Dominika Sikorska
ORCID 0009-0009-2449-9284
sikorska.contact@gmail.com

China's Path to Technological Superpower: Made in China 2025 and Dual-Use Technologies

Abstract

The article investigates the role of China's Made in China 2025 (MIC 2025) strategy as a blueprint for China becoming a global technological superpower. The paper explores how MIC 2025 integrates civilian industrial modernization with military capability development supported by a system of Military-Civil Fusion. It also analyses how MIC 2025 has promoted dual-use technologies and innovation in ten strategic sectors, such as new generation IT, robotics, advanced rail transportation, energy saving and new energy vehicles, new materials, or biotech and pharma. Drawing on Chinese policy documents, commentaries, and academic literature, and international research and analyses, the paper evaluates MIC 2025's achievements and remaining vulnerabilities. It seeks to contribute to a more nuanced understanding of how China's industrial policy intertwines with the military and security objectives in the pursuit of technological leadership.

Key words

Made in China 2025, dual-use technologies, Military-Civil Fusion, technological superpower

Introduction

China's rise over the past four decades has been marked by extraordinary economic growth and by significant technological development. The Made in China 2025 (中国制造 2025, hereafter MIC 2025) initiative announced in 2015 by the State Council of the People's Republic of China (PRC) declares, "building an internationally competitive manufacturing industry is the

only way China can enhance its comprehensive national strength, ensure national security, and build itself into a world power"[1]. This reflects China's long-term vision for national rejuvenation, global competitiveness, and laying the foundations for realizing the Chinese Dream (中国梦). MIC 2025, a state-led strategy, is the comprehensive national plan designed to upgrade China's manufacturing base, foster innovation in different sectors, and reduce dependence on foreign technology imports. The strategy is closely intertwined with the policy of Military-Civil Fusion (军民融合, hereafter MCF)[2], which seeks to combine civilian and military technological development. MIC 2025, supported by MCF, reflects a strategic belief that strong manufacturing, progress in advanced technologies and technological self-reliance are indispensable for economic resilience, defence modernization and national security. MIC 2025 targets ten strategic sectors which include (1) new-generation information technology, (2) high-end numerically controlled machinery and robotics, (3) aviation and aerospace equipment, (4) offshore engineering equipment and high-tech ships, (5) advanced rail transportation equipment, (6) energy saving and new energy vehicles, (7) electrical equipment, (8) agricultural machinery and equipment, (9) new materials, and (10) biotech, pharma, and high-performance medical devices. The cutting-edge civilian innovations in those sectors can be simultaneously applied by the People's Liberation Army (PLA), enabling military transformation and defence modernization. The paper aims to analyse the role of MIC 2025 in accelerating China's technological rise, focusing on the development of dual-use technologies. The analysis is guided by several central research questions:

1. How has MIC 2025 contributed to advancing China's industrial capabilities and technological innovation?

2. How has MIC 2025 been integrated into military modernization goals through the framework of MCF?

1 国务院关于印发《中国制造2025》的通知 [*Notice on the Publication of "Made in China 2025"*], https://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm [access: 22.08.2025].

2 习近平主持召开中央军民融合发展委员会第一次全体会议 [*Xi Jinping Presided Over the First Plenary Meeting of the Central Integrated Military and Civilian Development Commission*], https://www.gov.cn/xinwen/2017-06/20/content_5204059.htm [access: 22.08.2025].

3. What are the successes and shortcomings of the initiative after a decade of its implementation?

Methodologically, an analysis of original Chinese policy documents is combined with a review of Chinese and international academic literature, studies, and commentaries. The paper begins with the examination of the origins and objectives of MIC 2025. Next, it presents the MCF concept and its evolution, and the interconnectedness of MIC 2025 and MCF. Finally, it assesses the recent achievements and vulnerabilities of MIC 2025, identifying their dual-use potential. The paper seeks to contribute to a more nuanced understanding of how China's industrial policy intertwines with the military and security objectives in the pursuit of technological leadership.

Made in China 2025: Origins and Objectives

A decade ago, it was recognized that China's manufacturing was huge in scale but lagging technologically. Chinese leaders saw advanced manufacturing and technological innovation as essential to alter the country's state from "large but not strong" through "large but fairly strong" into "large and strong"[3]. In this context, in May 2015, the PRC State Council announced Made in China 2025 (MIC 2025), which aims to enhance the nation's manufacturing base and drive technological innovation. MIC 2025 is the first stage of a three-phase plan, which includes Made in China 2035 and Made in China 2045[4], and is to be achieved by 2049, the centennial of the People's Republic of China. The initiative is to "build our country into a manufacturing power that leads the development of the world's manufacturing industry through three decades of efforts. By the time the People's Republic of China celebrates the 100th anniversary of its founding, this will lay a solid foundation for realizing the Chinese dream

3 Q. Huang,"中国制造*2025*":成就、趋势与开放发展 *["Made in China 2025": Achievements, Trends, and Development*], „应用经济学评论" [„The Applied Economics Review"] 2025, no. 5, p. 10.

4 《中国制造*2025*》解读之：中国制造*2025*，我国制造强国建设的宏伟蓝图 [*The Interpretation of "Made in China 2025": Made in China 2025, a Grand Blueprint for Building China Into a Manufacturing Power*], „工业炉" [„Industrial Furnace"] 2025, no. 3, p. 46.

of the great rejuvenation of the Chinese nation"[5]. Drawing inspiration from Germany's Industry 4.0 development plan for smart manufacturing, MIC 2025's aims to enhance indigenous innovation, improve manufacturing quality, and reduce reliance on foreign technology. The core objectives are to be achieved by state support, which includes employing government subsidies, guiding state-owned enterprises (SOEs), research and development (R&D) funding, attracting and recruiting field experts, scientists and technological developers, and facilitating technology transfers and acquisitions[6]. MIC 2025 defines specific targets to benchmark progress by 2025. For instance, it seeks to achieve 70% self-sufficiency in core components and basic materials in key industries. What is more, it aims for full intelligentization for key areas of the manufacturing industry and achieving a globally advanced level of the green development of the manufacturing industry. Another example is that the proportion of internal expenditure on R&D expenditure of the manufacturing industry above a certain size in the main business income is to increase to 1.68%. Other targets include the development of quality and efficiency, or integrating information technology and industrialization, with broadband penetration reaching 82% by 2025[7]. The longer-term goal is to attain a leading position in global high-tech markets. MIC 2025 identifies ten strategic sectors as pillars of this transformation. These sectors include (1) new-generation information technology, (2) high-end numerically controlled machinery and robotics, (3) aviation and aerospace equipment, (4) offshore engineering equipment and high-tech ships, (5) advanced rail transportation equipment, (6) energy saving and new energy vehicles, (7) electrical equipment, (8) agricultural machinery and equipment, (9) new materials, and (10) biotech, pharma, and high-performance medical devices[8]. Developing capabilities in each of these sectors is crucial to economic and national security. Not only will it move China up the global value chain, but it will also significantly

5 国务院关于印发《中国制造*2025*》的通知 [Notice on the Publication of "Made in China 2025"]…

6 *Made in China 2025: Global Ambitions Built on Local Protections*, https://www.uschamber.com/assets/documents/final_made_in_china_2025_report_full.pdf [access: 22.08.2025].

7 国务院关于印发《中国制造*2025*》的通知 [Notice on the Publication of "Made in China 2025"]…

8 Ibidem.

reduce dependency on foreign suppliers. In sum, the overarching objectives of the MIC 2025 are to comprehensively upgrade China's industrial base and make domestic firms globally competitive in high-value sectors, and ensure greater self-reliance in critical sectors crucial to national sovereignty and economic growth. This, in turn, will lead the country through the process of vital industrial and technological reforms.

Military-Civil Fusion: Concept and Evolution

Military-Civil Fusion is a comprehensive strategy that aims to close the barriers between the civilian and military sectors. Its main objective is to enable the „military to civilian transfer, [and] civilian participation in military" („军转民"、"民参军")[9], which is to be achieved by seamless collaboration and resource exchange between these two sectors. The advancements in science, technology, and industrial capacity should be applied in military initiatives, and military efforts should be used for civilian purposes. The concept of Military-Civil Fusion can be traced back to Mao Zedong's rule. It has evolved under a variety of Chinese administrations, from Mao Zedong, Deng Xiaoping, Jiang Zemin, Hu Jintao to Xi Jinping. Each leader contributed to the concept's development, which has become one of China's future strategies. From the focus on the transfer of civilian technology to the military sector, the development of technologies with both civilian and military applications has been emphasized[10]. Xi Jinping made Military-Civil Fusion a strategic priority, which led to the establishment of the Central Military-Civil Fusion Development Commission (军民融合发展委员会) in 2017[11]. This high-level body, chaired by Xi Jinping, stresses the importance of

9 国务院办公厅关于推动国防科技工业军民融合深度发展的意见 [*Opinions of the General Office of the State Council on Promoting Closer Civil-Military Integration in the National Defence Science and Technology Industry*], https://www.gov.cn/zhengce/content/2017-12/04/content_5244373.htm [access: 25.08.2025].

10 N.S. Manhas, *China's Military-Civil Fusion from Mao to Xi: A Long Roadmap*, „Journal of Polity and Society" 2024, no. 1, p. 49.

11 中共中央政治局召开会议决定设立中央军民融合发展委员会 [*The Political Bureau of the CPC Central Committee Holds a Meeting Deciding to Establish the Central Military-Civil Fusion Development Commission*], https://www.gov.cn/xinwen/2017-01/22/content_5162263.htm [access: 25.08.2025].

MCF and enables coordination across ministries, the military, and industries. Policies under MCF include creating joint research platforms, dual-use technology incubators, or talent programs that embed military experts in civilian projects[12]. There are local MCF committees led by Party officials in nearly every province in China, which enables the alignment of regional industrial plans with military requirements. MCF emphasizes building dual-use infrastructure and supply chains that can serve peacetime commerce and defence production. It promotes the idea that there is no clear dividing line between the civilian and military sectors of development in a modern nation. Modern start-ups deploying AI algorithms, laboratories researching new materials, or factories producing high-tech goods are all part of the broader national security ecosystem. This multi-faceted strategy, covering technological, economic, industrial, and geopolitical spheres, represents a far more direct integration of civilian and defence resources than its earlier versions focusing on "military-civil integration"[13]. MCF reflects the quest for technology and military strength, which can be mutually reinforced and centrally directed from the top.

Made in China 2025 and Military-Civil Fusion

It was observed that under Xi Jinping's rule, the Military-Civil Fusion "has been part of nearly every major strategic initiative, including Made in China 2025"[14]. Many sectors targeted by MIC 2025, which aim for civilian market dominance, are those needed to build a world-class military, and the MCF strategy provides the bridge. It ensures that innovations supported by MIC 2025 can be transferred to the People's Liberation Army and the defence industry. Ten strategic sectors, which are significant for the national economy and have the potential to confer civilian and military advantages, include:

12 Y. Zhao, 新时代我国军民融合发展的战略举措探析, „现代商贸工业" [„Modern Business Trade Industry"] 2025, no. 15, p. 14–16.

13 N.S. Manhas, op. cit., p. 50.

14 *Civil-Military Fusion: The Missing Link Between China's Technological and Military Rise*, https://www.cfr.org/blog/civil-military-fusion-missing-link-between-chinas-technological-and-military-rise [access: 25.08.2025].

1. New generation IT, i.e. integrated circuits and special equipment, information communication equipment, operating systems and industrial software. These include semiconductors, 5G telecommunications, artificial intelligence and cutting-edge chips. Such technology is crucial for the development of a smart economy, and digital society, and can be used to secure communications, surveillance, and advanced military command systems.

2. High-end CNC machines and robotics, including advanced machine tools, automation systems, and industrial robots. These can enhance the development of "smart factories" and productivity, which benefits civilians. Militaries, on the other hand, benefit from the same technologies in automated production of weapons, unmanned systems, and AI-driven technologies.

3. Aviation and aerospace equipment, covering aircraft, heavy-duty helicopters, unmanned aerial vehicles (UAVs), carrier rockets, heavy-duty launch vehicles, satellites, and space platforms. This sector promotes the development of engines, space technology, manned spaceflight, and lunar and deep space exploration projects. Civilian advances in this sector can be transferred into military use to upgrade air and space power. An industrial base producing commercial jets and rockets can also produce military transport planes, missiles, and surveillance satellites.

4. Offshore engineering equipment and high-tech ships, including luxury cruise ships, liquid natural gas (LNG) tankers, deep-sea space stations, large floating structures, and the development of deep-sea exploration. Civilian shipyards build advanced ships to boost civilian trade and energy exploration. In parallel, they use similar know-how to support the construction of warships and submarines, enabling naval modernization.

5. Advanced rail transportation equipment, such as green, intelligent, high-speed trains and heavy-duty rail transit equipment systems. This sector seeks to establish a world-leading modern rail transit industry system. High-speed rail is mainly a civilian infrastructure used for economic development, but also has value in military logistics. This infrastructure enables fast redeployment of troops and equipment, enhancing national mobility and resilience.

6. Energy-saving and new energy vehicles (NEVs), focused on the development of hybrid and electric vehicles, including low-carbon, informatized, and intelligentized automobiles, as well as upgraded batteries,

drive motors, and engines. On the one hand, reduced emissions and the adoption of world-leading NEVs are civilian benefits. On the other hand, technologies, such as batteries or electric propulsion, can be applied to military vehicles and naval vessels. Strategically, NEVs advancement reduces dependence on imported oil.

7. Electrical equipment, covering the improvement of super-capacity hydropower units, nuclear power units, heavy-duty gas turbines, coal-fired power units, renewable energy and new energy equipment, and advanced energy storage devices. A modern power infrastructure is essential for the development of industry and cities. It also provides the backbone for critical defence facilities and military bases. Upgraded power electronics, grid stability, and nuclear reactor designs are crucial for national security.

8. Agricultural machinery and equipment, focusing on advanced farm machinery, agricultural technology, and smart agriculture, which accelerates production processes of grains, crops, cotton, oil, sugar, as well as breeding, planting, harvesting, transportation, and storage. Not only can these enable agricultural productivity and food security, but they also enhance stability in a protracted crisis. On the other hand, logistics systems or agricultural drones can be repurposed by the military.

9. New materials, such as high-performance structural materials, functional polymer materials, special inorganic non-metallic materials, advanced composite materials, superconducting materials, nanomaterials, and bio-based materials. New materials are essential for military and civilian use. They are used in the manufacturing of lighter, stronger industrial and consumer components, as well as aerospace-grade alloys for engines or heat-resistant materials for missiles.

10. Biotech, pharma, and high-performance medical devices, including chemical medicines, traditional Chinese medicines (TCM), biotech medicines, new vaccines, medical robots, treatment devices or 3D bioprinting. Advancements in this sector not only improve public health, but also contribute to military medicine and biodefence. A strong biotech sector can also reduce reliance on foreign pharmaceuticals[15].

15 国务院关于印发《中国制造*2025*》的通知 [Notice on the Publication of "Made in China 2025"]…

Each of these sectors exhibits a dual-use character, highlighting the MIC 2025 and MCF integration. As civilian industries transform and upgrade, the innovations can be transferred to the military. For instance, the upgrades in the information technology sphere, e.g., Artificial Intelligence, semiconductors or telecommunications, are all dual-use areas. New 5G, 6G and fibre-optic networks are developed for civilian use, and provide the PLA with high-bandwidth communications for command and control. Advances in AI, from autonomous driving algorithms to facial recognition, can have military applications such as target recognition, surveillance systems, and swarm drones. The innovations in semiconductors have been identified as having "immense commercial and military significance"[16]. In the aerospace and aviation domains, one of the MIC 2025's objectives is to develop space infrastructure and indigenous civilian aircraft, the commercial jet C919. This has yielded expertise in materials, avionics and aerodynamics, which can also benefit military aviation programs. On one hand, there has been an expansion of Chinese commercial drones possessing a dominant market share[17]. On the other hand, there have been breakthroughs in unmanned aerial vehicles (UAVs) capable of mid-air drone swarm deployment[18]. The expansion of the Chinese satellite network promoted by MIC 2025 provides the PLA with secure communications and precision navigation (the BeiDou navigation system) independent of foreign systems (GPS). Huge capacity and technical advances made in shipbuilding, another MIC 2025's pillar, have benefited the PLA Navy (PLAN), the world's largest army[19]. High-tech ships, liquid natural gas (LNG) tankers, aircraft carriers, and deep-sea exploration serve China's naval growth and modernization. Another example is the domain of energy-saving and new energy vehicles, including batteries, engines, lightweight materials, and

16 M. Rubio, *The World China Made "Made in China 2025" Nine Years Later*, https://www.americanrhetoric.com/speeches/PDFFiles/Marco-Rubio-The-World-China-Made.pdf [access: 25.08.2025].

17 M. Rubio, op. cit.

18 H. Nan, *China's Military-Civil Fusion: A Challenge to the US Military-Industrial Complex?*, https://www.thinkchina.sg/technology/chinas-military-civil-fusion-challenge-us-military-industrial-complex [access: 25.08.2025].

19 A. Palmer, *Unpacking China's Naval Buildup*, https://www.csis.org/analysis/unpacking-chinas-naval-buildup [accessed: 25.08.2025].

complete industrial systems[20]. Innovations in this sector can help the military to reduce the reliance on fuel supply lines in areas such as land vehicles, naval propulsion and aerospace. The modernization of crucial national sectors is bolstered by advanced manufacturing and robotics. Upgrades in this domain lead to faster, more accurate, and more effective manufacturing systems, which can be adopted by civilian and military industries alike. Institutionally, MIC 2025 and MCF are actively integrated by a variety of actions supported by the Chinese state. The number of private Chinese companies certified as military suppliers has increased, as barriers to entry have been reduced and incentives for technological companies have been distributed to pursue defence contracts[21]. In addition to beneficial incentives and policy support, other measures, including market expansion, participation of the private sector, and industrial cluster development, have been reinforced[22]. For instance, the Shanghai Minhang National MCF Zone, which is focused on aviation and aerospace, consists of small and medium-sized "high-tech enterprises" that serve the commercial sector and align with military needs. Such companies are rewarded financially through subsidies for contributing to defence outcomes[23]. The military gains quicker access to cutting-edge commercial technology, and civilian programs gain funding and direction by addressing national security imperatives. In sum, MIC 2025 elevates China's overall technological base in pivotal industries, while MCF mechanisms channel those civilian advances into military applications. As official strategy documents indicate, developing China into a technological superpower is not an end, but a means to "strong and rejuvenated nation" status[24], with military strength being its integral part.

20 国务院关于印发《中国制造*2025*》的通知 [Notice on the Publication of "Made in China 2025"]…

21 G. Levesque, *Commercialized Militarization: China's Military-Civil Fusion Strategy*, https://www.nbr.org/publication/commercialized-militarization-chinas-military-civil-fusion-strategy/ [access: 25.08.2025].

22 Z. Chen, L. Zhong, 新时代下军民深度融合的路径 [The Path to Deep Integration of Military and Civilian Sectors in the New Era], „中国军转民" [„Defense Industry Conversion in China"] 2025, no. 1, p. 23–24.

23 G. Levesque, op. cit.

24 国务院关于印发《中国制造*2025*》的通知 [Notice on the Publication of "Made in China 2025"]…

Made in China 2025: Progress and Dual-Use Significance

Ambitious upgrades across MIC 2025's ten strategic sectors have been actively pursued since the strategy was launched over a decade ago. China has achieved leadership in 5G networks, high-speed rail, and electric vehicles, but still faces enduring vulnerabilities in semiconductors, jet engines, and frontier pharmaceuticals. The Military-Civil Fusion strategy has been supporting the advances in dual-use technologies, which have been systematically channelled to strengthen the People's Liberation Army while also fuelling economic growth. The table below presents the examples of significant progress in each sector by 2025, highlighting their dual-use significance.

Table 1. Made in China 2025: Progress, Military-Civil Fusion Relatedness and Dual-Use Implications

Sector	**MIC 2025: Progress**
New generation and IT industry	World's largest 5G deployment (>4m base stations by 2024)[a-1] Global leadership in AI research output[a-2] Strong companies like Huawei or SenseTime[a-3] Chip self-sufficiency below 25%, being below the 70% target;[a-4] yet, Chinese chips accounting for nearly 40% of global chip output value[a-5] Limited ability to manufacture ultraviolet (EUV) lithography machines; semiconductors remaining a choke point[a-6]
	Dual-Use and MCF Implications
	5G networks as the digital backbone for PLA communications[a-7] AI applied to surveillance, drones, and "intelligentized" warfare[a-8]
Sector	**MIC 2025: Progress**
High-end numerically controlled machinery and robotics High-end CNC machines and robots	A sharp rise in robot density (470 units per 10,000 employees in 2023[a-9] Expansion of domestic robot firms; yet, high-precision CNC and advanced robotic systems sourced abroada[a-10]
	Dual-Use and MCF Implications
	Defence production strengthened by automation capacity and rapid scaling of weapons manufacturing
Sector	**MIC 2025: Progress**
Aviation and aerospace equipment [a-11]	The introduction of a commercial aircraft C919 by COMAC; yet 90% of its key component being provided by foreign suppliers Homegrown helicopters still in early stages Global leadership in unmanned drones; controlling 80% of the global drone market; DJI as a world-leading company in this domain Beidou, Chinese alternative to GPS, being adopted by BRI

	membership and across Eurasia, and gaining recognition as a universal satellite navigation system for commercial flights The completion of Tiangong space station, and aiming for large-scale multidisciplinary space science research and technology experiments[a-12]
	Dual-Use and MCF Implications
	Know-how for military aviation built by civil aircraft programmes. Drones, with extensive civilian uses, having military applications Beidou as a military-driven technology, driving the industry's technology
Sector	**MIC 2025: Progress**
Offshore engineering equipment and high-tech ships	China as a world leader in the shipbuilding industry[a-13] Accounting for 55% of global demand in 2024, with total sales reaching more than $110 billion[a-14] The launch of China's self-built, large-scale cruise ship[a-15] The construction of LNG carriers, offshore rigs, and aircraft carriers[a-16]
	Dual-Use and MCF Implications
	Civil shipyards supporting naval modernization Investment, infrastructure, and intellectual property from the commercial sector acquired by the military Offshore engineering expertise overlapping with military logistics, undersea surveillance, and sea lane control[a-17]
Sector	**MIC 2025: Progress**
Advanced rail transportation equipment Offshore engineering equipment and high-tech ships Advanced rail transportation equipment	The largest high-speed rail network in the world, covering 46,000 km, with indigenous trainset and signalling technologies[a-18] A high degree of self-reliance in high-speed rail technology, yet lacking the full self-sufficiency[a-19] Rail projects exported and built with foreign countries; "a diplomatic tool" and an important component of the Belt and Road Initiative[a-20]
	Dual-Use and MCF Implications
	High-speed rail networks as an efficient supply chain for the military, enabling the rapid deployment of military personnel and equipment, enhanced coordination of military operations, and improved security of strategic mobility[a-21] High-speed rail exports as a means to shape geopolitical influence
Sector	**MIC 2025: Progress**
Energy saving and new energy vehicles (NEVs) Electrical equipment Agricultural machinery and equipment	The number of NEVs in China reaching 31.4 million in 2024[a-22] From January to August 2025, NEV production and sales exceeding 8.2 million vehicles; the increase of market penetration to 45%[a-23] 45% of automotive market demand met by NEVs[a-24] (MIC 2025's target for 2025: 20%[a-25]) 90% of the market share held by domestic NEV manufacturers[a-26] China's dominant position in battery production, covering ca. 75% of global capacity[a-27]

	Dual-Use and MCF Implications
	Reduced oil import reliance due to the electrification technology Military vehicles and submarines supported by battery innovations
Sector	MIC 2025: Progress
Electrical equipment Biotech, pharma, and high-performance medical devices	More than 80% share of the global solar panel market, and a 60% share of the global wind turbine market; a high degree of self-reliance[a-28] A technology leader in nuclear power, aiming to build "Nuclear Belt and Road"; yet, this sector is to be enhanced[a-29] The development of the indigenous Hualong One nuclear reactor[a-30] The rapid deployment of ultra-high-voltage (UHV) grid optimizing cross-regional resource allocation[a-31]
	Dual-Use and MCF Implications
	Reliable domestic energy infrastructure as a core element of national security Power electronics applicable to naval propulsion and high-energy weapons
Sector	**MIC 2025: Progress**
Agricultural machinery and equipment	Crop cultivation and harvesting mechanization rate exceeding 75%[a-32] BeiDou Navigation Satellite System applied by "intelligent agriculture"[a-33] The wide application of agricultural drones, with China's annual agricultural drone operations exceeding 2.6 billion mu (approximately 166 acres) annually[a-34]
	Dual-Use and MCF Implications
	Agricultural modernization as a core factor enhancing food security Drone technologies transferable to military reconnaissance and logistics
Sector	**MIC 2025: Progress**
New materials	China's global dominance in the rare earth sector: ca. 60% of global rare earth elements (REE) production, 90% of REE processing, 99% of global heavy rare earth elements (HREE) processing[a-35] A vast R&D base for new materials Incremental progress in key materials, such as advanced carbon fibre, as well as in composites and alloys; yet, existing quality gaps in advanced carbon fibre (T-1000 carbon fibre)[a-36]
	Dual-Use and MCF Implications
	Rare earths as a critical component for munitions and radars Aerospace and naval hardware enhanced by advanced composites
Sector	**MIC 2025: Progress**
Biotech, pharma, and high - performance medical devices	Significant investments in biotech R&D[a-37] China as a global powerhouse in biotech research[a-38] Domestic COVID-19 vaccines, including a homegrown mRNA Covid vaccine, developed since 2020[a-39]

	China leading in the field of genomics, but still lagging in high-end devices[a-40]
	Dual-Use and MCF Implications
	Domestic vaccine production as a source of resilience Biomedical research as a support for military health and bio-defence applications

[a-1] *2024* 年通信业统计公报 [*Statistical Bulletin on Telecommunications Development in 2024*], https://www.gov.cn/lianbo/bumen/202501/content_7003010.htm [access: 28.08.2025].

[a-2] W. Chang, R. Arcesati, A. Hmaidi, *China's Drive Towards Self-Reliance in Artificial Intelligence: From Chips to Large Language Models*, https://merics.org/sites/default/files/2025-07/MERICS%20Report-AI_Stack_final.pdf [access: 28.08.2025].

[a-3] Ibidem.

[a-4] *Taiwan and the Global Semiconductor Supply Chain – China's Pursuit of Semiconductor Self-Sufficiency*, https://www.roctaiwan.org/uploads/sites/86/2025/04/250401_April_May_Issue_final.pdf [access: 28.08.2025].

[a-5] Q. Huang, op. cit.

[a-6] *Made in China 2025: The Cost of Technology Leadership*, https://www.europeanchamber.com.cn/en/publications-archive/1274 [access: 28.08.2025].

[a-7] S. Palve, *China's 5G-Powered Unmanned Army! PLA Bets On 1st Mobile 5G Station To Power Its Robots & UAVs In Warzone*, https://www.eurasiantimes.com/chinas-5g-powered-unmanned-army-pla-bets-on-1st-mobile-5g-station-to-power-its-robots-uavs-in-warzone/ [access: 28.08.2025].

[a-8] *China's National Defense in the New Era*, https://english.www.gov.cn/archive/whitepaper/201907/24/content_WS5d3941ddc6d08408f502283d.html [access: 28.08.2025].

[a-9] *China Emerges as Global Frontrunner in Industrial Robot Density: Report*, https://english.www.gov.cn/news/202411/21/content_WS673e6b34c6d0868f4e8ed447.html [access:28.08.2025].

[a-10] *Made in China 2025: The Cost of Technology Leadership*…

[a-11] Ibidem.

[a-12] Y. Zhao et. al., *On-Orbit Space Technology Experiment and Verification Project Outlook of China's Tiangong Space Station*, „Space Sci Technol" 2023, no. 3, p. 61.

[a-13] *China Dominates the Shipbuilding Industry*, https://www.csis.org/analysis/china-dominates-shipbuilding-industry [access: 28.08.2028].

[a-14] Q. Huang, op. cit.

[a-15] *Made in China 2025: The Cost of Technology Leadership*…

[a-16] M. Rubio, op. cit.

[a-17] Ibidem.

[a-18] Q. Huang, op. cit.

[a-19] *Made in China 2025: The Cost of Technology Leadership…*

[a-20] M. Rubio, op. cit.

[a-21] R. Uppal, *High-Speed Rail (HSR) in Military Logistics: China Leads the Way*, https://idstch.com/geopolitics/high-speed-rail-hsr-in-military-logistics-china-leads-the-way/ [access:29.08.2025].

[a-22] 图表：决胜"十四五"打好收官战 | 我国新能源汽车产业加速提质向新 [*Chart: Winning the Final Battle of the 14th Five-Year Plan|China's New Energy Vehicle*

Industry Accelerates Quality Improvement and Moves Towards a New Era], https://www.gov.cn/zhengce/jiedu/tujie/202508/content_7036224.htm [access: 29.08.2025].

[a-23] Ibidem.

[a-24] Ibidem.

[a-25] *Made in China 2025: The Cost of Technology Leadership*…

[a-26] Ibidem.

[a-27] *The Battery Industry Has Entered a New Phase*, https://www.iea.org/commentaries/the-battery-industry-has-entered-a-new-phase [access: 29.08.2025].

[a-28] *Made in China 2025: The Cost of Technology Leadership*…

[a-29] M. Rubio, op. cit.

[a-30] *World's First Hualong One Reactor Put Into Commercial Operation*, https://www.caea.gov.cn/english/n6759361/n6759362/c6811183/content.html [access: 29.08.2025].

[a-31] 十四五”国家电网发展成效③：供电保障坚强可靠 [*Development Achievements of the State Grid in the 14th Five-Year Plan ③: Strong and Reliable Power Supply*], http://www.nw.sgcc.com.cn/info/1013/23258.htm [access: 29.08.2025].

[a-32] 农业农村部召开全国农业机械化工作推进会议 [*The Ministry of Agriculture and Rural Affairs Held a National Meeting to Promote Agricultural Mechanization*], https://www.gov.cn/lianbo/bumen/202504/content_7020519.htm [access: 29.08.2025].

[a-33] *BeiDou Navigation Satellite System*, http://en.beidou.gov.cn/APPLICATIONS/Agriculture/ [access: 29.08.2025].

[a-34] 大疆农业联合农民日报发布《农业无人机行业白皮书（2024/2025）》[*DJI Agriculture and Farmers' Daily Released the "Agricultural Drone Industry White Paper (2024/2025)"*], https://ag.dji.com/cn/newsroom/ag-cn-news-white-paper-2025 [access: 29.08.2025].

[a-35] G. Baskaran, M. Schwartz, *Developing Rare Earth Processing Hubs: An Analytical Approach*, https://www.csis.org/analysis/developing-rare-earth-processing-hubs-analytical-approach [access: 29.08.2025].

[a-36] M. Rubio, op. cit.

[a-37] A. Brown, J. Groenewegen-Lau, *Lab Leader, Market Ascender: China's Rise In Biotechnology*, https://merics.org/en/report/lab-leader-market-ascender-chinas-rise-biotechnology [access: 29.08.2025].

[a-38] Ibidem.

[a-39] *Made in China 2025: The Cost of Technology Leadership*…

[a-40] M. Rubio, op. cit.

By 2025, Made in China 2025 has fostered an industrial-technological base substantially. In areas such as telecommunications, transport or green technologies, state-driven scale and incentives have helped close gaps quickly, which has created both civilian benefits and military dividends. However, the sectors requiring long-term fundamental innovation, like semiconductors, jet engines, and pharmaceuticals, still need more time to meet ambitious targets fully. From a Military-Civil Fusion perspective, dual-use synergies have emerged. 5G, 6G, and AI-enabled systems support PLA command networks, domestic energy technologies secure military bases, and automated factories

scale arms production. MIC 2025, along with accompanying strategies such as MCF, has laid the foundation for China's long-term techno-military rise.

Conclusions

China's pursuit of becoming a technological superpower has been supported by initiatives such as Made in China 2025 and Military-Civil Fusion, which have reshaped China's industrial and technological landscape over the past decade. MIC 2025 can be seen as neither an unqualified triumph nor a failure. It is the first step of a long-term strategy that has impacted the civil and military domains. On one hand, it has contributed to significant achievements or overachievements in core sectors by focusing national resources and providing financial and policy support. This has led to notable successes in 5G and 6G telecommunications, renewable energy, high-speed rail, shipbuilding, or electric vehicles. On the other hand, it has exposed the areas with room for improvement, where complete self-sufficiency has not been achieved yet, and China needs more time, sustained research, and other indispensable sources to accomplish the ambitious targets. Even though some domains, such as semiconductors, certain high-end components, or commercial aircraft, have not achieved MIC 2025 goals, the overall achievements have contributed to the broader vision of a global "great power" (大国) with solid foundations for realizing the Chinese Dream (中国梦) of the great rejuvenation of the Chinese nation[25]. The status of "great power" cannot be achieved without a complete and independent industrial system, and a modernized national security system. Hence, the advancements under MIC2025 have been gradually transferred into the military, blurring the lines between civilian economic progress and defence capacity. MCF has enabled the integration of MIC 2025 targets with military goals. MIC 2025 sectors targeted for civilian development have had parallel military applications and benefits for the PLA. The integration of the long-term policies supports China's transition from "large but not strong" through "large but fairly strong" into a "large and strong" nation[26]. This paper

25 国务院关于印发《中国制造*2025*》的通知 [*Notice on the Publication of "Made in China 2025"*]…

26 Q. Huang, op. cit.

has some limitations. It may not capture every facet, as it primarily relied on open-source data and analyses. Classified military benefits of MCF or the most recent Chinese internal assessments would provide a more detailed perspective on the dual-use interrelation between industrial and military policies. The evaluation of MIC 2025 progress is an overall picture of 2025 and recent years. China's progress in the core sectors is evolving rapidly. Further research could delve into specific case studies to provide deeper insights. It could also analyse global reactions and responses in the time of technological competition. As MIC 2025 is the first stage of the greater strategy, understanding the successes and limitations of MIC 2025 and accompanying policies, such as MCF, will be crucial for analysts and policymakers alike. China's path to technological superpower status has been a long journey. The first decade under MIC 2025 has moved China closer to that status. A decade ago, China was largely seen as the world's low-cost factory. Now, it has become a competitor in several advanced industries and has laid the groundwork for future breakthroughs. Yet, this is a continuous journey, meaning China must address internal weaknesses and external challenges. What can be seen on China's path to technological superpower is that Made in China 2025's legacy will be visible for years to come: both in the civilian and military sectors, both in China and globally.

Bibliography

Baskaran G., Schwartz M., *Developing Rare Earth Processing Hubs: An Analytical Approach*, https://www.csis.org/analysis/developing-rare-earth-processing-hubs-analytical-approach [access: 29.08.2025].

Brown A., Groenewegen-Lau J., *Lab Leader, Market Ascender: China's Rise In Biotechnology*, https://merics.org/en/report/lab-leader-market-ascender-chinas-rise-biotechnology [access: 29.08.2025].

Chang W., Arcesati R., Hmaidi A., *China's Drive Towards Self-Reliance in Artificial Intelligence: From Chips to Large Language Models*, https://merics.org/sites/default/files/2025-07/MERICS%20Report-AI_Stack_final.pdf [access: 28.08.2025].

Chen Z., Zhong L., 新时代下军民深度融合的路径 [*The Path to Deep Integration of Military and Civilian Sectors in the New Era*], „中国军转民" [„Defense Industry Conversion in China"] 2025, no. 1.

Huang Q.,"中国制造*2025*":成就、趋势与开放发展 [„*Made in China 2025": Achievements, Trends, and Development*], „应用经济学评论" [„The Applied Economics Review"] 2025, no. 5.

Levesque G., *Commercialized Militarization: China's Military-Civil Fusion Strategy*, https://www.nbr.org/publication/commercialized-militarization-chinas-military-civil-fusion-strategy/ [access: 25.08.2025].

Manhas N.S., *China's Military-Civil Fusion from Mao to Xi: A Long Roadmap*, „Journal of Polity and Society" 2024, no. 1.

Nan H., *China's Military-Civil Fusion: A Challenge to the US Military-Industrial Complex?*, https://www.thinkchina.sg/technology/chinas-military-civil-fusion-challenge-us-military-industrial-complex [access: 25.08.2025].

Palmer A., *Unpacking China's Naval Buildup*, https://www.csis.org/analysis/unpacking-chinas-naval-buildup [access: 25.08.2025].

Palve S., *China's 5G-Powered Unmanned Army! PLA Bets On 1st Mobile 5G Station To Power Its Robots* &

Rubio M., *The World China Made "Made in China 2025" Nine Years Later*, https://www.americanrhetoric.com/speeches/PDFFiles/Marco-Rubio-The-World-China-Made.pdf [access: 25.08.2025].

UAVs In Warzone, https://www.eurasiantimes.com/chinas-5g-powered-unmanned-army-pla-bets-on-1st-mobile-5g-station-to-power-its-robots-uavs-in-warzone/ [access: 28.08.2025].

Uppal R., *High-Speed Rail (HSR) in Military Logistics: China Leads the Way*, https://idstch.com/geopolitics/high-speed-rail-hsr-in-military-logistics-china-leads-the-way/ [access: 29.08.2025].

White Paper on China's Industrial Development Trends for the Next 50 Years, https://img.frostchina.com/attachment/17560512/3dotWjbdTCLfXgWYp5mcSp.pdf [access: 28.08.2025].

Zhao Y. et al., *On-Orbit Space Technology Experiment and Verification Project Outlook of China's Tiangong Space Station*, „Space Sci Technol" 2023, no. 3.

Zhao Y., 新时代我国军民融合发展的战略举措探析, „现代商贸工业" [„Modern Business Trade Industry"] 2025, no. 15.