D programs, of which China's National Key R&D Program is the most important. The program is a merger of a number of previously scattered programs. Government-funded basic research was conducted under the 973 Program, launched in 1997, while applied research was carried out under the 863 Program, launched in 1986. The central government also implemented the Torch Program, which focused specifically on the commercialization of scientific advances and the promotion of start-ups. In 2014, the government issued the Plan for Deepening the Reform of the Management of Central Government Science and Technology Programs (Special Projects, Funds, etc.), emphasizing the need for a new and unified approach to innovation management. As a consequence, the 863 and 973 Programs were integrated into the National Key R&D Program in 2016, while the Torch Program was discontinued and part of it was later replaced by China's SME promotion policies (see Section 4.2.2). At the organizational level, the National Key R&D Program starts from ”Major Special Items”, which are umbrella schemes in priority areas. Forty-two items were selected for the period of the 13th Five-Year Plan (2016–2020), and 60 were selected for the 14th Five-Year Plan (2021–2025). MOST supervises and evaluates the entire program at a holistic level, but most Major Special Items are assigned to one of eight central agencies that have competence in the particular research area. Major Special Items are subdivided into ”projects”, and projects are further divided into ”tasks”.

Research Institutes Research under the umbrella of these projects is carried out through industry–research–university collaboration, with ”research” referring to an elaborate system of state-backed research institutes organized within a hierarchical structure. At the top of this system are 20 national laboratories (国家实验室) and national research centers (国家研发中心), which carry out basic research in priority fields. One level below are the ”National Key Laboratories” (全国重点实验室, henceforth NKLs), which represent the most integral part of the government's innovation and industrial toolbox. Lists compiled by Chinese news outlets indicate that, as of 2025, there are more than 400 such laboratories nationwide. The NKLs explicitly focus on fundamental and original research in key and core technologies and are regularly evaluated based on their contribution to national strategic needs. While MOST is the supervisor, they are typically attached to a university, a ministry, often the Chinese Academy of Sciences or the Ministry of Education, or a large SOE. While the NKLs remain within the domain of fundamental research, the development of industrial applications for the domestic market is instead conducted in ”Engineering Research Centers” (工程研究中心, henceforth ERCs), of which there are, again, several types. The web of national-level laboratories is complemented by numerous types of smaller state-run laboratories at the provincial and municipal levels. They act as the interface between research and the market and integrate with firm-based policies by, for instance, providing R&D infrastructure for SMEs with tight budget constraints.

To facilitate research collaboration between different actors, the government also promotes the establishment of "new-type R&D institutes" (新型研发机构), designed as one-stop shops for all R&D-related activities. They are either set up by a government entity, such as a local government or the Chinese Academy of Sciences, or by a university, but they operate as market entities rather than conventional public institutes. They conduct research on general-purpose technologies, provide consulting and technical services, offer employee-training support, carry out testing and evaluation of new products, and contract specific R&D tasks to firms. Funding typically originates from key R&D projects, but new-type R&D institutes also generate revenue by monetizing their services. New-type R&D institutes are obliged to establish internal party organizations, and the central government encourages local governments to support their construction using central funding for S&T transfer.

Innovation Consortia A novel organization that has found its way into China's industrial policy playbook is the "innovation consortium" (创新联合体). Innovation consortia are alliances between universities, research institutes, and firms that are initiated by the central or a local government for the purpose of coordinating activities along the innovation chain of a specific technology. Although there are no standardized national guidelines for the formation of innovation consortia yet, they are legally recognized and often center on a leading firm or a public research institute as the coordinating body (Naughton, 2024). Innovation consortia usually form for a specific purpose, mostly to solve a particular technical task. In addition, they may also compete with each other for R&D funding, for which the government makes use of several selection mechanisms. Under the "open competition" (揭榜挂帅) mechanism, a single innovation consortium is selected in a competitive process and then solves the specific technological problem within the task defined by the agency that supervises the project. The open competition mechanism typically proceeds as follows: the supervising agency publishes application guidelines that lay out eligibility criteria for participation, such as legal requirements and the number of participating institutions. The guidelines then specify a technological task to be completed by the participant or participants, including technical details. A single entity or consortium is selected to fulfill the task within a certain time frame. Relevant authorities at the national level or within the respective localities support the efforts of selected consortia with research infrastructure, such as access to state laboratories, access to demonstration zones, and R&D subsidies. Consortia that achieve the necessary breakthroughs are granted IP rights and generous support for commercializing the advances made. This mechanism is at the heart of the government's emphasis on technology chokepoints, but it may equally focus on future industries. The open competition mechanism is risky, since the selected team may underperform, potentially leading to project failure. As an alternative, the government may implement the "horse racing" (赛马制) mechanism, in which several innovation consortia work in parallel on the same task. In the end, one or two viable teams are selected as winners. The horse-racing mechanism thus mitigates the risk of fund misallocation. In addition, instead of a single technological solution to a single problem, multiple winning teams may set the technology on different trajectories, each of which can lead to a distinct niche of commercial success.

4.2.2 Firm-based Policies

In line with the formulated priorities outlined in our framework, China's industrial policies incentivize firms to translate scientific advances into commercial applications and to integrate emerging technologies into their production processes. Implementation schemes aim to ensure that the firms best positioned to advance China's industrial policy priorities are selected and that the selected firms receive the adequate factor support. As China's industrial policy is intimately tied to innovation, there is a tight link between S&T policies and firm-based policies. Firms interact with state-funded research through innovation consortia and new-type R&D institutes.

Multi-tiered Firm Development Systems To optimize the allocation of government support to firms, the government has made extensive use of certification schemes in which the most promising firms are officially granted government-support status, unlocking preferential access to multiple types of state-controlled resources. There are separate certification schemes for sectoral and cross-sectoral priorities, i.e. (1) the development of emerging industries and (2) the upgrading of traditional industries through emerging-industry technologies (see Section 4.1). The commonality is that both types are implemented through a mechanism that can loosely be translated as a "multi-tiered firm development system" (梯度培育制度). The idea is that government support should be tailored to the development stage of a firm within an emerging industry, or to the degree to which a firm in a traditional industry has adopted technologies developed within emerging industries. In this way, selected firms move in stages toward the government's industrial policy goals. Both types of schemes are supervised by the MIIT and are a direct outgrowth of MiC2025, although the government has indicated that they will continue beyond 2025. Firms that wish to be part of one of the schemes apply to an annual call from the MIIT. Certification lasts for three years and can be withdrawn if the firm does not perform accordingly.

The development system for promoting emerging industries certifies firms into one of four tiers. "Innovative SMEs" represent the lowest tier and are selected at the provincial level. They are early-stage innovative firms that have already secured some form of IP rights. Once firms start to concentrate on a niche product, they can move up the hierarchy to become "specialized SMEs". Once firms occupy a significant national market share in the niche product, they can be selected as national-level "specialized little giant firms", which are mostly firms in supplier industries. Once firms reach a significant global market share, they become "single-item manufacturing champions". There are many prominent firms among the manufacturing champions, including EV producer BYD, EV battery producer CATL, JinKo Solar, the world's largest solar PV manufacturer, and video surveillance equipment manufacturer Hikvision, to name only a few. To be selected into one of the four tiers, applicant firms have to fulfill eligibility criteria that typically include high R&D intensity and a significant provincial, national, or global market share in a product in an emerging industry or a key and core technology. Being certified functions as a signaling mechanism and leads to the preferential provision of production factors from state-controlled resources, although government support is also highly tailored to the development stage of the firm. For instance, innovative and specialized SMEs with binding financial constraints may benefit from so-called "innovation vouchers" (创新卷), a local government subsidy usable to purchase research services such as rights to use R&D infrastructure in state labs or employee training in new-type R&D institutes. Little giant firms, as spearheads of China's effort to reduce dependencies on foreign-controlled intermediate goods, are encouraged to achieve economies of scale through IPOs. To illustrate this, in 2024 alone, about 58% of new listings on one of China's two main boards were little giant firms[4]. Manufacturing champions are supported in their internationalization strategies, e.g. they receive export credit and are matched with overseas partners. In addition, being certified with little giant or manufacturing champion status acts as a quality label that can grant preferential inclusion into innovation consortia, out of which IP rights can result. While piloted just after the release of MiC2025 in 2016, the program was standardized in 2021, and it is the main mechanism by which the Chinese government chooses firms for the commercialization of scientific progress. Several provinces and cities across the country have also adopted localized versions of the system.

The development system for the upgrading of traditional manufacturing comprises two sub-schemes: one for intelligent manufacturing and another one for green manufacturing, which constitute the two legs of "advanced manufacturing", laid out in MiC2025 (see Section 4.1). The benefits go to firms, but firms apply with one of their operating plants in which they have adopted intelligent or green technologies. For instance, as part of the system for intelligent manufacturing, selected firms are classified into one of four tiers, reflecting the degree to which they have adopted automation equipment and digital connectivity within the plant's production processes (MIIT, 2024). Firms in the foundational tier (基础级) experiment with process automation and have begun to adopt necessary production equipment, industrial software and systems. Once systems are widely deployed and firms integrate data analysis into production operations on a daily basis, they move into the advanced tier (先进级). The outstanding tier (卓越级) applies to firms that have integrated the necessary equipment and systems on a system-level and have begun to leverage intelligent manufacturing to optimize product life cycles and the supply chain linkages. Finally, firms in the leading tier (领航级) have moved to autonomously innovate in production equipment and ICT application to the firm's production system. Unlike the intelligent manufacturing development system, the development system for green manufacturing moves along both a horizontal and a vertical tiers. Along vertical tiers, firms can be certified with municipal-, provincial-, or national-level green factory status. At each level, the requirements for integrating energy-saving and clean technologies into the firm's operations become stricter. Along horizontal tiers, firms are certified according to how much they have reduced their ecological footprint throughout their supply chain. Certification under both sub-schemes comes with preferential access to resources specific to the industrial policy goal, enabling selected firms to move gradually up the different tiers. For green factory status, this may include access to green finance, such as green loans or tax deductions for the installation of energy-saving equipment, as well as preferential utility tariffs and eligibility for related research or demonstration projects. For intelligent factory status, it may include access to subsidies for automation and industrial transformation, including the purchase of intelligent manufacturing equipment and related R&D infrastructure. It is important to note that, while the early batches of the system featured almost exclusively traditional industries, firms in production-heavy emerging industries such as EVs may also be included.

The Chain Leader System Firms certified as little giants or manufacturing champions integrate into complementary firm-based policies. One of them is the chain leader system. The goal of the

[4]The number is obtained by matching the publicly available names of little giant firms with data on listed firms obtained through CSMAR.

chain leader system is to strengthen China's supply chain security (see Section 4.2) by leveraging the power of lead firms within value chains. The chain leader system features two principal actors: a "chain leader" (链长) and a "chain owner" (链主). The chain owner is typically the lead firm of the respective value chain. The chain leader represents the side of the government and its task is to support the chain owner in improving the connectivity between different segments of the supply chain, and to coordinate resources to facilitate innovation in weak linkages, particularly those vulnerable to foreign coercion. In that sense, the chain leader system is an essential part of the strategy to bridge short boards (see Section 4.1.2). There are two types of chain leaders. First, chain leaders can be representatives of the Chinese administrative state, often individual senior officials within relevant agencies that have sufficient influence to pool together the necessary resources. As bureaucratic actors are not themselves market entities, the advantage of this type is that the boundaries between the chain leader and the chain owner are relatively well-defined. The disadvantage is that, while this serves well for localized supply chains with a low degree of complexity, it might reach its limits in complex and cross-regional production networks where chokepoints are not easily observable from the viewpoint of the bureaucracy. As an alternative, the government can hand the role of chain leader to a central SOEs (Jiang et al., 2024). Central SOEs as market entities have a more direct overview over the structure of a value chain in complex products. They can also more easily supervise the direction of resilience building efforts beyond regional boundaries. Central SOEs as chain leaders also align with the reform of the SOE system, ongoing since 2014. As part of the "Modern Enterprise System with Chinese Characteristics", the state sector is expected to "influence and guide the development of private enterprises through a leading function in supply chains" (CCP Central Committee and State Council, 2025). The party leadership treats SOEs as the "party's ruling foundation" (执政基础) and reforms of the SOE management system have come to represent an important element of the party's reassertion over state affairs during the Xi era. Party organizations (党组) are more directly involved in critical decisions and their members fill most management positions (Beck and Brødsgaard, 2022), effectively turning state-owned enterprises into party-owned enterprises. Whether represented by the administrative state or a central SOE, chain leaders – and chain owners alike – typically coordinate the structure of the value chain by acquiring equity in relevant companies, either through government guidance funds or, in the case of firms, by means of their own budget. When acquiring stakes in firms at different segments of the supply chain, the chain leader/owner acts not only as a source of capital, but can also identify opportunities for collaboration between buyers and suppliers, and firms and activity-specific service providers while monitoring contract enforcement and punishing noncooperative behavior, a function that is, for instance, well documented for VC funds (Lindsey, 2008). Empirical evidence also shows how the influence of state connections trickles down to private SMEs. In 2019, about 45% of the total assets of private firms in China were controlled by private owners who either had direct links to state owners or were connected to other private owners that themselves had links to state owners. Large state-connected private firms have a higher propensity to acquire equity stakes in smaller, unconnected private firms (Bai et al., 2020).

4.2.3 Place-based Policies

Within China's industrial policy, place-based policies play an important role in linking higher education with public research institutions and firms, and in accelerating cycles of incubation and adoption of emerging technologies. Different entities within industry clusters can join forces to develop industry-specific applications of technologies, which upgrade the production processes of firms within the cluster. Since clusters are an essential source of national competitiveness (Porter, 1990), they are also part of China's strategy to foster long boards, i.e. extending leadership in industries that are already world-leading (see Section 4.1.2). Place-based policies intentionally interlock with S&T policies and firm-based policies. Industry clusters forge links between specialized SMEs, little giant firms, and manufacturing champions, but also amplify rivalry between competitors. The government can reinforce agglomeration effects by providing activity-specific factor inputs and infrastructure, such as special training centers and industry-specific digital platforms. Place-based policies come in the form of industrial parks, development zones, industry clusters, and, at a more macro level, city clusters. Industrial parks (园区) represent the smallest unit of place-based policies. They are set up by county or district governments and usually do not comprise more than a few property blocks. They are loosely governed by a local administrative committee and often feature a limited collection of local SMEs that share a common set of infrastructure. Industrial parks then aggregate into (1) development zones (开发区) and (2) industry clusters (产业集群).

Development Zones National-level development zones can be divided into economic and technological development zones, high-tech industrial development zones, and special customs supervision zones. Development zones are set up by the state in a top-down manner and are governed by an administrative committee that decides over land lease and business registration, investment approvals, and preferential treatment of firms active in the zone. Zones focus on priority areas but are typically diversified, as it is common for one zone to host multiple specialized industrial parks. Economic and technology development zones typically concentrate on attracting FDI and generating spillovers into the local economy. They aim at providing the right incentives to scale up production and catapult competitive firms into export markets. As they are industry-agnostic, they are of less importance for industrial policy, which aligns with the fact that they are supervised by the Ministry of Commerce. High-tech industrial development zones are different from this. They act as the main institutional platform to facilitate industry-research-university collaboration and the commercialization of scientific innovation. They often locate next to a major university, and high-tech development zones host around 80% of China's national key laboratories (MIIT, 2024). They are supervised by the MIIT, which also makes them a more obvious subject of industrial policy. The distinction between the different types of development zones, however, is increasingly blurry. Many economic and technological development zones also feature R&D facilities and promote collaboration between firms and local universities instead of merely attracting investment projects and promoting export.

Industry Clusters In contrast to development zones, industry clusters typically emerge organically through bottom-up agglomeration among firms in the same industry and are certified as clusters ex post. They often map directly into formulated industrial policy priorities, or complement S&T and firm-based policies. As of 2024, official sources count 555 certified industry clusters at the national level, divided into four categories based on priority areas. Clusters in each category are supervised by the agency under which the respective industrial policy priority was promoted. For instance, 66 out of the 555 industry clusters are strategic emerging industry clusters, and they are supervised by the NDRC. Advanced manufacturing industry clusters are supervised by the MIIT. A first batch of 45 was released in 2022 and a second batch in 2024, adding another 35. Innovation industry clusters are under the supervision of the MOST and currently reach a count of 109. The rest of the 300 are special SME clusters which are, again, supervised by the MIIT. SME clusters are particularly noteworthy as they connect to China's multi-tiered firm development system. According to the official guidelines, SME clusters must be geographically centered around either a single-item manufacturing champion, a little giant firm or contain at least ten specialized or innovative SMEs. Local government support these clusters by providing hard and digital infrastructure and hosting industry-specific public services platforms that match buyers with suppliers, producers with distributors etc.

City Clusters At a more macro level, zones and clusters merge into larger and more diversified city clusters. City clusters (城市群) were first mentioned as part of the Urban Development Plan in 2006, but were only formalized as an implementation scheme of China's industrial policy in 2016, after the 13th FYP further specified the creation of 19 city clusters across China (State Council, 2016b), divided into several types based on their size. At the top of the hierarchy are China's "world-class" (世界级) city clusters, i.e. the Beijing-Tianjin-Hebei area dubbed "Jing-Jin-Ji", the Yangtze River Delta, the Guangdong-Hong Kong-Macao Greater Bay Area. With the increasing importance of Xi Jinping's "common prosperity" since the 14th FYP, city clusters in China's central and Western provinces, the Chengdu-Chongqing region and the Yangtze Middle Reaches were elevated to the status of "new growth poles" for high quality development. City clusters feature more than one particular industry, although the NDRC has certified several city clusters with SEI industry cluster status for particular sectors. More important is their role in inter-regional coordination, specifically in the government's objective to achieve a country-wide division of labor. Western regions are crucial for the sourcing of raw materials. Central regions have become the target of low-end manufacturing investment, while technological upgrading is turning China's coastal provinces into the drivers of frontier innovation, which at the same time, act as springboard to world markets. City clusters function like nodes in a domestic system of complementary production-related activities, and an important aspect of macro-level industrial policy is the greasing of the wheels of this system.

5 Case Studies

Our framework has shown how China's industrial policies aim to accelerate the flow of technologies from scientific advances, to incubation, and to economy-wide adoption and diffusion. We have highlighted how implementation schemes are used to channel state-controlled resources into linkages between entities operating within industrial ecosystems, including universities, research institutes, SMEs and lead firms, and how place-based policies coordinate investment into supporting infrastructure. We now turn to three case studies that each illustrate how a specific aspect of this system works in practice. The case of electric vehicles demonstrates the logic behind the promotion of an emerging industry. The case of textiles and apparel shows how a traditional, labor-intensive industry is incentivized to upgrade. Finally, the case of advanced semiconductors illustrates China's strategy in breaking through technology chokepoints.

5.1 Electric Vehicles

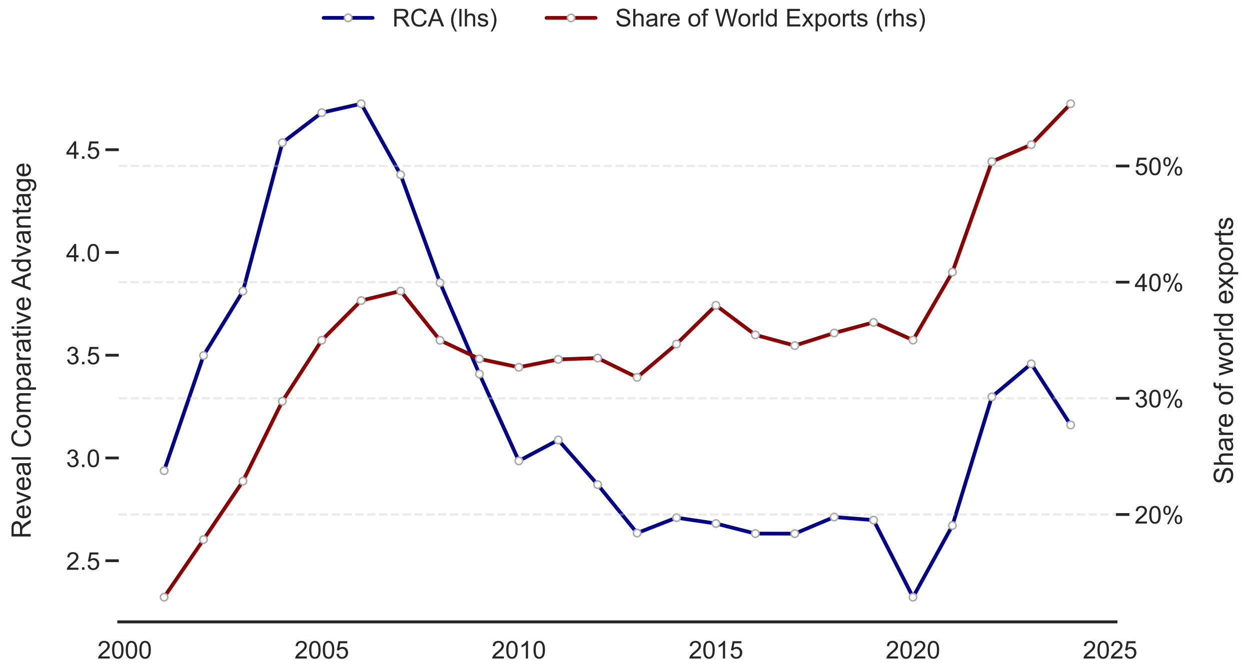
The EV industry represents perhaps the most prominent case of China's industrial policy, and illustrates the logic behind the focus on emerging high-end industries, in particularly the leapfrogging aspect: despite decades of technology-transfer policy, Chinese automotive firms did not manage to catch up with foreign producers in traditional internal combustion engine technology. At the same time, by the mid-2000s China had a comparative advantage in lithium-ion batteries and automotive components. Because there were few international competitors in global EV markets, the chances for successful leapfrogging were deemed high. The EV industry also demonstrates the kinds of implementation schemes that the government used to develop the industry. The MIIT selected competitive firms in upstream industries through the multi=tiered firm development system in order to foster the broader EV industrial ecosystem. Supply-side support was combined with a range of demand-side policies and the provision of industry-specific public inputs. Finally, as the EV industry emerged as a leading industry after 2020, industrial policy in the field became aligned with the strategy of "forging long boards." Policy attention placed renewed emphasis on support for R&D in core technologies such as lithium-ion batteries, while also highlighting the importance of inter-industry synergies, for example with the electricity sector through vehicle-to-grid integration. To further boost the international competitiveness of the EV industry, the central government certified regional industrial clusters specializing in EV production, as well as related and supporting industries.

To understand the logic behind the choice of the EV industry as an industrial policy priority, it is important to consider the historical thought process. Considerations of fostering a domestic EV industry floated around policy circles already around the turn of the millennium but were justified as contributing to China's energy security rather than as providing an opportunity to leapfrog. China's dependency on oil imports became a concern when its manufacturing sector started to grow during the late 1990s. The 10th Five-Year-Plan (2001-2005) identifies oil shortages and environmental pollution as one of six major economic and societal problems. New energy technologies could be leveraged to mitigate these problems (State Council, 2001). The same year, the MOST introduced the Major Science and Technology Special Project for Electric Vehicles under the 863 program, which targets technology subfields relevant for EVs, such as batteries and electric control systems (MOST, 2001).

Simultaneously, Chinese policymakers became increasingly disenchanted with the joint-venture model, in which foreign firms could gain access to the Chinese market in return for technology transfer to a Chinese partner. The market-for-technology model has been the norm since the 1980s in many heavy industries, but failed to deliver the desired results in the automotive industry. China's domestic automobile market continued to be dominated by foreign producers from the U.S., Germany, and Japan, and the internationalization of Chinese automotive firms remained limited. Chinese brands such as Geely and Chery were able to break into developing country markets, but never managed to produce traditional internal combustion engines at a world-class level. At times, Chinese firms also faced significant intellectual property rights barriers, as was exemplified by Chery's feud with GM China in 2003[5], and Shuanghuan Automobile's dispute with BMW. In response, Chinese policy commentators were rethinking how foreign technology should be adopted.

[5] The story can be retrieved: https://www.bloomberg.com/news/articles/2005-02-06/did-spark-spark-a-copycat?embedded-checkout=true

Figure 4: Revealed Comparative Advantage of China in Lithium-Ion Batteries



Source: UN Comtrade based on HS code 850760 and 850780.

An influential report, commissioned by the MOST and written by Feng and Lu (2005) from Beijing University's School of Government, criticized the reliance on FDI in the automotive industry and, specifically, the belief that technology embedded in the products by foreign producers would simply spillover regardless of China's own ability to innovate. The report became influential in shifting the policy trajectory towards a stronger emphasis on "indigenous innovation" (Chen and Naughton, 2016).

Energy concerns and the failure of the market-for-technology model coincided with the fact that China had made significant headway in technologies related to the EV industry. Batteries represent roughly 30% of the total cost of an EV, and China was able to gain a significant global market share in lithium-ion batteries already in the early 2000s. Initially, companies such as BYD and ATL (from which China's leading battery firm CATL emerged in 2011) produced batteries for consumer electronics. BYD secured a deal with Panasonic, Phillips and Motorala, while ATL first produced batteries for MP3 players and later supplied the battery for the Apple iPhone. By 2010, China had a share of lithium-ion battery exports in world exports of 32.67% while continuously maintaining a revealed comparative advantage (Figure 4). And while the market for technology model didn't bring the desired success in the quality of internal combustion engine, FDI from foreign automotive OEMs led to the formation of domestic industry clusters that fostered a competitive supplier base. When foreign OEMs entered the Chinese market, they often demanded their most important Tier 1 suppliers to go global as a precondition for being considered for a new part (Sturgeon and Florida, 2004). Increasingly, however, the foreign Tier 1 suppliers started to source their parts from Chinese Tier 2 suppliers. Yet, the opportunity to upgrade from Tier 2 supplier to Tier 1 supplier mainly stemmed from the demand of Chinese OEMs rather than foreign firms. In 2006, foreign car producers sourced on average 15.4% of their parts from Chinese suppliers, compared to 60.8% for Chinese OEMs (Van Biesebroeck and Zhang, 2026).

When the government shifted indigenous innovation to the forefront of policymaking in 2006, EVs were increasingly recognized as a potential pillar of future competitiveness. The State Council's 2009 Automotive Industry Adjustment and Revitalization Plan, launched in response to the great financial crisis one year earlier, explicitly identifies NEVs as a ”potential source of novel competitive advantages” (State Council, 2009). In 2010, the SEI initiative includes NEVs as one of seven industries in which China could leapfrog to claim ”the commanding heights” in international competition. Since EVs are final goods the demand would come from individual consumer rather than from producers.

Demand stimulus proceeded in roughly two phases. Between 2009 and 2015, the central government rolled out several city-level subsidy programs which included both demand stimulus through public procurement, and purchase subsidies for individual consumers. Government procurement programs included the ”10 cities, 1000 vehicles” launched in 2009 in which 10 selected municipalities would electrify their public bus and taxi fleet. (MOST et al., 2009). Purchase subsidies were piloted in 2009 in several larger cities in which central government hands out subsidies to the manufacturers that pass them onto the consumer as price reductions. From 2013 the purchase subsidies were standardized and rolled out throughout the entire country. Both initiatives yielded underwhelming results. The ”10 cities, 1000 vehicles” failed to deliver the expected results as no city met the targeted number of electric vehicles on its streets, while the purchase subsidies in particular became a source of debate, after subsidy fraud (骗补) started to attract media attention[6]. As a result the government de-emphasized purchase subsidies from 2016 onward.

A second phase began in 2016 when the government shifted to combining demand-side policies with industry-specific public inputs, as well as widespread supply-side support for crucial players within the EV industrial ecosystem. A plan from October 2015 stipulated the construction of charging stations ”moderately ahead of demand” across regions in China (NDRC et al., 2015), and set a quantitative target of an additional 12,000 central charging and battery swap stations throughout the country by 2020, with a geographic focus on regions where demand is expected to be highest. The roll out of charging stations was combined with a campaign of license plate restrictions for traditional ICE vehicles. This typically included the auction off of a license plate for traditional ICE vehicles at a significant price, which in some cities could reach the price of the vehicle itself. As new energy vehicles would be exempted from this, the incentives to shift towards EVs were substantial. As a policy tool to mitigate urban air pollution and traffic congestion in the late 2000s, it developed into a dedicated tool to boost sales of electric vehicles from 2016 onward, rolled out nationwide by 2018 (MPS, 2017). On the supply side, the government actively supported the formation of the domestic EV industrial ecosystem. In July 2018, the government of Shanghai – a city under the direct control of the central government – signed an agreement with Tesla to build a Giga factory at the outskirts of the Eastern part of the city. The company soon benefited

[6]Some companies would sell cars without a battery (or low-quality standards) to affiliated companies to cash in subsidies, a practice known as ”vehicle without battery” (有车无电). Others would write fake documents for procurement, vehicle production and sales, original invoices and records to obtain the subsidies, a practice known as ”brand without vehicle” (有牌无车). Some would sell large batches of vehicles to affiliated companies which would never use them, cashing in subsidies in the process, a practice known as ”idle vehicle” (车辆闲置). (see, for instance: `https://paper.people.com.cn/zgcsb/html/2016-09/19/content_1714534.htm`)

from preferential treatment, i.e. tax reductions, subsidized land and favorable loans. On the one hand, the idea was to use the branding power an American company could bring to boost EV demand at a general level, similar to how Apple's iPhone drove demand for smart phones in the early 2010s (McGee, 2025). On the other hand, the entry of Tesla would put competitive pressures on China's nascent EV industry, thus inciting Chinese EV firms to boost their productive efficiency. This strategy which became widely known as "catfish effect" (鲶鱼效应). A precondition for market entry were local content requirements that facilitated EV supply base around the city of Shanghai. Since suppliers can serve several OEMs at the same time, Tesla's market entry contributed to industry-wide spillovers (Van Biesebroeck and Zhang, 2026). In parallel to Tesla's market entry, major domestic firms along the EV value chain entered China's multi-tiered firm development system: In 2017, today's largest lithium extraction and processing firm, Ganfeng Lithium, entered the very first batch of single-item manufacturing champions. CATL was selected into the third batch in 2019, and StarCharge and TELD, China's largest EV charging infrastructure firms entered the fifth batch in 2021. To assess the individual effects of these policies remains out of scope for this paper, but the EV market grew rapidly from 2020 onward. According to data from the China Association of Automobile Manufacturers, sales of new energy vehicles grew from 1.1 million units in 2020 to 13.88 million units in 2024 (CAAM, 2026).

As the EV industry gained in competitiveness, central agencies also integrated EV industrial policy into the goal to forge long boards. The NEV Industrial Development Plan (2021 - 2035) emphasizes the completion of the industrial ecosystem, improving linkages between producers, suppliers, energy infrastructure and related services, and promoting cross-industry spillovers such as vehicle-to-grid integration and intelligent connected vehicles. R&D activities should concentrate on vehicle connectivity and the further advancements of power battery technology. Besides, cluster policy reflected the aim to solidify the competitiveness of the bourgeourning EV industry. The city of Ningde, headquarter of CATL, was designated as advanced manufacturing industry cluster for power batteries in 2022. The Shanghai, the Guangdong-Hong Kong Greater Bay, and the Jing-Jin-Ji city clusters were certified with EV industry cluster status by the NDRC in 2022 and 2023. Several SME clusters were certified, including one for EV components in Liuzhou, one for EV drive systems in Chongqing, one for EV power systems in Tianjin, one for EV electric power equipment in Changzhou, one for EV power batteries in Jingmen, and two for EV smart connectivity in Sihui and Wuhan. As BYD increasingly ventured into overseas markets, it was certified with single-item manufacturing champion status in 2023.

5.2 Textiles and Apparel

The textile and apparel (T&A) industry has been a pillar industry of the Chinese economy during the first two decades of China's reform and open era, but rising wages and land scarcity have eroded the factor advantage on which its success was based. Within our framework, the case for T&A illustrates the Chinese approach to upgrading a traditional, labor-intensive industry through emerging high-end technologies. One particular aspect of this upgrading has been the adoption of environmental protection technologies. T&A manufacturing is notorious for its pollution stemming from high water consumption, chemicals, and microfibers. In line with the goals stipulated by MiC2025, Chinese local governments have pressured firms in the industry into introducing energy-saving equipment into their production processes, and the gradient cultivation systems have become a standard implementation scheme to achieve this. Another aspect focuses on the adoption of automation tools and digital technologies, in which the T&A industry is so far a laggard.

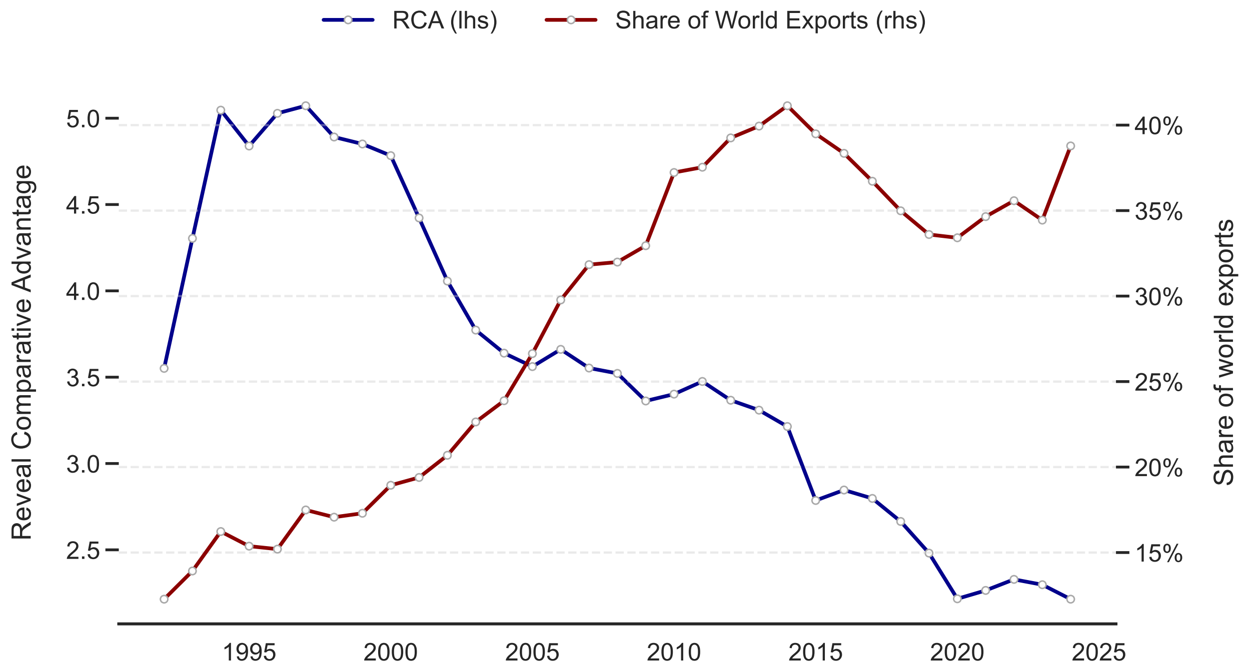
To illustrate the thought process behind the current approach to industrial policy in the T&A industry, it is worth reviewing how the textile industry became a pillar industry of the Chinese economy. Its early stage development is closely related to two institutional development implemented during the 1980s. First, a new type of collectively-owned enterprise emerged that became known as township- and village enterprise (TVE). TVEs were local collective firms under the control of the township or village government that would specialize in labor-intensive production, a direct outgrowth of the commune system of the Mao era. Second, the government started to build special economic zones in coastal areas to attract foreign direct investment, during the 1980s mainly from overseas Chinese diasporas in labor-intensive industries, in particular T&A. TVEs in the hinterland of the special economic zones became integrated into global export processing trade. At the time, TVEs remained in low-value added tasks such as cutting, making, and trimming, but the T&A industry evolved into a pillar industry of the Chinese economy. According to the third industrial census of 1995, T&A manufacturing exports accounted for 85.1% of total TVE exports, and 22.5% of total Chinese exports (Fu and Balasubramanyam, 2003).

During the 1990s, a wave of newly founded private firms began expanding into additional segments of the T&A value chain. Some of these firms such as Luthai Textile or Weiqiao Pioneering emerged out of TVEs that were privatized as part of market-oriented reforms after 1994, often through the sales of control rights to managers and employees (Che and Qian, 1998). Others such as Texhong Textile and Hengli Group were founded as start-ups by a new class of private entrepreneurs. Many of the newly founded firms started to move beyond the cut-make-trim model of the 1980s to become original equipment manufacturers, integrating backward linkages into their operations. They sourced raw materials and produced the fabric of the garment by themselves, which resulted in the formation of a sophisticated industrial base.

The structural change that transformed the Chinese economy during the 1990s brought the T&A industry into the discussions about the appropriate treatment of labor-intensive manufacturing. Having reached a peak in 1997, China's RCA in apparel and accessories began to decline during the early 2000s when FDI related to more capital-intensive industries flowed into the country, and China's coastal areas experienced rises in wages and land prices. The decline in the RCA does not so much reflect a slump in T&A exports in absolute terms, but rather the shift of the Chinese economy towards more capital-intensive industries. The total export value of Chinese T&A rose from US$5.27 billion in 1997 to US$12.3 billion in 2005, while the share of T&A in Chinese exports fell from 23.89% to 13.2% over the same period. After the mid-2000s, policy communication also started to raise concerns about the high degree of pollution and low technical efficiency of T&A firms, especially in the dyeing and finishing segment. In 2005 the NDRC released its first Industrial Restructuring Catalogue which divides production equipment into three treatment types ”encouraged”, ”restricted”, and ”outdated”. Local governments often threatened closure in order to pressure firms with outdated capacity to relocate to inland regions or low-wage countries (Lei, 2023). Relocating low-end manufacturing to areas with lower cost of labor and land would allow the T&A industry to remain competitive, while China's Eastern provinces refocus on emerging high-tech industries.

Following the policy shift of the early 2010s (see Section 4.1.1), the government started to

Figure 5: Revealed Comparative Advantage of China in Textile and Apparel



Source: UN Comtrade based on SITC codes 83, 84, 85.

view emerging industries and traditional industries as complements rather than substitutes. Next to relocation or exit, firms in labor-intensive manufacturing were given the additional option of technological upgrading. MiC2025 stipulates the adoption of intelligent equipment in the textile industry, as well as the greening of printing and dyeing in particular (State Council, 2016a). A dedicated plan on the implementation of MiC2025 in the textile industry released by the MIIT illustrates the thinking behind intentionally using emerging industry technologies to upgrade traditional industries. The plan mentions the following emerging industries with potential application in T&A manufacturing: New materials, environmental and energy-saving equipment, new-generation ICT, and advanced manufacturing equipment. New materials should introduce new types of chemical fibers into the textile supply chain, which facilitates product upgrading by enabling the design of new varieties for consumers, but also by diversifying away from consumer products to textiles used in the aerospace, the medicine, and the defense sector. Environmental protection and energy-saving equipment should reduce the ecological footprint of textile firms. For instance, water-saving and wastewater recycling equipment should lower water use in the printing and dyeing segment, which is notorious for its high water consumption and pollution. The potential for intelligent manufacturing should come from adopting automation systems such as digital weaving and robotic sewing systems, but also specialized equipment that increases technical precision and has the potential to accelerates production cycles. New-generation ICT includes predictive algorithms to forecast failures and minimize machine downtime and to allow connectivity between different segments of the value chain. The use of digital technologies also integrates with energy- and resource-saving equipment when digital solutions are used to optimize pollution controls. AI also enables "smart flexibility" which allows firms to reconcile mass production with customization. Since in apparel manufacturing demand increasingly shifts toward personalized products, this can be a competitive advantage in global markets. Through the application of emerging industry technologies, the manufacturing of T&A shifts from low value-added to high value-added. The T&A industry in turn – which in 2016 still accounted for 10.99% of Chinese exports – provides a market for firms in emerging industries.

The option of technological upgrading came at a time when China's T&A industry started to face international competition. From 2014, the China's share in global T&A exports began to decline in addition to an already declining RCA, a sign that the industry was losing its relative competitiveness. Yet, at an absolute level China continued to retain a significant RCA in the industry. Partial relocation of low-end production to emerging economies like Cambodia, Vietnam, and Bangladesh, did not substantially undermine China's dominant position (Hanson, 2020). According to a 2017 survey on light manufacturing firms, only 10.4% reported relocating to be one of the strategies of coping with higher labor and input costs, while 72.7% reported technological upgrading, although T&A firms were more likely to consider relocating than firms in other industries (Wu et al., 2019).

China's multi-tiered development systems became an important vehicle for supporting firms that were successfully upgrading. An implementation plan released by the MIIT in 2022 explicitly labels China's multi-tiered development system for SMEs and manufacturing champions, and for green and intelligent manufacturing as a mechanism for transforming and upgrading the T&A industry (MIIT et al., 2023). Although the single-item manufacturing champions are typically part of emerging industries, a few of the largest Chinese T&A firms made it into the early batches, including Weiqiao Textile, Huafu Fashion and Lutai Textile in textile fabrication, as well as Shandong Ruyi and Jiangsu Yangguang in apparel manufacturing. With a few exceptions, by 2020 almost all of the large T&A firms had received green manufacturing certification, either for a particular plant or, in the case of some of the vertically integrated apparel manufacturers, for greening their supply chain. The case is different altogether for intelligent manufacturing. Despite intentions of technological upgrading, China's T&A industry has been a slow adopter of robotics compared to more capital-intensive industries. Only a handful of China's large T&A firms were still able to enter the intelligent manufacturing gradient system, among them Esquel, Bosideng, Weiqiao Textile, and Shandong Ruyi. The Hangzhou Bay and the area that connects Suzhou, Nantong, and Wuxi were also selected as advanced manufacturing clusters.

5.3 Advanced Semiconductors

Due to its central role in the U.S. strategy to contain China's technological progress, China's industrial policy in advanced semiconductors has become emblematic of the country's policy to achieve breakthroughs in technology chokepoints. Within our framework, the semiconductor case reveals the logic behind China's new-type whole-of-nation approach to innovation, in which the state pools national resources and directs them toward strategically important segments of supply chains. The whole-of-nation approach also illustrates how S&T policies interlock with firm-based policies. Since 2024, the cornerstone of China's semiconductor strategy has resembled a national-level chain leader system, in which Vice Prime Minister Ding Xuexiang, together with the semiconductor team at the NDRC, acts as the chain leader, and high-tech conglomerate Huawei acts as the chain owner. The NDRC identifies technological chokepoints and coordinates the allocation of resources, while Huawei draws in relevant players along the supply chain to carry out related R&D in partnership with public research institutions. Some of the firms participating in the Huawei-led consortium were selected as single-item manufacturing champions.

Although China has long sought to develop a domestic semiconductor industry, efforts have been complicated by dependence on foreign know-how and intermediate inputs, as well as by the breakneck pace of innovation in an industry that is defined by a high degree of global division of labor. During the 1990s, government attempts to set up competitive production lines through public-private partnerships with state-owned chip manufacturer Huahong failed due to bureaucratic hurdles and the lack of innovation from Chinese design firms. The foundations of the industry were laid in the early 2000s, when many of today's major Chinese semiconductor firms were founded. For example, China's largest semiconductor manufacturing firm, the Semiconductor Manufacturing International Corporation (SMIC), was founded in 2000 by Richard Chang, a Taiwanese-American who previously worked for Texas Instruments and TSMC. SMIC had early success in attracting capital, including a $630 million investment in 2003 from, among others, Walden International, Temasek, and a Singapore consortium led by Vertex Management, and was listed on the New York Stock Exchange in 2004. Alongside SMIC, new chip design firms were established, including Spreadtrum (today's Unisoc) in 2001 and Huawei's design arm HiSilicon in 2004, to name only a few. During the 2000s, China also carved out a significant global market share in semiconductor assembly and testing, the final and most labor-intensive segment of the semiconductor value chain. However, despite these initial advances, progress in higher value-added segments remained limited. In semiconductor design and manufacturing, Chinese start-ups faced a steep uphill battle against foreign incumbents. For instance, in a feud with Taiwan's main chip manufacturing firm TSMC over alleged IP theft, SMIC had to pay $375 million and cross-license patents. The picture appeared even more grim in chip design. The limited scale of Chinese design start-ups meant that IC design firms had to put up with price wars launched by foreign rivals. According to a Caixin report from that time, Taiwanese companies often pushed down prices when taking notice of their Chinese competitors, in some cases to a point below the marginal cost of the mainland firm (Lao Yao, 2011). Chinese firms entered into a few joint-venture agreements with foreign firms, but investment activities clustered in a few cities (Wuxi, Shanghai, and Suzhou), where foreign partners brought their familiar suppliers from abroad. Chinese workers remained in low-skilled tasks, and no notable spillovers to Chinese start-ups materialized. No industry-wide requirements for joint ventures were imposed on FDI activities. (Tan, 2021). A likely explanation is that, contrary to the automotive industry, foreign chip companies used China as a production hub for semiconductors but not as a final goods market. This meant that the government was unable to use the Chinese market as a bargaining tool to demand technology transfer from foreign firms (Minnich, 2023).

The underwhelming progress gave impetus to a more comprehensive industrial ecosystem approach, in which the central government increasingly viewed centralized coordination as vital to the industry's development. This marks the current chapter of China's industrial policy in the industry. Semiconductors were part of "New Generation ICT" when the strategic emerging industries initiative was launched, a dedicated plan came in 2011, and another one followed in 2014. MiC2025 also integrates the advanced IC industry into the top ten priority sectors, the high priority of the industry is perhaps best exemplified by the establishment of a National IC Industry Leading Small Group led by then Vice Prime Minister Ma Kai. A watershed came in 2014, when the National Integrated Circuit Industry Investment Fund, dubbed the "Big Fund", was set up under the MIIT with a fundraising target of US$21.8 billion. The Big Fund provides equity investment to selected firms with the goal of coordinating capital allocation across the Chinese chip value chain and has been key to China's industrial policy in the sector. While local state equity funds came to play a major role in covering the fixed costs of Chinese EV manufacturers, the scale and centralized nature of the Big Fund render it unique among the central government's industrial policy instruments. The Big Fund also partially functioned as a signaling tool. Sub-national governments followed up with their own funding initiatives to support local projects, some of them in partnership with the Big Fund, and others by setting up separate IC-related funds.

The Big Fund proceeded in five-year phases. The first phase (2014–2019) focused on expanding the scale of China's semiconductor foundries and marked China's entry into memory chips, but it did not yet prioritize self-reliance in manufacturing equipment and materials. Based on data from WIND, funding mainly flowed to established players such as SMIC and Huahong (Ouyang and Tang, 2019). Tsinghua Unigroup, a state-owned commercial offshoot of Tsinghua University with several subsidiaries along the semiconductor value chain, acted as a strategic coordinator of the ecosystem, and its CEO Zhao Guowei became one of the members of the National IC Leading Small Group. Packaging firm JCET and chip designer Spreadtrum (acquired in 2013 by Tsinghua Unigroup) also received substantial equity injections, and both were selected in 2017 as part of the first batch of single-item manufacturing champions. Equipment manufacturers AMEC and Naura were among the beneficiaries as well, but together received only about 2% of total funding. Another 19.33% of the Big Fund's investment went into NAND memory chip producer Yangtze Memory Technology, which the Fund set up in 2016 in collaboration with the Hubei provincial government and Tsinghua Unigroup. Yangtze Memory later turned into one of the first phase's success stories. Phase II of the fund, starting in 2019, coincided with the intensification of the U.S.-China technology rivalry and therefore focused much more on creating an industrial ecosystem. SMIC, Yangtze Memory, and Changxin Memory, a major DRAM manufacturer, received the bulk of investment, but the fund also allocated a considerable amount of funds to semiconductor materials. In addition, the Big Fund started to invest in many design start-ups, about half of which entered the fifth batch of little giant firms in 2023[7]. By 2020, however, many of the investments conducted through the Big Fund were riddled with stories of corruption and misappropriation of funds. Tsinghua Unigroup itself, hailed as the hope of China's design efforts, defaulted on US$198 million in bonds, reducing its credit rating from AA to BBB overnight. The company filed for bankruptcy reorganization in 2021. In May 2025, CEO Zhao Weiguo was convicted and given a de facto life sentence on charges of corruption. In addition, high-level personnel of the Big Fund were charged with corruption, including the former CEO and chairman of the Big Fund's management company, Sino IC.

Following the corruption scandals associated with the Big Fund, the downfall of Tsinghua Unigroup, and the increased impatience in Beijing in the aftermath of the 2022 U.S. export controls, the government adjusted its strategy. The evidence for the post-2022 period remains limited, and the Chinese government has reportedly been careful in publishing information on its semiconductor strategy. Yet a careful reading of Chinese and foreign sources suggests that the Chinese leadership has shifted from using the Big Fund as a central coordinating tool to selecting a smaller group of national champions, most notably Huawei, that would concentrate resources into a narrow set of critical linkages. The new approach represents a national version of the chain leader system (see

[7]These include BIWIN, Smartsens, Geehy, Saimcore, Ingenic, and Chipown.

Section 4.2.2), in which Vice Prime Minister Ding Xuexiang, together with the semiconductor team at the NDRC, acts as the chain leader, and Huawei acts as the chain owner[8]. Huawei leverages the capabilities of its IC design subsidiary HiSilicon and coordinates the allocation of available funds through its investment firm Hubble Technology, a mini Big Fund aligned with Huawei's internal roadmap (Groenewegen-Lau, 2024). To what extent the MIIT-supervised Big Fund will align with the NDRC-led effort is unclear, but despite the bureaucratic competition between the two agencies, it will likely complement investment efforts made by Huawei itself (Triolo, 2026). Huawei is also central to leading innovation consortia that tackle problems in critical linkages. The most critical one is EUV lithography technology, without which the fabrication of logic semiconductors at below 5-nanometer processes is at present impossible, and to which China is blocked from access by the U.S.-led export regime. By 2025, the innovation consortium leading the effort to assemble a functioning and commercializable EUV machine included, alongside chain owner Huawei, SMIC, lithography machine start-up SiCarrier, equipment manufacturers AMEC and Naura, and likely four SOEs from China's military industrial complex[9]. AMEC and Naura were selected as single-item manufacturing champions in 2020 and 2023, respectively, for a 28–7 nm etching system and the ELEDE Series high-density plasma etching machine. Central to the work of the consortium is collaboration with the Changchun Institute for Optics, Fine Mechanics and Physics, one of China's major defense-related research institutes (RAND Corporation, 2026), and with which Huawei published patents on an EUV light source, a crucial part of an EUV lithography machine. The institute hosts six national key laboratories, and among the 30 start-ups that emerged out of the research, nine of which have become little giant firms and three manufacturing champions. Huawei invested in suppliers of photoresists, specialty gases, and substrates, and announced plans to build a fully functioning advanced logic chip production line at its Shenzhen-based fab Pengxinwei, using 100% domestically produced equipment. It is worth noting that the growing centrality of Huawei as a chain owner has reportedly caused unease among competitors, notably SMIC. SMIC has more capacity to produce older-generation chips with its 7 nm process but is obliged to allocate some of that capacity to manufacture Huawei's smartphone chips.

6 Conclusion and Directions for Further Research

In this contribution, we proposed a schematic framework for conceptualizing the design of China's industrial policies. Based on an extensive qualitative policy review using Chinese-language sources, the framework illustrates how state support is intended to foster technology linkages across different industry types, including emerging industries, future industries, and traditional industries. Implementation schemes grant favored firms preferential access to state-controlled production factors, such as land, capital, skills, data, energy, and raw materials, but increasingly aim to encourage collaboration among entities within industrial ecosystems, including between SMEs and lead firms, firms and R&D institutes, domestic firms and overseas partners, and other actors.

The shift from industrial policy instruments focused on factor allocation toward the functional

[8]There is, to the best of our knowledge, no comprehensive public register of selected chain owners, but Chinese media outlets often informally refer to Huawei as a chain owner, which matches the reading of the situation more generally.

[9]This information comes from Triolo (2026) and is, as the author admits, an educated guess rather than verified by Chinese sources.

embedding of relevant entities within industrial chains, innovation consortia, and clusters has important implications for further research. Current analyses of China's industrial policy often focus on a narrow set of financial incentives (Branstetter et al., 2023), while leaving out more intangible forms of support associated with the state-guided formation of industrial ecosystems, as well as firm-level government certification. Besides, publicly available databases such as Global Trade Alert (Global Trade Alert, 2026), which seek to quantify industrial policy support at the global level, apply uniform methods across geographies. While this ensures comparability, it risks overlooking important qualitative differences between jurisdictions in the internal logic of industrial policies and the institutional context in which they are implemented. Some recent contributions have provided a more granular analysis of China's industrial policies instruments through textual analysis (Fang et al., 2025). In the future, researchers focusing on industrial policy need to advance further on this front by quantifying more intangible instruments, such as the government curation of innovation consortia, the effects of certification schemes, and the official designation of favored firms as anchor firms in industry clusters. Failing to capture these forms of state support risks underestimating the extent of state intervention in China and thereby biasing assessments of its effectiveness.

Besides its methodological implications, our analysis raises a set of interesting research questions. A first, and probably the most policy-relevant, question is to what extent—and why—China's attempt to foster competitive suppliers of high-tech goods in priority industries has succeeded. Given the current fragmentation of the global trading system, the relevance of this question is of more universal interest: when domestic buyers rely on sourcing high-tech inputs from geopolitical rivals, or from countries subject to the influence of a geopolitical rival, they face the risk of severe disruptions to their operations. Dual sourcing through a domestic alternative can mitigate this risk, but the relevant technology may not be available, or domestic suppliers may simply not be cost-competitive. A case for industrial policy emerges in industries where disruptions not only harm individual firms but also generate national security externalities, that is, where they affect the geopolitical bargaining power of the entire nation. Because this bargaining power is not reflected in market prices, buyers naturally underinvest in mitigating such risks (Kooi, 2025). Government intervention may help strengthen the domestic supply base and support the development of viable substitutes. China provides an opportunity to empirically assess this form of industrial policy.

While our contribution focused primarily on the internal logic of national-level industrial policies, further research is also needed on the trade-off between the centralization of industrial policy and local implementation. There is general agreement that China under Xi Jinping has experienced a strong trend toward political tightening (Shambaugh, 2021; Cho, 2025). The underlying mechanisms are diverse and include the anti-corruption campaign, the fusion of Xi Jinping Thought with the law, and reforms to cadre evaluation systems. This tightening has led to a significant increase in the pass-through of industrial policy priorities from the center to localities. One side effect is that localities have become more willing to defy their local comparative advantage in favor of pursuing sectoral priorities promoted by the center (Fang et al., 2025). This also implies that industrial structures across regions become more similar and that, as a result, localities compete with one another in the same industries rather than contributing to a domestic division of labor. The outcome can be uncontrolled capacity expansion and domestic price wars launched by industry leaders, a phenomenon visible in many emerging industries in China and described by the Chinese government as “involutionary competition” (内卷式竞争). How governments can conduct industrial policy while minimizing regional protectionism remains an open and intriguing question.

References

Aiginger, K. and Rodrik, D. (2020). Rebirth of Industrial Policy and an Agenda for the Twenty-First Century. *Journal of Industry, Competition and Trade*, 20(2):189–207.

Bai, C.-E., Hsieh, C.-T., Song, Z. M., and Wang, X. (2020). Special Deals from Special Investors: The Rise of State-Connected Private Owners in China. *NBER Macroeconomics Annual*, 35(1):295–344.

Beck, K. I. and Brødsgaard, K. E. (2022). Corporate Governance with Chinese Characteristics: Party Organization in State-owned Enterprises. *The China Quarterly*, 250:486–508.

Boullenois, C., Black, M., and Rosen, D. H. (2025). Was Made in China 2025 Successful? Report prepared for the U.S. Chamber of Commerce, Rhodium Group.

Branstetter, L. G., Li, G., and Ren, M. (2023). Picking winners? Government subsidies and firm productivity in China. *Journal of Comparative Economics*, 51(4):1186–1199.

CAAM (2026). Brief analysis of new energy vehicle production and sales in december 2025. [2025 年 12 月新能源汽车产销情况简析]. Available at: `http://www.caam.org.cn/chn/5/cate_39/con_5237008.html`.

Cao, C., Suttmeier, R. P., and Simon, D. F. (2006). China's 15-year Science and Technology Plan. *Physics Today*, 59(12):38–43.

CCP Central Committee and State Council (2025). Opinions on Improving the Modern Enterprise System with Chinese Characteristics. [中共中央办公厅国务院办公厅关于完善中国特色现代企业制度的意见]. Available at: `https://www.gov.cn/zhengce/202505/content_7025304.htm`.

Che, J. and Qian, Y. (1998). Institutional Environment, Community Government, and Corporate Governance: Understanding China's Township-Village Enterprises. *Journal of Law, Economics, and Organization*, 14(1):1–23.

Chen, L. and Naughton, B. (2016). An Institutionalized Policy-making Mechanism: China's Return to Techno-Industrial Policy. *Research Policy*, 45(10):2138–2152.

Cho, S. (2025). History Rhymes: The Shou-Fang Cycle in Chinese Politics. *Journal of Chinese Political Science*, 30(1):1–21.

Ding, J. (2024). The Diffusion Deficit in Scientific and Technological Power: Re-assessing China's Rise. *Review of International Political Economy*, 31(1):173–198.

DiPippo, G., Mazzocco, I., and Kennedy, S. (2022). Red Ink: Estimating Chinese Industrial Policy Spending in Comparative Perspective. Report, Center for Strategic and International Studies (CSIS), Washington, DC.

Fang, H., Li, M., and Lu, G. (2025). Decoding China's Industrial Policies. NBER Working Paper No. 33814.

Farrell, H. and Newman, A. L. (2019). Weaponized Interdependence: How Global Economic Networks Shape State Coercion. *International Security*, 44(1):42–79.

Farrell, H. and Newman, A. L. (2023). *Underground Empire: How America Weaponized the World Economy*. Henry Holt and Company, New York.

Feng, K. and Lu, F. (2005). Policy Choices for Developing China's Indigenous-Intellectual-Property Automobile Industry [发展我国自主知识产权汽车工业的政策选择]. Technical report, Peking University. In Chinese.

Fu, X. and Balasubramanyam, V. N. (2003). Township and Village Enterprises in China. *Journal of Development Studies*, 39(4):27–46.

Global Trade Alert (2026). Global Trade Alert Database. Accessed 30 April 2026: `https://www.globaltradealert.org/`.

Groenewegen-Lau, J. (2024). Whole-of-Nation Innovation: Does China's Socialist System Give It an Edge in Science and Technology? Mercator Institute for China Studies (MERICS). Report.

Hanson, G. H. (2020). Who Will Fill China's Shoes? The Global Evolution of Labor-Intensive Manufacturing. NBER Working Paper No. 28313.

Hausmann, R. and Rodrik, D. (2003). Economic Development as Self-Discovery. *Journal of Development Economics*, 72(2):603–633.

He, D., Chen, T., Liu, H., and Yang, F. (2025). Policy Practices and Countermeasures Analysis on the Deep Integration of Technological Innovation and Industrial Innovation. *Bulletin of Chinese Academy of Sciences*, 40(5):781–794. In Chinese.

Heilmann, S. (2008). From Local Experiments to National Policy: The Origins of China's Distinctive Policy Process. *The China Journal*, (59):1–30.

Heilmann, S. (2016). *China's Political System*. Oxford University Press, Oxford.

Jiang, H., He, J., and Zhang, X. (2024). Collaboration Governance Mechanisms and Strategies for Central State-Owned Enterprise Industrial Chain Chiefs: The Case of China Mobile [中央企业产业链链长协作治理机制与策略：以中国移动为例]. *Enterprise Economy*, 5:76–86. In Chinese.

Juhász, R., Lane, N., and Rodrik, D. (2024). The New Economics of Industrial Policy. *Annual Review of Economics*, 16(1):213–242.

Juhász, R. and Steinwender, C. (2024). Industrial Policy and the Great Divergence. *Annual Review of Economics*, 16(1):27–54.

Kooi, O. (2025). Power and Resilience: An Economic Approach to National Security Policy. Job Market Paper, University of Chicago, March 21.

Lane, N. (2025). Industrial Policy and Industrialization in South Korea. *The Quarterly Journal of Economics*, 140(3):1683–1741.

Lao Yao (2011). Mainland IC Design Has Already Gained Strength and Is on the Verge of Takeoff. [大陆 IC 设计已经具备一定的实力，也正处在爆发的边缘]. Caixin Blog. Available at: https://laoyao.blog.caixin.com/archives/12164.

Lei, Y.-W. (2022). Upgrading China through Automation: Manufacturers, Workers and the Techno-Developmental State. *Work, Employment and Society*, 36(6):1078–1096.

Lei, Y.-W. (2023). *The Gilded Cage: Technology, Development, and State Capitalism in China*. Princeton University Press, Princeton, NJ.

Li, G. and Branstetter, L. G. (2024). Does "Made in China 2025" Work for China? Evidence from Chinese Listed Firms. *Research Policy*, 53(6):105009.

Li, L. (2018). China's Manufacturing Locus in 2025: With a Comparison of "Made in China 2025" and "Industry 4.0". *Technological Forecasting and Social Change*, 135:66–74.

Lin, J. (2015). Part One of the Special Exposition on "Adhering to and Developing Socialism with Chinese Characteristics". [坚持和发展中国特色社会主义专题阐述之一]. People's Daily Online (Theory Channel), May 31, 2015. Available at: http://theory.people.com.cn/n/2015/0531/c40531-27081720.html.

Lin, J. Y. (2012). *New Structural Economics: A Framework for Rethinking Development and Policy*. The World Bank, Washington, DC.

Lin, J. Y., Chen, C., and Fu, C. (2025). Theory of New-Quality Productive Forces: A New Structural Economics Perspective [新质生产力理论：新结构经济学的视角]. *Journal of the Institute of New Structural Economics*, (1):1–12. In Chinese.

Lindsey, L. (2008). Blurring Firm Boundaries: The Role of Venture Capital in Strategic Alliances. *The Journal of Finance*, 63(3):1137–1168.

McGee, P. (2025). *Apple in China: The Capture of the World's Greatest Company*. Scribner, New York, NY.

McMahon, D. and Sun, W. (2024). Trivium's Policy Influence Index: The Top 20 Advisors Shaping Chinese Economic Strategy. *Trivium China*.

Miao, W. (2011). Speech by the Minister of the Ministry of Industry and Information Technology on Cultivating and Developing Strategic Emerging Industries [工业和信息化部部长苗圩讲话]. *Caixin Economy*. March 20. https://economy.caixin.com/2011-03-20/100238852.html. In Chinese.

Miao, W. (2015). Only a Manufacturing Powerhouse Can Become a World Powerhouse [唯有制造强国才能变身世界强国]. *Central Cyberspace Affairs Commission Office*. November 19. Speech delivered at the 13th meeting of the 12th National Committee of the CPPCC. https://www.cac.gov.cn/2015-11/19/c_1117235034.htm. In Chinese.

MIIT (2024). Implementation Plan for the Multitiered Cultivation of Intelligent Factories. [智能工厂梯度培育行动实施方案]. Available at: https://www.gov.cn/zhengce/zhengceku/202410/P020241029426205755773.pdf.

MIIT, MoE, MOST, MOT, MCT, SASAC, and CAS (2024). Implementation Opinions on Promoting Innovation Development of Future Industries. [关于推动未来产业创新发展的实施意见]. Available at: https://www.gov.cn/zhengce/zhengceku/202401/content_6929021.htm.

MIIT, NDRC, MOFCOM, and SAMR (2023). Implementation Plan for Upgrading the Textile Industry (2023–2025). [纺织工业提质升级实施方案（2023-2025 年）]. Available at: https://www.gov.cn/zhengce/zhengceku/202312/content_6918720.htm.

Minnich, J. (2023). Scaling the Commanding Heights: The Logic of Technology Transfer Policy in Rising China. MIT Political Science Department Research Paper No. 2023-2.

MOST (2001). Major Electric Vehicle Science and Technology Project under the National High-Tech R&D Program (863 Program). [“十五”国家高技术研究发展计划（863 计划）电动汽车重大科技专项, 2001–2005].

MOST, MoF, NDRC, and MIIT (2009). Ten Cities, One Thousand Vehicles Demonstration Project for Energy-Saving and New Energy Vehicles. [“十城千辆”节能与新能源汽车示范推广应用工程].

MPS (2017). Interview with a Responsible Official of the Traffic Management Bureau on the Promotion and Application of Dedicated License Plates for New Energy Vehicles. [公安部交管局相关负责人就推广应用新能源汽车专用号牌专访答记者问]. Available at: https://www.mps.gov.cn/n6557563/c5757122/content.html.

Naughton, B. (2024). Re-engineering the Innovation Chain: How a New Phase of Government Intervention is Transforming China’s Industrial Economy.

NBS (2025). China’s Expenditure on Research and Experimental Development (RD) Exceeded 3.6 Trillion Yuan in 2024. [2024 年我国研究与试验发展（R&D）经费超过 3.6 万亿元]. Available at: https://www.stats.gov.cn/sj/zxfb/202501/t20250123_1958421.html.

NDRC, NEA, MIIT, and MOHURD (2015). Guidelines for the Development of Electric Vehicle Charging Infrastructure (2015–2020). [电动汽车充电基础设施发展指南(2015—2020 年)]. Available at: https://www.gov.cn/zhengce/2015-10/09/content_5076250.htm.

Ouyang, S. and Tang, H. (2019). Understanding the First Phase Layout of the National Big Fund and Prospects for the Second Phase [一文看懂国家大基金一期布局，展望二期看点]. In Chinese. Available at: https://pdf.dfcfw.com/pdf/H3_AP201910081368240918_1.pdf.

Porter, M. E. (1990). *The Competitive Advantage of Nations*. Free Press, New York.

Qiu, S., Steinwender, C., and Azoulay, P. (2025). Paper tiger? Chinese science and home bias in citations. *Journal of International Economics*, 157:104123.

RAND Corporation (2026). *Chinese Academy of Sciences Directory*. RAND Corporation, Santa Monica, CA.

Shambaugh, D. (2021). *China’s Leaders: From Mao to Now*. Polity, Cambridge, UK.

Shen, Z. and Jiang, F. (2024). Innovation in Future Industries and Strategic Emerging Industries and New Quality Productive Forces: Theoretical Logic and Practical Pathways [未来产业与战略性新兴产业的创新与新质生产力: 理论逻辑和实践路径]. *Journal of Jinan University (Philosophy and Social Sciences Edition)*, pages 1–15.

State Council (2001). Outline of the Tenth Five-Year Plan for National Economic and Social Development of the People's Republic of China (2001–2005). [中华人民共和国国民经济和社会发展第十个五年计划纲要]. Available at: https://www.gov.cn/gongbao/content/2001/content_60699.htm.

State Council (2006). Outline of the National Medium- and Long-Term Program for Science and Technology Development (2006–2020). [国家中长期科学和技术发展规划纲要（2006-2020 年）]. Issued February 9, 2006. Available at: https://www.gov.cn/gongbao/content/2006/content_240244.htm.

State Council (2009). Automotive Industry Adjustment and Revitalization Plan. [汽车产业调整和振兴规划]. Available at: https://www.gov.cn/zwgk/2009-03/20/content_1264324.htm.

State Council (2010). Decision of the State Council on Accelerating the Cultivation and Development of Strategic Emerging Industries. [国务院关于加快培育和发展战略性新兴产业的决定]. Available at: https://www.gov.cn/zwgk/2010-10/18/content_1724848.htm.

State Council (2012). Notice of the state council on issuing the "energy-saving and new energy vehicle industry development plan (2012–2020)" (国务院关于印发节能与新能源汽车产业发展规划（2012—2020 年）的通知). Guofa [2012] No. 22.

State Council (2014). Important Speech at the First Meeting of the Central National Security Commission. [习近平在中央国家安全委员会第一次会议上发表重要讲话]. Available at: https://www.gov.cn/xinwen/2014-04/15/content_2659641.htm.

State Council (2016a). Made in china 2025. [国务院印发《中国制造 2025》]. Available at: http://www.scio.gov.cn/gwyzclxcfh/cfh/2016n_14283/2016n05y06r/xgzc_14378/202208/t20220808_295311.html.

State Council (2016b). Outline of the Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China (2016–2020). [中华人民共和国国民经济和社会发展第十三个五年规划纲要（2016-2020 年）]. Available at: https://www.gov.cn/xinwen/2016-03/17/content_5054992.htm.

State Council (2023a). Industrial Strategic Emerging Industries Classification Catalogue (2023). [战略性新兴产业分类目录（2023）]. Document No. GJPCBZ [2023] No. 24. Office of the Fifth National Economic Census Leading Group of the State Council.

State Council (2023b). Xi Jinping Presides over the First Meeting of the 20th Central Financial and Economic Affairs Commission. [习近平主持召开二十届中央财经委员会第一次会议]. Available at: https://www.gov.cn/yaowen/2023-05/05/content_5754275.htm.

Sturgeon, T. and Florida, R. (2004). Globalization, Deverticalization, and Employment in the Motor Vehicle Industry. In Kenney, M. and Florida, R., editors, *Locating Global Advantage: Industry Dynamics in a Globalizing Economy*, pages 52–81. Stanford University Press, Palo Alto, CA.

Tan, Y. (2021). *Disaggregating China, Inc.: State Strategies in the Liberal Economic Order*. Cornell University Press, Ithaca, NY.

Torigian, J. (2022). Xi Jinping and Ideology. Wilson Center, Washington, DC. 2021–22 Wilson China Fellowship Essay.

Triolo, P. (2026). Innovation under Pressure: China's Semiconductor Industry at a Crossroads. American Affairs Journal, Available at: `https://americanaffairsjournal.org/2026/02/innovation-under-pressure-chinas-semiconductor-industry-at-a-crossroads/`.

Van Biesebroeck, J. and Zhang, H. (2026). Lessons on Industrial Policy from Industrial Organization: Introduction to the Special Issue. *International Journal of Industrial Organization*, 104:103243.

Wang, Y. (2021). Policy Articulation and Paradigm Transformation: The Bureaucratic Origin of China's Industrial Policy. *Review of International Political Economy*, 28(1):204–231.

Wang, Y. (2024). *Markets with Bureaucratic Characteristics: How Economic Bureaucrats Make Policies and Remake the Chinese State*. Columbia University Press, New York.

Whitfield, L. and Wuttke, T. (2026). China's Technological Catch-Up and Leapfrogging in Electric Vehicles: A Firm-Level Study of BYD and CATL. *Progress in Economic Geography*, 4(1):100054.

Wu, J., Zhu, S., and Groenewold, N. (2019). The Determinants and Effectiveness of Industrial Policy in China: A Study Based on Five-Year Plans. *China Economic Review*, 53:243–253.

Xi, J. (2020). Speech at the Symposium of Scientists. [在科学家座谈会上的讲话]. Available at: `https://www.gov.cn/xinwen/2020-09/11/content_5542862.htm`.

Xi, J. (2023). We Must Better Coordinate Development and Security [习近平说，我们要更好统筹发展和安全]. *Xinhua News Agency*. March 13. `https://www.gov.cn/zhengce/2023-03/13/content_5746463.htm`.

Xu, C. (2011). The Fundamental Institutions of China's Reforms and Development. *Journal of Economic Literature*, 49(4):1076–1151.

Zhao, Z. (2025). Effectively Cultivating Strategic Emerging Industries: Shaping New Momentum for Development and Future Competitive Advantages [有效培育战略性新兴产业塑造发展新动能和未来竞争新优势]. *New Industrialization*. Available at: `https://www.miit.gov.cn/ztzl/rdzt/xxgyhqk/tjyd/zjlt/art/2025/art_3cc4c2b43ee84131a3caefe26466fb9f.html`.

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