



# Foreign STEM Talent is the Key to Future U.S. Competitiveness

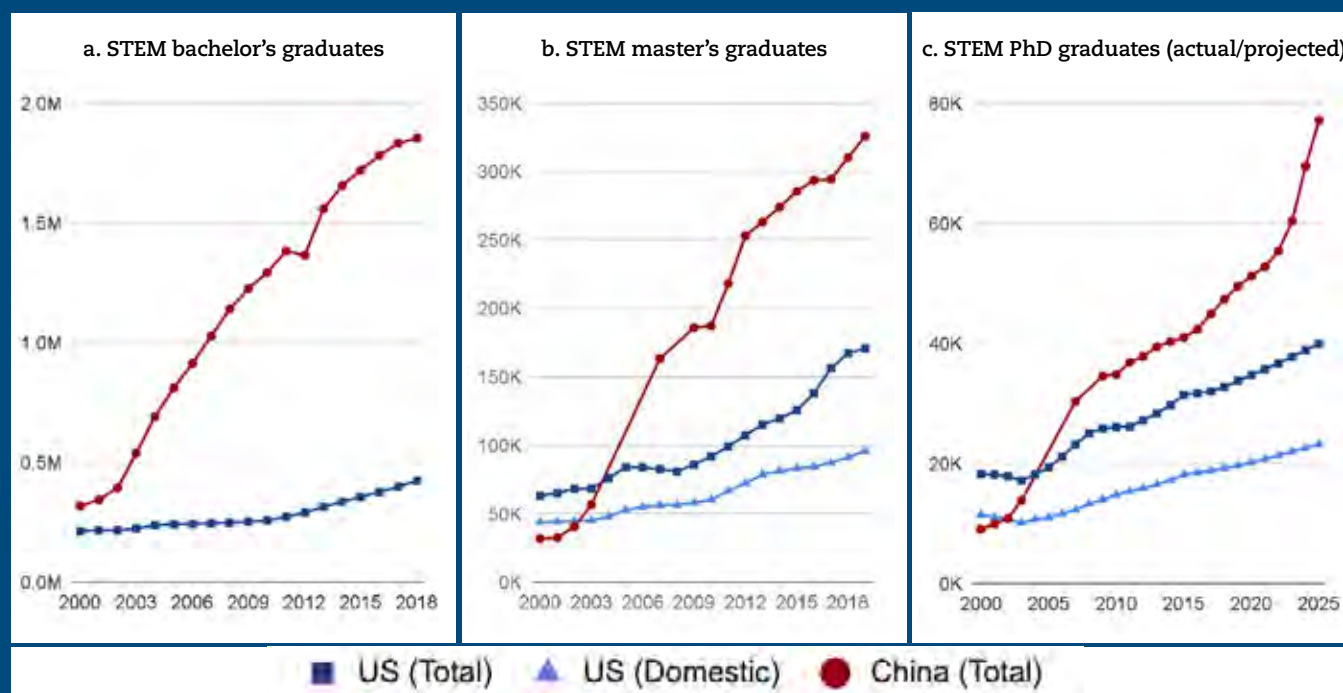
Helen Toner

U.S. technological leadership in the second half of the twentieth century did not derive only from federal government investments in research and development, nor from the relatively large and well-educated U.S. population. What really gave the United States an edge was the uniquely high proportion of the world's best STEM talent that chose to make this country their home, drawn by America's political freedoms, high standard of living, world-leading research universities, and favorable corporate environment. Scratch the surface of any major U.S. technological achievement and you will find immigrants involved. Since 1901, almost half of the world's Nobel Laureates have been U.S.-based scientists, about 10 times more than the size alone of the U.S. population would predict; in turn, immigrants represent a third of the U.S.-based laureates, also a disproportionately large share.<sup>1</sup> Immigrants are even more over-represented among successful entrepreneurs: more than half of U.S. startups valued at over \$1 billion have an immigrant founder, as do more than half of the Forbes 2019 list of "most promising" artificial intelligence startups.<sup>2</sup>

In other words, for much of the twentieth century the combination of U.S. homegrown talent and highly-skilled immigrants added up to a significant scientific and technological advantage for the United States. This advantage is now eroding. As technological competition with China heats up, the United States must recognize high-skill immigration as the core national security issue that it is.

China, long home to the world's largest population but lacking economic and educational clout, has now come into its own as a technological power. Leveraging science and technology to boost national power has long been a major component of Chinese government planning documents, and in the 2010s these efforts began to bear fruit. Many of China's flashier achievements, including high-speed rail, monkey cloning, and 5G dominance, have drawn international attention. At least as important, however, is the underlying infrastructure that has powered these achievements, such as its increasingly capable education system.

China has made and continues to make major, sustained investments in its education system, including in higher education. The result is that China now vastly outproduces the U.S. in STEM graduates each year at the bachelor's, master's, and doctorate levels (Figure 1). The rise of high-end doctorate education, and its associated R&D, is the result of deliberate actions by the Chinese government. For example, at the government's behest, more than 1,300 new PhD programs were created between 2003 and 2007, producing a spurt of new home-grown Chinese research scientists.<sup>3</sup> Higher education spending by the Chinese Ministry of Education roughly doubled in the years between 2012 and 2021, supporting a large increase in enrollments.<sup>4</sup> Figure 1c combines data on current enrollment patterns with historical graduation rates to project how this will lead to another huge increase in STEM PhD graduates by 2025.

**FIGURE 1**

Source: Remco Zwetsloot, “Winning the Tech Talent Competition” (Center for Strategic and International Studies, 2021).

What these charts make clear, in addition to the success of Chinese educational reforms, is how indispensable foreign STEM graduates are for the United States. Improving U.S. domestic education is often raised as an alternative to increasing high-skill immigration. These charts make plain how untenable that strategy is. Make no mistake: building a modern, equitable education system for American-born students is an urgent priority. But no matter how highly we prioritize education reforms, or how successfully we improve outcomes for domestic students, this alone cannot compensate for the U.S.-China discrepancy in STEM talent. This should not be a surprise: China’s population is more than four times larger than the United States’, and it still has room to grow before it reaches U.S. per capita education levels. It is inescapable that as the Chinese education system grows and matures enough to provide opportunities to Chinese students, the United States will only be able to keep up by drawing talent from all around the globe.

Fortunately, the United States is in the enviable position of being a highly desirable destination for top scientists and engineers. Surveys show that around 60 percent of international scientists say they would consider moving to the United States, versus only around 10 percent who would consider China.<sup>5</sup> Immigrants are drawn by the political freedoms and high standard of living enjoyed by U.S. residents, as well as by the prospect of joining world-leading research groups at U.S. universities and working for (or starting) innovative U.S. companies. What’s more, China recognizes this dynamic as a major threat to its technological plans: complaining, for instance, that “the number of top talents lost in China ranks first in the world.”<sup>6</sup>

Against this backdrop, current U.S. immigration policies amount to shooting ourselves in the foot. Numerical caps, unclear requirements, increasingly lengthy processing times, and other problems are both a barrier and a deterrent to top STEM talent deciding to move to the United States. With countries such as Canada and the United Kingdom revising immigration rules to better attract these immigrants, it becomes even more urgent for the United States to keep up.

High-skill immigration has been in political stalemate for decades, with both parties agreeing it is valuable to the United States, but holding the issue hostage to immigration reforms with less bipartisan consensus. This approach was always questionable, but now that it is clear how important STEM talent is for technological competition with China, further inaction is unconscionable. Although executive authority can make some changes, congressional

action is required to achieve reforms of the scale necessary to meet the challenge at hand. At the time of writing, the reconciliation bill moving through Congress contains provisions that would meaningfully ease the barriers to STEM talent staying in the United States. If passed, these measures should be seen not only as an enormous economic boon, but also as a major national security victory. If, on the other hand, these provisions are watered down or dropped, then seeking alternate avenues to exempt STEM advanced degree holders from green card caps, create a statutory student-to-worker visa pathway, or otherwise ease the process of coming to—and staying in—the United States must become a major priority. The options are many; what is lacking is a broad acknowledgment of the urgency of the problem, particularly in Congress.

Washington already understands the critical role of science and technology in strategic competition with China. Bills such as the United States Innovation and Competition Act would provide a needed boost to research funding, research security, and other areas. But if these initiatives neglect the vital part played by human capital—and fail to fix long-standing problems with U.S. STEM immigration policy—other measures will be in vain.

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**Helen Toner** is Director of Strategy at Georgetown University's Center for Security and Emerging Technology (CSET).

- <sup>1</sup> Fanni Farago and Michele Waslin, "Leading through Creativity and Innovation: The 2020 Nobel Laureates, MacArthur and Schmidt Science Fellows, and Immigrant Scientists in Search of a COVID-19 Vaccine" (George Mason University, December 2020), [https://d101vc9winf8ln.cloudfront.net/documents/37892/original/Nobel\\_Prize\\_Paper\\_2020\\_FINAL\\_12.8.20.pdf](https://d101vc9winf8ln.cloudfront.net/documents/37892/original/Nobel_Prize_Paper_2020_FINAL_12.8.20.pdf); for immigrants as share of U.S. population, see Abby Budiman, "Key Findings about U.S. Immigrants," *Pew Research Center*, August 20, 2020, <https://www.pewresearch.org/fact-tank/2020/08/20/key-findings-about-u-s-immigrants/>.
- <sup>2</sup> Stuart Anderson, "Immigrants and Billion-Dollar Companies" (National Foundation for American Policy, October 2018), <https://nfap.com/wp-content/uploads/2018/10/2018-BILLION-DOLLAR-STARTUPS.NFAP-Policy-Brief.2018.pdf>; Tina Huang, Zachary Arnold, and Remco Zwetsloot, "Most of America's 'Most Promising' AI Startups Have Immigrant Founders" (Center for Security and Emerging Technology, October 29, 2020), <https://cset.georgetown.edu/publication/most-of-americas-most-promising-ai-startups-have-immigrant-founders/>.
- <sup>3</sup> Remco Zwetsloot et al., "China Is Fast Outpacing U.S. STEM PhD Growth" (Center for Security and Emerging Technology, August 5, 2021), <https://cset.georgetown.edu/publication/china-is-fast-outpacing-u-s-stem-phd-growth/>.
- <sup>4</sup> Zwetsloot et al.
- <sup>5</sup> Remco Zwetsloot, "Winning the Tech Talent Competition" (Center for Strategic and International Studies, October 2021), <https://www.csis.org/analysis/winning-tech-talent-competition>.
- <sup>6</sup> "2013 中国海创周在大连举行 吸引留学人员回国" ["2013 China Overseas Scholar Innovation Summit took place in Dalian, attracting overseas students to return home"], *新浪 [Sina]*, June 28, 2013, <http://dl.sina.com.cn/news/s/2013-06-28/09557339.html>.