Here to Stay: Where the United States Stands in the International Competition for STEM Talent

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Abstract

Today, the United States is a top destination for international students pursuing doctoral degrees in STEM fields. Contrary to some claims, the vast majority of these students choose to stay in the United States after graduation. This ability to attract and retain top talent gives the United States a significant advantage. However, the country risks losing this edge if it fails to reform its immigration process to keep up with other countries.

International graduate students are among the most mobile and highly skilled migrants in the world, and demand for their expertise is growing as emerging technologies reshape the global economic and security landscape. The United States remains a top destination for these scholars, awarding tens of thousands of PhDs in STEM fields to foreign nationals every year.

Contrary to fears of a "reverse brain drain," research suggests that a large majority of these students stay in the United States after graduation, founding promising companies, strengthening the domestic innovation ecosystem, and contributing to society at large. However, without reforms to its immigration system, the United States risks losing more of these experts to other countries in the future.

International STEM PhDs in the United States

Countries that hope to lead in high-tech industries like artificial intelligence (AI), microelectronics, and synthetic biology must have access to a robust and well-trained workforce. PhDs represent a small but critical part of that talent pool, leading research efforts that push the boundaries of their respective fields and educating the next generation of scientists, technologists, and entrepreneurs.

Today, many of the best and brightest prospective PhDs from around the world flock to US universities, where they make up a significant share of the country's doctoral recipients. Between 2000 and 2017, approximately 208,000 foreign nationals graduated from US universities with doctoral degrees in STEM fields (life sciences, physical sciences, medical sciences, computer science, mathematics, and engineering), accounting for roughly 42 percent of the STEM PhDs who graduated during that period. About two-thirds of these international students come from just five countries and regions: China (36 percent), India (14 percent), Iran (6 percent), South Korea (5 percent), and the European Union (5 percent).

Foreign nationals are far more likely to pursue STEM degrees than their American counterparts: About 70 percent of international PhD students study STEM compared to

just 34 percent of domestic students. In certain fields—such as computer science, engineering, and mathematics—foreign students consistently make up the majority of the national graduating class.

International STEM Graduates Tend to Stay in the United States

In recent years, the large number of international students in the US university system has fueled concerns among some policymakers that the country suffers from "reverse brain drain." Today, they believe, many foreign-born graduates—particularly Chinese nationals—return to their home countries and use their skills to support efforts that undercut US economic and security interests. However, we and our colleagues at Georgetown University's Center for Security and Emerging Technology (CSET), along with others, have found the large majority of international students remain in the United States long after obtaining their degrees. Chinese STEM students are in fact more likely to stay than almost any other student category.

Broadly speaking, there are two ways to measure "stay rates" among foreign nationals: intention-to-stay rates, which measure how many students plan to stay in the United States upon graduation, and long-term stay rates, which count graduates who still live in the country after a certain period of time. Regardless of metric, however, stay rates among international STEM PhDs in the United States are high.

Looking at the latest data from the National Science Foundation's (NSF) annual Survey of Earned Doctorates (SED), we found that between 2012 and 2017, the intention-to-stay rate among foreign nationals who specialized in STEM was 82 percent (compared to 72 percent for all international graduates). Across all STEM fields, intention-to-stay rates have either held steady or increased since 2000.

Data on long-term stay rates suggests that the actual behavior of foreign graduates aligns with their intentions. A CSET analysis of data from the NSF's 2017 Survey of Doctorate Recipients (SDR) found that approximately 76 percent of foreign nationals who earned STEM PhDs from US universities between 1998 and 2015 were living in the country in February 2017. While more recent graduates were the most likely to reside in the United States, the stay rate among those who graduated 10 years or more before the survey was still about 75 percent. (An initial analysis of responses to the 2019 SDR showed no significant change in stay rates—a forthcoming CSET report will explore this data further.) Using a different dataset of PhD graduates specializing in artificial intelligence, another CSET study found five-year stay rates higher than 80 percent.

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Stay rates vary significantly by nationality. Roughly 90 percent of graduates from China and India intended to stay in the United States after graduation, compared to about 65 to 75 percent of those from the European Union, Canada, Turkey, and elsewhere. Long-term stay rates among Chinese and Indian graduates were also higher than average: More than 90 percent of Chinese nationals and 86 percent of Indian nationals who graduated from STEM PhD programs between 1998 and 2015 were residing in the country in February 2017. Early analysis of the 2019 SDR data found similar trends.

Looking Ahead: Will Stay Rates Decline?

But stay rates among international STEM PhDs are not guaranteed to remain as high as they are today. An individual's decisions to remain in or leave the country where they obtained their degree is influenced by a variety of factors, including the health of the economy and social and cultural ties to their home country. In the current US context, however, two factors are likely to drive down stay rates in the years ahead: immigration restrictions and increasing international competition for STEM talent.

Graduates are more likely to leave countries where they face high barriers to immigration, and in the United States, even those with in-demand skills can have trouble establishing long-term residency. A 2020 CSET survey of international AI PhDs found that more than half of those who left after graduation cited immigration issues as "extremely" or "somewhat" relevant to their decision. Even among those who stayed in the country, 60 percent reported facing significant difficulties with the US immigration system. These challenges are exacerbated for Chinese and Indian nationals—who account for roughly half of international STEM PhDs—due to country-based caps and large backlogs.

Other countries have capitalized on these inefficiencies in the US immigration process. For instance, Canada has made a concerted effort to draw immigrant talent across the border, and their efforts appear to be succeeding. Chinese observers similarly say that US immigration policies "have provided China opportunities to bolster its ranks of high-end talent." With backlogs and other issues increasingly bogging down the US immigration system while other countries invest in talent recruitment, there is a significant chance that more US-educated STEM PhDs will take their talents abroad in the future.

As technology transforms the geopolitical and economic landscape, leaders across the globe view STEM talent as a critical national asset. Chinese President Xi Jinping has called it "the first resource" for "independent innovation," and the Biden administration has said "win[ning] the race for talent" is necessary to "succeed[ing] in a competitive world." Today, one of the United States' biggest advantages in that race is the thousands of students who flock to the country every year to pursue STEM doctorates, most of whom stay in the country long after graduating. However, amid heated debates about immigration reform, it remains to be seen whether the United States will maintain or lose that edge. ◢

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