

# Myths and Realities of China's Military-Civil Fusion Strategy

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Elsa B. Kania  
Lorand Laskai



Center for a  
New American  
Security

Center for a New American Security  
1152 15<sup>th</sup> Street NW, Suite 950, Washington, DC 20005  
T: 202.457.9400 | F: 202.457.9401 | CNAS.org | @CNASdc

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## About the Authors



**Elsa B. Kania** is an Adjunct Senior Fellow with the Technology and National Security Program at CNAS. Her research focuses on Chinese military strategy, defense innovation, and emerging technologies. Her book, *Fighting to Innovate*, will be forthcoming with the Naval Institute Press in 2021. Ms. Kania has been invited to testify before the House Permanent Select Committee on Intelligence, the U.S.-China Economic and Security Review Commission, and the National Commission on Service. Ms. Kania holds a MA (in passing) from and is a PhD candidate in Harvard University's Department of Government.



**Lorand Laskai** is a JD candidate at Yale Law School and a visiting researcher at Georgetown's Center for Security and Emerging Technology. He recently co-edited "Measure Twice, Cut Once," a series of reports on the prospect of U.S.-China decoupling, for the Johns Hopkins University Applied Physics Laboratory. Mr. Laskai has written extensively on China, technology, and national security for publications including *Foreign Affairs* and *Slate* and testified before the U.S.-China Economic and Security Review Commission. He previously worked at the Council on Foreign Relations and at the *Financial Times* in Beijing. He holds a BA from Swarthmore College.

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## Introduction

In U.S. policy debates on China, military-civil fusion (MCF) has emerged as a frequent subject of debate and concern. Once a niche topic of study among only avid watchers of Chinese military modernization and defense technological development, Beijing's drive to break down barriers and create stronger linkages between its civilian economy and defense industrial base has started to draw considerable attention in Washington.<sup>1</sup> During Donald Trump's administration, Vice President Mike Pence, Secretary of State Mike Pompeo, senior officials across the State Department and Defense Department, and members of Congress all devoted time to MCF in speeches, using it to justify a broad range of policies. These included expanding investigations into intellectual property theft, banning Huawei from U.S. networks and critical infrastructure, urging companies like Microsoft and Google to stop working with Chinese counterparts, and even advocating for "decoupling" from the People's Republic of China (PRC), such as in supply chains and by limiting technological collaboration.<sup>2</sup> MCF has emerged as a key analytic driver of the intensifying economic and technological competition between the United States and the PRC in recent years. While Joe Biden's administration will have an opportunity to reset the tone of the U.S.-China relationship and recalibrate the use of instruments of U.S. policy, China's model of MCF is likely to remain a major concern for U.S. policymakers.



*Then-Secretary of State Mike Pompeo addressed the Silicon Valley Leadership Group in January 2020, raising concerns about military-civil fusion and the implications for American companies, especially those involved in developing sensitive technologies. (U.S. Department of State)*

Despite its increasing prominence in U.S. policy circles, MCF has remained poorly understood and under-studied relative to its increasing importance. That discrepancy could undermine U.S. policy responses and public messaging. Rather than prompting a deeper understanding of this complex subject, the recent surge in interest in MCF has at times instead contributed to a tendency toward oversimplification and mischaracterizations of MCF as a strategy, its potential implications, and the continuing challenges to its implementation. In particular, discussions in the United States on MCF have sometimes mischaracterized it as a *fait accompli*, instead of recognizing that this strategy has yet to be fully realized.

To the contrary, the intense attention that Chinese leaders have dedicated to MCF, along with forceful rhetoric, reflects concerns that reforms have not progressed rapidly enough. MCF aims to promote deeper integration of China's civilian and defense economies and their respective technological ecosystems. This effort is intended to create and leverage synergies between economic development and military modernization, allowing the defense and commercial enterprises to collaborate and synchronize their efforts through the sharing of talent, resources, and innovations. MCF is startlingly expansive in scope, including everything from efforts in big data and infrastructure to logistics and national defense mobilization.<sup>3</sup>

The success of this strategy is hardly a foregone conclusion. The "fusion" that MCF intends to create remains primarily aspirational, such that this phrasing is not yet a true reflection of realities on the ground in China. Over the past 30 years, China's defense sector has been primarily dominated by sclerotic state-owned enterprises that remain walled off from the country's dynamic commercial economy. At its core, MCF is intended as a remedy to this problem. However, years of reforms and policy initiatives have had

limited efficacy in reducing those barriers. Still, only a small proportion of private companies have participated in defense projects, and enterprises that are developing technologies relevant to the military have found cutting through the red tape involved in procurement to be cumbersome, not unlike the frustrations of their American counterparts.<sup>4</sup>

American policymakers have often failed to recognize the complexities of MCF with regard to its objectives and actual progression. Chinese policymakers have long and assiduously studied U.S. policies toward its defense and innovation base. The reverse has not always been the case. These dynamic risks place Washington at a disadvantage in responding to Beijing's strategy of MCF. Any distortions and misleading characterizations also risk creating conditions for flawed policy choices. A case in point is the Trump administration's executive order in May 2020, which called to deny or cancel visas for Chinese students and researchers from universities involved in China's "military-civil fusion strategy."<sup>5</sup> The executive order defined MCF as "actions ... to acquire and divert foreign technologies"—a definition largely divorced from the crux of PRC MCF policies, and instead describes general technology transfer.<sup>6</sup>

U.S. policies are less effective without clear guidance and messaging. The illicit transfer of technology can relate and contribute to MCF initiatives, but these are distinct issues that require different solutions. Moreover, this executive order overlooks the reality that licit and illicit transfers of critical military and commercial technologies occur along a number of channels, of which many do not involve actors that are overtly linked to MCF efforts. U.S. policies that relate to MCF should be rigorous and transparent in implementation, including on the question of how risk factors are evaluated. Otherwise, policies intended to enhance research integrity could become controversial and counterproductive, such as if visa denials appear to be arbitrary or mistargeted.<sup>7</sup>

Without an accurate understanding and communication of MCF as a strategy, American policymakers cannot square up to the competitive challenge. MCF could enhance Chinese defense innovation and support the development of emerging capabilities that may impact the future military balance. This initiative also raises concerns about scientific and technological engagement with China, given the linkages to tech transfer of dual-use research and advances. However, not properly assessing and messaging on the threat could result in the pursuit of ineffective countermeasures. At times, U.S. elected officials and policymakers have appeared to regard all Chinese companies or individuals with suspicion and even as potential accomplices that could extract foreign technology on behalf of China's MCF drive, a characterization that stands in stark contrast to the incomplete character of MCF.<sup>8</sup> Even though such insinuations do not appear to be a mainstream perspective, any sweeping suspicions would raise concerns about poorly targeted policies that may disrupt scientific engagements critical to American competitiveness, while not adequately addressing actual threat actors and vectors. Even if U.S. policies are only perceived to be (rather than actually being) influenced by generalized suspicion or potential prejudice, countermeasures to tech transfer could be delegitimized.

This policy brief is intended to improve policymakers' understanding of the challenges that MCF presents to enhance the U.S. government's ability to grapple with these urgent policy issues. In particular, this analysis considers and seeks to correct several apparent myths—or at best generalizations and oversimplifications—that have been prominent in U.S. debates on the topic.

- **Myth 1:** The pursuit of MCF is a new initiative that is unique to Chinese President Xi Jinping.
  - *Reality:* MCF builds upon a long history of prior policies and initiatives that demonstrate the difficulty of achieving true "fusion," even in a system with a strong state that seeks to exercise central control.

- **Myth 2:** China possesses a clear, perhaps decisive advantage relative to the United States in national defense because of MCF.
  - *Reality:* As a strategy, MCF is still in its early stages, and its success is difficult to evaluate. American advantages in defense and military capabilities that stem from the strength of the U.S. defense economy and its overall innovation ecosystem shouldn't be taken for granted. It is not a foregone conclusion that China will successfully surpass the United States in MCF.
- **Myth 3:** China has imposed a legal obligation on Chinese companies to participate in MCF.
  - *Reality:* While China's party-state does not need a law to compel a company to turn over technology, MCF appears to leverage incentives more than coercion. Moreover, state coercion or direction cannot create the integrated ecosystem that is necessary for the success of MCF.
- **Myth 4:** Nearly every Chinese enterprise is already actively involved in MCF. As a result, it is all but inevitable that any collaboration between American and Chinese researchers is likely to end up directly or indirectly supporting military modernization.
  - *Reality:* At present, a more limited proportion of China's high-tech enterprises are actively or openly engaged in supporting the military, yet the numbers of companies and universities involved may continue to increase as this strategy gains traction.

## History of Military-Civil Fusion

### **Myth 1: The pursuit of MCF is a new initiative that is unique to Xi Jinping.**

While concerns about MCF have only recently gained prominence in U.S. policy debates, MCF is not a new initiative. China has been pursuing MCF in some form since at least the early 1980s. Antecedents to today's MCF strategy can be traced back decades to attempts by Deng Xiaoping to find synergies between economic development and military modernization.<sup>9</sup> These prior efforts, known as "civil-military integration" or "military-civil integration" (*junmin jiehe*, 军民结合), created the legacy and foundation for Xi Jinping's deepening of those policies under the moniker of "military-civil fusion" (*junmin ronghe*, 军民融合).<sup>10</sup> The history behind MCF illustrates not only that this has been a consistent objective for Chinese leaders but also that the structural changes required to realize it can be slow to occur even in an economy with strong central control.

Despite long-standing commitment to the idea of civil-military integration, implementation has been uneven. During the 1990s and 2000s, it remained challenging for civilian enterprises to marshal the capital or create the capabilities necessary to get involved with the defense economy.<sup>11</sup> The People's Liberation Army (PLA) was primarily procuring weapons systems from the typical players in the Chinese defense industry, whereas private companies had more limited involvement and contributions. In some cases, graft and familiarity also appear to have encouraged top military leaders on the Central Military Commission (CMC) to continue working primarily with state-owned defense conglomerates, even when superior private sector alternatives may have existed.<sup>12</sup>

**Reality: MCF builds upon a long history of prior policies and initiatives that demonstrate the difficulty of achieving true “fusion,” even in a system with a strong state that seeks to exercise central control.**

Xi Jinping's latest efforts to jumpstart and accelerate MCF with new policies and initiatives are certainly notable, yet these efforts are occurring against a backdrop of prior failures, or at best limited progress. While it is too soon to write off these ongoing initiatives—Xi's high-level attention and the PLA's genuine demand for emerging technologies from commercial enterprises may lead to noteworthy breakthroughs—the future of these initiatives still should be regarded with some skepticism given this history.

Rather than a sign of China's strength, MCF should instead be recognized as China's attempt to overcome serious and persistent deficiencies in its military procurement and research and development (R&D) ecosystem. Xi Jinping's decision to elevate MCF to a national strategy appears to reflect concerns among Chinese leaders that progress in reducing barriers between the military and private enterprises, dating back to the 1990s and early 2000s, had stalled.<sup>13</sup> So too, the establishment of a central, national commission to oversee its implementation reflects the sense of urgency and importance of this agenda.<sup>14</sup> In other words, the sustained attention to MCF reflects the current weaknesses and challenges, not the strength, of the Chinese system.

## China's Potential Advantages

**Myth 2: China possesses a clear and perhaps decisive advantage relative to the United States in national defense because of MCF.**

Chinese leaders often sketch out lofty long-term aspirations for MCF. Take, for example, Xi Jinping's remarks for the 19th Party Congress' work report in October 2017:

“We should ensure that efforts to make our country prosperous and efforts to make our military strong go hand in hand. We will strengthen unified leadership, top-level design, reform, and innovation. We will speed up implementation of major projects, deepen reform of defense-related science, technology, and industry ... and build integrated national strategies and strategic capabilities.”<sup>15</sup>

Beyond being aspirational, such rhetoric often highlights that this strategy is intended to be informed by the logic of systems science and engineering. That is, Chinese leaders seek to undertake the design and function of this national innovation ecosystem in a directed and “scientific” manner.<sup>16</sup>

In practice, this so-called top-level design has proven difficult to execute. The ideal end state that Xi's remarks describe, a carefully orchestrated architecture for a precisely implemented strategy, belies the much messier reality of how MCF has taken shape through a range of local policies.<sup>17</sup> For instance, China's numerous industrial parks and special development zones help create conditions for the development of industry clusters, such as major initiatives for artificial intelligence (AI) and high-performance computing in Tianjin.<sup>18</sup> However, these local initiatives can be inconsistent despite efforts to promote greater standardization. The overall progress has been described in official commentary as only recently having entered “the phase of transition from initial fusion to deep fusion,” while continuing to confront a range of obstacles in the process.<sup>19</sup>



Chinese President Xi Jinping (center), along with former Chinese presidents Hu Jintao (left) and Jiang Zemin (right), attend the opening session of the 19th National People's Congress. In the 19th Party Congress' work report, Xi laid out lofty long-term aspirations for military-civil fusion. (Lintao Zhang/Getty Images)

Over the long term, China's authoritarian system—with its ability to implement top-down policies, compel compliance, and marshal resources for long-term industrial planning, enabled by large-scale investments—may afford China a structural advantage in MCF initiatives.<sup>20</sup> The most visible indication of this potential advantage is the amount of investment dedicated to MCF through state, hybridized, and commercial mechanisms.<sup>21</sup> Since 2015, there have been over 35 funds established that are dedicated to investing in firms related to MCF. The total for these MCF funds is estimated to have reached over \$68.5 billion USD (447.16 billion RMB) in *anticipated* total funding (to be distributed over several years).<sup>22</sup> These funds continue to be created and expanded to

make strategic investments in state priorities, often combining state funding and commercial investment. While that figure appears to dwarf the budgets of the Defense Innovation Unit (DIU), In-Q-Tel, and other defense-related investment vehicles in the United States, a direct comparison can be misleading due to uncertainties about the effectiveness of the PRC MCF funds.<sup>23</sup>

It is far too early to evaluate with much confidence the returns on these Chinese MCF investment vehicles. While the price tag on PRC MCF funds has captured headlines, the management of these funds, including alleged incidents of “turmoil and greed” in some cases, merit a critical assessment.<sup>24</sup> There is some evidence that these funds do not spend all the money that was raised and may even, as an accounting trick, claim to have more money than is actually raised.<sup>25</sup> It's an open question whether some of these funds simply funnel their money back into the state-owned defense industry, thereby reinforcing existing bottlenecks in China's defense ecosystem, rather than investing in the next-generation enterprises that would disrupt the status quo. Currently, the funds lack transparency, such that the results and outcomes are difficult to evaluate.

China may perhaps achieve traction in high-tech sectors with dual-use technologies that have received significant investment. In particular, commercial advancements in drones, robotics, launch vehicles, and microsats have started to emerge as sectors in which MCF has achieved some successful accomplishments within the past several years.<sup>26</sup> Chinese strategists prioritize emerging domains of MCF, such as biology, space, cyberspace, biotechnology, and maritime development, and they expect these industries to achieve significant breakthroughs in the years to come.<sup>27</sup> For instance, SubBlue, which makes undersea robotic systems for defense and commercial applications, has established a partnership with Tianjin's AI MCF Innovation Center, which works with PLA's Academy of Military Science.<sup>28</sup> Realis is developing virtual reality training rooms equipped with AI that allow for multi-person training, including for scenarios of counterterrorism operations.<sup>29</sup> ADASpace produces and operates AI-enabled satellites that employ data processing capabilities as a central feature.<sup>30</sup> Qihoo360 is prominent in cybersecurity, not only as a leading company but also because of its apparent contributions to Chinese military cybersecurity and talent cultivation.<sup>31</sup>

***Reality: As a strategy, MCF is still in its early stages, and its success is difficult to evaluate. American advantages in defense and military capabilities that stem from the strength of the U.S. defense economy and its overall innovation ecosystem shouldn't be taken for granted. It is not a foregone conclusion that China will successfully surpass the United States in MCF.***



Chinese defense experts and strategists are often candid in discussing problems that bedevil MCF.<sup>32</sup> Chinese state-owned defense conglomerates have long been lumbering and inefficient, inclined toward preserving their state-sanctioned monopoly, remaining in a position of advantage due to obstacles to fair competition with private enterprises.<sup>33</sup> Among high-tech firms outside of the traditional defense industry, few companies have found sufficient incentives to actively participate in supporting national defense, relative to often more lucrative opportunities with commercial applications. Those enterprises that are interested in serving the military still tend to encounter significant hurdles in meeting licensing and confidentiality requirements.<sup>34</sup>

The People's Liberation Army has thus remained effectively cordoned off from much of the dynamic high-tech commercial economy, which is the main engine of innovation in emerging technologies. To some extent, this is still the case. There have been efforts underway since 2015 to create more public platforms for procurement to facilitate a more open process for bidding on tenders or applying to projects. These efforts are starting to create competitive opportunities for commercial enterprises to do business with the military.<sup>35</sup> While such efforts are notable steps toward more competitive procurement, the PLA's established patterns and practices will take time and robust reforms to change. Although Chinese officials have lauded certain private companies as models of MCF—which creates the perception and may provide an initial indication that the government has achieved some success in removing these barriers—officials and industry observers agree that significant obstacles remain.<sup>36</sup>

With the exception of corruption in the military, which Xi has confronted head-on, the current initiatives for MCF have altered few of the underlying conditions that derailed past attempts. For one, even as Xi has embarked on MCF, he appears to have essentially abandoned efforts to reform large state-owned enterprises (SOEs).<sup>37</sup> The dominance of SOEs in the defense sectors, with the state-sanctioned monopolies, continues to discourage private companies from engaging the military.<sup>38</sup> The recent efforts to streamline licensing to reduce the barriers to entry remain nascent. These structural impediments could continue hindering Xi's MCF push.

While China's possible advantage in MCF remains unproven, American advantage in civil-military integration has a proven track record. The United States government in collaboration with private industry has pioneered some of the enduring innovations of the past century—the integrated circuit, GPS, the internet, and stealth. A world-class network of American universities and companies that work closely with federal organizations like the Defense Advanced Research Projects Agency (DARPA) are responsible for these breakthroughs. The surest reminder of this system's history of success is that Chinese officials and experts are eagerly studying and attempting to replicate elements of it through MCF. American policymakers who condemn MCF ignore the parallels in America's own defense innovation ecosystem, which have opened up critiques of hypocrisy from the Chinese government. So too, the focus on MCF rather than the specific threat activities to which it can be linked (e.g., tech transfer) can distort U.S. responses.

Considering deficiencies in China's defense industry, a number of Chinese defense experts have looked to the United States as a model of MCF.<sup>39</sup> (In fact, Chinese scholars use the same term and phrasing, military-civil fusion, to refer to integration between the civilian and defense sectors in the United States.) Certain Chinese initiatives take inspiration from elements of the American approach, including convening challenges and competitions in the style of DARPA, such as one competition that leveraged machine reading to support military intelligence.<sup>40</sup> The CMC Science and Technology Commission also created a "rapid-response small group" for national defense scientific and technological innovation, designed to leverage commercial technologies for military applications and first established in Shenzhen, a hub for high-tech industry.<sup>41</sup> Given its focus on outreach to the tech sector, this initiative appears to be analogous in its mission to the Defense Department's DIU. Future MCF reforms might emulate laws like the Federal Technology Transfer Act of 1986 and the Federal Acquisition Reform Act, which enabled the growth of dual-use industries in the United States.<sup>42</sup> Even as American policymakers express dismay at China's

drive to fuse its civilian and defense sectors, Chinese leaders and experts still regard the United States as a country that possesses the highest level of “fusion.”<sup>43</sup>

However, under its current system, China will be unable to utilize the most important ingredient of the U.S. MCF model: the rule of law and public accountability. Both have provided a robust foundation for public-private collaboration, enabling researchers and private companies to innovate without fear of government intrusion or a state-owned entity stealing their technology. Given the expansion of extrajudicial authorities under Xi, Chinese officials will struggle to provide similar safeguards to companies that choose to work with the military and defense industry. None of this means that China's potential long-term advantages in MCF should be dismissed or disregarded. Certainly, the success of Chinese industrial policies in 5G wireless technology and elsewhere means that U.S. policymakers should take MCF seriously. Ultimately, however, the track record of these efforts shows that it is too soon to declare that MCF has given China the decisive security advantage that some media coverage has assumed.<sup>44</sup>

## Obligations Under PRC Law

### ***Myth 3: China has imposed a legal obligation on Chinese companies to participate in MCF.***

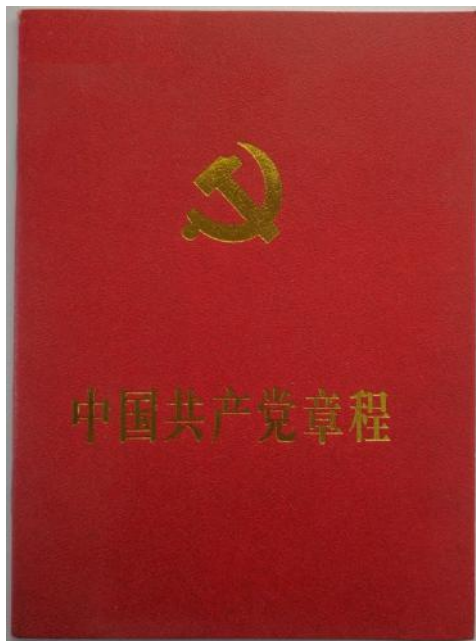
Much has been made of a supposed legal obligation mandating that companies participate in MCF. For instance, former Vice President Mike Pence said that MCF means that “[b]y law and presidential fiat, companies in China—whether private, state-owned, or foreign—must share their technologies with the Chinese military.”<sup>45</sup> Then-Secretary of State Mike Pompeo said in January 2020 remarks, “Under Chinese law, Chinese companies and researchers must—I repeat, must—under penalty of law, share technology with the Chinese military.”<sup>46</sup> So too, conservative investor Peter Thiel claimed a recent amendment to China's constitution “mandates that all research done in China be shared with the People's Liberation Army.”<sup>47</sup>

While scrutiny of legal questions may appear abstruse or of marginal importance, misunderstanding or misinterpretation of the legal issues in play could cause American policymakers to overestimate the extent of “fusion” occurring in China. To the contrary of Thiel's suggestion, no such legal obligation or constitutional requirement exists in China at present. The constitutional amendment that Thiel appears to be referencing is a 2017 update to the Chinese Communist Party's (CCP's) constitution (中国共产党章程), not the country's national constitution.<sup>48</sup>

When the 19th CCP National Congress approved an update to the party constitution in October 2017, this revision enshrined Xi's top priorities, including the Belt and Road Initiative.<sup>49</sup> The provision that mentions MCF, far from mandating society-wide participation in MCF or offering any affirmative command, is simply included among a listing of various strategies for party cadres to implement.<sup>50</sup>

“It is necessary to implement the strategy of rejuvenating the country through science and education, the strategy of strengthening the country through talent, the strategy of innovation-driven development, the strategy of revitalizing the countryside, the strategy of regional coordinated development, the strategy of sustainable development, and the strategy of military-civil fusion development.”<sup>51</sup>

The provision thus merely reaffirms what is already apparent on many fronts: namely, that the party considers MCF a strategic priority.



*The Constitution of the Chinese Communist Party (CCP) is binding upon CCP members and promotes party priorities and initiatives, including military-civil fusion. (Hosiet/Wikipedia)*

Where the party constitution applies only to party members and is updated every five years to reflect the party's ideological consensus and top objectives, the Chinese constitution is, at least notionally, the country's "supreme legal authority," a legal document that has only been amended a handful of times and is binding upon everyone in the country.<sup>52</sup> Updating the Chinese constitution to mention MCF would be a notable deviation from Chinese governance practices.<sup>53</sup> Refreshing the party constitution to highlight current initiatives that are favored by Xi Jinping, on the other hand, is significant, but par for the course as another manifestation of Xi's personalistic influence.

Apart from the CCP constitution, no statute or law mandating compulsory participation in MCF appears to exist. Indeed, Chinese experts often point to the lack of adequate legal standing for MCF as an obstacle inhibiting MCF's implementation.<sup>54</sup> For instance, policies and regulations that the PLA might issue at a local level are not binding on personnel beyond their purview. The National People's Congress had started to explore the possibility of creating a "MCF Promotion Law" (军民融合促进法), adding this legislation to China's legislative agenda as early as March 2012.<sup>55</sup> However, the drafting process has proven slower than anticipated. Evidently, the legal and policy issues that come

into play are complex and require extensive coordination among stakeholders.<sup>56</sup>

The National People's Congress had introduced the draft of the MCF Development Law (军民融合发展法) as of the fall of 2018, but its progress remained limited in 2019 and into 2020.<sup>57</sup> The focus on the legalization (*fazhihua*, 法治化) of MCF could be interpreted as the "legal institutionalization" of this national initiative.<sup>58</sup> The party-state has introduced a series of new laws in recent years to bolster, expand, and formalize its authority, rather than to constrain or delineate the bounds of state power.<sup>59</sup> While the party-state's authority is increasingly unconstrained, this call for a new law for MCF belies claims that Beijing already possesses adequate capacity to implement its objectives in their totality.

Beyond the inherent complexity of this legislative undertaking, another potential explanation for the protracted timeline is that China's leaders may not feel prepared to formalize the MCF system in law. Currently, various stakeholders are still experimenting with different approaches to issues that include intellectual property protection and mechanisms for technology transfer between defense and commercial enterprises or applications.<sup>60</sup> The lack of clarity on such legal issues has impeded progress in MCF initiatives, which belies claims that a legal mandate is a strength of this approach. This dynamic process demonstrates that China's overarching strategy toward MCF is still evolving, based on lessons learned from early pilots and initiatives.<sup>61</sup>

While there is no specific law for MCF, many commentators believe that other laws compel companies to participate in MCF.<sup>62</sup> These laws include the National Security Law, Cybersecurity Law, and National Intelligence Law. These laws approach various aspects of national security as involving the whole of society and as an endeavor to which everyone is obligated to contribute, at least in the abstract.<sup>63</sup> Each law has vague provisions that impose expansive, ambiguous obligations upon companies or individuals to render unspecified assistance to national security, which as defined by the CCP includes economic security as well as scientific and technological security.<sup>64</sup>

A basic legal guidance for such policies can be traced back to the 1997 National Defense Law, which described the government's commitment to "promote the coordinated development of national defense construction and economic construction."<sup>65</sup> Article 9 of the law envisions rewards and potential punishment based on contributions to various national defense activities:

"The state and society shall commend and reward organizations and individuals who have contributed to national defense activities in various forms. Anyone who, in violation of this law and related laws, refuses to perform national defense obligations or endangers national defense interests, shall be investigated for legal responsibility according to law."<sup>66</sup>

This legal provision highlights the long-standing, generalizable responsibility for citizens to contribute to national defense. Hypothetically, articles like this one are generic enough to compel companies to participate in MCF. Yet China's past record on MCF suggests this legal obligation, combined with the coercive power of the state, has done little to encourage military and civilian cooperation.

In general, PRC laws tend to be formulated to preserve maximum leeway in interpretation and implementation.<sup>67</sup> Often, specific aspects of the laws are further defined and delineated afterwards in regulations and guidelines that clarify specific points.<sup>68</sup> For instance, the 2015 National Security Law (国家安全法)<sup>69</sup> articulated an expansive understanding of national security and delineated the authorities of the state in defending it.<sup>70</sup> According to Article 11:

"Citizens of the People's Republic of China, all state organs and armed forces, all political parties and mass organizations, enterprises, institutions and other social organizations shall have duties and obligations to safeguard national security."<sup>71</sup>

Such sub-articles are vague enough to be plausibly construed or extrapolated to force companies to render assistance on matters of defense technological development, but do not explicitly or directly delineate any such demand. Nor do they seem likely to be a functional mechanism to that end.<sup>72</sup>

Although the laws currently in effect are relevant and indicative of the types of expansive authorities that can be exercised within the Chinese system—and for this reason, warrant concern—none of these laws creates the necessary groundwork for a regime of compulsory participation in MCF or compelled technology transfer. The existing framework of laws appears weak and unlikely to be effective in promoting MCF in a systematic manner. The ongoing efforts to develop a law dedicated to the promotion of MCF merit continued analytic attention, as does the ongoing evolution of local policies and regulatory frameworks for its implementation.

***Reality: While China's party-state does not need a law to compel a company to turn over technology, MCF appears to leverage incentives more than coercion. Moreover, state coercion or direction cannot create the integrated ecosystem that is necessary for the success of MCF.***

China's party-state does not require a law to achieve a desired end result *in extremis*. The balance of power between central authorities relative to companies is different from the United States and other democracies with mature legal systems, in which a company could more readily seek legal redress or go public to the media with its concerns.<sup>73</sup> If the Chinese military or government wants a technology that a company holds, then extralegal influence or coercion can compel the company to turn it over. However, that does not mean forced transfers occur routinely or are effective as a policy mechanism. Ultimately, the extralegal options at the party-state's disposal have not been sufficient to make MCF a reality.

If the party-state's past track record of limited success in enlisting companies in military projects and procurement is any indication, its coercive power has so far been an ineffective instrument to compel or create the conditions for widespread participation in MCF. To the contrary, MCF policies enacted by the central government or local governments have concentrated much more on promoting and creating the conditions for cooperation among the military, academia, and companies. Most military technologies are highly complex systems with tens of thousands of components, produced by thousands of suppliers.<sup>74</sup> While coercion can be applied selectively to achieve desired outcomes, such as to target certain inventions, such an approach cannot feasibly provide the basis for an ecosystem that powers genuinely collaborative innovation.

Even when officials demand outcomes, companies can drag their feet or avoid compliance selectively. When regulators from the Cyberspace Administration of China (CAC) requested user data from Didi, China's primary rideshare service, the company was initially reluctant to comply and then opted to print out user data in hard copy rather than providing it in a digital form that would be more usable.<sup>75</sup> Similarly, when the People's Bank of China requested user data from Tencent and Alibaba for its credit scoring program, the companies initially refused to cooperate.<sup>76</sup> Likewise, technology companies are often slow in carrying out censorship as requested by the CAC. While it would be a mistake to hold these examples up as evidence that Chinese companies enjoy true autonomy from the government, such cases do suggest that companies can and do resist requests, or, at the very least, drag their feet when complying with orders they see as contrary to their commercial interests.

The direction of policy under Xi Jinping has involved greater assertion of party-state authority over companies through party committees within tech companies, conditioning preferential financing on serving party goals, and other forms of soft coercion that may increase the state's capacity to secure compliance with orders.<sup>77</sup> However, these tools are unlikely to end the ongoing dynamics of push and pull between the government and companies. Studies of Chinese corporate governance have found that even state-owned enterprises do not universally conform to party orders, and among those that do conform, compliance is often symbolic, rather than substantive.<sup>78</sup> Among private companies, whether the board or CEO is politically connected appears to be the most significant determiner of compliance.<sup>79</sup> This dynamic implies U.S. policies intended to shape the incentives of Chinese companies, especially those with global presence and ambitions, against active participation in military-civil fusion could be productive.

## Implications for U.S.-China Technological Engagement

***Myth 4: Because MCF is eliminating barriers between civilian and defense sectors, any collaboration between American and Chinese researchers is likely to end up directly or indirectly supporting the military.***

MCF as a strategy can be regarded as intended to promote the "elimination of barriers" between civilian and defense sectors.<sup>80</sup> As a result, even when technology is intended to be leveraged for peaceful purposes, the risks to U.S. national security are "enormous" nonetheless, by Pompeo's characterization.<sup>81</sup> By that logic, any American company that is doing business in China may create "indirect benefit," even "direct benefit to the Chinese military," even if partnering only with civilian counterparts, then-Chairman of the Joint Chiefs of Staff Joseph Dunford warned in the case of Google.<sup>82</sup> The risks of that mentality could be a tendency to shame or constrain U.S. companies from engaging in China, instead of focusing attention on the highest-risk relationships.

Certainly, a growing number of Chinese universities and companies are actively participating in MCF initiatives in some capacity. The goal of MCF, after all, is to expand the overall ecosystem of public and private institutions and enterprises that support national defense. Several hundred Chinese universities receive military funding, educate military students, conduct defense research, and/or have established dedicated initiatives or laboratories to these ends.<sup>83</sup> By contrast, a majority of Chinese companies and enterprises are not known to be deeply involved in MCF efforts, and many institutions that do actively engage with the military are relatively straightforward to identify, at least for the time being, often openly publicizing their involvement.<sup>84</sup>

Beyond the universities that are the “seven sons of national defense,” which have a long history of support to the military,<sup>85</sup> a range of Chinese universities are actively supporting MCF.<sup>86</sup> For instance, a growing number of universities have been designated by the State Administration for Science, Technology, and Industry for the National Defense (SASTIND) pursuant to “joint construction” (共建) programs.<sup>87</sup> Many universities have launched their own platforms for MCF or created national defense laboratories, often receiving funding from the CMC Equipment Development Department or Science and Technology Commission for their projects.<sup>88</sup> Meanwhile, certain universities are actively supporting military training and education, including in partnership with the new PLA Strategic Support Force, which wields the PLA’s space, cyber, and electronic warfare capabilities.



*Tsinghua University, also known as “China’s MIT,” engages in classified Chinese military research to advance MCF goals. The university hosts many labs that support military research topics such as artificial intelligence, quantum physics, and nuclear technology. (N509FZ /Wikimedia)*

The number of private companies, especially small and medium enterprises, that participate in MCF by contributing directly to military research and projects has been rising.<sup>89</sup> Ascertaining the total number of private companies participating in MCF is difficult. However, the available evidence suggests that the total number remains a relatively limited proportion of China’s tech sector. For instance, according to data from 2016, only around 1,000 private enterprises hold the Weapons and Equipment Research and Production Certificate, which is required to engage in R&D or production related to advanced weapons systems.<sup>90</sup> However, the number is underinclusive, since only a subset of all MCF companies is required to acquire this specific license. Those companies that have received the

required defense certifications to do so are then fully qualified to participate in military projects and procurements.

***Reality: At present, a more limited proportion of China’s high-tech enterprises are actively or openly engaged in supporting the military.***

Despite decades of efforts to promote civil-military integration, China’s track record has displayed only limited success. As of 2019, Chinese experts estimated that only 2 percent of China’s private high-tech enterprises were involved in defense work, and mainly in auxiliary roles.<sup>91</sup> That is only marginal progress relative to 2010, when Chinese scholars estimated that less than 1 percent of China’s private high-tech enterprises were involved in defense-related activities.<sup>92</sup>

The balance of incentives may differ for leading technology companies that occupy a much more prominent and privileged position within the Chinese and international technology ecosystem. Companies like Baidu, Alibaba, and Tencent, as well as Huawei, have global presence and ambitions. For such companies, visible or prominent involvement with the Chinese military could become a liability and source of controversy for their overseas activities and engagements. The question that arises when evaluating risk is the distinction between the absence of evidence of engagement in MCF relative to confirmation of non-participation in MCF. As the implementation of MCF continues to advance, companies that did not have previous involvement could be incentivized to become more directly involved. It is possible to evaluate and compare companies based on their relative degrees of involvement, but this is a dynamic question, and assessments of risk will evolve over time.

There is limited information about these companies' support to MCF, but more oblique indications point to potential involvement in dual-purpose and/or defense-oriented research. For instance, Baidu's joint laboratory with the China Electronics Technology Group (CETC) was reported to involve collaboration on the use of AI in command and control.<sup>93</sup> Baidu and iFlytek also contributed as co-organizers to a contest for machine reading and natural language processing directed by the CMC Equipment Development Department that concentrated on the application of those techniques for use in military intelligence.<sup>94</sup> AliCloud has apparently supported data centers intended to promote MCF initiatives, and an Alibaba vice president participated in a conference on military big data organized through the Academy of Military Science.<sup>95</sup> Meanwhile, Huawei has a history of linkages to the PLA and has collaborated in recent years on research projects, including on 5G with the PLA Strategic Support Force's Information Engineering University. The extent of its engagement with the military beyond that remains fairly opaque but is suspected to be more extensive than its executives have claimed or admitted.<sup>96</sup>

The attempts to harness such new champions as members of the PRC's "national team" in AI speaks to their strategic significance as drivers of China's national ambitions in AI.<sup>97</sup> The obligations of these companies pursuant to their designation remain somewhat ambiguous. Each of the companies that have joined this initiative as national team members have launched their own projects and platforms that can contribute to making tools and resources available to enhance developments across ecosystem. For instance, in March 2017, China's National Engineering Laboratory for Deep Learning Technology was established under the leadership of Baidu.<sup>98</sup> With the launch of new open innovation platforms intended to promote openness and sharing for core capabilities,<sup>99</sup> Baidu is focusing on autonomous vehicles, Alibaba Cloud (Aliyun) on smart cities, Tencent on medical imaging and iFlytek on smart voice technologies. Of course, such open and shared resources can be generally available to military end users, as are those developed by American institutions.

These efforts remain nascent and their actual impact difficult to evaluate for the time being. Yet the licensing requirements to fully participate in MCF will be prohibitive for many of China's leading technology companies. For example, companies with foreign investors, including from Hong Kong and Macau, are currently disqualified from acquiring the necessary licenses to participate in MCF.<sup>100</sup> While Chinese officials might make exceptions for especially valuable companies, they often appear loath to partner with companies with overseas ties.<sup>101</sup> Qihoo 360, for example, delisted from the Nasdaq and relisted in China, apparently to demonstrate its loyalty as a would-be "national champion" in cybersecurity.<sup>102</sup> For this reason, Chinese analysts believe being a "purely domestically funded enterprise" (纯内资) is an important prerequisite for a company that intends to compete for sensitive national security contracts.<sup>103</sup>

By contrast, leading American technology companies have been much more open and active about pursuing opportunities to work more closely with the Department of Defense. Amazon and Microsoft have fiercely competed over the Pentagon's JEDI contract to provide cloud computing.<sup>104</sup> Google, despite its withdrawal from Project Maven, has continued to pursue opportunities to work with the Pentagon on other projects.<sup>105</sup> Chinese reporting on Pentagon outreach to Silicon Valley characterizes the two as "hand in hand," even as the U.S. national security community expresses dismay about the gap and distance that remain.<sup>106</sup>

## Conclusions and Implications

As U.S.-China military rivalry and technological competition continue to intensify, a sophisticated understanding of PRC policy and strategy is essential for American decision-making. These analytical and informational challenges of great-power competition require that the United States continue to develop the capacity and expertise across and throughout the government, as well as in the military and academia, to pursue reasoned courses of action. Certain clichés and common caricatures about China can prove highly problematic, especially when used to justify arguments for policies that could be damaging to American competitiveness in the long term.

Each of these myths constitutes a misleading or oversimplified understanding that may distract or detract from appropriate responses. A failure to appreciate the history behind MCF can contribute to overreaction or ignorance of the structural barriers that remain to its realization. So too, the notion that MCF promises a unique advantage to China can distract from a recognition of the strengths of the U.S. system in ways that contribute to the calls for similarly state-driven approaches in the United States. If the U.S. responds in ways that attempt to emulate elements of China's policies that have limited efficacy in actuality, those efforts could backfire. The view of MCF as the result of legal compulsion can distract from an understanding of the incentives and mechanisms through which China is actually expanding its capacity to leverage commercial technologies. The notion that there are no boundaries between military and civilian sectors in China can be misleading if that supposition reinforces assumptions that maximalist solutions in decoupling are necessary despite the collateral damage. For instance, proposals to block all Chinese students from the United States or arguments to pursue a more indiscriminate approach to "decoupling" the American and Chinese economies and technological ecosystems, which have at times invoked MCF as a rationale, would be deeply damaging to American competitiveness—and U.S. image and appeal—in the long term.<sup>107</sup>

U.S. analysts and officials must be as precise and accurate as possible in discussing and designing policies to respond to threat activities that relate to MCF. In particular, clarity in messaging is critical to establishing credibility as a foundation for continued coordination with allies and partners. At a moment when the U.S. government must rebuild its global credibility, messaging and assessments on China must be measured to advance U.S. interests and facilitate joint policy action. Any mischaracterizations of Chinese strategy or capabilities, including by playing into Chinese government messaging propaganda that U.S. policy debates and responses are unreasonable or motivated by protectionism, can be counterproductive in ways that risk alienating U.S. allies and partners. Moreover, there are reasons to question whether the intense concentration on MCF is a productive narrative when this focus opens the United States up to accusations of hypocrisy, given the obvious parallels in the American defense innovation ecosystem. When the core threat and concern is tech transfer, orienting the conversation upon the long-term challenge of this Chinese strategy can distract from the particular activities that U.S. policy seeks to change and counter.



A highly targeted approach that accounts for the complexities of international cooperation and competition in science, technology, and innovation will be critical in a world that is highly globalized and interconnected. At the same time, the implementation of MCF is intended to blur boundaries and increase the connectivity of defense and commercial developments and applications in China. This dynamic has created new risks and gives American institutions reason to be cautious of partnership and collaboration with Chinese counterparts. These risks include potential vulnerabilities in supply chains, as well as new vectors for the theft or transfer of sensitive technologies. This report has assessed current dynamics and is intended to clarify points of frequent confusion and misinformation. These issues merit continued analytic attention as China's MCF strategy continues to evolve and progress in the years to come.

## Questions for Future Analysis

This policy brief has addressed prominent misperceptions with the aim of advancing the understanding of China's MCF strategy, which will be of great consequence to China's future economic development and military modernization. However, a number of questions that remain unanswered or unanswerable based on current information highlight the imperative of continued research on this topic.

- To what extent are China's leading technology companies willing and/or eager to work with the Chinese military, relative to their potential concerns about reputational consequences as relate to their global presence and ambitions?
- How often have the resources dedicated to MCF been wasted and/or embezzled? To what extent are local actors taking advantage of this strategy for branding and/or exploitation with only limited involvement or participation?
- To what degree do rivalry and/or coordination among Chinese bureaucracies facilitate or introduce impediments to the pursuit of MCF?
- Is MCF continuing to adapt and learn from American approaches, and in what cases or contexts might U.S. policy look to China for relevant lessons or practices to advance American competitiveness in dual-use emerging technologies?
- To what extent can U.S. policy measures influence Chinese companies and universities to dissuade them from getting actively involved in military-civil fusion initiatives? How can the risks of scientific or commercial collaboration with a certain entity or individual be rigorously evaluated over time?

As China's strategy of military-civil fusion continues to evolve and adapt, U.S. analysis of these trends should advance as well. Going forward, American competitive strategies and countermeasures require improved intelligence and understanding, as well as messaging, of the core issues at stake.

<sup>1</sup> For reference and representation of the existing academic literature: Tai Ming Cheung, *Fortifying China: The Struggle to Build a Modern Defense Economy* (New York: Cornell University Press, 2013). See also: Tai Ming Cheung and Eric Hagt, "China's Efforts in Civil-Military Integration, Its Impact on the Development of China's Acquisition System, and Implications for the United States," in *Proceedings of the Sixteenth Annual Acquisition Research Symposium* (Monterey, CA: Naval Postgraduate School, 2019), <https://calhoun.nps.edu/handle/10945/63022>; Greg Levesque and Mark Stokes, "Blurred lines: MCF and the 'going out' of China's defense industry" (*Pointe Bello*, December 2016), [https://static1.squarespace.com/static/569925bfe0327c837e2e9a94/t/593dad0320099e64e1ca92a5/1497214574912/062017\\_Pointe+Bello\\_Military+Civil+Fusion+Report.pdf](https://static1.squarespace.com/static/569925bfe0327c837e2e9a94/t/593dad0320099e64e1ca92a5/1497214574912/062017_Pointe+Bello_Military+Civil+Fusion+Report.pdf); and Marcel Angliviè de la Beaumelle, Benjamin Spevack, and Devin Thorne, "Open Arms: Evaluating Global Exposure to China's Defense-Industrial Base," C4ADS, September 25, 2019, <https://www.c4reports.org/open-arms>.

<sup>2</sup> See, for instance: "Challenges and rewards of doing business with China," ShareAmerica, January 16, 2020, <https://share.america.gov/challenges-and-rewards-of-doing-business-with-china/>; "Rubio, Cotton, Cornyn Urge Members of United Kingdom's National Security Council to Reject Huawei in 5G Infrastructure," Marco Rubio, press release, January 27, 2020, [https://www.rubio.senate.gov/public/index.cfm/press-releases?ContentRecord\\_id=5EFF3CDB-FFDD-471E-A1BC-23B45399FE9B](https://www.rubio.senate.gov/public/index.cfm/press-releases?ContentRecord_id=5EFF3CDB-FFDD-471E-A1BC-23B45399FE9B); Madhumita Murgia and Yuan Yang, "Microsoft worked with Chinese military university on artificial intelligence," *Financial Times*, April 10, 2019, <https://www.ft.com/content/9378e7ee-5ae6-11e9-9dde-7aedca0a081a>; Sydney J. Freedberg Jr., "Google Helps Chinese Military, Why Not US? Bob Work," *Breaking Defense*, January 27, 2020; Mike Pence, "Remarks by Vice President Pence at the Frederic V. Malek Memorial Lecture" (Conrad Hotel, Washington, October 24, 2019); and Michael R. Pompeo, "Technology and the China Security Challenge" (Commonwealth Club, San Francisco, January 13, 2020).

<sup>3</sup> See also: "Military and Security Developments Involving the People's Republic of China 2020" (Office of the Secretary of Defense, 2020); and Alex Stone and Peter Wood, "China's Military-Civil Fusion Strategy" (China Aerospace Studies Institute, June 15, 2020), <https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/>.

<sup>4</sup> For example, acquiring the necessary licenses can cost as much as 1 million RMB (~\$141,000) and take multiple years. As one Beijing-based law firm put it, "the main obstacles to private sector participation in the military sector are found in the relatively high barriers to entry into the market, the intersecting management that exists, lengthy application cycles, and relatively high maintenance costs." See 杨明 [Yang Ming], 浅析我国军民融合发展法律制度(一) [A Brief Analysis of China's Legal System for Military-Civil Fusion Development (Part One)], *China Law Insight*, April 17, 2018, <https://www.chinalawinsight.com/2018/04/articles/corporate-ma/%E6%B5%85%E6%9E%90%E6%88%91%E5%9B%BD%E5%86%9B%E6%B0%91%E8%9E%8D%E5%90%88%E5%8F%91%E5%B1%95%E6%B3%95%E5%BE%8B%E5%88%B6%E5%BA%A6%EF%BC%88%E4%B8%80%EF%BC%89/>.

<sup>5</sup> "Proclamation on the Suspension of Entry as Nonimmigrants of Certain Students and Researchers from the People's Republic of China," Proclamation No. 10043, 85 Fed. Reg. 34353 (May 29, 2020), <https://trumpwhitehouse.archives.gov/presidential-actions/proclamation-suspension-entry-nonimmigrants-certain-students-researchers-peoples-republic-china/>.

<sup>6</sup> The executive order defined MCF as: "actions by or at the behest of the PRC to acquire and divert foreign technologies, specifically critical and emerging technologies, to incorporate into and advance the PRC's military capabilities"; "Proclamation on the Suspension of Entry as Nonimmigrants of Certain Students and Researchers from the People's Republic of China."

<sup>7</sup> See: Helen Davidson, "US cancels 1,000 China student visas, claiming ties to military," *The Guardian*, September 9, 2020, <https://www.theguardian.com/world/2020/sep/10/us-cancels-1000-china-student-visas-claiming-ties-to-military>.

<sup>8</sup> See, for instance: Elizabeth Redden, "The Chinese Student Threat?" *Inside Higher Ed*, February 15, 2018, <https://www.insidehighered.com/news/2018/02/15/fbi-director-testifies-chinese-students-and-intelligence-threats>; Michal Kranz, "The director of the FBI says the whole of Chinese society is a threat to the US — and that Americans must step up to defend themselves," *Business Insider*, February 13, 2018, <https://www.businessinsider.com/china-threat-to-america-fbi-director-warns-2018-2>; and Ros Krasny, "GOP Senator Says Don't Let Chinese Students Study STEM in U.S.," *Bloomberg*, April 26, 2020, <https://www.bloomberg.com/news/articles/2020-04-26/gop-senator-says-don-t-let-chinese-students-study-stem-in-u-s>.

<sup>9</sup> Deng Xiaoping's notable "16-character instruction"—"军民结合、平战结合、军品优先、以民养军 [combine military and civilian activities, combine peacetime and wartime preparations, give priority to military products, and let the civilian sector support the military sector]"—articulated the basic direction for civil-military integration work in the 1990s and 2000s.

<sup>10</sup> Confusingly, "MCF" is still often rendered as "civil-military integration" in official English translations of Chinese documents, even though the shift in terminology is a significant indicator of new directions in this agenda. We choose to use the literal translation for clarity and consistency. Moreover, a literal translation of the characters for either phrase has the ordering "military-civil," rather than "civil-military," such that the change from "CMI" to MCF is only a change to a more direct translation, not intended to imply a reordering of the characters in the Chinese phrasing.

<sup>11</sup> Evan Feigenbaum, *China's Techno-Warriors: National Security and Strategic Competition from the Nuclear to the Information Age* (Stanford University Press, 2003).

<sup>12</sup> Feigenbaum, *China's Techno-Warriors*; Certain officers from the former General Armaments Department later became targets of the anti-corruption campaign launched under Xi Jinping. Minnie Chan, "Former China defence minister Chang Wanquan 'given military demotion over link to corruption case,'" *South China Morning Post*, July 11, 2019, <https://www.scmp.com/news/china/military/article/3018125/chinas-former-defence-minister-chang-wanquan-given-military>; and Dennis J. Blasko, "Corruption in China's Military: Omen of Many Problems," *War on the Rocks*, February 16, 2015, <https://warontherocks.com/2015/02/corruption-in-chinas-military-one-of-many-problems/>.

<sup>13</sup> "从“军民结合”到“军民融合”——改革开放以来中国国防科技工业领导管理体制的调整与完善 [From "Military-Civil Integration" to "Military-Civil Fusion"—Adjustment and Improvement of China's National Defense Science and Technology Industry Leadership Management System Since Reform and Opening Up]," CCP History Network [中共党史网], August 29, 2019, [http://www.rl.gov.cn/szb/Web/F0\\_0\\_28D070X5OS3W0SWKST2KBWQE51.htm](http://www.rl.gov.cn/szb/Web/F0_0_28D070X5OS3W0SWKST2KBWQE51.htm).

14. “习近平谈军民融合：关乎国家安全和发全局 [Xi Jinping talks about military-civil fusion: related to the overall outlook for national security and development],” 求是 [Seeking Truth], October 16, 2018, [http://www.qstheory.cn/zhuangqu/rdji/2018-10/16/c\\_1123565364.htm](http://www.qstheory.cn/zhuangqu/rdji/2018-10/16/c_1123565364.htm).
15. “习近平在中国共产党第十九次全国代表大会上的报告 [Xi Jinping's report at the Chinese Communist Party 19th National Congress],” China.com.cn, October 27, 2017, [http://www.china.com.cn/19da/2017-10/27/content\\_41805113\\_3.htm](http://www.china.com.cn/19da/2017-10/27/content_41805113_3.htm).
16. For example, Xi Jinping said at the Central Commission for the Development of MCF, “推动军民融合发展是一个系统工程，要善于运用系统科学、系统思维、系统方法研究解决问题，既要加强顶层设计又要坚持重点突破，既要抓好当前又要谋好长远。[Promoting the development of military-civil integration is [a matter of] systems engineering. We must be good at using systems science, systems thinking, and systems methods to study and solve problems. We must strengthen the top-level design and adhere to key breakthroughs.]” See: “习近平谈军民融合 [Xi Jinping talks about military-civil fusion].” For context, see “The Rise of Systems Engineering in China,” *Science*, September 2016, [http://www.sciencemag.org/sites/default/files/custom-publishing/documents/ALSSE%20supplement\\_Final%20online.pdf](http://www.sciencemag.org/sites/default/files/custom-publishing/documents/ALSSE%20supplement_Final%20online.pdf).
17. For instance, Tianjin is a city in which these initiatives have been particularly prominent: See: “天津市智能科技领域军民融合专项行动计划 [the Tianjin City Intelligent S&T Domain MCF Special Projects Action Plan].” CSET has produced a detailed English summary of this document: [https://cset.georgetown.edu/wp-content/uploads/t0033\\_Tianjin\\_mil\\_civil\\_fusion\\_EN.pdf](https://cset.georgetown.edu/wp-content/uploads/t0033_Tianjin_mil_civil_fusion_EN.pdf).
18. See, for instance: “军民融合创新产业园将在顺德揭牌 [Military-Civil Fusion Innovation Industry Park Will Be Unveiled at Shunde],” CNR, December 22, 2017, [http://www.cnr.cn/gd/gdkx/20171222/t20171222\\_524072073\\_1.shtml](http://www.cnr.cn/gd/gdkx/20171222/t20171222_524072073_1.shtml).
19. “军报评论：把军民融合搞得更好一些更快一些 [Military Report Commenter: Make military-civil fusion better and faster],” China Military Online, June 21, 2017, [http://www.81.cn/jmywyl/2017-06/21/content\\_7646619.htm](http://www.81.cn/jmywyl/2017-06/21/content_7646619.htm).
20. For more on China's potential advantage in industrial planning and high-tech initiatives, see Sebastian Heilmann, “Facing up to China's state-led tech revolution,” *Nikkei Asia*, May 2, 2018, <https://asia.nikkei.com/Opinion/Facing-up-to-China-s-state-led-tech-revolution2>.
21. For several examples of these hybrid funds, known as guidance funds, established to promote MCF, see, for instance: “国华军民融合产业发展基金创立 [Guohua MCF Industrial Development Fund established],” National Defense Science and Industry Bureau, September 7, 2016, [http://www.gov.cn/xinwen/2016-09/07/content\\_5106111.htm](http://www.gov.cn/xinwen/2016-09/07/content_5106111.htm). For context, see also: “军民融合产业基金：助力军民融合深度发展 [MCF Industry Fund: Helping the deep development of MCF],” cj.sina.com.cn, March 19, 2019, <https://cj.sina.com.cn/articles/view/6750296084/19259581400100hwv7>.
22. See this estimate by the author, pending further updates or additions: <https://docs.google.com/spreadsheets/d/16LxDBATaOFn5QkOhvpAxOHpYfMPaQma9FuLn5Ebphc0/edit?usp=sharing>.
23. DIU's 2019 budget was \$44 million and In-Q-Tel's 2005 budget was \$37 million. In-Q-Tel's budget may have grown considerably since—its annual budget is classified—but is still likely significantly lower than Chinese MCF funds. See, for instance: Scott Maucione, “Failure is an option for DoD's experimental agency, but how much?” Federal News Network, October 30, 2019, <https://federalnewsnetwork.com/defense-main/2019/10/special-report-failure-is-an-option-for-dods-experimental-agency-but-how-much/>.
24. “河南宏科军民融合产业投资基金在洛成立调研 [Investigation on the establishment of Henan Hongke Military-civilian Integration Industry Investment Fund],” May 9, 2020, <http://www.jomwsmut9.com/l5cfm5/13315.html>.
25. Because most government financing vehicles in China require nongovernment sources to finance about two-thirds of the overall fund, officials will often announce the amount they plan to raise eventually, rather than the amount they have on hand. For more, see: Emily Feng, “China's state-owned venture capital funds battle to make an impact,” *Financial Times*, December 23, 2018, <https://www.ft.com/content/4fa2caaa-f9f0-11e8-af46-2022a0b02a6c>; and Lance Noble, “Paying for Industrial Policy,” *Gavekal Dragonomics*, December 4, 2018, <https://research.gavekal.com/gavekal-dragonomics>.
26. For a more detailed discussion, see: Lorand Laskai, Visiting Researcher, Center for Security and Emerging Technology (CSET), “Building China's SpaceX: MCF and the Future of China's Space Industry,” Testimony before the U.S.-China Economic and Security Review Commission, April 25, 2019, <https://www.uscc.gov/sites/default/files/Lorand%20Laskai%20USCC%2025%20April.pdf>.
27. See, for instance: “2019年中国军民融合发展形势展望 [Outlook for China's Military-Civil Fusion Development in 2019],” China Industry and Information Technology in 2019 [2019年中国工业和信息化] Development Situation Outlook Series [发展形势展望系列], <https://web.archive.org/web/20190406163231/http://www.ccidwise.com/uploads/soft/181220/1-1Q220153F5.pdf>.
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- <sup>58</sup> See: "提高军民融合深度发展的法治化水平 [Improve the level of legalization in the deep development of MCF]."
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- <sup>63</sup> Samantha Hoffman, "China's state security strategy: 'everyone is responsible,'" Mercator Institute for China Studies, December 12, 2017, <https://www.merics.org/en/blog/chinas-state-security-strategy-everyone-responsible>.
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- <sup>65</sup> "Law of the People's Republic of China on National Defence," March 14, 1997, [http://www.npc.gov.cn/zqrdw/englishnpc/Law/2007-12/11/content\\_1383547.htm](http://www.npc.gov.cn/zqrdw/englishnpc/Law/2007-12/11/content_1383547.htm).
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- <sup>71</sup> "中华人民共和国国家安全法 [National Security Law of the People's Republic of China]."
- <sup>72</sup> For example, Article 77 requires citizens to render assistance that includes the notion of "providing conditions to facilitate national security efforts and other assistance" and "other duties provided by law or administrative regulations."

<sup>73</sup> See, for instance, Apple's response when asked by the FBI to unlock an iPhone. Jack Nicas and Katie Benner, "F.B.I. Asks Apple to Help Unlock Two iPhones," *The New York Times*, January 7, 2020, <https://www.nytimes.com/2020/01/07/technology/apple-fbi-iphone-encryption.html>.

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<sup>78</sup> Lauren Yu-Hsin Lin and Curtis J. Milhaupt, "Party Building or Noisy Signaling? The Contours of Political Conformity in Chinese Corporate Governance," *European Corporate Governance Institute – Law Working Paper No. 493/2020, Stanford Law and Economics Olin Working Paper No. 545, City University of Hong Kong Centre for Chinese and Comparative Law Research Paper Series Paper No. 2020/005 (European Corporate Governance Institute Working Paper Series in Law, 2020)*, <https://ssrn.com/abstract=3510342>.

<sup>79</sup> Lin and Milhaupt, "Party Building or Noisy Signaling?" 22.

<sup>80</sup> See the characterization in the Department of State's fact sheet on the topic: "The Chinese Communist Party's Military-Civil Fusion Policy," <https://2017-2021.state.gov/military-civil-fusion/index.html>.

<sup>81</sup> *Ibid.*

<sup>82</sup> "In Exchange with Hawley, Chair of Joint Chiefs Declares Google Providing 'Direct Benefit' to China's Military," Josh Hawley, press release, March 14, 2019, <https://www.hawley.senate.gov/exchange-hawley-chair-joint-chiefs-declares-google-providing-direct-benefit-chinas-military>.

<sup>83</sup> See, for instance: Alex Joske, "The China Defence Universities Tracker" (Australian Strategic Policy Institute, November 25, 2019), <https://www.aspi.org.au/report/china-defence-universities-tracker>.

<sup>84</sup> See: Beaumelle, Spevack, and Thorne, "Open Arms: Evaluating Global Exposure to China's Defense-Industrial Base," 65.

<sup>85</sup> The Seven Sons of National Defense are: the Beijing Institute of Technology, Beihang University, Harbin Engineering University, Harbin Institute of Technology, Nanjing University of Aeronautics and Astronautics, Nanjing University of Science and Technology, and the Northwestern Polytechnic University.

<sup>86</sup> See the "China Defence Universities Tracker," a project directed by Alex Joske from the Australian Strategic Policy Institute: <https://www.aspi.org.au/report/china-defence-universities-tracker>.

<sup>87</sup> "国防科工局共建高校将超过50所,看看都有哪些大学?名单出炉! [SASTIND's joint construction 50 colleges and universities will exceed 50. See which universities? The list is out!]," *Sohu*, October 9, 2018, [http://webcache.googleusercontent.com/search?q=cache:t5qMwQAKNogJ:www.sohu.com/a/258334436\\_100175020+&cd=1&hl=en&ct=clnk&gl=us](http://webcache.googleusercontent.com/search?q=cache:t5qMwQAKNogJ:www.sohu.com/a/258334436_100175020+&cd=1&hl=en&ct=clnk&gl=us).

<sup>88</sup> Joske, "The China Defence Universities Tracker."

<sup>89</sup> Overall numbers are hard to come by. However, a number of data points suggest that private enterprise participation is increasing. First, statistics from 2016, for example, recorded a 127 percent increase in private companies obtaining Weapons and Equipment Research and Production Certificates (武器装备科研生产许可证) for MCF work. However, how fast and significant this uptick is remains unclear. The number of private companies at the beginning of 2016 with the necessary licenses was roughly 1,000 – only 300 more than in 2010. Second, statistics from 2018 record a 360 percent increase in private companies obtaining Equipment Manufacturing Unit Qualification Permits (装备承制单位资格认证) since the 18th Party Congress in 2012.

<sup>90</sup> "千余民营企业获武器装备科研生产许可证 [Around one thousand private companies receive Weapons and Equipment Research and Production Certificate]," *Guancha Net*, March 15, 2016, [https://www.guancha.cn/military-affairs/2016\\_03\\_15\\_353932.shtml](https://www.guancha.cn/military-affairs/2016_03_15_353932.shtml). However, other indicators support the inference that MCF companies are not particularly numerous. Recent data states that 2,300 private companies currently have the Equipment Manufacturing Unit Qualification Permit (装备承制单位资格认证). There is almost certainly overlap between the holders of the two license types. "军民融合科技装备产业投资促进报告 [MCF S&T equipment industry investment promotion report]," Ministry of Commerce, November 2018, [https://web.archive.org/web/20200608231930/http://pdf.dfcfw.com/pdf/H3\\_AP202002211375367494\\_1.pdf](https://web.archive.org/web/20200608231930/http://pdf.dfcfw.com/pdf/H3_AP202002211375367494_1.pdf). Data from provincial and municipal governments also back up this point. For example, Mianyang, a municipality in Sichuan that is one of China's premier defense clusters and leaders in MCF, reported only 500 MCF companies at the beginning of 2020. "绵阳: 2020年军民融合企业突破500家 [Mianyang: MCF companies break through 500 in 2020]," *Sohu*, March 1, 2019, [https://www.sohu.com/a/298418289\\_487612](https://www.sohu.com/a/298418289_487612).

<sup>91</sup> See also the sources cited and assessment in: Alex Stone and Peter Woods, "China's Military-Civil Fusion Strategy: A View From Chinese Strategists" (China Aerospace Studies Institute, June 2020), <https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/>.

<sup>92</sup> Tai Ming Cheung (ed.), *China's Emergence as a Defense Power* (New York: Routledge, 2013), 50.

- <sup>93</sup> “中国电科28所与百度公司成立“智能指挥控制技术联合实验室”推动军民融合向新技术领域纵深迈进 [CETC 28th Research Institute and Baidu Company Establish the ‘Joint Laboratory for Intelligent Command and Control Technologies’ Giving Impetus to MCF in the Domain of New Technologies Deeply Advancing],” January 23, 2018, [https://www.sohu.com/a/218485100\\_779538](https://www.sohu.com/a/218485100_779538).
- <sup>94</sup> “全国第二届‘军事智能机器阅读’挑战赛 [The 2nd National ‘Military Intelligence Machine Reading’ Challenge],” <https://www.keosci.com/home/competition/5d142d8cbb14e6002c04e14a>.
- <sup>95</sup> “大数据构筑最强‘军事大脑’ [Big data builds the strongest ‘military brain’],” *Seeking Truth*, July 12, 2018, <https://web.archive.org/web/20190505163610/http://www.qsjournal.com.cn/junshiquofang/46518.html>.
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- <sup>98</sup> “深度学习技术及应用国家工程实验室在百度揭牌 [National Engineering Laboratory of Deep Learning Technologies and Applications Unveiled at Baidu],” *Xinhua*, March 2, 2017, [http://news.xinhuanet.com/tech/2017-03/02/c\\_1120557779.htm](http://news.xinhuanet.com/tech/2017-03/02/c_1120557779.htm). Meng Jing, “China’s First ‘Deep Learning Lab’ Intensifies Challenge to US in Artificial Intelligence Race,” *South China Morning Post*, February 21, 2017, <https://www.scmp.com/tech/china-tech/article/2072692/chinas-first-deep-learning-lab-intensifies-challenge-us-artificial>.
- <sup>99</sup> Center for Security and Emerging Technology, translation of “Ministry of Science and Technology Notice on the Publication of the *Guidance on National New Generation Artificial Intelligence Open Innovation Platform Construction Work*,” translated in September 2019, <https://cset.georgetown.edu/wp-content/uploads/Ministry-and-Science-and-Technology-Notice-on-Publication-of-Guidance-1.pdf>.
- <sup>100</sup> 武器装备科研生产单位保密资质认证 [Weapons Equipment Research and Production Unit Confidential Qualification Certification], China Military-Civil Integration Platform, <https://perma.cc/3W5Z-S3KX>. Also see, Beaumelle, Spevack, and Thorne, “Open Arms: Evaluating Global Exposure to China’s Defense-Industrial Base,” 28.
- <sup>101</sup> In addition to foreign ownership, ownership by Chinese nationals with foreign spouses also renders companies ineligible. Beaumelle, Spevack, and Thorne, “Open Arms: Evaluating Global Exposure to China’s Defense-Industrial Base,” 28.
- <sup>102</sup> When delisting Qihoo 360, CEO Zhou Hongyi only alluded to building national security qualifications as a reason for bringing his company back to China. However, the delisting coincided with the start of Qihoo framing its activities as in service to MCF and other national security objectives. Further, follow-up reporting confirmed that MCF was an important part of the decision. As one news report put it, “This time Zhou Hongyi made no secret that after 360’s de-listing, the company gained greater momentum in the security market. It has already begun working with public security departments, and the unspoken implications [of delisting] is that the company needed to become a purely domestic company in order to develop the ‘credentials’ to maintain its domestic position in cybersecurity. “周鸿祎首次公开谈论私有化，但核心问题压根不提，却把国内安全环境痛批了一顿 [Zhou Hongyi talks about taking 360 private for the first time, but avoids the core issue while criticizing the domestic security environment],” 36Kr, August 27, 2016, <https://webcache.googleusercontent.com/search?q=cache:5UJzPvFd5xcJ:www.chuangkem.com/archives/102861+&cd=1&hl=en&ct=clnk&ql=u.s>.
- <sup>103</sup> Jeff Ding translation of Wu Xi, “后浪可畏：云从科技获国家基金18亿元融资，距A股上市仅剩临门一脚 [Respect the Latecomer Wave: Cloudwalk receives 1.8 billion RMB in financing from national funds],” *Synched*, May 14, 2020, [https://docs.google.com/document/d/1n07iJTVK\\_Hlhleztz4fuHBy2FX97nVXCoVqxiR\\_9FWQ/edit#](https://docs.google.com/document/d/1n07iJTVK_Hlhleztz4fuHBy2FX97nVXCoVqxiR_9FWQ/edit#).
- <sup>104</sup> Kate Conger, “Judge Halts Work on Microsoft’s JEDI Contract, a Victory for Amazon,” *The New York Times*, February 13, 2020, <https://www.nytimes.com/2020/02/13/technology/amazon-jedi-pentagon-contract-microsoft.html>.
- <sup>105</sup> Sydney J. Freedberg, “Google To Pentagon: ‘We’re Eager To Do More,’” *Breaking Defense*, November 5, 2019, <https://breakingdefense.com/2019/11/google-pentagon-pledge-to-work-together-were-eager-to-do-more/>.
- <sup>106</sup> “军民融合促五角大楼‘牵手’硅谷 [MCF Promotes the Pentagon [to be] ‘hand in hand’ with Silicon Valley],” *Xinhua*, May 23, 2018, [http://www.xinhuanet.com/mil/2018-05/23/c\\_129878941.htm](http://www.xinhuanet.com/mil/2018-05/23/c_129878941.htm).
- <sup>107</sup> See, for instance: “Trump’s Trade War Targets Chinese Students at Elite U.S. Schools,” *TIME*, June 3, 2019, <https://time.com/5600299/donald-trump-china-trade-war-students/>; Megan Cassella, “Break with China? Top Trump aide eyes an opening with coronavirus,” *Politico*, February 26, 2020, <https://www.politico.com/news/2020/02/26/trump-china-trade-coronavirus-117531>; and Peter Thiel, “Good for Google, Bad for America.”