

# Beyond an Artificial Technonationalism

## Reframing China's AI Development

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# Intro/Outline of Piece

This report is organized into two main parts. The first deconstructs the “artificial technonationalist” assumptions that have shaped analyses of China’s AI development. Technonationalist framings of China’s pursuit of AI and other advanced technologies are usually produced by a combination of the following three frames:

1. The “technonationalist policy frame”: a focus on ***nationalist*** policies that support technology sectors
2. The “techno-nation unit of analysis frame”: A focus on ***the nation*** as the key unit of analysis for technological change
3. The techno-national security frame”: A focus on ***national interests***, especially national security, as the dominant consideration for technological development

There are undoubtedly benefits tied to both parsimony and descriptive accuracy from adopting technonationalist frames in analyzing China’s AI development; however, within each of these three categories, narratives seeped in what I call “artificial” technonationalism have stretched these assumptions too far. This report argues that relying too heavily on a technonationalist lens to analyze China’s AI development is both mistaken and *dangerous*. First, it points out that most narratives about a country’s technonationalist policies fail to make cross-country or cross-time comparisons. This gap is especially meaningful in the context of China’s AI development, as top-down, state-backed industrial policy has become less central to China’s technological pursuits. Concretely, AI-related central planning has lagged behind the proactive lead of the private sector and subnational governments, and China’s technoglobalist turn in allowing for foreign companies to set up local research labs in strategic technologies sectors has played an essential role in China’s AI development.

Second, this paper questions the assumption that the nation-state is the key unit of analysis for technological change. Rather, China’s AI landscape should be disaggregated, shedding light on the important role of regulators, scientists, powerful firms, and other interest groups. Bureaucratic infighting, diverging interests in technical standards between Chinese firms and the Chinese state, and cross-border talent flows all have increasingly significant effects in shaping the trajectory of strategic technologies like AI. More broadly, while pure technoglobalism is not the answer — the state is still an important actor — the empirical record of technology sharing, which combats the idea that the success of nations is dependent on how well nations innovate, should incentivize researchers to view China’s AI push taking place within a “global village.”

Third, building upon the previous two frames, the national interest frame advances the assumption that national interests require nations to adopt technonationalist policies, often spilling over into a worldview that sees nations engaged in a perpetual competition to achieve a technological edge. With regards to China’s development of AI, this frame has produced two memes that are in need of disassembling: the AI-Sputnik meme and the AI arms race meme. In

both cases, the memes rely on flawed historical analogies, stretching Cold War logics to a context in which they no longer apply. Additionally, both memes are pernicious beyond their corruption of history: they could justify a more expansive technocracy that weaponizes anything related to AI development.

The second part of the report outlines potential avenues to move beyond an artificial technonationalism in analyzing of China's AI development. The intuition is not to completely abandon all technonationalist considerations — analysts are right to emphasize the pre-eminence of the party-state in certain areas, such as content regulation — but rather to open up space for alternative frames, ones that are often unable to gain traction in the narratives surrounding China's pursuit of advanced technology because there is no special interest group that pushes them.

Toward that end, the paper offers three alternative directions to analysis of China's AI development. The first is to take technoglobalist arguments seriously. Throughout history, revolutionary technologies have pushed forward globalization in shrinking and integrating the world. Machine translation, as one such technological innovation boosted by AI, could do the same. Additionally, technoglobalist conceptions about technology sharing are also worthy of consideration, especially given the trend toward open-source publishing in the AI community.

Second, technohybridism, defined as the state's employment of technoglobalist means to pursue technonationalist aims of boosting the competitiveness of domestic firms in global markets, offers a third way between the two ideologies.

Lastly, technonationalism is not going to go away, but better specification of country-specific modules of technonationalism provide a more nuanced way of understanding its effects. In the case of China's AI dream, it appears that Chinese ethnicity is an important factor in strategic discussion of AI. Those of Chinese origin, regardless of their current citizenship, are looped into a Chinese "commonwealth" of sorts. Articles about top talents in the AI space, reports from major organizations like Kai-fu Lee's Sinovation focus on 华人 (ethnic Chinese who may be foreign citizens). This links with a widening body of studies of how the Chinese nation attempts to shape and is shaped in turn by overseas Chinese and Chinese diaspora communities. Rather than merely assessing the degrees of techno-nationalism, this turn toward understanding the kinds of technonationalism opens up space for deeper investigations into technology-society relations, as well as how gender, ethnicity, ideology, and history affect the driving forces behind China's pursuit of AI.

# 1. Nationalist Frame

The technonationalist policy frame is one that is commonly deployed but rarely contextualized. According to a commonly-used definition, technonationalist policies are policies within a given state aimed at promoting and protecting scientific and technological advancements within the national context, often taking the form of insulating domestic firms from foreign competition and investing in indigenous innovation.<sup>2</sup> Defined broadly, all countries adopt technonationalist policies to some extent. Thus, moving beyond an artificial technonationalist frame in analyzing China's technonationalist approach requires answering three questions: Technonationalist compared to whom? Technonationalist compared to when? Technonationalist compared to whom when?

A more substantive discussion of technonationalist policies necessitates specifying the comparator. China is technonationalist compared to whom? There are ways to better flesh out the comparator. For instance, per the U.S. Trade Representative (USTR), China is joined by 11 other countries (including Canada) on the 2018 Priority Watch List, which calls out states for unfair industrial policy practices.<sup>3</sup> But, as the historian David Edgerton points out, it's oftentimes the case that the countries who label others as technonationalist also fit the same label.<sup>4</sup> For instance, one common complaint about China's technonationalist approach is its manipulation of steel prices;<sup>5</sup> at the same time, the U.S. has taken 144 actions to restrict steel imports, which have a cumulative effect of covering 96.8% of U.S. steel imports.<sup>6</sup> One of the main critiques of the USTR's June 2018 Section 301 Report was aimed at joint venture (JVs) schemes in China under which foreign companies traded key technologies for market access.<sup>7</sup> What is left out is the fact that the 8000 JVs operating in China make up less than 10% of the total of 110,000 JVs and strategic alliances that have been established globally since 1990.<sup>8</sup> Cross-country comparisons in the area of tariffs and foreign direct investment also paint China in a less technonationalist light. On average, China imposes lower tariffs than Brazil or India, and foreign direct investment garners 3.8% more in returns than the worldwide rate.<sup>9</sup>

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<sup>2</sup> Ostry and Nelson, 1995

<sup>3</sup>

<https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/april/ustr-releases-2018-special-301-report>

<sup>4</sup> Shock of the Old - track down exact quote

<sup>5</sup>

<https://itif.org/publications/2018/02/27/china-induced-global-overcapacity-increasing-threat-high-tech-industries>

<sup>6</sup> <https://www.globaltradealert.org/reports/44>

<sup>7</sup> <https://ustr.gov/sites/default/files/USTR%20301%20Fact%20Sheet.pdf>

<sup>8</sup>

<https://www.project-syndicate.org/commentary/ustr-section-301-report-biased-by-stephen-s--roa-ch-2018-04>

<sup>9</sup> <https://www.economist.com/node/21541448/print>

Comparisons should also be made across time: has China become more or less technonationalist over time? While it is important to point out continuities and the deep roots of China's technonationalism,<sup>10</sup> it is also necessary to take note of how Chinese innovation has transformed: rather than a straight-line path from importation of foreign technology to indigenous innovation, it has been a “messier process in which the lines between Chinese and non-Chinese ideas, technologies and capabilities are harder to draw.”<sup>11</sup> Contrary to the common view that China is experiencing a resurgence of technonationalism,<sup>12</sup> there are some indicators that point toward a declining trend. According to a 2018 AmCham China survey of businesses operating in China, 96 percent of respondents said that China's enforcement of intellectual property rights had improved in recent years, and respondents found fewer policy-related barriers to innovation compared to the previous year, including the restrictiveness of data security-related policies, requirements to comply with unique China standards, indigenous innovation policies that discriminate against foreign-invested enterprises, and restrictive licensing requirements.<sup>13</sup>

In particular, initial trends in China's AI development landscape confirm that top-down, state-backed industrial policy has become less central to China's technological pursuits. China's much-lauded July 2017 AI Development Plan was not so much the government starting the push on AI development but more so the state “riding the wave” formed by private companies and local governments leading the way.<sup>14</sup> Additionally, in the past decade, there has been a significant loosening of restrictions for science and technology cooperation, in particular with respect to allowing foreign companies to setup research labs. For example, the Ministry of Science and Technology lifted the limits on foreign investment in research areas.<sup>15</sup> Some executives of U.S. companies with research bases in China have been told by the Chinese government that their companies are regarded as Chinese companies.<sup>16</sup> Again, this trend is playing an important role in AI development. Microsoft's Beijing-based research arm, Microsoft Research Asia, which will be the subject of a case study later on in this paper, has played an essential role as a training school of sorts for Chinese AI researchers. Other important AI-related labs include Amazon China, IBM, Intel's lab, as well as Google's new AI center.

Lastly, the question of technonationalist compared to whom and when is also relevant. One easy analogue is the fear of Japan's technonationalist domination of advanced technology in the 1980s. As David Edgerton writes, “The term techno-nationalism is used by Western analysts primarily in relation to Japan and now China, to describe a potentially, perhaps actually,

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<sup>10</sup> Evan Feigenbaum piece in Macro Polo

<sup>11</sup> Nesta Absorptive state report

<sup>12</sup> Find citations for this

<sup>13</sup> The one technonaitonalist policy area where there was a slight increase was the barrier of IP localization requirements and technology transfer requirements. THough AmCham CHINA is the American Chamber of Commerce in the People's Republic of China, its survey respondents included companies that had a legal presence that was global in nature (China + U.S. + other countries — 51%), legal presence that consisted of China+U.S (11%), U.S.-only legal presence (3%), China-only legal presence (21%), outside China and U.S.-only legal presence (9%), and a legal presence that consisted of China+Outside China and U.S. (5%). Source: AmCham 2018 survey (do the full citation)

<sup>14</sup> Triolo and Goodriwch riding the wave; Deciphering China's AI Dream

<sup>15</sup> Higgins; find more details on this

<sup>16</sup> Higgins

dangerous thing.”<sup>17</sup> Additionally, Germany has also been linked to technonationalism in various periods of its history. In fact, Edgerton remarks that intellectuals were intensely nationalistic about science and technology, particularly in the mid-20th century, in almost every country around the world.<sup>18</sup> The U.S. is not exceptional in this respect. After World War II, U.S. military procurement, which was restricted primarily to American firms, cultivated the American semiconductor and computer industries. Moreover, the U.S. government amended antitrust law to support the Microelectronics and Computer Technology Corp and also provided ample support for public-private research associations such as Sematech.<sup>19</sup> Many of the companies seeded from this form of industrial policy remain major players in the AI landscape today.

Technonationalist policy frames are also found wanting in addressing the “so what” question. The Trump administration’s Section 301 report claimed that China’s industrial policies had led to \$50 billion in harm to the U.S. economy, a claim that was not backed up by any calculations or further analysis.<sup>20</sup> It’s unclear whether this figure, which represents about .25% of the U.S. annual GDP, is the cumulative effect of all of China’s industrial policies to date or a yearly figure. Some have filled this “so what” gap with policy recommendations. The Information Technology and Innovation Foundation (ITIF), an influential D.C.-based think tank on science and technology policy, has been at the forefront of arguing that China wants to extend their “innovation mercantilist” strategy to advanced-technology industries like artificial intelligence. To combat China’s mercantilism, Stephen Ezell, vice president of the ITIF, has recommended that the U.S. “suspend scientific and other technical cooperation with China.”<sup>21</sup> More reasonable responses usually call for a more “level playing field,” but serious issues roam about within this vague assertion, namely whether a level playing field should take into account industrial policies in the past that have shaped the present day situation, or whether some degree of diversity in national innovation environments could be net-beneficial for the world.

## 2. Nation frame

This paper also aims to deconstruct the “technonationalist nation frame” — one that assumes that nations are the primary units where technological innovation happens, where the effects of technology are seen, and where the drivers of technology are located. Instead, the national container is increasingly porous as people, ideas, and capital are all flowing across borders. Indeed, the move toward “techno-transnationalism” can also be applied to China’s development of AI. This section focuses on two sets of transnational communities: multinational firms in AI-related industries and AI researchers.

For the first set of actors, multinational firms, three international practices reveal how Chinese and international firms pursue interests divergent from those set by their home states:

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<sup>17</sup> Shock of the Old

<sup>18</sup> Contradictions of techno-nationalism and techno-globalism

<sup>19</sup> Ostry and ... Brookingsbook

<sup>20</sup> <https://www.csis.org/analysis/surviving-march-madness-us-china-trade-relations?>

<sup>21</sup>

[https://www.realclearpolicy.com/articles/2018/04/23/tariffs\\_wont\\_stop\\_chinas\\_mercantilism\\_here\\_are\\_10\\_alternatives\\_110605.html](https://www.realclearpolicy.com/articles/2018/04/23/tariffs_wont_stop_chinas_mercantilism_here_are_10_alternatives_110605.html)

the practice of setting technical standards, the practice of cross-licensing, and the practice of overseas investments and acquisitions. In the realm of international technical standards, as noted by Suttmeier and Yao, Chinese firms may back standards set by foreign technology leaders rather than those pushed by the Chinese state and other Chinese firms, resulting in a politics of standards defined by “increasingly complex and cross-cutting cleavages.”<sup>22</sup> In one high-profile case that came to light in May 2018, the Chinese firm Lenovo voted for a 5G technology standard led by U.S. firm Qualcomm when an alternative standard by Chinese firm Huawei was also available.<sup>23</sup> Additionally, foreign companies also play a role in shaping Chinese domestic standards. As noted by the USTR, the technical committee for cybersecurity standards has started to allow foreign companies to participate in standardization work, as foreign companies are allowed to vote at the working group level in developing standards even in a relatively sensitive area.<sup>24</sup> In the AI field, foreign companies with bases in China, such as Intel and Panasonic, participated in a large-scale effort by the China Electronic Standardization Institute to coordinate AI standards.<sup>25</sup>

Second is the practice of cross-licensing. Especially for industries relevant for AI, in which technologies are pieces of complex systems, patents on different parts of these systems are owned by different firms. Thus, cross-licensing of patents is a necessity, because if patent rights are strictly enforced, a race to the bottom would occur and no firm could benefit from their inventions.<sup>26</sup> The Google-Tencent licensing deal, announced in January of 2018, is a perfect encapsulation of how firms are taking more technoglobalist approaches to AI development. In addition to both sides wanting to prevent aforementioned issues related to patent infringement, this licensing deal also involved mutual benefits related to advances in artificial intelligence. According to one analysis using the PatSnap platform<sup>27</sup>, an industry insider guessed that the deal involved the following nine AI-related patents:

1. CN104915340A (Natural Language Question-Answering Method and Device)—TENCENT
2. CN102801548B (Method, device and information system of intelligent early warning)—TENCENT
3. CN106250508A (Answering questions using environmental context), which has a valuation of \$194,000—GOOGLE
4. CN105045799A (Searchable index), which has a valuation of \$18,000—GOOGLE
5. CN105210064A (Classifying Resources Using a Deep Network), valued at \$1,900,000—GOOGLE
6. CN102227724B (Machine Learning for Transliteration), valued at \$1,700,000—GOOGLE

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<sup>22</sup> Suttmeier and Yao

<sup>23</sup> <https://technode.com/2018/05/16/lenovo-huawei-5g/>

<sup>24</sup>

<https://ustr.gov/sites/default/files/files/Press/Reports/2018%20National%20Trade%20Estimate%20Report.pdf>

<sup>25</sup>

<https://www.newamerica.org/cybersecurity-initiative/digichina/blog/chinese-interests-take-big-seat-ai-governance-table/>

<sup>26</sup> Ostry brookings

<sup>27</sup> <https://blog.patsnap.com/google-tencent-licensing-deal-2018-patents>

7. CN102549603B (Relevance-Based Image Selection), valued at \$530,000—GOOGLE
8. CN105160397A (Training Distilled Machine Learning Models), valued at \$18,000—GOOGLE
9. CN105719001A (Large-Scale Classification in Neural Networks Using Hashing), valued at \$18,000—GOOGLE

Both giants benefit from deals like these. Google gets to embed its AI-related software and products into IP and technologies into Chinese products as a way to access the Chinese market, while Tencent, which has an AI-related patent count of only about 6% of Google's, gives its nascent AI lab a boost using Google's technologies.<sup>28</sup>

Lastly, multinational firms are increasingly active and independent in overseas acquisitions and investments. In 2017, Baidu, Alibaba, and Tencent invested in or acquired a total of 226 companies, including many overseas AI-related startups.<sup>29</sup> The key is that there is significant variation in the degree to which the central government influences overseas acquisitions. In 2016, the record overseas deal spree was largely spurred by private companies, but following Newton's Third Law, in 2017, China promulgated a set of new rules on overseas investments, which were aimed against "irrational" acquisitions of assets in industries such as real estate and gambling, resulting in state-owned enterprises accounting for nearly 60% of outbound investments in the first half of 2017.<sup>30</sup> Some private company-led deals in the AI space have also been linked to state directives. For instance, Midea, a privately owned Chinese company, bought Kuka AG — a German company that specializes in industrial automation and AI — with the help of financing from China's Exim bank. But it is unclear to what extent this was a top-down directive.<sup>31</sup> In the simplistic, artificial terms, the Exim bank is a tool joined at the hip to the party-state; in reality, the Ministry of Commerce's Exim bank is enmeshed within bureaucratic struggles with the Ministry of Foreign Affairs and other entities.<sup>32</sup>

For the second set of actors, the transnational community of AI researchers, there are two flows that are important to highlight. This section fleshes out these two flows by drawing from two original datasets: the first is a corpus of high-impact AI publications (top 1 percentile of most cited articles from that year) from the past ten years, and the second is information on the past and current affiliations of 249 Microsoft Research Asia Ph.D. fellows from 2005-2016.

One important transnational interaction in the global AI research community is that of coauthorship. With respect to this flow, scientometric analysis of the corpus of high-impact AI publications from the past ten years reveals that AI research is conducted through country collaboration networks. These country collaboration networks, which measure the linkages between the countries based on the country affiliation of authors who co-author papers together,

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<sup>28</sup> <https://blog.patsnap.com/google-tencent-licensing-deal-2018-patents>

<sup>29</sup> <https://mp.weixin.qq.com/s/ARBkWUN9iBLwy4VVVF78fA>

<sup>30</sup>

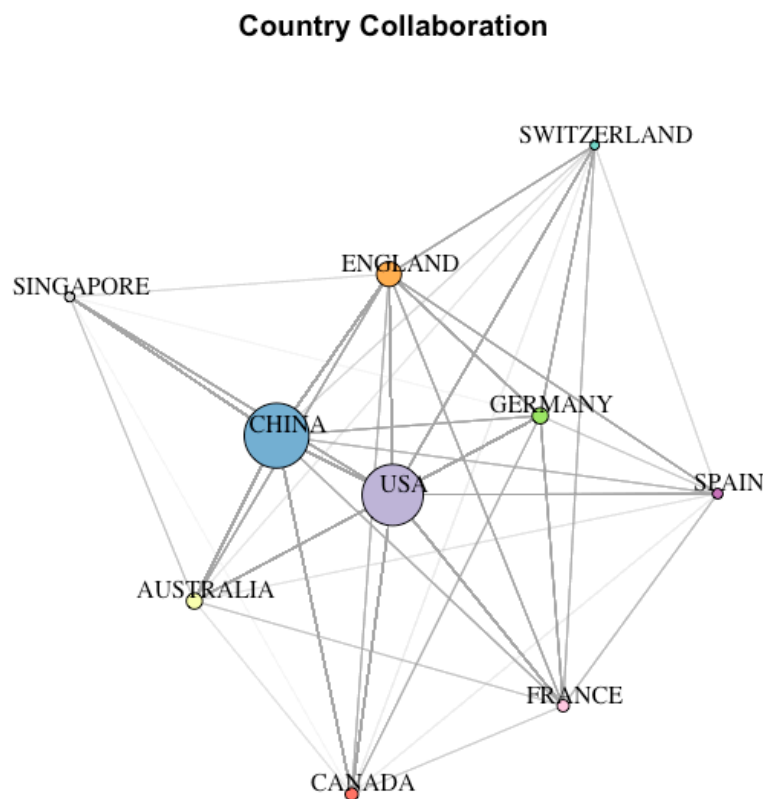
<https://www.bloomberg.com/news/articles/2017-08-18/china-further-limits-overseas-investment-in-push-to-reduce-risk>

<sup>31</sup> Track down source of this

<sup>32</sup> <http://journals.giga-hamburg.de/index.php/jcca/article/viewFile/930/619>

reveals the transnational character of the AI research community. Co-authorship is an important feature of the AI research community because it could serve as an indicator for the level of social ties between researchers from different countries. Figure 1 shows the country collaboration network for the AI research community in a Fruchterman-Reingold layout, which is an intuitive format in that nodes (countries) that share more connections are closer to each other on the graph. It seems that China, the U.S., England, and Germany occupy central positions in the AI research community. The U.S. is the closest to the very center of the network and has close collaborations with all the countries. Compared to the U.S., China has closer connections with Australia and Singapore, while the U.S. is closer to European countries like Switzerland.

Figure 1 - Country Collaboration Network



One interesting finding is the presence of strong ties between China and Singapore in AI research. Per a Nature Index report, collaboration between Chinese and Singaporean institutes has been a significant factor in boosting the number of Chinese articles listed in the Nature Index in the field of chemistry, which is the field that has accounted for the large increase in Chinese articles.<sup>33</sup> Given the strength of top Singaporean universities in AI, China-Singapore collaboration could be an important factor in the future of AI research.

<sup>33</sup> <https://www.enago.com/academy/chinese-scientists-increase-global-research-collaboration/>

The country collaboration network also reveals a very close co-authorship network between the U.S. and China (Figure 2).<sup>34</sup> Previous scientometric research on the nanotechnology research community has shown that Chinese American scientists are crucial in facilitating these collaborations.<sup>35</sup> It appears that Chinese American and Taiwanese American

| ****Co-Authorship Relationships among Researcher Nationalities in AAAI Conference Presentations**** |       |       |       |     |    |        |         |       |        |       |           |
|-----------------------------------------------------------------------------------------------------|-------|-------|-------|-----|----|--------|---------|-------|--------|-------|-----------|
| AAAI                                                                                                | Japan | Korea | China | USA | UK | France | Germany | Italy | Canada | Spain | Australia |
| Korea                                                                                               |       | 0     |       |     |    |        |         |       |        |       |           |
| China                                                                                               |       | 5     | 2     |     |    |        |         |       |        |       |           |
| USA                                                                                                 |       | 6     | 6     | 80  |    |        |         |       |        |       |           |
| UK                                                                                                  |       | 4     | 0     | 9   | 24 |        |         |       |        |       |           |
| France                                                                                              |       | 2     | 0     | 1   | 16 | 4      |         |       |        |       |           |
| Germany                                                                                             |       | 0     | 0     | 2   | 17 | 7      | 6       |       |        |       |           |
| Italy                                                                                               |       | 0     | 0     | 0   | 8  | 12     | 3       | 1     |        |       |           |
| Canada                                                                                              |       | 3     | 1     | 11  | 25 | 1      | 3       | 9     | 0      |       |           |
| Spain                                                                                               |       | 0     | 0     | 0   | 3  | 0      | 1       | 2     | 2      | 0     |           |
| Australia                                                                                           |       | 2     | 0     | 37  | 20 | 8      | 5       | 12    | 4      | 8     | 0         |
| India                                                                                               |       | 0     | 3     | 0   | 13 | 0      | 2       | 1     | 0      | 0     | 0         |
|                                                                                                     |       |       |       |     |    |        |         |       |        |       | 2         |
|                                                                                                     |       |       |       |     |    |        |         |       |        |       |           |
|                                                                                                     |       |       |       |     |    |        |         |       |        |       |           |
| *Source: Hoshida 2016                                                                               |       |       |       |     |    |        |         |       |        |       |           |

scientists play a similar role in the AI field. Of all the individual academics in the dataset, Ming-Hsuan Yang stands out as the Taiwanese American scholar most connected to Chinese academics. He completed his undergraduate studies in Taiwan in 1991, and then moved to the U.S. for two master's degrees followed by a PhD .at the University of Illinois at Urbana-Champaign. Currently, he is a professor of electrical engineering and computer science at the University of California, Merced. Out of 22 journal papers from 2016-2017, sampled from the selected publications on Yang's website with the full paper linked, 18 of these papers are co-authored with at least one academic based at a Chinese institution.<sup>36</sup> The range of Chinese institutions Professor Yang has partnered with is impressive and includes:

- State Key Laboratory of Information Security, Institute of Information Engineering, Chinese Academy of Sciences
- Harbin Institute of Technology
- College of Computer Science, Zhejiang University
- Dalian University of Technology
- Beijing Institute of Technology
- Nanjing University of Information Science and Technology
- Nanjing University of Posts and Telecommunications
- Tsinghua University
- Shanghai Jiao Tong University

He also served as the general chair of the Asian Conference on Computer Vision in 2016.

<sup>34</sup> Need to change the graphic to include the title of "Figure 2"

<sup>35</sup> Wang, X., Xu, S., Liu, D. and Liang, Y., 2012. The role of Chinese–American scientists in China–US scientific collaboration: A study in nanotechnology. *Scientometrics*, 91(3), pp.737-749.

<sup>36</sup> <http://faculty.ucmerced.edu/mhyang/pubs.html>

Threads similar to Yang's story appear throughout the corpus. The most cited article from the last year (2017) in the dataset was called the "Structural Minimax Probability Machine", which outlines a model that leverages the structural information of data to design better classifiers. The paper has three co-authors, two of who are based in Nanjing University of Information Science and Technology in China and the third who is based in the University of Central Arkansas. Per his curriculum vitae, Victor Sheng, the third author, moved from China to Canada in 2003 in order to undertake graduate studies in computer science.<sup>37</sup> After completing a PhD in computer science, he was offered a postdoctoral fellowship award from the Natural Sciences and Engineering Research Council of Canada and is now an associate professor at the University of Central Arkansas.

Talent transfer across borders is also an important thread in the AI technical community. Human talent may be the most fundamental driver of AI development. Companies devote billions toward acquiring and recruiting talented AI researchers, and governments, most notably the Chinese government, have set up talent programs to attract AI researchers to work in their countries.<sup>38</sup> The section examines the case of Microsoft Research Asia (MSRA), Microsoft's Beijing-based research lab which attracts Asia's most talented computer science and AI researchers. The lab draws researchers from China, Japan, Korea, Singapore, Taiwan, and Australia, with Chinese researchers making up the significant majority (Figure 3). Since its founding in 1998, MSRA has developed into a prestigious research institute that has produced impressive results in applied AI fields such as computer vision, speech recognition and translation.<sup>39</sup> Dubbed by MIT Technology Review as "the world's hottest computer lab,"<sup>40</sup> MSRA is also known as the Whampoa Military Academy of China's Internet scene, a reference to the graduating school for many Chinese military leaders who fought in 20th century conflicts. Indeed, the lab has trained over 4,800 Chinese interns, more than 100 professors teaching at top universities in China, and more than 500 professionals who are active in the Chinese IT industry, taking on executive and lead engineer positions in a variety of companies, including Baidu, Alibaba, Tencent, Huawei, Bytedance, and Lenovo.<sup>41</sup>

Given its status as a training ground for elite AI researchers in Asia, MSRA serves as a useful case study for analyzing the features of AI talent flows. Specifically, this study uses the recipients of the MSRA Ph.D. Fellowship as the main source of analysis. In describing the fellowship program, Microsoft claims that "fellows have gone on to become prominent researchers and influential individuals in academia and industry."<sup>42</sup> Thus, by taking MSRA Ph.D.

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<sup>37</sup> <http://faculty.uca.edu/ssheng/>

<sup>38</sup> [https://www.fhi.ox.ac.uk/wp-content/uploads/Deciphering\\_Chinas\\_AI-Dream.pdf](https://www.fhi.ox.ac.uk/wp-content/uploads/Deciphering_Chinas_AI-Dream.pdf)

<sup>39</sup>

<https://www.microsoft.com/en-us/research/publication/achieving-human-parity-on-automatic-chinese-to-english-news-translation/>

<sup>40</sup> <https://www.technologyreview.com/s/402786/the-worlds-hottest-computer-lab/>

<sup>41</sup> <https://www.weibo.com/p/1001643998598932131471>. I thank Matt Sheehan for this point.

<sup>42</sup> <https://www.microsoft.com/en-us/research/academic-program/fellowships-microsoft-research-asia/>

fellows as a proxy for the “best and brightest” AI talent in the Asian region, results from the case of MSRA show the global nature of talent flows.

FIGURE 3: Country of Ph.D. Institution Breakdown for MSRA Fellows

| <b>Countries as sources of MSRA Fellows</b> | <b>Number of Fellows</b> | <b>Percentage of Total Fellows</b> |
|---------------------------------------------|--------------------------|------------------------------------|
| China                                       | 141                      | 56.6%                              |
| Korea                                       | 25                       | 10.0%                              |
| Hong Kong                                   | 21                       | 8.4%                               |
| Japan                                       | 19                       | 7.6%                               |
| Taiwan                                      | 19                       | 7.6%                               |
| Singapore                                   | 14                       | 5.6%                               |
| Australia                                   | 10                       | 4.0%                               |

Information on the current employment of MSRA fellows was collected from public websites, such as LinkedIn and biography pages. For some fellows, no such information was uncovered. Out of the original dataset of 249 fellows, the current employment information for 202 fellows was collected, just over 80% of the total number of fellows in the dataset. These findings are current as of May 2018 (Figures 4 and 5).

FIGURE 4: Most Current Affiliations of MSRA Fellows

| <b>Current Affiliation</b>                    | <b>Number of Fellows</b> | <b>Percentage of Total Fellows</b> | <b>Country Affiliation</b> |
|-----------------------------------------------|--------------------------|------------------------------------|----------------------------|
| Microsoft                                     | 18                       | 8.9%                               | US                         |
| Nanjing University                            | 10                       | 5.0%                               | China                      |
| Google                                        | 6                        | 3.0%                               | US                         |
| Huazhong University of Science and Technology | 5                        | 2.5%                               | China                      |
| Snap                                          | 5                        | 2.5%                               | US                         |
| Harbin Institute of                           | 4                        | 2.0%                               | China                      |

|                                                                |   |      |       |
|----------------------------------------------------------------|---|------|-------|
| Technology                                                     |   |      |       |
| Institute of Computing Technology, Chinese Academy of Sciences | 4 | 2.0% | China |
| MIT                                                            | 4 | 2.0% | US    |
| Zhejiang University                                            | 4 | 2.0% | China |
| Baidu                                                          | 3 | 1.5% | China |
| Facebook                                                       | 3 | 1.5% | US    |
| IBM                                                            | 3 | 1.5% | US    |
| Samsung                                                        | 3 | 1.5% | Korea |
| Sensetime                                                      | 3 | 1.5% | China |
| Shanghai University of Finance and Economics                   | 3 | 1.5% | China |
| University of Science and Technology of China                  | 3 | 1.5% | China |

FIGURE 5: Country headquarters of Current Affiliations of MSRA Fellows

| Home countries for current affiliations of MSRA Fellows | Number of Fellows | Percentage of Total Fellows |
|---------------------------------------------------------|-------------------|-----------------------------|
| China                                                   | 88                | 43.6%                       |
| US                                                      | 64                | 31.7%                       |
| Japan                                                   | 11                | 5.5%                        |
| Korea                                                   | 11                | 5.5%                        |
| Taiwan                                                  | 8                 | 5.0%                        |
| Australia                                               | 5                 | 2.5%                        |

|             |   |      |
|-------------|---|------|
| Singapore   | 5 | 2.5% |
| Hong Kong   | 3 | 1.5% |
| UK          | 3 | 1.5% |
| Germany     | 2 | 1.0% |
| Netherlands | 1 | .5%  |
| Spain       | 1 | .5%  |

As demonstrated by these results, labs and universities in non-Asian countries have attracted the best and brightest Asian researchers. While a substantial percentage of MSRA recipients are based at Chinese institutions and companies, at least 64 are working in the United States, and many move back and forth between AI ecosystems. People matter in shaping Chinese policy. Matthew Evangelista has emphasized the importance of the international Pugwash movement, which brought scientists together to assess the dangers of weapons of mass destruction, arguing that scientific communities played an important role in shaping Soviet foreign policy during the Cold War.<sup>43</sup> In a similar vein, China's AI technical community could play a big role in influencing Chinese policy-making and diplomacy. Would China's government be as receptive as Soviet leaders to the influence of a transnational network of scientists? The answer is unclear, but rather than giving into artificial technonationalism and not asking the question at all, we should hold on to it as a question worth investigating.

### 3. National Security Frame

Technonationalist narratives of China's AI development often draw upon historical analogies, attempting to link the current state of affairs to a Cold War environment in which the U.S. and Soviet Union were engaged in an existential battle to develop the most advanced technologies.

Perhaps the most dangerous instantiation of technonationalist thinking about China's AI development is the growing narrative of an AI arms race. Media and scholarly accounts of an AI arms race between the U.S. and China have proliferated in the past couple of years. Before 2015, there were no mentions of the phrase "AI arms race" in any news article from major world publications, per the Lexis Nexis database.<sup>44</sup> Since then, there have been 45 articles referencing an "AI arms race" in major world publications, including the *Wall Street Journal* and

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<sup>43</sup> Check how many times you are using "played an important role" or variations throughout this paper and change that

<sup>44</sup> Lexis Nexis

*The Guardian*.<sup>45</sup> According to reports of this impending U.S.-China AI arms race, the weapons China will use to win the AI arms race range from supercomputers and quantum technologies (which are unproven and have unclear linkages to AI development),<sup>46</sup> an abundance of data useful for narrow applications of facial recognition and precision medicine (which do not necessarily translate into useful military applications),<sup>47</sup> and Chinese children (who are people not weapons).

The absence of any degree of conceptual clarity for what constitutes an AI arms race has potentially dangerous consequences for policy. When the Bush administration grouped chemical, biological, and nuclear weapons under the umbrella term "weapons of mass destruction," this conceptual blurring flattened the risk profile and conflated the danger of Iraq possessing anthrax-filled shells with the risk that it had nuclear weapons.<sup>48</sup> Similar issues could arise if any competitive dynamic related to AI is conflated with an "AI arms race." For instance, a fierce competition for talented AI researchers, a trend that is often framed in the context of an AI arms race, could actually lead to a more diversified, cosmopolitan AI research base that would mitigate race dynamics over AI weapons. Indeed, at present, the real threat of an "AI arms race" is the risk that this narrative weaponizes anything with a loose connection to AI,<sup>49</sup> turning developments that could benefit all (e.g. China's efforts to improve cancer survival rates with the help of AI systems) into zero-sum competition.<sup>50</sup>

Another notable example of linking China's AI development to historical analogies rooted in the Cold War is the emergence of the "Sputnik moment" meme. The meme's genesis came after AlphaGo's victory over Lee Sedol in March 2016, as a New York Times article stated that two Chinese professors who helped draft China's AI development plan described AlphaGo's victory "as a sort of Sputnik moment for China."<sup>51</sup> Other media outlets were quick to follow, describing AlphaGo as the world's "second 'Sputnik moment,'" coming sixty years after the first.

<sup>52</sup>

In the months following China's release of a national AI development plan in July 2017, the Sputnik meme proliferated and flourished. Breaking Defense, a leading portal for the U.S. defense industry news, stated it most bluntly with the following headline: "Our Artificial

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<https://www.theguardian.com/technology/2018/apr/09/killer-robots-pressure-builds-for-ban-as-government-s-meet>; <https://www.wsj.com/articles/the-new-arms-race-in-ai-1520009261>

<sup>46</sup> <https://www.wsj.com/articles/the-new-arms-race-in-ai-1520009261>

<sup>47</sup> <https://www.ft.com/content/e33a6994-447e-11e8-93cf-67ac3a6482fd>

<sup>48</sup> From: *deadly arsenals: nuclear, biological, and chemical threats* - cirincione, jon b wofsthal, and miriam Rajkumar (Chapter 1, pg. 3)

<sup>49</sup> Of course, down the road, there is real potential for AI-enabled applications to spur different modes of warfare - though this paper challenges some of these notions in a later section - but they should not consume all of our attention on AI and are undefined/far-off in the future.

<sup>50</sup> <http://www.wired.co.uk/article/china-artificial-intelligence-education-superpower>

<sup>51</sup> <https://www.nytimes.com/2017/07/20/business/china-artificial-intelligence.html>

<sup>52</sup> See: <https://www.theverge.com/2017/8/3/16007736/china-us-ai-artificial-intelligence>

Intelligence 'Sputnik Moment' is Now: Eric Schmidt & Bob Work.<sup>53</sup> At the event, Schmidt, who was the head of Google's parent company at the time, called for the U.S. to come up with its own national AI strategy in response to China, and Work, a former Deputy Defense Secretary, argued that the U.S. needed to respond to China's plan at the highest levels, just as it did following the launch of Sputnik.<sup>54</sup> As all effective memes do, the AI-Sputnik meme has expanded. Larry Diamond, a leading scholar in democracy studies and a senior fellow at the Hoover Institution at Stanford University, lumps AI, supercomputing, drones, robotics, gene editing, and other advanced medical technology into a list of technologies that will enable China's authoritarian sharp power projection, labeling this as the U.S.'s new Sputnik moment.<sup>55</sup>

The AI-Sputnik meme suffers from serious logical and historical flaws. Most obvious is a basic counting flaw: Sputnik was a singular, defining event; thus, each claim of a new AI-Sputnik in the two-year-plus span since AlphaGo nullifies the other Sputnik moments. Whenever Rand Simberg, a space policy analyst, hears about a modern-day Sputnik analogy, he thinks "it is almost guaranteed to be a foolish and false analogy."<sup>56</sup> The AI-Sputnik analogies crumble when placed under even a small degree of scrutiny. AlphaGo was launched by a private company not a national government; China's AI plan was a plan not a demonstration of technological superiority.

More important than the mechanics of Sputnik itself, the surrounding world has changed in the past sixty years, and Cold War era logic and analogies do not travel well. A unique event in American history, Sputnik occurred in the midst of an existential struggle between enemies who were both racing over nuclear capabilities that had the potential to obliterate the other side. While the U.S.-Sino relationship certainly has competitive dynamics, the U.S. is not engaged in an existential struggle with China as its main enemy, at least according to the U.S. official policy stance which states "the U.S. welcomes a strong, peaceful, and prosperous China playing a greater role in world affairs and seeks to advance practical cooperation with China."<sup>57</sup> Consider also the immense changes in the space landscape since Sputnik. Before 1990, over 70 percent of satellites were military satellites; as the two major actors, the U.S. and Soviet Union were responsible for over 90 percent of all space launches.<sup>58</sup> Now, based on the latest data from the Union of Concerned Scientists (UCS), only 20 percent of satellites are military satellites,<sup>59</sup> and the U.S. and Russia were responsible for only 32 percent of all space launches in 2017.<sup>60</sup>

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<https://breakingdefense.com/2017/11/our-artificial-intelligence-sputnik-moment-is-now-eric-schmidt-bob-work/>

<sup>54</sup>

<https://breakingdefense.com/2017/11/our-artificial-intelligence-sputnik-moment-is-now-eric-schmidt-bob-work/>

<sup>55</sup> <https://www.the-american-interest.com/2017/12/15/this-sputnik-moment/>

<sup>56</sup> <https://www.nationalreview.com/corner/enough-sputnik-moments-already-rand-simberg/>

<sup>57</sup> <https://www.state.gov/r/pa/ei/bgn/18902.htm>

<sup>58</sup> <https://warontherocks.com/2018/01/deterrence-last-sanctuary/>

<sup>59</sup> Author's own calculations, based on the UCS Satellite Database, which was last updated in August 2017. <https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.Wyu981MvxTZ>

<sup>60</sup> <https://warontherocks.com/2018/01/deterrence-last-sanctuary/>

Indeed, the danger of the AI-Sputnik meme comes from its attempt to map Cold War dynamics into a context that no longer fits.

In fact, the Sputnik analogy does provide insights into the current AI landscape, but rather than confirming technonationalist narratives, it is instructive about the dangers of technonationalist impulses. In what has been described as “the most comprehensive history of space activity written to date,” *The Heavens and the Earth*,<sup>61</sup> the historian Walter McDougall makes a persuasive case that Sputnik presaged a troubling U.S. turn to “technocracy,” which he defines as “the institutionalization of technological change for state purposes.” In studying the large public outcry after Sputnik, two things become clear according to McDougall: first, pundits exaggerated the danger of the Soviet satellite in order to leverage public support for their own agendas; second, journalists themselves were as ignorant of the importance of Sputnik as the public and had to educate themselves even as they reported on the issue.<sup>62</sup>

Politicians and industry leaders also co-opted Sputnik for their own interests. Senate Majority Leader Lyndon B. Johnson’s aide, George Reedy, wrote Johnson a memo which contained lines such as, “It really doesn’t matter whether the satellite has any military value. The important thing is that *the Russians have left the earth and the race for control of the universe has started*” (Reedy’s emphasis),<sup>63</sup> and “The issue [Sputnik] is one which, if properly handled, would blast the Republicans out of the water, unify the Democratic party, and elect you President.”<sup>64</sup> Despite President Dwight Eisenhower’s attempts to quell the rise of the military-industrial complex — Eisenhower created NASA in 1958 partly to prevent the armed services from “parlaying the Sputnik craze into the militarization of space”<sup>65</sup> — the publicly available military budget for space exceeded NASA’s in 1980. This occurred for the first time since the Apollo program, which was endorsed by McNamara to appease the aerospace industry, another group that benefited greatly after Sputnik. By 1960, the U.S. government funneled 35 percent of national R&D spending into aerospace despite the fact that the industry accounted for only 4 percent of the total value-added by U.S. manufacturing.<sup>66</sup> Thus, the turn to mobilizing the total resources of the nation for technology as an end in and of itself was pushed by groups pursuing their own interests.

Similarly, the desire to compete with China’s technocratic approach is a motivating factor behind the AI-Sputnik meme. In some respects, China’s approach toward AI development, which emphasizes university-industry-government integration (find source for this - in education space) mirrors calls by Webb for the forging of a “university-industry-government complex” for Space Age systems.<sup>67</sup> But policymakers who want the U.S. to respond to China’s AI development by adopting China’s approach should be careful what they wish for. The extension of effective technocracy may lead to a totalism that wields complete control over society with

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<sup>61</sup> I thank Miles Brundage for pointing me toward this text. Give full citation of the book

<sup>62</sup> Page 142, of *The Heavens and the Earth*

<sup>63</sup> [www.slate.com/articles/news\\_and\\_politics/war\\_stories/2011/01/obamas\\_sputnik\\_moment.html](http://www.slate.com/articles/news_and_politics/war_stories/2011/01/obamas_sputnik_moment.html)

<sup>64</sup> Pg. 149 *Heavens and Earth*

<sup>65</sup> Find page number from *Heavens and Earth*

<sup>66</sup> pg. 437

<sup>67</sup> Pg. 381o

technology.<sup>68</sup> China's efforts to use AI systems to strengthen censorship, build a AI-enabled social credit system, and boost surveillance of dissidents and minority groups with facial recognition systems represents what a more expansive technocracy could lead to.<sup>69</sup>

Indeed, McDougall's warning about the dangers of the post-Sputnik technonationalist turn resonates today:

*"The social mechanisms required to tap the full technological potential of a nation, particularly in the context of cold war competition, mean we have to pay a price for our advances in science and technology and the price is usually a sacrifice in human values. I believe it is inevitable, as long as international competition is the primary engine moving history, and technology is brought to bear in the competition, that we will move more and more toward management of people by a huge bureaucracy, by technocracy."*<sup>70</sup>

## Alternatives to Technonationalist Frames

Memes like the AI-Sputnik and U.S.-China AI arms race are, in the best light, driven by simplistic technonationalist assumptions that are neither grounded in cross-time, cross-country comparisons nor cognizant about the increasing importance of transnational actors. In a worse light, proponents of these memes are aiming to benefit their own interests in pushing countries like the U.S. in the direction of technocracy, potentially at the expense of us all. These strategies could very well backfire through one of two channels. First, there's no guarantee that technonationalist policies are successful at spurring AI development. It is still early days for the core AI and AI-related industries and there are warning signs that aspects of China's approach to AI development could be counterproductive. Duplication of efforts by local governments, a trend in the Chinese robotics industry, has led to overcapacity and enormous amounts of wasted spending.<sup>71</sup> A similar story could unfold in the AI industry, as local governments have rolled out AI plans, which have a combined benchmark for the core AI industry of almost triple the national target set by the State Council. Moreover, the MoST designated AI as a megaproject, a type of top-down allocation of funds for science research that has been criticized for leading to rent-seeking and bureaucrats picking their favorites, which could trade off with bottom-up approaches that reward those doing the most innovative science.<sup>72</sup> In the second channel, U.S. reactions that escalate technonationalist dynamics, in the same vein as banning space cooperation with China, could compel China to devote even more effort to be less dependent on the U.S. and seek other partners, as was the case with manned spaceflight.<sup>73</sup>

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<sup>68</sup> Pg. 447

<sup>69</sup> (get sources for all of this)

<sup>70</sup> From a book review, new york times, need to track down the actual page number in the book

<sup>71</sup> [https://www.merics.org/sites/default/files/2017-09/MPOC\\_No.2\\_MadeinChina2025.pdf](https://www.merics.org/sites/default/files/2017-09/MPOC_No.2_MadeinChina2025.pdf)

<sup>72</sup> Deciphering China's AI dream

<sup>73</sup> <https://tribunecontentagency.com/article/china-and-the-u-s-a-clash-of-techno-nationalists/>

Admittedly, it's easy to criticize policies and assumptions; it's much harder to provide solutions. While the bulk of the report is dedicated to outlining deficiencies in various version of technonationalism, the report concludes by offering three lens to reframe the conversation about technonationalism and China's AI development.

## 4. Taking Technoglobalism Seriously

The focus on the effect of nations on technology misses the significant, independent effects of technology itself. Most scholarship on the intersection of AI and politics emphasizes how political circumstances (e.g. structural economic forces, interstate competition) will affect AI, while neglecting consideration of how AI itself will affect politics. While technoglobalism does not tell the whole story, throughout history, the impacts of revolutionary technologies have disrupted the conduct of relations between nations, often binding them more closely together in different ways.

The telegraph certainly revolutionized interactions between peoples, dropping communication times between Britain and India from six months in the 1830s to the same day in the 1870s.<sup>74</sup> However, electronic telegraphy also presented significant coordination problems, such as one described by Ruggie concerning what happened to messages when they reached a border.<sup>75</sup> Eventually, the European communications complex evolved from a series of bilateral treaties into several multilateral arrangements and, finally, into the International Telegraph Union (ITU).<sup>76</sup> The ITU was the first standing intergovernmental organization, representing “the rise of permanent institutions of global governance”.<sup>77</sup> This trend holds for other technologies as well; Murphy notes that a new generation of international organizations emerged as a regulatory response to revolutionary communication technologies, citing the ITU, the Radiotelegraph Union in 1906, and the International Telecommunications Satellite Organization in 1964.<sup>78</sup> But the ITU set the precedent for the shape of multilateral arrangements to come: it codified rules of the road regarding the network of telegraph lines connecting Europe (and later the world), it established a permanent secretariat to administer those rules, and it convened periodic conferences to review the rules.<sup>79</sup>

While there were concrete effects of communication by telegraph – e.g. diplomats could send and receive messages without long delays– the intangible effects of virtually instantaneous communication may be more significant. Buzan and Lawson argue that the telegraph created a qualitatively different interaction capacity, linked peoples in a more intensely connected global

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<sup>74</sup> Buzan and Lawson 2013

<sup>75</sup> Ruggie 1993

<sup>76</sup> Ruggie 1993

<sup>77</sup> Buzan and Lawson 2013

<sup>78</sup> Murphy 1994

<sup>79</sup> Ruggie 1993

economy, and generated a “19<sup>th</sup> century discourse” that shrank the world and allowed humanity to view themselves as one global body.

In certain respects, AI technologies have the potential to bind nations more closely together. One example is in the realm of translation. Within just the past three years, AI techniques have resulted in significant leaps forward in machine translation. In 2016, Google Translate overhauled its phrase-based statistical machine translation system with one based on a neural network, resulting in “overnight improvements roughly equal to the total gains the old one had accrued over its entire lifetime” (a decade).<sup>80</sup> In March 2018, researchers from MSRA and Microsoft’s lab in Redmond announced that they had achieved human parity on automatic Chinese to English news translation.<sup>81</sup> Momentum is not slowing down any time soon. Per analysis of Arxiv.org research papers by Slator, neural machine translation output hit record highs in April 2018.<sup>82</sup>

Since the nuances of language are ever-shifting and reliant on a broad and deep source of historical and cultural knowledge, machine translation may never be completely “solved”; still, significant improvements in machine translation is already making an impact on supply chains and productivity gains in the business world.<sup>83</sup> Similar to other technologies, AI applications like machine translation could significantly slash the cost of transmitting information internationally by lowering transaction costs. For instance, a working paper has argued that the rise of Internet technologies helped propel the disaggregation of the state and the rise of transgovernmental networks as significant forces in international governance.<sup>84</sup>

Machine translation could shrink the world in a variety of ways. First, a limited, specific example. The 2017 USTR report on foreign trade barriers contained a section on how China has not made available translations of all its trade-related laws, regulations, and other measures in one or more of the WTO languages.<sup>85</sup> This gap in translations of Chinese regulations could be largely mitigated by improvements in machine translation. Second, similar to Internet technologies, machine translation could also lead to a marked reduction in international communications, leading to a more integrated global system. Finally, similar to the second effect of the telegraph outlined by Buzan and Lawson, improvements in machine translation could enable humanity to view themselves more as one global body, as people have more widespread access to popular works from other countries.

Another aspect of taking technoglobalism seriously is to interrogate the innovation-exceptionalism framing of many technonationalist accounts. In fact, to a large extent,

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<sup>80</sup> <https://www.nytimes.com/2016/12/14/magazine/the-great-ai-awakening.html>

<sup>81</sup>

<https://www.microsoft.com/en-us/research/publication/achieving-human-parity-on-automatic-chinese-to-english-news-translation/>

<sup>82</sup>

<https://slator.com/technology/google-facebook-amazon-neural-machine-translation-just-had-its-busiest-month-ever/>

<sup>83</sup> I’ve benefited in my own work with the ChinAI newsletter. Google Translate gets you 90% of the way and you only have to adjust the final 10%.

<https://slator.com/technology/google-facebook-amazon-neural-machine-translation-just-had-its-busiest-month-ever/>

<sup>84</sup> IR colloquium research paper, one of co-authors is Snidal

<sup>85</sup> <https://ustr.gov/sites/default/files/files/reports/2017/NTE/2017%20NTE.pdf>

countries share technologies in a global pool, and nations acquire more new technology from abroad than they innovate themselves.<sup>86</sup> Global technological sharing, between rich countries, and between rich and poor, has been the norm. Technology transfer between rich and poor countries, which has been a much maligned aspect of U.S.-China relations, is actually much less significant than the movement of technologies between rich countries. For instance, the bilateral technology flows between Britain and France in the 20<sup>th</sup> century may have been much more significant than those between Britain and India, and there were extraordinary flows of technological knowledge across the Atlantic in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries.<sup>87</sup>

This is the case for strategic technologies as well. Germany was where the internal-combustion-powered motor-car was first invented but the U.S. became the dominant producer by 1914; the powered airplane was first innovated in the U.S. by the Wright brothers in 1903, but Britain, France, and Germany had much larger air fleets by 1914.<sup>88</sup> Even strictly military technologies are no exception. As Edgerton points out, “Despite the Cold War, and intense national efforts to develop national technology, in the 1950s the United States, Britain and the Soviet Union shared a remarkable amount of technology, aside from captured German technology. The multinational atomic bomb project became more multinational still, not because of scientific or technological internationalism, but because of espionage by political internationalists. They helped ensure that the Soviet Union made a near copy of the plutonium bomb in 1949.”<sup>89</sup>

## 5. Technohybridism

Techno-hybridism offers a much better lens to analyze China’s approach to advanced technologies. Higgins defines the aim of China’s techno-hybridism as “the construction of hybrid firms that are both Chinese and foreign in ownership structure via alliance mechanisms that allow Chinese state leaders to appropriate value from network and ecosystem collaboration, coordination, and embeddedness, rather than from industry or sectoral monopolisation.”<sup>90</sup> What Higgins deems “new alliance capitalism” is able to account for the powerful role of multinational firms in high-tech industries; for example, in the development of the Chinese 4G TD-LTE standard, there were actually more foreign firms involved in the process than domestic ones (including Google, Samsung, and Motorola).<sup>91</sup>

Douglas Fuller has identified Taiwan’s development model as one based on technohybrid tactics.<sup>92</sup> In the sector of integrated circuits, Taiwan has leveraged international linkages, including the acceptance of foreign multinational companies in strategic sectors and deals with significant foreign backing, to create strategic suppliers in the pure-play foundry sector.

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<sup>86</sup> Edgerton shock of the old

<sup>87</sup> Shock of the Old

<sup>88</sup> Shock of the Old

<sup>89</sup> This whole technology sharing is very Edgerton-centric, need to rewrite significantly or potentially cut

<sup>90</sup> Higgins, 2014

<sup>91</sup> Kuawk, Lee, and Chung, 2012

<sup>92</sup> Technology Transfer between the U.S., China, and Taiwan (Fuller and Robinstein)

Need to do: include section on integrated, global supply chains, emphasize the context of AI (uniqueness of modularity); include notes from Reuters article: "Exclusive: U.S. considers tightening grip on China ties to corporate America"; include stuff from this paper [http://www.aies-conference.com/wp-content/papers/main/AIES\\_2018\\_paper\\_163.pdf](http://www.aies-conference.com/wp-content/papers/main/AIES_2018_paper_163.pdf) in the dangers of an AI arms race section; add stuff from here for more of the backlash bit - <https://www.wired.com/story/america-china-ai-ascension/> ; interesting Reuters article to unpack: <https://www.reuters.com/article/us-usa-china-techinvesting-insight/chinas-penetration-of-silicon-valley-creates-risks-for-startups-idUSKBN1JP08V>

## 6. Country-specific Modules of Technonationalism

Lastly, technonationalism is not going to go away, so we should be better at specifying country-specific modules of technonationalism. Again, history offers a useful lens to frame this argument. From the end of the 19th century to the end of the First World War, both Germany and the United Kingdom demonstrated significant adherence to technonationalist principles: the race over ships, airships, and airplanes involved large public celebrations over technological advances.<sup>93</sup> However, based on an analysis of how prominent pilots were idolized in the public sphere, Reiger concludes that Germany's emphasis on technology's national importance possessed more aggressive traits than did the outlook in the UK, which conceived of their nation's pursuit of technological leadership in defensive terms.<sup>94</sup> Technonationalism in Germany and the UK interacted with gender issues. As Reiger points out, German aviatrixes found it much more difficult to rise to national prominence than their British counterparts, who confronted less rigid notions of masculine toughness, a product of the varying gender concepts that informed debates about aviation in the two countries.<sup>95</sup>

For China's approach to AI development, it appears that Chinese ethnicity is an important factor in strategic discussion of AI. Those of Chinese origin, regardless of their current citizenship, are looped into a Chinese "commonwealth" of sorts. Articles about top talents in the AI space, reports from major organizations like Kai-fu Lee's Sinovation focus on 华人 (ethnic Chinese) who may be foreign citizens. This links with a widening body of studies of how the Chinese nation attempts to shape and is shaped in turn by overseas Chinese and Chinese diaspora communities.

Rather than merely assessing the degrees of techno-nationalism, this turn toward understanding the kinds of technonationalism opens up space for deeper investigations into technology-society relations, as well as how gender, ethnicity, ideology, and history affect the driving forces behind China's pursuit of AI.

## Feedback from GovAI Seminar (8.29.19)

Better to say "extreme" forms of techno-nationalism; I can have this belief but not have it related to the ideology of my country

Public being more technonationalist

Is it kinda like feminism -- it's a set of beliefs -- I'm interested in a set of people

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<sup>93</sup> Reiger book: Technology and the Culture of Modernity in Britain and Germany, 1890-1945

<sup>94</sup> Reiger book

<sup>95</sup> Reiger book

**European view: there is an enormous debate about European strategic autonomy on everything (e.g. military, tech)**

- **Should we be talking about sovereignty instead?**
- **There's something here to study on Europe --** Ulrike wants to be there on the research side
- EU is thinking in certain things

Where is the world currently going?

- There is extreme criticism of globalization in general, especially in tech
- I'm very counter-trend
- **Double down on when techno-nationalism makes sense-- I could think of a way of writing it in a way that makes sense**
- **Smarter techno-nationalism --** using tech policy to strengthen the nation
- **Some slippage with techno-nationalism --** acting like a cosmopolitan actually helps being techno-nationalism
- Superiority vs. autonomy: you want to be autonomous to check against
  - Linking the superiority concept all the way through: **not sure whether we like promoting the superiority claim -- by cooperating with allies**

Technonationalism and not techno-nationalism

Technonationalism vs. protectionism ---

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