

# The Seven Sons of National Defense

Dan Murphy<sup>1</sup>

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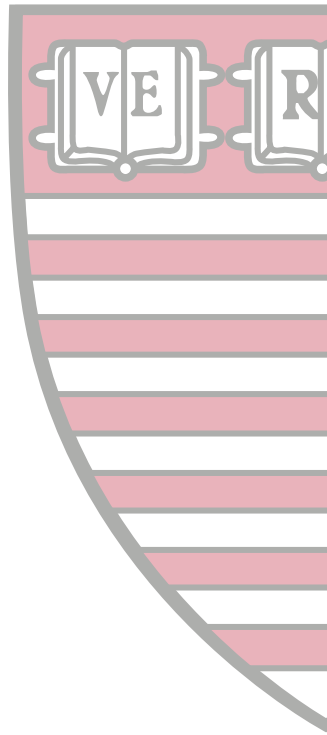
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**ASH CENTER**

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# The Seven Sons of National Defense

**Dan Murphy**

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November 2024

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## **Abstract**

This paper provides context and information to policymakers, academics, and higher education administrators on the seven Chinese universities sometimes referred to as the Seven Sons of National Defense. While it examines collaboration between Seven Sons schools and American universities, the lessons learned have global implications. It starts by providing the geopolitical, bureaucratic, and policy contexts for the Seven Sons, before proceeding to a bibliometric analysis of STEM (science, technology, engineering, and mathematics) publications of these universities based on citation data from the Web of Science, a commonly used database. The paper concludes that academic collaboration with Seven Sons schools entails heightened potential risk due to their connections to the Chinese defense sector. However, academic institutions and scholars should consider the nature of the Seven Sons schools as well as specific projects, individuals, and fields of study when determining whether to proceed with a particular collaboration.

## **Keywords**

Higher education, Seven Sons of National Defense, STEM, Bibliometric Analysis

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## Introduction

The Seven Sons of National Defense provide an intriguing case study for international academic collaboration as they are neither civilian Chinese universities nor purely military academies. Instead of reporting to the Ministry of Education, as might be presumed, they are supervised by the Ministry of Industry and Information Technology (MIIT), which has ties to both the defense and civilian sectors. This administrative structure makes them among the most challenging universities to evaluate for the appropriateness of academic collaboration and thus is a worthy topic of study.

Academic collaboration with the Seven Sons has generated significant concern within government, the media, and at universities. In the United States, this growing unease culminated in May 2020, when the Trump administration released a proclamation effectively suspending nonimmigrant visas for Chinese students, alumni, and employees from the Seven Sons (see the text box below for a list of the schools). Specifically, the proclamation refers to citizens of the People's Republic of China (PRC) who had "been employed by, studied at, or conducted research at or on behalf of, an entity in the PRC that implements or supports the PRC's 'military-civil fusion strategy.'"<sup>2</sup> An exception is provided for students pursuing undergraduate study in the US. The Secretary of State was given broad discretion to determine which students would be affected by this proclamation.

Further underscoring these concerns, a study from Georgetown University's Center for Security and Emerging Technology shows that the Seven Sons are likely among the affected schools.<sup>3</sup> Each of these seven universities is also on the US Department of Commerce's Entity List, which records entities "that are subject to specific license requirements for the export, reexport and/or transfer (in-country) of specified items."<sup>4</sup> Moreover, a widely used database produced by the Australian Strategic Policy Institute<sup>5</sup> lists collaboration with these seven schools as "very high" risk, and news reports from the United Kingdom,<sup>6</sup> Germany,<sup>7</sup> Sweden,<sup>8</sup> and elsewhere in Europe<sup>9</sup> on the Seven Sons have led to questions about collaborations between them and Western universities.

The question of if and how American academic institutions should engage with China is critical given the substantial impact of Chinese students and researchers on the advancement of science and engineering in the US and globally. In 2020, 17% of PhDs in science and engineering awarded in the US went to students from the PRC.<sup>10</sup> Meanwhile, academics at Chinese institutions are America's leading international partners on papers in the STEM fields.<sup>11</sup> By some measures, Chinese research in the sciences rivals or even exceeds America's.<sup>12</sup> However, colleagues in China anecdotally report that such statistics greatly overstate the success of Chinese science and that false data in research publications and citation trading are rampant.

While concerns about collaboration are significant, they should not be construed to suggest that all collaborations with the Seven Sons are inherently inappropriate. The complexities of these partnerships require careful consideration of the specific projects,

individuals, and fields of study involved. American universities benefit enormously from international collaboration, and navigating these relationships thoughtfully is crucial to balancing academic integrity with national security and ethical concerns.

## Background

### The Seven Sons of National Defense

Beihang University 北京航空航天大学  
 Beijing Institute of Technology 北京理工大学  
 Harbin Institute of Technology 哈尔滨工业大学  
 Harbin Engineering University 哈尔滨工程大学  
 Nanjing University of Aeronautics and Astronautics 南京航空航天大学  
 Nanjing University of Science and Technology 南京理工大学  
 Northwestern Polytechnical University 西北工业大学

### Three Global Trends

Three broad trends provide a backdrop for evaluating academic collaborations with China. The first trend—sharpening geopolitics—includes extremely tense US-China relations, which is reflected in dramatically different approaches to the war in Ukraine. The Chinese Foreign Ministry blamed the United States and NATO expansion for the war,<sup>13</sup> while the United States has condemned Russian aggression. However, worsening US-China relations pre-dates the war in Ukraine. The virtual consensus that “engagement” should be the primary mode for US-China relations, which was accepted by mainstream American analysts for many decades, began to crumble nearly 10 years ago. Since then, distrust has blossomed across the spectrum of US-China relations despite increasingly consequential issues such as climate change, dual-use technology, pandemics, and tension over Taiwan. On the Chinese side, there is a persistent belief that the United States seeks to contain China’s rise through restricting access to technology while entangling it in disputes that affect its “core interests.”

The second trend is the growing importance of science, technology, and innovation to economic and military might.<sup>14</sup> Advancements in semiconductors and artificial intelligence have both civilian and military applications, which the US and China recognize as key drivers of their economic development. This connection is reflected in the headline of the White House fact sheet for the CHIPS and Science Act, a signature piece of bipartisan legislation, which reports that it will “lower costs, create jobs, strengthen supply chains, and *counter China*”<sup>15</sup> (emphasis added). The Biden administration’s 2022 National Security Strategy is forthright: “Technology is central to today’s geopolitical competition and to the future of our national security, economy and democracy.”<sup>16</sup> Meanwhile, Chinese leader Xi Jinping’s report at the 20th Party Congress includes the word “science” 28 times. It further notes that “China’s overall development objectives for the

year 2035” include “[s]ignificantly increase economic strength, scientific and technological capabilities, and composite national strength.”<sup>17</sup>

The final trend is greater internationalization of higher education. As Johnson et al. (2022) report, “in the early 1980s, most countries had as little as 5 percent of their original research papers published in academic journals with co-authors from a second country.” By 2022, these numbers were much higher for countries such as the UK (67%), France (61%), Germany (56%), the United States (40%), Japan (32%), India (24%), and China (19%).<sup>18</sup> Further, the number of Chinese students studying in the United States increased from 60,000 in the 2000–2001 academic year to over 370,000 in 2019–2020, before dropping to 290,000 in the 2022–2023 academic year.<sup>19</sup>

These three trends have the potential to be mutually reinforcing. That is, as tensions between China and the United States deepen, the role of science and technology in building economic and military strength will come to the fore, and the internationalization of higher education will become more sensitive.

### **Bureaucratic and Policy Context**

Administrative context is critical for understanding the development of the Seven Sons schools. The original Seven Sons of National Defense were administered by the Commission for Science, Technology, and Industry for National Defense (COSTIND) 国防科学技术委员会 starting 1961.<sup>20</sup> (See text box for a listing of the original Seven Sons schools.) The original list of schools was subsequently revised to drop two schools and add two others. In 2008, many of the COSTIND’s responsibilities, including the administration of the Seven Sons, were transferred to the newly created MIIT.<sup>21</sup> Under MIIT’s guidance, a new agency was created: the State Administration of Science, Technology, and Industry for National Defense (SASTIND, 国家国防科技工业局).

#### **Original Seven Sons of National Defense**

In 1961, seven universities came under the management of the Commission for Science, Technology and Industry for National Defense.

- Shanghai Jiao Tong University\* 上海交通大学\*
- Harbin Institute of Technology 哈尔滨工业大学
- Beijing Industrial College 北京工业学院 (predecessor of Beijing Institute of Technology)
- Beijing Aeronautical College 北京航空学院 (predecessor to Beihang University)
- Nanjing Aeronautical College 南京航空学院 (predecessor to Nanjing University of Aeronautics and Astronautics)
- Chengdu Telecommunications and Engineering College\* 成都电讯工程学院\* (predecessor to University of Electronic Science and Technology of China)
- Northwest Polytechnic University 西北工业大学

\*No longer Seven Sons schools



Unlike the COSTIND, which focused on national defense, the MIIT focuses on a much broader range of issues, both civilian and military. In 2020, the US-China Business Council described MIIT as responsible for “regulating and managing China’s telecommunications and software sectors, as well as the electronics and information technology manufacturing industries. Its functions also include project planning, industry development, and regulatory management of China’s radio and television (including cable) transmission networks, as well as satellite telecom networks. MIIT oversees China’s defense industry.”<sup>22</sup>

While some English-language sources indicate that SASTIND directly administers the Seven Sons schools,<sup>23</sup> only one Chinese primary source reviewed for this paper supported this conclusion.<sup>24</sup> All others indicated that the Seven Sons are directly administered by MIIT.<sup>25</sup> Further support for this conclusion is that the MIIT has one deputy minister overseeing SASTIND, while a separate deputy minister is responsible for communication with higher education institutions.<sup>26</sup>

While SASTIND does not directly supervise these schools and its involvement in their operations remains unclear,<sup>27</sup> it is apparently substantial. In 2016, SASTIND publicly noted that it focuses its “support” (支持) for higher education on the Seven Sons schools, referring to them as “military engineering universities” (军工院校).<sup>28</sup> However, the nature of the support provided is not clear. SASTIND involvement with the Seven Sons schools is noteworthy because, according to its own description,

the major responsibilities of SASTIND involve the nuclear weapon, aerospace technology, aviation, armament, watercraft and electronic industries. It is established to strengthen military forces with additional personnel and more advanced equipment. Ensuring material supplies for the army is its top priority. Furthermore, it intends to contribute to the prosperity of the whole country by stimulating the manufacturing industry, gaining competitive edges through with [sic] superior production techniques. As the administrative and regulatory agency of science, technology, and industry for national defense, SASTIND serves the needs of national defense, military forces, national economy, and military-related organizations. Meanwhile, it is also responsible for the coordination of communications and cooperation on the use of nuclear power and space activities with countries and international organizations.<sup>29</sup>

In addition to SASTIND, the MIIT also oversees the Department of the Advancement of Military-Civil Fusion (军民融合推进司). Chinese leader Xi Jinping, who holds the supremely important roles of General Secretary of the Communist Party of China and Chairman of the Central Military Commission, has elevated and promoted China’s long-standing military-civil fusion strategy. The military-civil fusion model seeks to enhance connections between the civilian and military science and technology sectors.<sup>30</sup> More

research is needed to understand the exact relationship between the Department of the Advancement of Military-Civil Fusion and the seven schools that report to the MIIT.

One might reasonably wonder why Seven Sons schools exist at all. Why does any Chinese university report to a government ministry (other than the Ministry of Education)? Why not just have civilian universities and military universities? The answer is that after the PRC's founding in 1949, the structure of the Chinese education system was borrowed from the Soviet Union, China's closest partner:

According to the framework of the Soviet Union, universities were divided into three types: comprehensive universities, industrial universities, and specialized colleges. Some of the original comprehensive universities were reorganized into industrial universities. . . . In addition, the system of all kinds of specialized universities under the leadership of various ministries and commissions was also adopted, so that the Ministry of Agriculture, the Ministry of Health, the Ministry of Finance, and other ministries had their own subordinate universities.<sup>31</sup>

By the early 1980s, China had begun moving away from the Soviet model, followed by significant debate about the best educational models to follow.<sup>32</sup> In 1999, the State Council issued a Decision (决定) stipulating that with some exceptions, most schools would cease reporting to government ministries other than the Ministry of Education.<sup>33</sup>

However, after the reforms in 1999, some schools, including the Seven Sons, continued to report to government ministries (or other government entities). For example, China Foreign Affairs University reports to the Ministry of Foreign Affairs,<sup>34</sup> the University of Science and Technology of China reports to the Chinese Academy of Science,<sup>35</sup> the National University of Defense Technology reports to the Central Military Commission,<sup>36</sup> and China Women's University reports to the All China Women's Federation.<sup>37</sup> The National Ethnic Affairs Commission supervises six higher education institutions,<sup>38</sup> while the Ministry of Public Security supervises a group as well.<sup>39</sup> Additionally, various lower-level universities report to provincial governments.<sup>40</sup> The Ministry of Education only supervises 75 Chinese universities.

In June 2017, MIIT organized the Seven Sons into the "Universities Group of MIIT" (工业和信息化部高校联盟),<sup>41</sup> or "G7" for short. Information on the G7 is difficult to find in the ensuing years, and so its purpose remains unclear.

The ways in which these seven schools are "directly subordinate" (直属) to the MIIT may be different for different universities. However, the relationship includes at least three aspects: funding; personnel appointments; and high-level guidance, approvals, and meetings.

*Funding.* The Seven Sons schools are listed among a total of 70 "second-tier funding units" (二级预算单位) funded by the MIIT.<sup>42</sup> Given the MIIT's size and importance, we can assume that these funding streams are significant.

*Personnel appointments.* Appointment decisions about top officials at Seven Sons schools, including the party secretary (党委书记), president (校长), and vice presidents (副校长), are either made by the MIIT or the MIIT attends the meeting at which these personnel decisions are announced. It is beyond the scope of this paper to cover in detail the appointment process, but it is sufficient to say that MIIT's involvement is significant. Information on the appointments can be found on the websites of Seven Sons schools and in media reports.<sup>43</sup>

*High-level guidance, approvals, and meetings.* A review of the annual yearbooks (年鉴) of the Seven Sons schools provides insight into the MIIT's involvement in school affairs. For example, the following is an example recorded in the "chronicle of major events" (大事记) section of the 2018 Harbin Engineering University yearbook:

January 10: The School [Harbin Engineering University] held a major annual work report meeting for the 2017 school leadership team and leading cadres. Xu Bo, Head of the Cadre Section for units under direct supervision of the Personnel and Education Department at the MIIT, attended the meeting to provide guidance. All members of school leadership, faculty representatives, current cadres at the director and deputy director levels, deputy heads of departments and schools, representatives from all areas of United Front work, members of the executive committee of the faculty representative council, and representatives for retired personnel attended the meeting.<sup>44</sup>

Similarly, the 2014 annual yearbook for Northwestern Polytechnical University (NPU) includes the following entries:

January 14: Li Li, the Deputy Director of the Science and Technology Department of MIIT, along with Zeng Gan from the High Technology Department of the National Development and Reform Commission, and others came together to Northwest Polytechnical University for an investigation of science and technology innovation work.<sup>45</sup>

June 5: At the delegation of the Personnel and Education Department of the MIIT, the School's Party Committee held a meeting at the conference center on appointing new cadres. The entire school's leadership and vice presidents attended.<sup>46</sup>

As a final example, the 2018 yearbook for the Nanjing University of Aeronautics and Astronautics includes the following entry:

May 15: The Party Committee of the Ministry of Industry and Information Technology decided that Shi Daning and Song Yingdong, having completed their probationary periods and passed their assessments, would be formally appointed as vice presidents of Nanjing University of Aeronautics and Astronautics.<sup>47</sup>

Research confirms that a disproportionately high number of graduates from the Seven Sons schools go on to work for Chinese defense contractors.<sup>48</sup> Further, these universities often note their military connections when describing their own histories. For example, an excerpt from a text from the Party Propaganda Department of Beijing Institute of Technology (BIT) reads “For a very long time, the university has breathed in time with the [Communist] Party [of China], with the same fate, inheriting the red genes of the roots of Yan’an<sup>49</sup> and the spirit of military work.”<sup>50</sup>

Relatedly, in a book about the history of NPU, the following is noted in an introduction from the school’s party secretary: “the growing strength of Northwest Polytechnical University has been closely linked from beginning to end to the project of national defense, social development, and the development of China’s western regions.”<sup>51</sup>

While this does not assure us that every scholar or graduate of these universities adheres to this sentiment, it is a powerful reminder of the connection between these schools and the Chinese defense sector.

Research from Wang and Zhang (2022) notes the steady increase, especially since 2010, in joint patents between the Seven Sons and the Chinese defense industry. This is in addition to increasingly dense networks among Chinese institutions of higher education with military backgrounds and the defense industry. The authors even refer to the Seven Sons as the “principal force behind innovation in military-civil cooperation” (“国防七子” “高校是军民科技合作创新的主力军”).

### “Joint Construction”

Relevant literature on the military connections to Chinese universities often notes that SASTIND has “joint construction” (共建) arrangements with dozens of universities,<sup>52</sup> where SASTIND provides funding and plays a role in decision-making. However, less discussed in the English literature is the broader policy context of these joint construction arrangements, which were raised in Ministry of Education policy documents as early as 1995.

The concept of joint construction was first used in Guangdong Province in the early 1990s through an agreement between the predecessor organization to the Ministry of Education and the provincial government to “jointly construct” two universities.<sup>53</sup> As one scholar describes, these projects aimed “to take central government ministries and local governments that were separately managing schools and change that into jointly running the schools, to mobilize the Center and local governments to be more proactive, and to collectively run the schools well, thus raising the level of the country’s overall education and comprehensive competitiveness.”<sup>54</sup>

Initially, these joint construction projects did not have exclusive ties with the military or defense sector. One early goal of this strategy apparently was to develop universities in China’s poorer central and western regions.<sup>55</sup> Many government units, including SASTIND, participated in this process, particularly after (and perhaps because of) the

education reforms of 1999, which led to many government ministries ceasing their direct supervision of schools.

To illustrate this point, it is useful to review statistics from a 2014 paper which notes that in 2011 there were 39 universities “jointly constructed” by government ministries (or other government units) and local governments. SASTIND was involved in four of these cases: Central South University (中南大学), Hunan University (湖南大学), North University of China (中北大学), and University of South China (南华大学). Besides the Ministry of Education, which is most often involved in these collaborations, the Ministry of Agriculture, the Ministry of Health, the National Administration of Traditional Chinese Medicine, the Overseas Chinese Affairs Office, and other government units were all involved in the joint construction of universities alongside local governments.<sup>56</sup>

More recent statistics show increased SASTIND involvement in joint construction. For example, the Australia Strategic Policy Institute’s China Defence University Tracker Report shows a mean average of eight to nine such agreements annually from 2010 to 2019.<sup>57</sup> This has occurred alongside—and probably because of—the elevation of China’s military-civil fusion model.

A separate paper could be devoted to the system of joint construction. For the purposes of this discussion, it is sufficient to note that SASTIND has been actively involved with various Chinese educational institutions. However, it is not the only government entity involved in this system, which is part of a broader strategy extending beyond the defense sector. Historically, joint construction likely stems from Chinese educational reforms aimed at transitioning universities away from the control of government ministries. Additionally, the model is likely not monolithic—joint construction agreements may vary across different universities.

## Bibliometric Data

Given the unique nature of the Seven Sons and the responses to collaborating with them, policymakers and university administrators should have a clear understanding of their work. For example, what is the scope and scale of their domestic and international research collaborations? What fields of study do they publish in most widely? Even rudimentary answers to these questions, which this paper provides, can help us to better understand the nature of these schools.

The following bibliometric data provides a basic analysis of research publications in the STEM fields from researchers at the Seven Sons of National Defense. The data comes from the Web of Science and, as such, only considers English-language publications and author *affiliations* (not citizenship). Additionally, it does not measure formal collaboration agreements.

**Domestic, Bilateral, and Multilateral Work**

Figure 1 presents the number of English-language STEM publications by the Seven Sons schools. **Harbin Institute of Technology (HIT), Beihang University, Northwestern Polytechnical University (NPU), and Beijing Institute of Technology (BIT) publish the most papers.**

**Figure 1.** Number of Publications by the Seven Sons Schools (2013–2022)

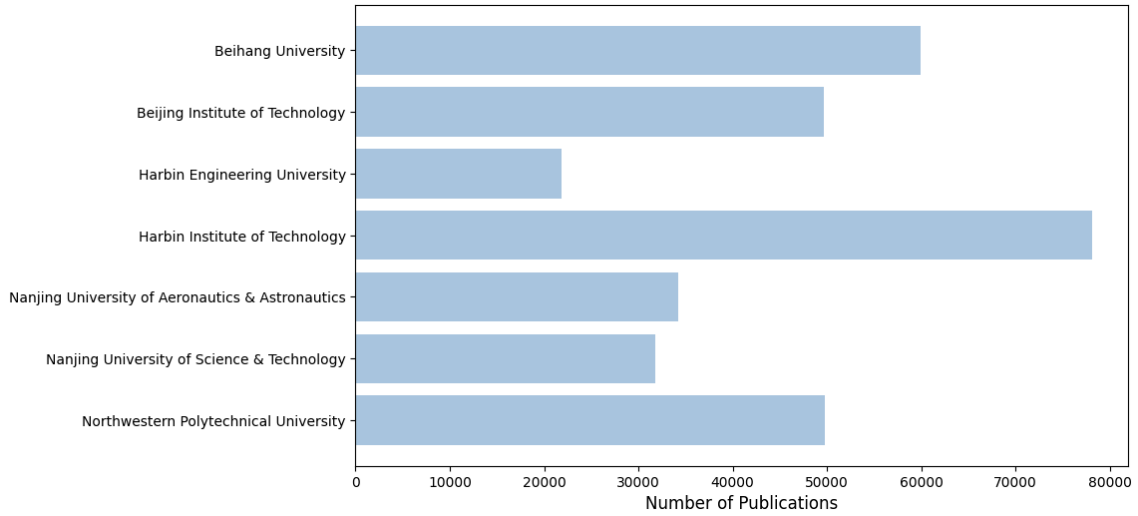
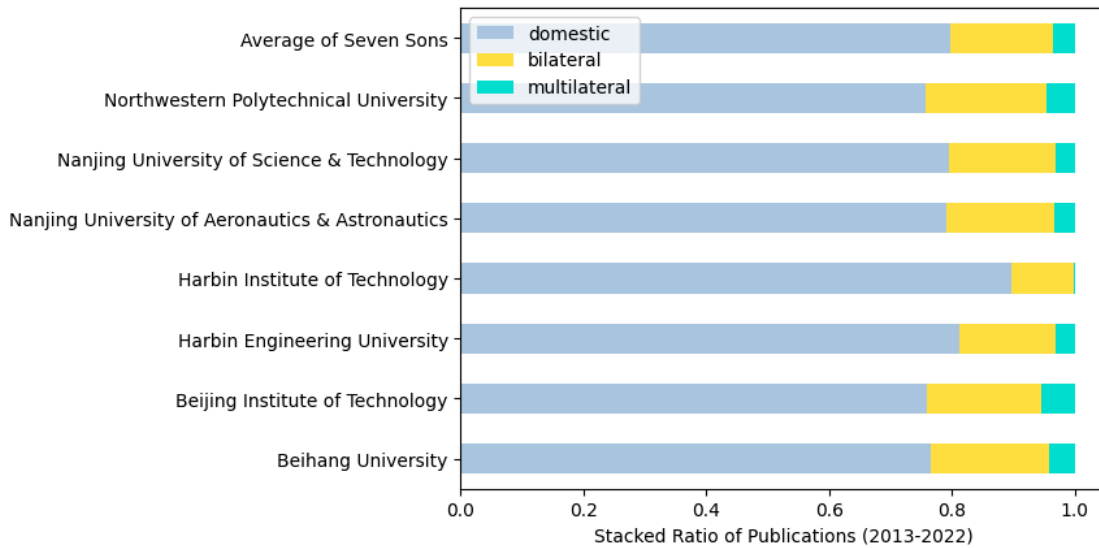


Figure 2 presents ratios of domestic, bilateral, and multilateral work published in English by the Seven Sons. **The vast majority of research is conducted with other domestic universities within China.** HIT has the highest percentage, at 89.7%, while BIT and NPU have the lowest, at 75.9% and 75.7%, respectively. Correspondingly, HIT has the lowest percentage of research with international partners, while NPU has the highest.

**Figure 2.** Ratios of Domestic, Bilateral, and Multilateral Work Published by the Seven Sons (2013–2022)



### Trends in Collaborating Countries for Seven Sons Schools

Figure 3 shows the countries of home universities of coauthors in papers written with scholars from the Seven Sons schools. It identifies the top collaborating countries with the Seven Sons schools, with the United States being the foremost. **In 2022, the top five collaborating countries with the Seven Sons schools were the US, the UK, Australia, Singapore, and Canada.**

The figure also shows that the number of papers coauthored by researchers at Seven Sons schools and American institutions began to decline starting in 2019, after a steady increase over the preceding six years. The reason for this downturn is unclear, and this paper does not examine whether this trend is similar to those experienced by Chinese universities outside the Seven Sons schools.

**Figure 3.** Location of Home Universities for Coauthors of Papers Written with Scholars from Seven Sons Schools (2013–2022)<sup>58</sup>

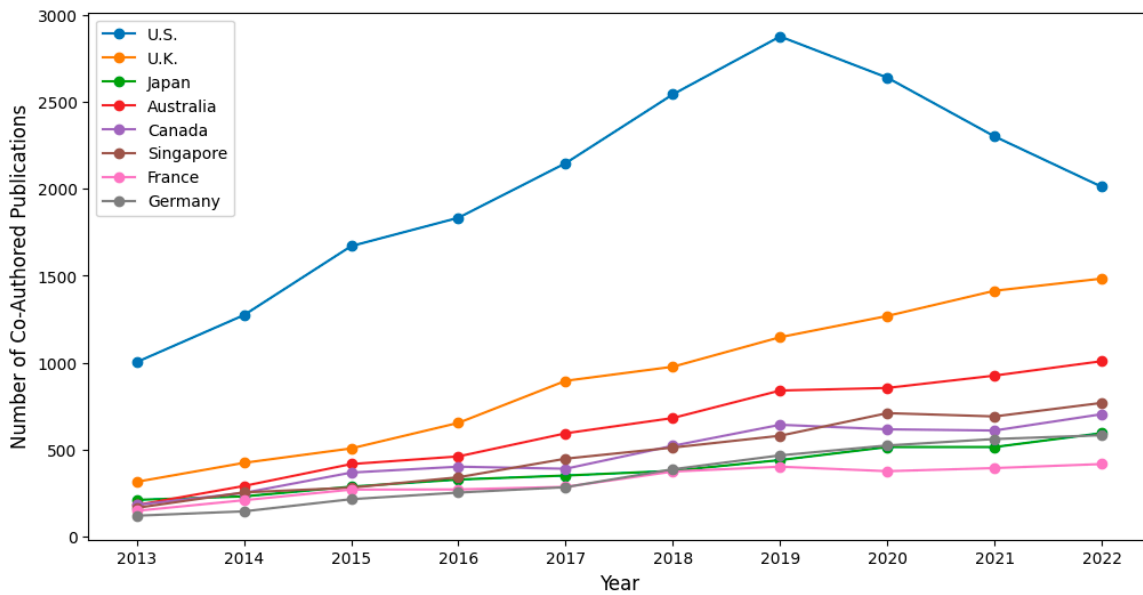




Figure 4 shows that **Beihang University and Beijing Institute of Technology have the strongest international ties in terms of numbers of publications.** Their connections with U.S. institutions are particularly strong.

**Figure 4.** Top International Collaborators of Each of the Seven Sons Schools

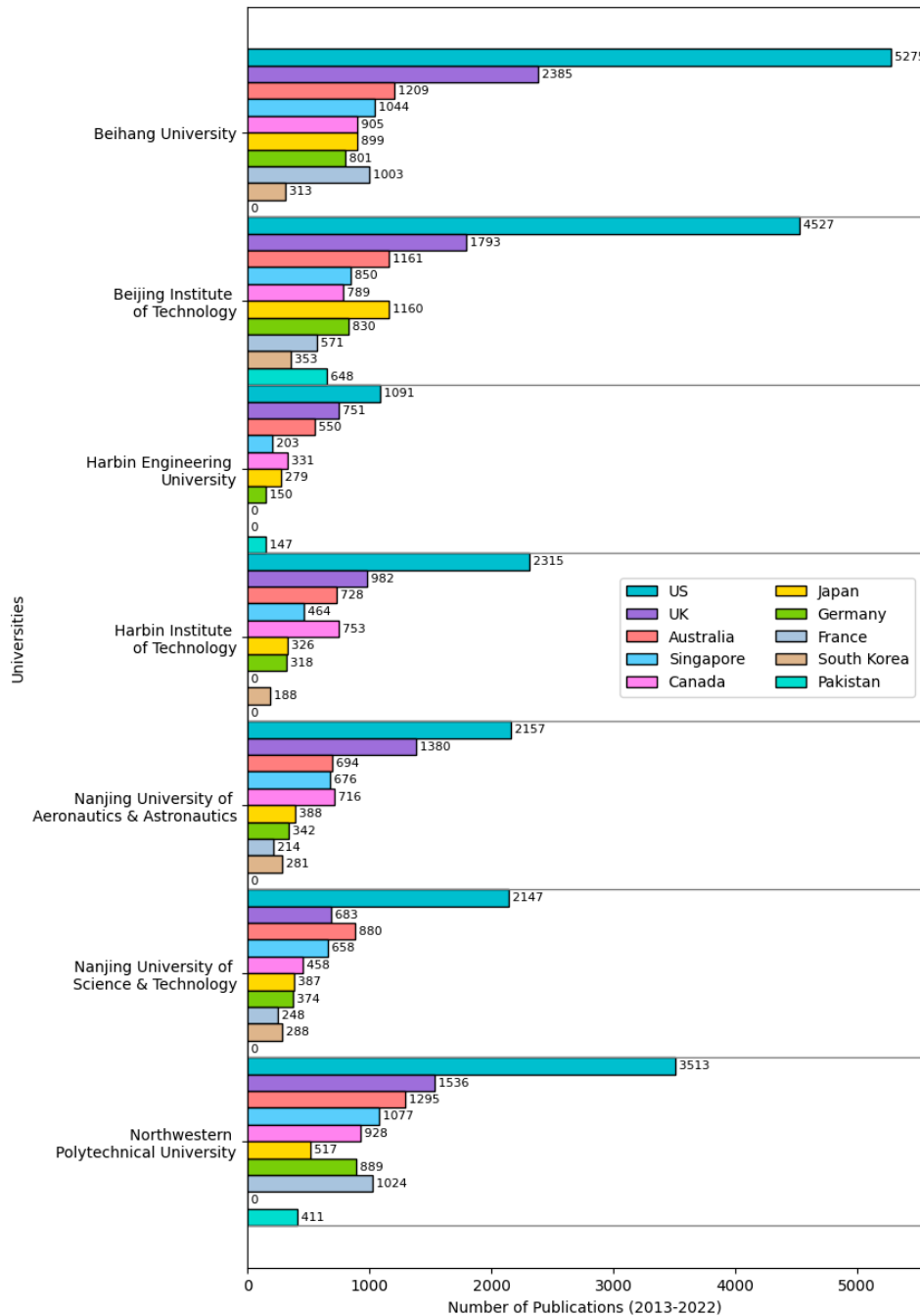
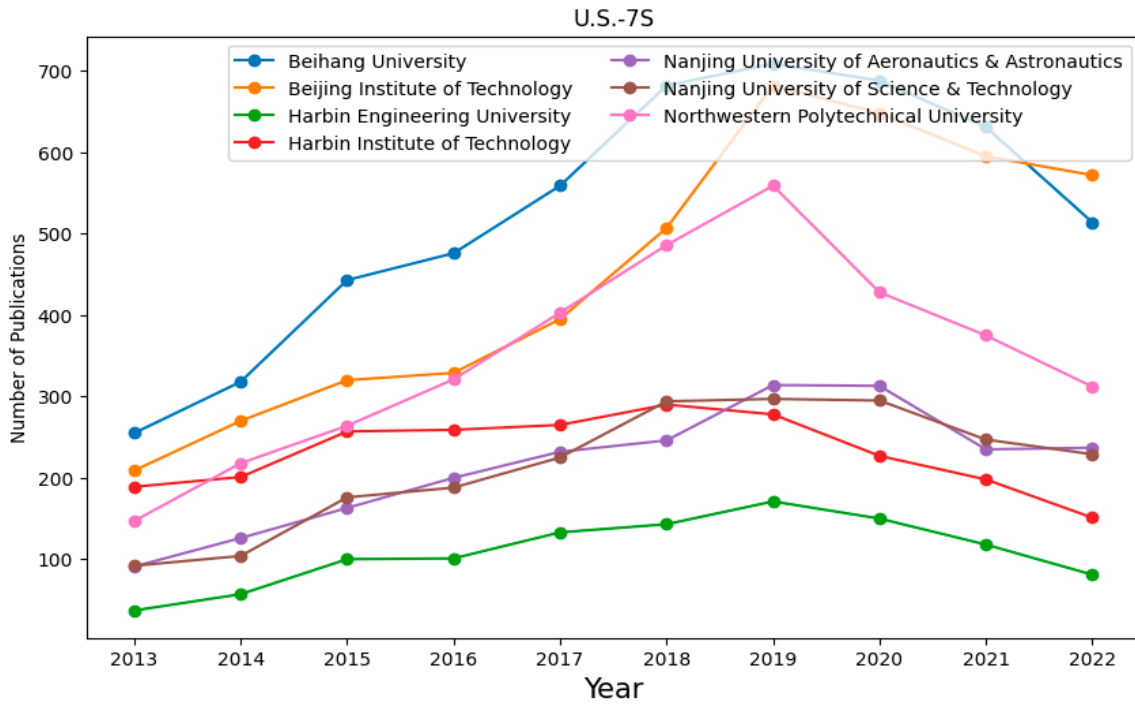


Figure 5 presents trends of US-Seven Sons publications by year and school. **The decrease in publications is broadly consistent across Seven Sons schools, beginning in 2019 or 2020.** Beihang University and NPU show the steepest drop since 2019.<sup>59</sup>

**Figure 5.** Trends of US-Seven Sons Publications by Year and by School



### Trends in Chinese Domestic Collaborations with Seven Sons Schools

Figure 6 presents the top Chinese collaborating institutions of Seven Sons schools. **Domestic collaborations occur most frequently among authors from the same institution** (indicated by the bars labeled “internal”). For example, the chart for Beihang University shows that there are over 35,000 papers written by authors who are only affiliated with the university.

**Figure 6.** Top Chinese Collaborating Institutions of Seven Sons Schools (2012–2023)

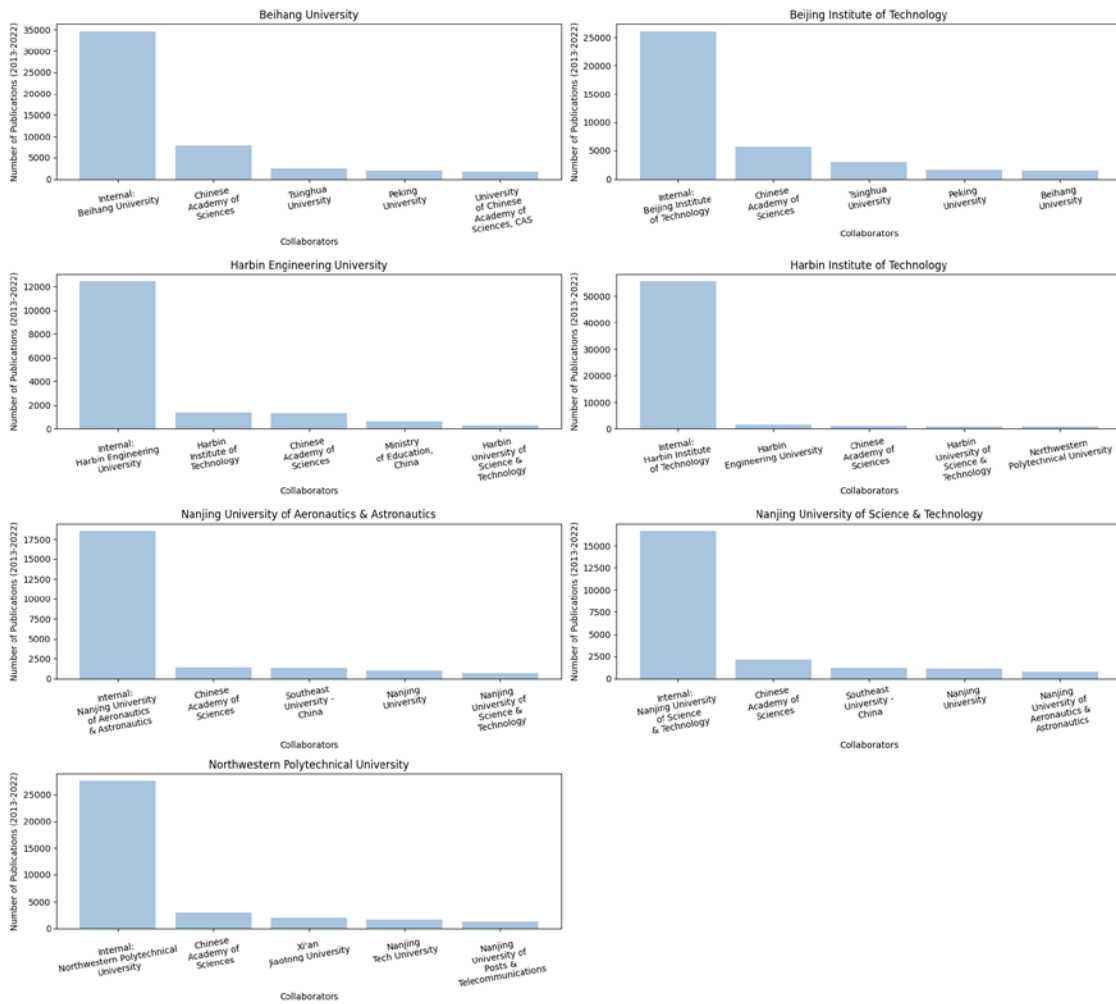
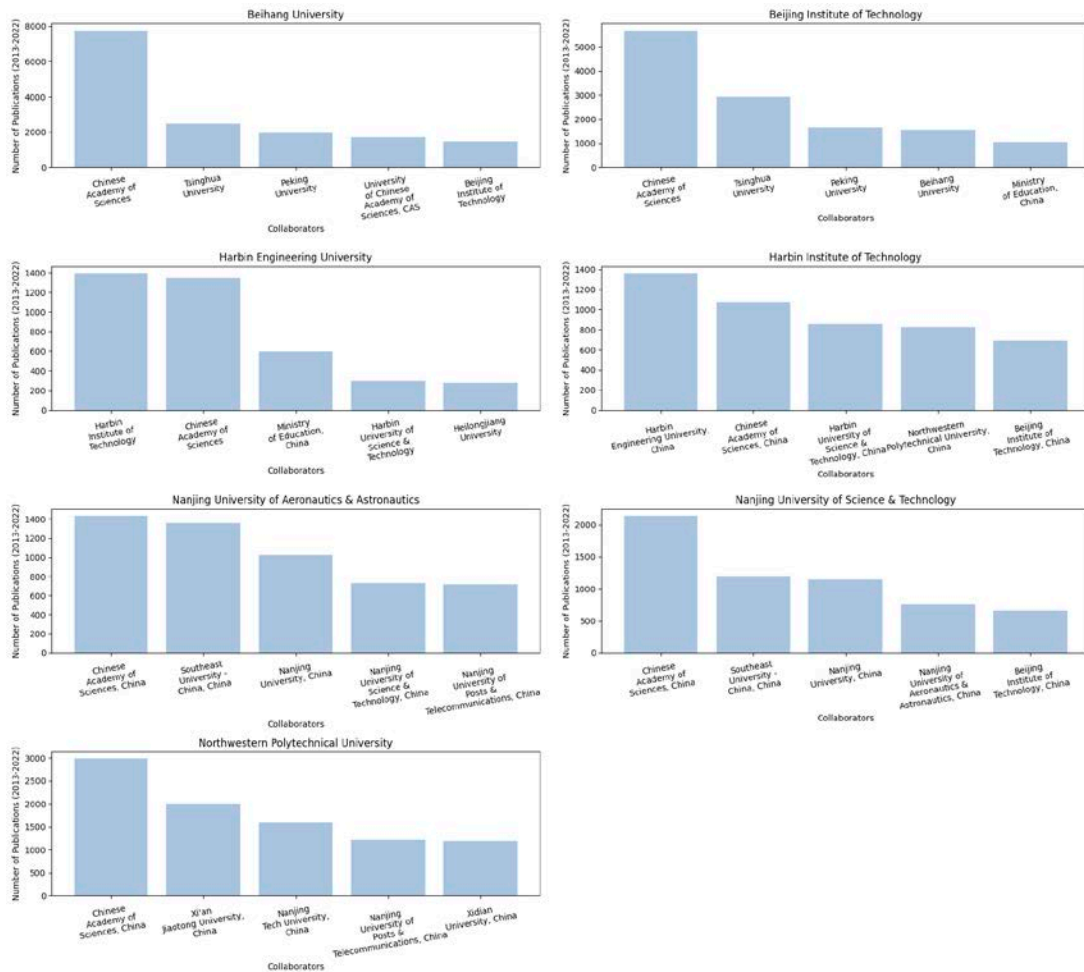


Figure 7 presents the top Chinese collaborating institutions of Seven Sons schools but excludes publications from authors within the same institution to better illustrate collaborations with external domestic institutions. For example, in the case of Beihang University, the figure excludes publications with authors exclusively affiliated with Beihang University. The figure demonstrates that **the Chinese Academy of Sciences is the most frequent external collaborator** for nearly all the schools.<sup>60</sup>

Also, **collaborations outside of the Seven Sons schools and the Chinese Academy of Science usually occur between institutions located within the same city.** For instance, the top external collaborators for BIT and Beihang University (after the Chinese Academy of Science) are Tsinghua University and Peking University, which are both located in Beijing. NPU's top collaborating institution (after the Chinese Academy of Science), Xi'an Jiaotong University, is located in the same city.

**Figure 7.** Top Chinese Collaborating Institutions of Seven Sons Schools Excluding Internal Collaborations (2012–2022)

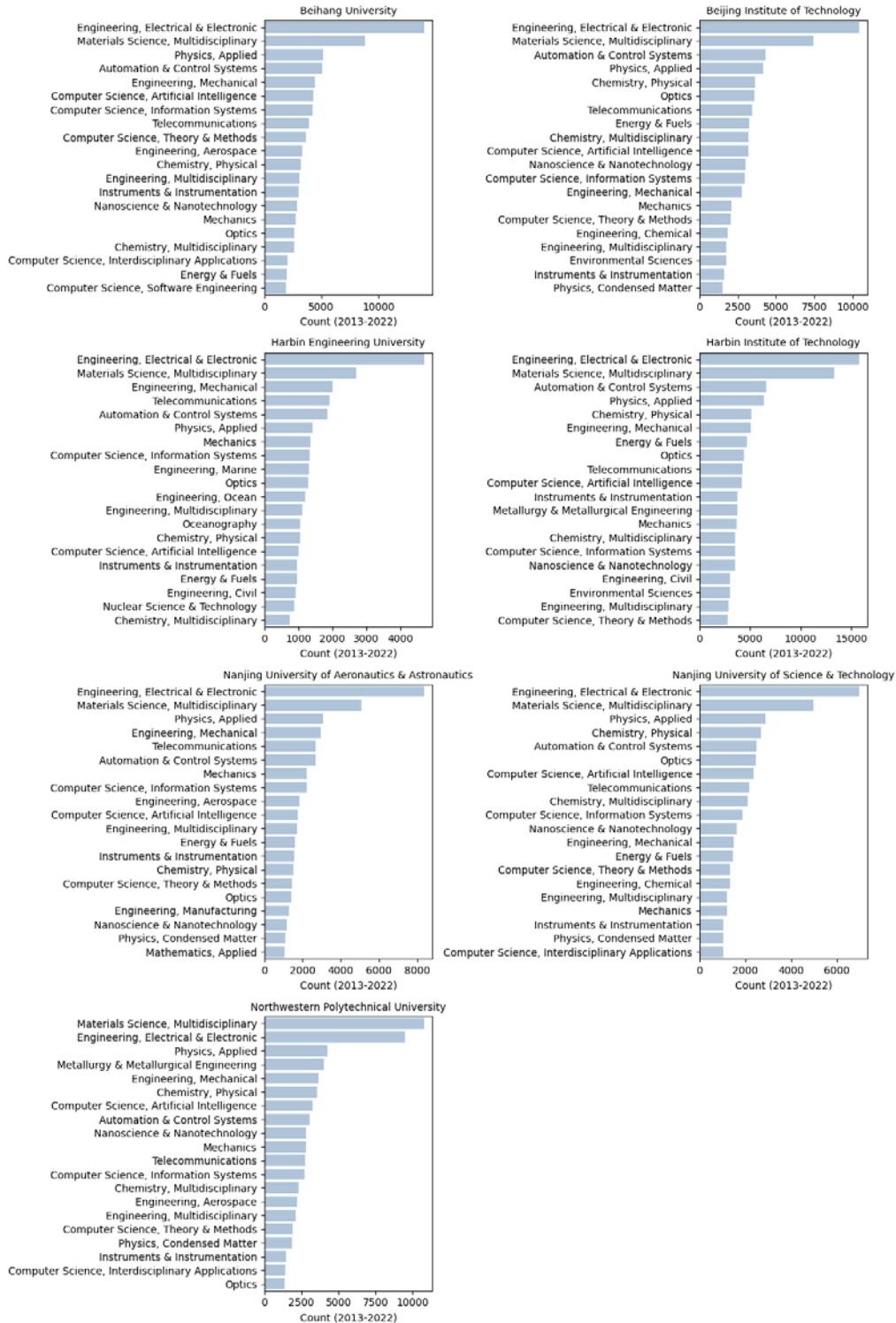


### **Areas of Research Emphasis for Seven Sons Schools**

The Web of Science assigns categories for each of the journals in its database. While the categorization system is imperfect, it provides a general idea of research areas covered by publications from the Seven Sons schools. As shown in Figure 8, **electrical and electronic engineering are the top research areas for all schools except for NPU**, where it ranks second. **Materials science ranks second for all schools except for NPU**, where it ranks first. **Each school also lists several specializations within computer science, indicating a strong focus in this area. Applied physics is another popular field, ranking in the top six for all schools** and ranking third four times. Mechanical engineering, automation and control systems, and telecommunications also feature prominently across the Seven Sons schools.

Among the Seven Sons schools, Harbin Engineering University is the only institution with significant publications in marine engineering, ocean engineering, and oceanography. This is not surprising given its ties with the Chinese Navy. In 2007 the university was “jointly constructed” (共建) by COSTIND, the Ministry of Education, the People’s Government of Heilongjiang Province, and the Chinese Navy.<sup>61</sup> It also has significant publications in the areas of “energy and fuels” and “nuclear science and technology.”

Figure 8. Research Areas of Seven Sons Schools



## The Limits of Bibliometric Analysis

Bibliometric analysis using the Web of Science is a useful tool for achieving a broad understanding of English-language research publications. However, it has some limitations:

- Bibliometric analysis of the Web of Science is useful for measuring English-language publications, but it does not include Chinese-language publications. While we can assume that much of the best science is published in English in journals with global reach, the networks of Chinese-language publications are generally ignored.
- Bibliometric analysis does not effectively tell us the specific nature of individual academic partnerships. For example, it cannot show us whether one party leads the work while another follows, or if there is relative parity.
- There is also the risk that bibliometric analysis measures the quantity of papers published but not the quality. While data shows that Chinese scientific publications rival that of the US regarding the quality of STEM research,<sup>62</sup> colleagues in China anecdotally report that bibliometric statistics fail to account for the ways in which Chinese science provides significant labor and expensive equipment for projects developed and led by scientists at American universities. They also anecdotally share stories of significant “citation trading,” which makes Chinese scientific work appear more significant than it really is.
- Bibliometric analysis only provides limited information about authors’ research networks. It only shows the author’s current affiliation, without information about their undergraduate or graduate education affiliations. Network analysis could reveal patterns that would deepen our understanding of these collaborations.
- As research has shown,<sup>63</sup> many Chinese universities have received approval to conduct “secret” (保密) work, with over 150 universities receiving credentials as authorized units for confidential science and research on weapons production (武器装备科研生产单位保密资格).<sup>64</sup> Thus, some research related to this type of work would not be published.

## Conclusion

The security of academic STEM research in the United States is primarily governed by the National Security Decision Directive 189, issued by the Reagan administration in 1985 during the Cold War. The directive asserts that “to the maximum extent possible, the products of fundamental research remain unrestricted. It is also the policy of this Administration that, where the national security requires control, the mechanism for control of information generated during federally-funded fundamental research in science, technology and engineering at colleges, universities and laboratories is classification.”<sup>65</sup>

This policy—reaffirmed by Secretary of State Condoleezza Rice in 2001 and Undersecretary of Defense Ashton Carter in 2010<sup>66</sup>—has been highly effective, placing

American higher education and science at the forefront globally. However, how, if at all, should this directive adapt to the connections between the Chinese defense sector and higher education, the overlap in civilian and military technologies, and the highly international nature of research networks? China operates a network of state and defense laboratories,<sup>67</sup> and the number of schools granted accreditation to conduct “secret” (保密) work has grown.<sup>68</sup> A broad range of schools are engaged by SASTIND or other defense-related entities in China to undertake work relevant to national defense. As detailed in this paper, the historic and current military connections of the Seven Sons schools make them particularly challenging to assess for academic collaboration.

But should collaboration with these schools be categorically prohibited, even if the work is unrelated to national defense, enhances understanding of developments within China, or leads to scientific advances that are broadly shared? Completely excluding certain types of universities from collaboration could unnecessarily harm the American academic enterprise by restricting academic collaboration and access to talent. Determining the types of collaborations that are appropriate requires both acknowledging the risk profile of working with the Seven Sons and considering individual circumstances and fields of study.

Researchers have long navigated the ethical implications of their work extending beyond the classified/unclassified binary. Yet, these ethical considerations are currently clouded by an atmosphere of fear and suspicion. Indeed, survey data shows that among US-based scientists of Chinese origin, “35% . . . feel unwelcome in the United States . . . 72% do not feel safe as an academic researcher . . . 65% are worried about collaborations with China; and . . . 86% perceive that it is harder to recruit top international students now compared to 5 years ago.”<sup>69</sup>

We need to replace this atmosphere of fear with rational analysis. This paper contributes to that effort by providing context on the research collaborations of Seven Sons schools, which, due to their military backgrounds and connections, are unique cases.

## Areas for Future Study

- This paper does not consider collaboration in the social sciences and humanities. Collaboration in these areas should be of a much different risk profile than those related to sensitive technologies. Future work could focus on collaboration in the social sciences and humanities.
- It is certainly the case that many Chinese universities receive funding from entities related to the Chinese defense industry. Future work could examine how schools reporting to the MIIT compare to other schools that receive such funding.
- Future work could compare Chinese universities with American universities that receive defense funding.
- More research should be done on the strategy of “joint construction” (共建) and its practical implications.



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## Appendix A

**Table 1-A. Personnel Appointments and Sources**

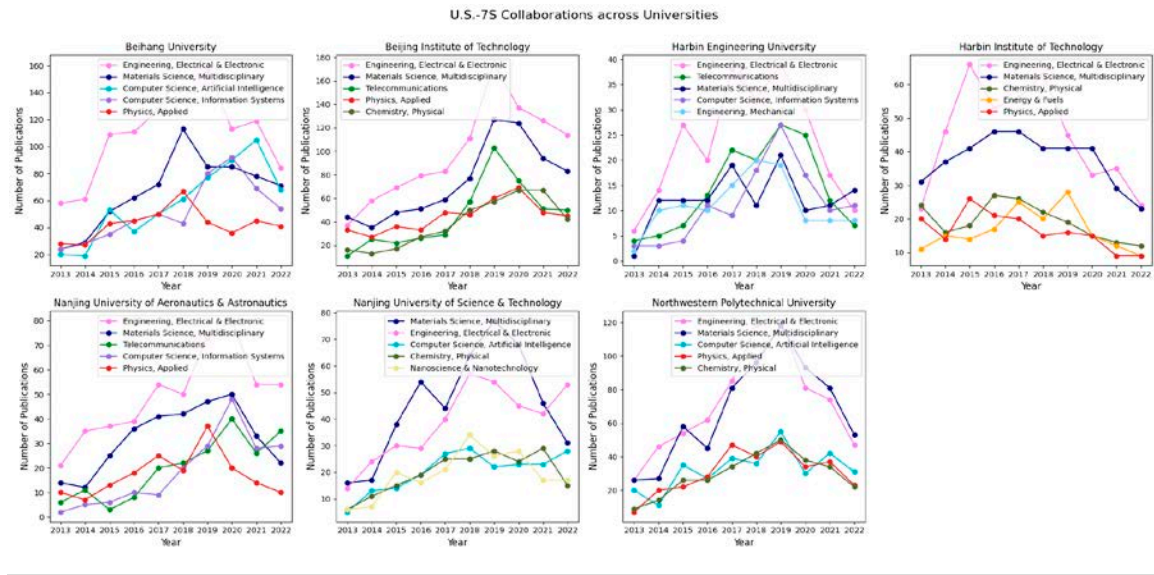
School		Party Secretary	President	Vice President
Beihang University	Name	Zhao Changlu 赵长禄	Wang Yunpeng 王云鹏	Fang Jiancheng 房建成
	MIIT role	Attended meeting	Attended meeting	Decided
	Source	“赵长禄同志任北京航空航天大学党委书记。” Sohu. Accessed December 1, 2023. <a href="https://www.sohu.com/a/540246817_434501">https://www.sohu.com/a/540246817_434501</a>	“王云鹏同志任北京航空航天大学校长。” Acabridge. Accessed December 1, 2023. <a href="https://www.acabridge.cn/news/202209/t20220909_2_244921.shtml">https://www.acabridge.cn/news/202209/t20220909_2_244921.shtml</a>	“房建成校友任北京航空航天大学常务副校长。” Xi'an Jiaotong University Alumni website. Accessed December 1, 2023. <a href="https://alumni.xjtu.edu.cn/info/1139/3239.htm">https://alumni.xjtu.edu.cn/info/1139/3239.htm</a>
Beijing Institute of Technology	Name	Zhang Jun 张军	Long Teng 龙腾	Wang Xiaofeng 王晓锋
	MIIT role	Attended meeting	Attended meeting	Decided
	Source	“张军同志任北京理工大学党委书记。” Beijing Institute of Technology website. Accessed December 1, 2023. <a href="https://www.bit.edu.cn/xww/zhxw/yjjs/9742eac6f1234a7ea22dd16eb2461e00.htm">https://www.bit.edu.cn/xww/zhxw/yjjs/9742eac6f1234a7ea22dd16eb2461e00.htm</a>	“龙腾同志任北京理工大学校长。” Beijing Institute of Technology website. Accessed December 1, 2023. <a href="https://www.bit.edu.cn/xww/zhxw/yjjs/3c50c5403d9342829a2f6019_9939d597.htm">https://www.bit.edu.cn/xww/zhxw/yjjs/3c50c5403d9342829a2f6019_9939d597.htm</a>	“王晓锋同志任我校党委常委、副校长。” Beijing Institute of Technology website. Accessed December 1, 2023. <a href="https://www.bit.edu.cn/xww/zhxw/a122121.htm">https://www.bit.edu.cn/xww/zhxw/a122121.htm</a>
Harbin Institute of Technology	Name	Xiong Sihao 熊四皓	Han Jiecai 韩杰才	Cao Xibin 曹喜滨
	MIIT role	Attended meeting <sup>70</sup>	Decided	Decided
	Source	“熊四皓任哈尔滨工业大学党委书记。” ciudsrc.com. Accessed June 12, 2024. <a href="http://www.ciudsrc.com/webdiceng.php?id=149792">http://www.ciudsrc.com/webdiceng.php?id=149792</a>	“韩杰才任哈工大常务副校长 曹喜滨刘宏任哈工大党委常委、副校长。” Harbin Institute of Technology website. Accessed December 1, 2023. <a href="https://news.hit.edu.cn/2019/0226/c420a216418/page.psp">https://news.hit.edu.cn/2019/0226/c420a216418/page.psp</a>	“韩杰才任哈工大常务副校长 曹喜滨刘宏任哈工大党委常委、副校长。” Harbin Institute of Technology website. Accessed December 1, 2023. <a href="https://news.hit.edu.cn/2019/0226/c420a216418/page.psp">https://news.hit.edu.cn/2019/0226/c420a216418/page.psp</a>

School		Party Secretary	President	Vice President
Harbin Engineering University	Name	Gao Yan 高岩	Yao Yu 姚郁	Wu Linzhi 吴林志
	MIIT role	Decided	Decided	Decided
	Source	“高岩任哈尔滨工程大学党委书记。”Gongxue Zhoubao. Accessed December 1, 2023. <a href="https://wx.ihwrm.com/baokan/article/info.html?doc_id=3135197">https://wx.ihwrm.com/baokan/article/info.html?doc_id=3135197</a>	“姚郁任哈尔滨工程大学校长。”中国共产党新闻网. CCPnews.com. Accessed December 1, 2023. <a href="http://renshi.people.com.cn/n/2015/0420/c139617-26870303.html">http://renshi.people.com.cn/n/2015/0420/c139617-26870303.html</a>	“工业和信息化部关于韩端锋 吴林志正式任职的通知。”Sina. Accessed December 1, 2023. <a href="https://news.sina.cn/2017-07-27/detail-ifyinwmp_0178039.d.html?from=wap">https://news.sina.cn/2017-07-27/detail-ifyinwmp_0178039.d.html?from=wap</a>
Nanjing University of Aeronautics and Astronautics	Name	Shan Zhongde 单忠德	Jiang Bin 姜斌	Wu Qihui 吴启晖
	MIIT role	Decided	Decided	Decided
	Source	“单忠德任南京航空航天大学校长。”Tsinghua Alumni Association. Accessed December 1, 2023. <a href="https://www.tsinghua.org.cn/info/1014/12801.htm">https://www.tsinghua.org.cn/info/1014/12801.htm</a>	“单忠德任南京航空航天大学党委书记，姜斌任校长。”Sohu. Accessed December 1, 2023. <a href="https://www.sohu.com/a/738928940_616825">https://www.sohu.com/a/738928940_616825</a>	“刘宇雷任学校党委副书记 吴启晖任学校党委常委、副校长。”Nanjing University of Aeronautics and Astronautics website. Accessed December 1, 2023. <a href="https://newsweb.nuaa.edu.cn/2021/0617/c743a250195/pagem.htm">https://newsweb.nuaa.edu.cn/2021/0617/c743a250195/pagem.htm</a>
Nanjing University of Science and Technology	Name	Zhang Jun 张骏	Fu Mengyin 付梦印	He Yong 何勇
	MIIT role	Decided	Decided	Decided
	Source	“工信部直属高校领导调整：张骏调任南京理工大学党委书记。”The Paper. Accessed December 1, 2023. <a href="https://m.thepaper.cn/kuaibao_detail.jsp?contid=3338716&amp;from=kuaibao">https://m.thepaper.cn/kuaibao_detail.jsp?contid=3338716&amp;from=kuaibao</a>	“工业和信息化部关于付梦印正式任职的通知”Sina. Accessed December 1, 2023. <a href="https://news.sina.cn/sa/2017-07-27/detail-ikmyaawa7359051.d.html">https://news.sina.cn/sa/2017-07-27/detail-ikmyaawa7359051.d.html</a>	“南京理工大学召开校领导任职宣布会”News, Nanjing University of Science & Technology website. Accessed December 1, 2023. <a href="https://www.njust.edu.cn/t1303/15/3d/c18617a267581/page.psp">https://www.njust.edu.cn/t1303/15/3d/c18617a267581/page.psp</a>
Northwestern Polytechnical University	Name	Li Yanrong 李言荣	Song Baowei 宋保维	Hou Chengyi 侯成义
	MIIT role	Attended meeting	Attended meeting	Decided
	Source	“国内顶级高校领导密集调整：李言荣院士任西工大党委书记。”Sina. Accessed December 1, 2023. <a href="https://finance.sina.cn/2023-02-22/detail-imyhqaiw8512249.d.html?oid=3814581933579485&amp;vt=4&amp;cid=76729&amp;node_id=76729">https://finance.sina.cn/2023-02-22/detail-imyhqaiw8512249.d.html?oid=3814581933579485&amp;vt=4&amp;cid=76729&amp;node_id=76729</a>	“中央批准：宋保维任西北工业大学校长。”Meiri Jingjin Xinwen. Accessed December 1, 2023. <a href="https://m.nbd.com.cn/articles/2023-04-01/2741133.html">https://m.nbd.com.cn/articles/2023-04-01/2741133.html</a>	“西工大召开宣布干部任命会议。”Northwestern Polytechnical University website. Accessed December 1, 2023. <a href="https://news.nwpu.edu.cn/info/1002/61362.htm">https://news.nwpu.edu.cn/info/1002/61362.htm</a>

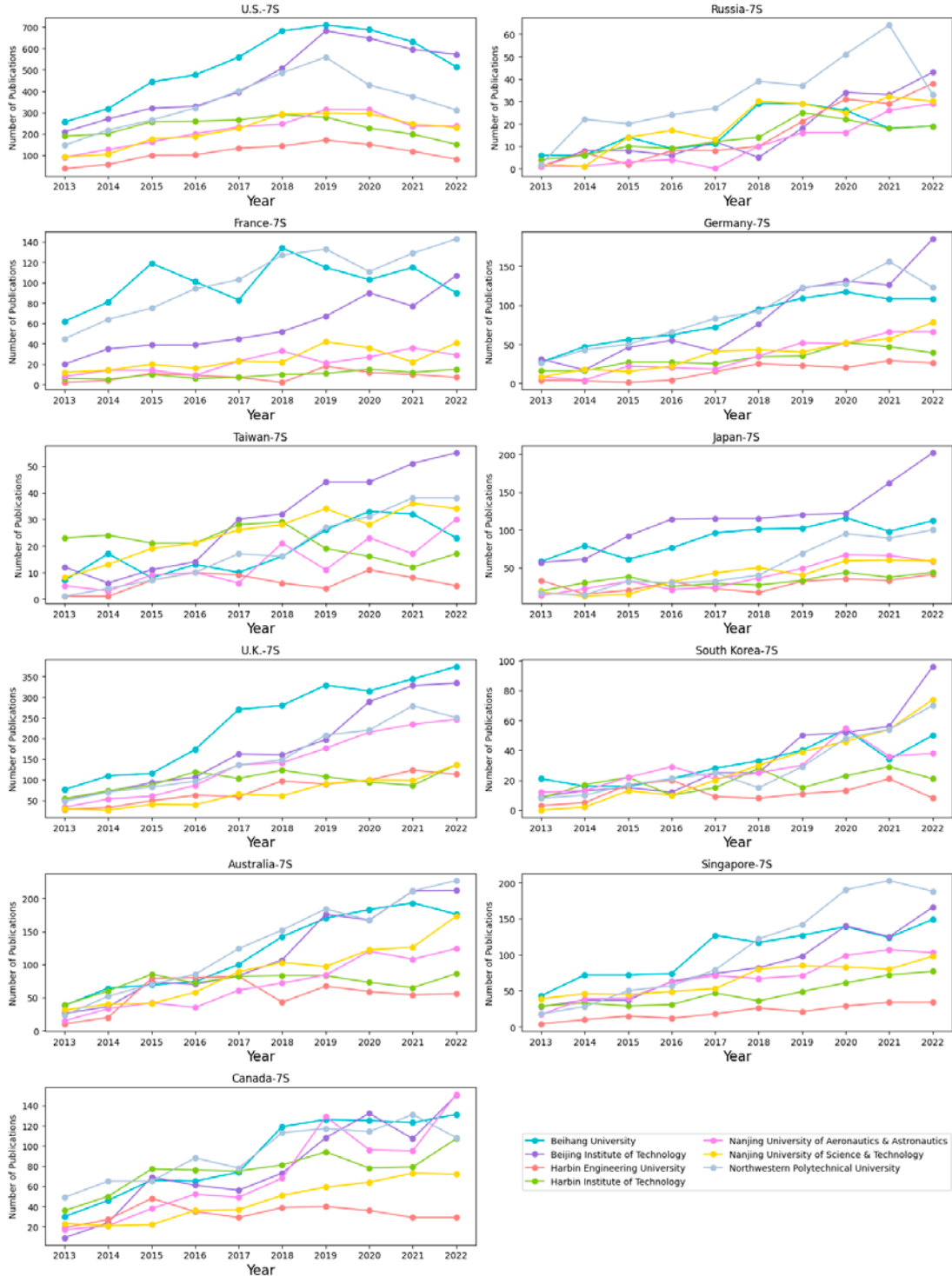
## Appendix B

Figure B-1 demonstrates that with a few exceptions, the downturn in publications between Sevens Sons schools and US institutions occurred broadly across topic areas starting around 2019. This points toward broad institutional or policy reasons for the downturn in publications rather than concerns over specific fields of study.

**Figure B-1. US-Seven Sons Collaborations by Category**



**Figure B-2.** Trends in Publications by Year for Selected International Partners of the Seven Sons Universities



## Notes

1. Dan Murphy is executive director of the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School.
2. Trump White House Archives (2020).
3. Zwetsloot, Weinstein, and Fedasiuk (2021).
4. Bureau of Industry and Security, Department of Commerce (2024).
5. Australian Strategic Policy Institute (2021).
6. Fisher and John (2024).
7. CORRECTIV (2022).
8. Sallinen and Lindholm (2023).
9. Matthews and Hudson (2023).
10. Xie et al. (2023).
11. Schneider, Alexander, and Thomas (2023).
12. Brainard and Normile (2022).
13. Hua (2022).
14. Schmidt (2023).
15. White House Briefing Room Statements and Releases (2023).
16. White House (2022).
17. Xi (2022).
18. Schneider, Alexander, and Thomas (2023).
19. Institute for International Education (n.d.).
20. Shanghai Jiaotong University (2018); Jun (2022), 15.
21. State Council Organizational Reform (2009); Jun (2022), 15; Mulvenon and Tyroler-Cooper (2009).
22. US-China Business Council (2020).
23. See Fedasiuk and Weinstein (2020), 18; Harting et al. (2024), 40. After presented with the evidence in this paper, the excellent and informative Center for Security and Emerging Technology (CSET) report by Fedasiuk and Weinstein was updated on March 5, 2024, to reflect that the Seven Sons are not supervised by SASTIND.
24. The web page from the website of a research center at the Nanjing University of Science and Technology indicates that the Seven Sons are subordinate to SASTIND. See <https://nssperc.njust.edu.cn/7836/list.htm>, accessed January 31, 2024.
25. There are numerous examples of Chinese sources noting that the Seven Sons report directly to the MIIT. Some examples follow: Chen, Du, and Qin (2011), the Nanjing University of Science and Technology (n.d.), and Beijing Institute of Technology (n.d.).
26. The MIIT website includes job descriptions for various deputy ministers. See Ministry of Industry and Information Technology (n.d.a.) and (n.d.b.).
27. Mulvenon and Tyroler-Cooper (2009) indicate that “although it is not clear from MIIT guiding documents whether or not [the Seven Sons] schools are managed through SASTIND specifically, early 2009 visits to Beijing University of Aeronautics and Astronautics and Beijing Engineering University by Chen Qiufa in his role as SASTIND director indicate that SASTIND is at least involved in their administration.”
28. The SASTIND article reads as follows: “为进一步增强国防科技原始创新能力，支持高等院校创建世界一流大学和一流学科，培养更多创新型人才，促进大众创业、万众创新，支撑国防科技工业建设，服务经济社会发展，国防科工局加大力度，“十三五”期间，将在重点支持北京



航空航天大学、北京理工大学、哈尔滨工业大学、西北工业大学、哈尔滨工程大学、南京航空航天大学、南京理工大学等7所军工院校的同时，继续在国防特色学科建设、国防科技创新基地建设、国防基础研究等方面对有关部门和省（市）共建高校给予支持，并对共建高校实施中期评估、动态管理” (SASTIND will increase its efforts to further enhance original innovation capabilities of science and technology for national defense; support colleges and universities to create world-class universities and first-class disciplines; cultivate more innovative talents; promote mass entrepreneurship and popular innovation; support the construction of the national defense science and technology industry; and serve economic and social development. During the “Thirteenth Five-Year Plan,” [2016-20] SASTIND will increase focus on efforts to support seven military engineering universities, [the Seven Sons]. At the same time, based on building disciplines with national defense characteristics, construction of innovation bases of science and technology for national defense, and basic research for national defense, SASTIND will continue to provide support to relevant departments and provinces (municipalities) to jointly construct universities and will implement interim evaluations and dynamic management of them). See State Administration of Science, Technology and Industry for National Defense (2016).

29. State Council of the People’s Republic of China (2014).
30. Fritz (2019).
31. Shen, Zhang, and Liu (2022).
32. Ogden (1982).
33. State Council (2012).
34. China Foreign Affairs University (2020).
35. University of Science and Technology (2024).
36. National University of Defense Technology (n.d.).
37. China Women’s University (n.d.).
38. National Ethnic Affairs Commission (n.d.).
39. Examples include Zhengzhou Police University (n.d.), the Criminal Investigation Police University of China (n.d.), and the People’s Public Security University of China (n.d.).
40. For the listing of the management units for various Chinese universities as of 2000, see State Council (2000).
41. Universities Group of MIIT (n.d.).
42. Center for Security and Emerging Technology (2022); Ministry of Industry and Information Technology (2022).
43. See Appendix A for sources.
44. Hu and Ling (2018), 481–482. The original Chinese is as follows: “10日学校召开2017年度校领导班子和领导干部述职大会。工业和信息化部人教司直属单位干部处处长徐波到会指导。全体校领导、教授代表、全体现职正副处级干部和院系领导副职、统战各界代表、教代会执行委员会成员、离退休人员代表参会。”
45. Hou (2014), 445. The original Chinese is as follows: “工业和信息化部科技司副司长李力，国家发改委高技术司曾钢等一行到西北工业大学调研科技创新工作。”
46. Hou (2014), 450. The original Chinese is as follows: “受工业和信息化部人事教育司委托，学校党委在会议中心召开干部任命会议，全体学校领导，校长助理参加会议。”
47. Nanjing University of Aeronautics and Astronautics (2018), 387–388. The original Chinese is as follows: “工业和信息化部党组决定，施大宁，宋迎东试用期满，考核合格，正式任南京航空航天大学副校长。”
48. Fedasiuk and Weinstein (2020).

49. Yan'an was the location of a key Communist base during the war with the Nationalist Party and the Japanese invasion of China.
50. Beijing Institute of Technology (2018), Republication Explanation (重印说明).
51. Yang and Huang (2007), 4.
52. Joske (2019).
53. Li and Guo (2017), 69.
54. Ibid, 70.
55. Zhang and Lv (2007), 10.
56. Yu (2014), 40–41.
57. Joske (2019).
58. See Appendix Figure B-2 for a breakdown of collaborations for each of the Seven Son school's collaborations with these countries, plus Russia, Taiwan, and South Korea.
59. Appendix Figure B-1 demonstrates that with a few exceptions, the downturn in publications between Sevens Sons schools and US institutions occurred broadly across disciplines starting around 2019.
60. Note that the chart for Beihang University includes the University of Chinese Academy of Sciences, a school that reports to the Chinese Academy of Science.
61. Harbin Engineering University (n.d.). It is unclear how long the “joint construction” agreement lasted.
62. Wagner, Zhang, and Leydesdorff (2022).
63. Australian Strategic Policy Institute (2021).
64. National Administration of State Secrets (2018); discussed further in Joske (2019).
65. National Policy on the Transfer of Scientific, Technical and Engineering Information (1985). Fundamental research is defined in the directive as “basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community.”
66. JASON (2019).
67. For more information on China's state and defense laboratories, see Stone and Xiu (2022).
68. For a highly useful discussion of this phenomenon, see Joske (2019).
69. Xie et al. (2023).
70. Xiong also worked at MIIT from July 2008 to January 2013. See China Overseas-Educated Scholars Development Foundation, “二十大代表中的留学人员（六）,” accessed December 1, 2023, [http://www.cosdf.org.cn/news\\_view.aspx?nid=2&typeid=50226&id=1846](http://www.cosdf.org.cn/news_view.aspx?nid=2&typeid=50226&id=1846).

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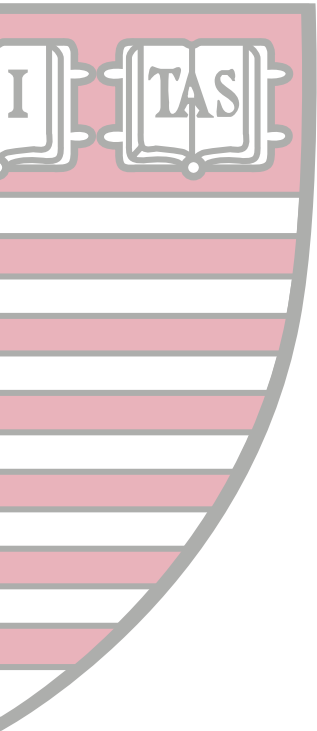
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