Modernization and the Military-Civil Fusion Strategy

CAPT ALEXANDER E. FARROW, USAF

Abstract

This article employs economic and political theory to elucidate a novel approach by which China seeks to gain military advantages through a technological surge. It specifically posits that Beijing intends to expedite economic efficiency by investing in advanced technologies. Simultaneously, the military-civil fusion strategy enables Beijing to rapidly and efficiently convert this technological investment into military applications, thus modernizing its armed forces. In response, the United States should counter this strategy by impeding China’s modernization endeavors. To be more precise, it can target China’s military-civil fusion strategy by disrupting technology development through limitations on supply chains and imposing sanctions on companies. This paper contributes to the existing body of research on this subject by suggesting that the United States should enhance its own military-civil fusion strategy by strengthening the pathways for translating technology into military applications. Additionally, this paper prescribes ways for the operational force to tackle this challenge by expediting research, development, and the application of key dual-use technologies.

***

Every nation amasses national power as a countermeasure against external influence or potential threats from other countries.¹ Thus, it comes as no surprise that China would inevitably pursue regional and global influence. What is truly remarkable is the rapidity of China’s economic ascent. Numerous factors have contributed to this ascent, including the United States’ policy of granting China “most favored nation” status and China’s accession to the World Trade Organization.² However, this article scrutinizes China through the specific lens of its state’s internal economic mechanisms, particularly after entering the global marketplace. From this nuanced perspective, the subsequent analysis sheds light on China’s strategy of harnessing economic prowess to fuel military modernization, chiefly through its military-civil fusion strategy.

China’s state priorities and resource allocation have steered the nation’s economic trajectory for several decades. Examples of such endeavors encompass the establishment of special economic zones, agricultural reforms, and the promotion of private enterprises. As private-sector economic activity gained momentum in the 1990s, the state progressively reduced its involvement, facilitating companies’ seamless integration into global markets and their subsequent financial prosperity. In essence, through a deliberate shift toward state capitalism, the state oversaw the opening of the economy by progressively permitting limited privatization.

However, the global financial crisis in 2008 ignited concerns within the state about China’s excessive reliance on global trade and exports. Consequently, the state initiated an economic stimulus, infusing capital excessively and engendering surging local government and corporate debts. By 2015, these circumstances contributed to a financial crisis. Consequently, the pendulum swung in the opposite direction, as officials within the Chinese Communist Party began to exert greater influence and control over firms, aiming for a more active economic management approach. By 2017, more than 73 percent of firms had established party cells, and the state leveraged financial tools such as equity stakes to exert its influence. Moreover, the state began penalizing organizations for failing to align with its political agenda, even expelling prominent international news agencies such as the *New York Times*, *Wall Street Journal*, and *Washington Post* for not retracting unfavorable stories. Essentially, economics underwent a transformation into a more closely monitored political pursuit, giving rise to China’s new party-state capitalism economic model.

Further evidence of this evolving economic model lies in China’s dramatic shift in its debt-to-GDP ratio, serving as a proxy for evaluating the impact of investments on economic output. From the 1970s to around 2008, restrained state capitalism engendered productive economic activity. Notably, China’s debt burden increased at a similar rate to GDP during those years, signifying productive investment. However, after 2008, debt accumulation began to outpace GDP gains, indicating that not all public investments yielded substantial GDP gains. In essence, investments began contributing to objectives beyond economic activity, suggest-

---

5 The term is introduced by Pearson, Rithmire, Tsai, “Party-State Capitalism.”
ing that China’s conventional long-term growth model was no longer sustainable.\

These economic maneuvers have had a substantial impact on China’s overall output, a metric encompassing labor, capital, and efficiency variables that determine sustainable long-term growth. Specifically, China, conceivably reaching its zenith of engagement with global markets in the 2000s, might have encountered diminishing marginal returns on both labor and capital, limiting the extent of labor hours and capital investment. Furthermore, this zenith may have diminished further due to the political constraints imposed by the party-state capitalism model on free-market dynamics. Consequently, the productivity of China’s privatized labor and capital components was curtailed by both global market saturation and government-induced inefficiencies.

In a scenario where labor and capital no longer exerted a significant influence on output, Beijing found itself compelled to explore avenues for enhancing output through increased efficiency. This could be achieved by actively guiding markets toward efficiency-enhancing factors, such as advanced technology. Indeed, there is compelling evidence that Chinese Communist Party (CCP) leaders sought to boost output by enhancing efficiency, with a particular focus on investing in advanced technology (refer to fig. 1). In Xi Jinping’s 2022 address to the Party Congress, he underscored one of his key visions: “modernizing the industrial system.” Additionally, Xi has championed China’s recent prioritization of technology, highlighting a surge in R&D expenditures from 1 trillion yuan to 2.8 trillion yuan, resulting in China hosting the “largest cohort of R&D personnel in the world.” Over the long term, China intends to continue expanding its industrial foundation by integrating advanced technologies into production processes, thereby leveraging tools like advanced manufacturing and digital innovation. This strategic approach aims to amplify the productivity of each worker and each dollar within the economy, sustaining favorable growth rates over an extended period.
China currently possesses a significant demographic advantage over the United States. If it persists in maximizing the output of each worker through technological advancements, its sheer population size will ensure substantial economic expansion. Should each Chinese worker achieve the same level of productivity as an American worker, China is poised to surpass the United States in economic size, fostering sustainable economic growth.

**Transfer to Military Power**

*A wealthy China would surely build a formidable military, as populous and rich countries invariably convert their economic power into military power.*

—John Mearsheimer

From a realist perspective, it’s virtually inevitable that China will translate its economic strength into military power. After all, a robust military capability enables a nation to counter and deter potential adversaries. In the case of China, a formidable military serves as a deterrent against Western powers in its regional sphere of influence, particularly in the Indo-Pacific region. For instance, China could leverage its military might in the South China Sea to assert regional dominance and secure access to crucial sea trade routes. Additionally, a strong military is vital for any potential action related to the Taiwan issue. If China were to con-

---

template annexation by force, it must be confident in its military’s capabilities. This becomes even more significant, considering recent events where Russia overestimated its military strength prior to the invasion of Ukraine in 2022. In any case, China aims to ensure it maintains control over the outcome of a Taiwan conflict, aligning with its national interests given the region’s impact on China’s economy.  

Naturally, a prosperous nation can enhance its military strength through increased procurement, allowing for the support of larger troops and more military equipment. However, the quantity of resources alone does not reflect the quality of talent or equipment that may be procured. What purpose does it serve to have an arsenal of antiquated systems when the U.S. possesses some of the most advanced weaponry globally? CCP leadership acknowledges this limitation and places emphasis on the goal of pursuing high-quality military upgrades. For example, Xi highlighted the Party’s objective of building a modern military through “mechanization, informatization, and application of smart technologies.” Consequently, these modernization efforts are aimed at developing a world-class military. As a result, the CCP seeks to integrate advanced technologies into the People’s Liberation Army (PLA), ultimately aspiring to possess a highly modernized military force.

This article asserts that the means by which Beijing seeks to facilitate military modernization is through the strategy of military-civil fusion. Essentially, this strategy aims to break down barriers between China’s civilian and military sectors. The objective, according to the US Department of State, is to accelerate the development of technologies such as quantum computing, big data, 5G, and advanced nuclear technologies, among others, to position the PLA for “intelligent warfare.” Beijing employs a range of both legal and illegal methods to bridge this connection, including theft and the development of dual-use technologies.

To provide a more organized framework for understanding the military-civil fusion process, consider the proposed pathway for how the state might acquire advanced military capabilities through this strategy (see fig. 2). In essence, the

---


12 “Transcript: Xi Jinping’s Report to China’s 2022 Party Congress”

13 This strategy is mentioned 倪桂桦 (Ni Guihua) and 朱锋 (Zhu Feng) “The State and Dilemmas of the Biden Administration’s Strategic Competition with China” [拜登政府对华战略竞争的态势与困境], *Interpret: China*, 2023, original work published 26 January 2022, https://interpret.csis.org/.

state prioritizes key technologies through its vision, funding, and regulatory efforts. Subsequently, universities, research centers, and laboratories translate these state priorities into research initiatives. Coupled with resources and manufacturing capabilities, research efforts materialize as developments. Finally, the military integrates these dual-use advancements into its weaponry. Conceptually, this model bears similarities to the state-capitalism model for economic prioritization, as it implies that the state guides military modernization through technological prioritization. This framework could assist policy makers in articulating the nuances of how this process operates and enable US defense analysts to identify specific phases to target when devising strategies to disrupt and counter China’s military-civil fusion strategy.

![Figure 2. Military-civil fusion pathway for military application](image)

**Considerations**

Notably, several points of friction exist that impede the seamless integration of advanced technology into the military apparatus, with two significant obstacles being intellectual property rights and coordination issues.

In a nation with robust intellectual property (IP) laws, legal safeguards can restrict the utilization of dual-use technology, constraining the military’s ability to expand upon a company’s proprietary products. Moreover, entities retaining IP rights may impose limitations on knowledge sharing, hindering other organizations from building upon their research. Essentially, robust IP laws create market inefficiencies that primarily benefit the IP holders, potentially to the detriment of the military’s interests.

In contrast, China has historically grappled with weak IP protection. Instances of appropriating brands for counterfeit luxury goods, replicating a faux Disney-land in Shijingshan, or cloning Google China’s website are indicative of a culture where copycat companies have often disregarded all forms of IP ownership in their pursuit of market dominance. Consequently, entrepreneurial innovators in China have been able to swiftly develop minimum viable products and gauge
demand without protracted lead times.\textsuperscript{15} Within this context, knowledge can circulate more freely, and both companies and the government can leverage market-tested expropriated technologies, whether foreign or domestic, without significant concerns of reprisal. This enables the military to apply advanced technology to dynamic problem sets with heightened agility, drawing from a broad pool of potential technologies irrespective of IP barriers.

Another point of friction centers around coordination issues, particularly in countries where there exists a separation between the private sector (comprising companies, universities, think tanks, and so forth) and the military. In such circumstances, the flow of novel research into effective military applications may encounter obstacles, potentially resulting in a military-industrial complex that lags in innovation.

In contrast, China experiences fewer coordination issues due to the substantial influence and control exercised by government officials over the private sector, exemplifying the party-state capitalism model. For instance, the Chinese Communist Party and local governments embed officials directly into the corporate governance structures of non-state entities, both domestic and international. These officials report directly to their respective governmental chains of command and wield state-sanctioned influence over the operations of these companies. Moreover, the state frequently solidifies its control by investing in equity stakes in various non-state entities, thereby asserting ownership rights. Consequently, evidence suggests that the government utilizes its corporate leverage to compel changes in business behavior, at times resorting to political persecution of business executives.\textsuperscript{16} This close alignment between the government and the private sector fosters innovation and operational coherence, mitigating the friction associated with coordination issues.

Given the combination of weak IP protections and fluid coordination, the military-civil fusion strategy proves particularly efficient for Beijing. Operating under the pretext of acquiring advanced technology to enhance economic efficiency, China can swiftly transition these acquisitions into military applications, thereby modernizing its armed forces. As a theoretical illustration, the commercial sector may possess a strong incentive to drive AI integration to bolster everyday business decision-making, such as resource management. This technological advancement may simultaneously hold a dual-use military application by enhancing operational decision-making efficiency and accuracy. Indeed, there is ongoing

\textsuperscript{16} Pearson, Rithmire, Tsai, “Party-State Capitalism,” 209–212.
strategic discourse about how China’s military can harness AI to automate decisions and enhance smart weaponry, such as cruise missiles and drone swarms.\textsuperscript{17} In essence, this military-civil fusion strategy empowers Beijing to expedite the modernization of its military, mirroring the pace and level of overall national investment.

**Responding to China’s Modernization Model**

The United States should harbor concerns over China’s potential pursuit of military modernization through the military-civil fusion strategy. As Beijing enhances its military capabilities, it concurrently amplifies its global influence. This expanded influence is poised to disrupt international norms, trade patterns, and regulations, encompassing digital and privacy regulations.\textsuperscript{18} Such developments pose a challenge to the existing hegemonic structure, which is geared toward preserving US advantage.

Additionally, American senior leadership actively voices apprehension regarding this threat, as highlighted in the National Security Strategy, which underscores China’s ambition to “reshape the international order” by harnessing its “technological capacity” and a “rapidly modernizing military.” In response, the United States has formulated a strategy to counter this threat, termed integrated deterrence. This approach involves building a counterbalancing network spanning various domains, regions, intergovernmental agencies, and international coalitions.\textsuperscript{19}

The following innovative recommendations propose a more proactive counterstrategy, envisioning a comprehensive approach that explores ways to influence the entire pathway to military modernization. These recommendations serve as the foundation for an operationalized strategy that could enhance the existing integrated deterrence model, broadening the strategic toolkit. Specifically, this strategy concentrates on two key aspects: (1) disrupting China’s military-civil fusion pathway and (2) invigorating the US military-civil fusion pathway.


Disrupting China’s Strategy

Using the proposed pathway as a framework for devising prescriptive solutions (refer to fig. 2), the United States can disrupt China’s military-civil fusion strategy by targeting various phases. Coercing State Priorities presents challenges, as it implies a strategy of altering the goals of the Chinese Communist Party (CCP), effectively suggesting a degree of regime change. However, not only is internal change unnecessary, but it also carries the risk of provoking retaliation from the Party, which primarily prioritizes its self-preservation.20

Additionally, distorting the Military Application phase is fraught with danger, as it suggests overt confrontation with the PLA, potentially escalating tensions. Escalation is perilous, given the uncertainty regarding whether American leaders and the public would support such open confrontation. If support were tepid, targeting the PLA’s military application of advanced technology could backfire.

Another approach for the United States is to curtail China’s military-civil fusion strategy by focusing on the Research phase. This could involve limiting or even prohibiting collaboration between US universities and Chinese institutions. Furthermore, US policy makers might consider mitigating the risk of expropriation of cutting-edge research by restricting the freedom of university students to matriculate from, or return to, China—essentially altering the current student visa program to incorporate selective criteria. Moreover, policy makers could curtail joint research initiatives on areas of mutual importance, such as space or environmental research, thereby reducing the exchange of cutting-edge technological knowledge between the two nations. Lastly, US regulators could explore options for restricting open-access digital libraries and repositories.

Although these actions would impede China’s research capabilities, they come with substantial costs. Limiting university collaboration risks domestic backlash from higher education institutions due to potential infringements on intellectual freedom. Restricting Chinese student visas could be viewed as discriminatory immigration regulation, undermining America’s professed liberal values and potentially fostering anti-US sentiment among Chinese youth. Decoupling from China in joint research efforts could limit breakthroughs in technologically vital areas, with global repercussions, particularly in the case of environmental cooperation. Decoupling is also challenging due to significant overlapping interests between the two nations. Lastly, restricting access to digital online repositories and libraries not only hampers domestic research but also contradicts American values of freedom of speech and information. Therefore, while US leadership can

20 Colby, “After Hegemony.”
target China’s Research phase, it must carefully weigh the costs and potential compromises of its values.

Instead, the most effective means of disrupting China’s strategy is to focus on the Development phase. US leadership can achieve this by limiting China’s access to crucial resources and imposing costs on manufacturers of dual-use technology. Primarily, the United States can target the resources fueling China’s conversion of research into development, exemplified by semiconductors, a vital component of the technology supply chain.²¹ By imposing sanctions that restrict China’s access to advanced semiconductors, the U.S. can slow technological development and, consequently, military modernization. Furthermore, US policy makers can target manufacturers by sanctioning companies perceived as contributing to military-civil fusion.

However, targeting China’s Development phase carries its own set of costs and challenges. Limiting access to resources like semiconductors can strain global markets and incentivize China to bolster its supply chains and domestic production capacity, potentially rendering it immune to resource sanctions in the long run. Sanctioning manufacturers is complex and requires the cooperation of allies. For example, if Huawei were a sanctioned target, allied countries reliant on the company for telecommunications infrastructure might not support limiting its reach. Without allied support, the effectiveness of such restrictions on the company’s global growth is questionable. Lastly, targeting developers raises ethical questions, as it forces the United States to consider whether hampering China’s technological progress, with likely implications for the civilian sector, is morally justifiable given the potential cost of limiting Chinese citizens’ access to life-improving technology.

**Enhancing US Military-Civil Fusion**

Furthermore, the United States can enhance its own pathway for military application, focusing on State Priorities, Research, Development, and Military Application. US leaders should also explore opportunities to leverage the collective technology research and development (R&D) of allied nations.

In terms of State Priorities, the United States can continue to prioritize technological development, aligning with the vision outlined in the 2022 National Security Strategy.²² Moreover, leadership should ensure substantial funding and regu-

---

latory support to fortify the defense industrial base. Thoughtful policy measures can facilitate the transfer of innovative technologies into both the commercial and military sectors. For instance, policy makers might consider the restructuring of regulations pertaining to government-business IP-sharing, technology transfer between the private and public sectors, and coordination challenges stemming from parallel efforts. Naturally, these avenues carry legal and business complexities, necessitating further exploration in future policy research.

The United States can also stimulate Research by subsidizing dual-use technologies through funding for universities, national laboratories, and research centers. These institutions can work on problem sets with potential applications in the military domain. Additionally, war fighters should actively engage with universities, think tanks, nonprofits, and commercial enterprises to foster relationships and advocate for military applications. The imperative lies in breaking down barriers that have traditionally limited resource and knowledge sharing between the military and the private sector.

An effective means of addressing this gap involves enhancing technical proficiency throughout the operational force. For instance, embedding service members alongside civilian counterparts at research universities can facilitate the translation of dual-use technologies into military applications. However, in the US Air Force, opportunities for active duty servicemembers to engage with university faculty are limited. For officers, the Air Force Fellows program offers various avenues for servicemembers to interact with civilian institutions. Notably, the prestigious Chief of Staff of the Air Force Masters Program sponsors a Mid-Career Masters in Public Administration, while the Advanced Academic Degree Program administers a diverse portfolio of initiatives, including the US Air Force Academy Faculty Pipeline, which supports the education of future faculty members through select educational programs.

While the aforementioned programs indeed facilitate the connection between war fighters and academia, they are relatively scarce, possess limited scope, and remain somewhat detached from the frontline. Moreover, these initiatives are characterized by formalization and centralization. An innovative approach that operational commanders could explore is to integrate academia into operational units involves utilizing wing innovation funds to sponsor warfighters as temporary university research assistants. This approach not only benefits operational

---


commanders but also holds appeal for university faculty, as they would not need to utilize their own resources to support these research assistants. Future research should concentrate on devising novel pathways, like this one, for frontline warfighters to establish connections with research-generating institutions in a more decentralized, unit-level manner.

Turning to the realm of Development, the United States can fortify critical resources within technology supply chains, particularly focusing on securing access to essential components like semiconductors. Reducing dependence on imports, such as semiconductors from Taiwan, ensures that the United States maintains ownership and control over its technological inputs. Furthermore, the government can contemplate subsidizing domestic companies that play pivotal roles in vital research areas. For example, if automation is a key technology domain, US policy makers might allocate funds to companies involved in the manufacture of robotics equipment.

To support development efforts, the operational force can prioritize funding defense contractors when they engage in the application of commercial technology within the defense context. Programs such as the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) already possess the infrastructure necessary to expedite military-civil fusion. Future research should concentrate on refining the structure of these programs to ensure that operational commanders lead the efforts to procure dual-use technology at an accelerated pace.

Lastly, these endeavors should not be undertaken in isolation. Instead, the United States should forge partnerships with allied nations to collaboratively engage in advanced technology R&D, thereby creating a counterbalancing force against China’s technological growth. To achieve this, an allied coalition should fine-tune information sharing mechanisms and cooperative agreements, enabling the transformation of economic strength into technological development and, subsequently, military modernization. The advantages of such collaboration include tapping into innovation from a diverse array of perspectives and sharing the costs and resources associated with modernization efforts. However, it’s important to acknowledge potential limitations related to security, funding, and implementation risks.

A noteworthy example of coordinated international efforts is the recently launched NATO Innovation Fund, a pioneering venture capital fund involving 22

nations. This fund’s primary objective is to invest 1 billion euros in key emerging technologies, including artificial intelligence and autonomy, all of which possess dual-use capabilities, energizing both the private and public sectors. It’s worth highlighting that the United States is not presently a contributor to this fund, but its participation would significantly bolster the US military-civil fusion strategy.

Conclusion

China’s traditional growth model lacks sustainability. Instead, Beijing intends to boost productivity through investments focused on enhancing efficiency, particularly in advanced technology sectors. The military-civil fusion strategy aims to leverage these investments by transforming advanced technology into military assets. This is crucial as it forms the foundation for the modernization endeavors of the PLA.

In response, the United States can strategically target specific components within the military-civil fusion process, specifically focusing on R&D. While curtailling China’s research efforts carries the potential for imposing global costs and challenging liberal values, an alternative approach involves directing attention towards China’s development phase. This can be achieved through sanctions on critical resources and manufacturers, which is likely to impede overall technological progress. However, this counterstrategy is not without risks. US leaders must carefully consider the potential impact on allies, Chinese citizens, and global markets.

Furthermore, the operational force can actively engage in this intricate strategic landscape. Unit-level commanders can take the lead by interfacing with various elements of the US military-civil fusion pathway. Specifically, units can drive the research and development of key technologies, underscoring their direct and influential role in the competition for economic and military modernization.

Capt Alexander E. Farrow, USAF
Capt Farrow is a remotely piloted aircraft pilot at Creech Air Force Base, Nevada. He recently graduated from the Master of Business Administration program at Harvard Business School. His research interests encircle defense strategy and innovation.

Disclaimer: The views and opinions expressed or implied in the Journal of Indo-Pacific Affairs are those of the authors and should not be construed as carrying the official sanction of the Department of Defense, Department of the Air Force, Air Education and Training Command, Air University, or other agencies or departments of the US government or their international equivalents.