

To Stay or Not To Stay: The Calculus for International STEM Students in the United States

JANUARY 4, 2017 FEATURE | By Luka Klimaviciute

With the demand for specialists in science and technology booming, many countries recognize the value of college degree holders in these fields. As the top global destination for international students, the United States stands to benefit economically from their skills, given it faces its own labor shortages in select science, technology, engineering, and math (STEM) fields. At the same time, other advanced economies are stepping up their efforts to recruit highly skilled graduates from abroad—in some cases targeting those educated in the United States.

In order to permit STEM students to pursue work in the United States after graduation, the U.S. government has taken steps to make it easier for them to stay. But will these initiatives be enough? Though two-thirds of international STEM students educated in U.S. higher education institutions remain in the country after graduation, the United States is no longer perceived as economically powerful as it once was. Given that other countries provide easier paths to permanent residence, the United States might consider incentivizing students to stay, not only immediately after graduation but also later in their careers. This article provides an overview of the international STEM student population in the United States, evaluates labor market gaps for STEM jobs, and explores how these students perceive life in the United States, in order to assess whether policy initiatives might motivate them to stay.

Overview of STEM Students in the United States

There were more than 1 million international students in the United States in the 2015-16 school year—a record level and a 7 percent increase over the previous year. This includes nearly 150,000 participating in Optional Practical Training (OPT) following completion of their studies. International students made up 5

Definitions

The term STEM—which stands for science, technology, engineering, and mathematics—was coined in 2001 by Judith A. Ramaley, a former Director at the National Science Foundation. The U.S. Census Bureau and other

percent of the more than 20 million students overall in U.S. higher education. More international students study in the United States than in any other country, and the U.S. international student population is nearly twice that of the United Kingdom, the second top destination.

Of international students in the United States, 41.6 percent were enrolled in STEM fields, compared to 35 percent of all students at the undergraduate level and 22 percent at the graduate level.

International students are more prevalent in graduate STEM programs than undergraduate: one-third (10,000) of all STEM PhDs awarded in 2013 went to students from abroad, compared to 5 percent (roughly 16,000) of all STEM undergraduate degrees. In 2014, half of all foreign undergraduate STEM students came from China, Saudi Arabia, and South Korea. Chinese and Indian students comprised more than two-thirds of international graduate student enrollment in the United States, with Iran a distant third.

To Stay or Not To Stay

Many factors are involved in an international student's decision to stay or leave the United States after graduation, and the choice is not always clear. Forty-eight percent of international doctoral STEM students reported intending to remain after graduation, 12 percent said they wished to leave, and roughly 40 percent said they were undecided, according to a survey conducted in 2015 by Xueying Han and Richard P. Appelbaum. This sizeable undecided share raises a question about whether the United States will remain as popular a work destination in the future. Career opportunities play an important role in these decisions: there is an 87 percent likelihood that those who chose to study in the United States because of future job prospects will stay after graduation. Students find the United States especially attractive for work in the private sector or for start-ups—77 percent of those who said they wished to work for a company or launch their own business hoped to stay, compared to 68 percent who reported considering careers in academia, government, or nongovernmental organizations (NGOs). Students who intended to leave said family was the main reason for their decision.

International student perceptions of the United States are growing more negative, which could increase their chances of leaving. When asked in 2008, a majority of international STEM and business students enrolled in U.S. higher education institutions said the best days of the U.S. economy were behind it. Furthermore, the U.S. share of international student enrollment declined from 28 percent in 2001 to 22 percent in 2014. This is significant because 57 percent of all doctoral engineering degrees awarded in 2012-13 went to foreign graduates, and so did 53 percent of doctoral computer science degrees—two fields with labor shortages.

Still, international student enrollment in the United States has increased in absolute numbers because more students now study internationally than ever before. In addition, more international students are staying in the United States after graduation. In 2011, 64 percent of science and engineering PhDs (including those in the social sciences) had stayed in the United States for five to ten years after graduation, an 8 percentage point increase from 2001, according to Michael G. Finn from the Oak Ridge Institute for Science and Education. The share of doctoral students who remain in the United States declines slightly as they age, but more international

organizations commonly use the term as a catch-all for science and related disciplines. While some studies include social sciences in the STEM umbrella, this article defines STEM to include mathematics, engineering, biological, computer, and physical sciences, but excludes psychology and social and agricultural sciences.

Data on international students in the United States come from the Institute of International Education as well as the National Science Foundation and include currently enrolled students as well as those who remain on a student visa post-study for Optional Practical Training (OPT), a period that can span up to 36 months for some fields.

science and engineering doctorates are staying now than at any other point in the past 15 years. Even though the share of foreign students who choose U.S. colleges and universities has declined, the United States is now more appealing as a postgraduation home for those specialists who do decide to study there.

Labor Shortages and Surpluses

To determine whether the United States should incentivize more international STEM students to remain postgraduation, it is important to assess whether the U.S. economy needs them, and if so, in which fields and at what education levels. On the first point, the evidence is mixed. In 2012, the President's Council of Advisors on Science and Technology issued a report arguing that the U.S. labor market would need 1 million more STEM specialists by 2018 than were being produced at current rates. Yet, 74 percent of STEM college graduates did not work in a STEM occupation in 2014, the U.S. Census Bureau reported. Furthermore, of computer science graduates who do not work in information services, 32 percent reported they could not find a job relevant to their skills, according to the Economic Policy Institute. Based on such contradictory evidence, it is difficult to say whether the economy needs more STEM workers, or if incentivizing more international students to work in the United States would increase competition for already scarce jobs.

However, a more nuanced picture shows that labor shortages for some jobs do in fact exist. Massachusetts Institute of Technology (MIT) researchers examined individual STEM occupations instead of studying STEM graduates as a homogenous group. Based on data from 2010 to 2014, they found that labor shortages exist, but not in all STEM fields: in particular, the private sector lacks software developers, petroleum engineers, and data scientists. The government sector, too, has experienced shortages of nuclear and materials science engineers. These occupations require more than a bachelor's degree, explaining why some STEM graduates have difficulty finding a job. However, the MIT researchers reported a surplus of biomedical PhDs and the demand for physics PhDs is not very high. Therefore, immigration incentives might focus on the most-needed specialists: computer scientists and engineers.

Policy Framework for International STEM Students

In recognition of the role international STEM students play in the economy, current immigration policy already provides some pathways for these graduates to work in the United States. All international students are eligible for one year of Optional Practical Training (OPT) after they complete their studies, during which they can work in a job related to their area of study. Once the year ends, non-STEM graduates must find an employer willing to sponsor them for a work visa (for example, an H-1B visa) whereas STEM graduates are eligible for an OPT extension for up to 24 additional months. At the end of the extension, STEM graduates must receive a work visa to continue working legally.

However, even for the best and brightest, the path to long-term residency can be lengthy, expensive, and uncertain. For instance, H-1B visas are given out for a maximum of six years, during which time employees cannot switch employers without being reapproved for the H-1B status. Furthermore, the United States grants 85,000 H-1Bs each year (including 20,000 allotted for graduates with a master's degree or higher from U.S. universities), with a roughly one in three chance of receiving an H-1B based on the number of people who apply (for fiscal year 2017, U.S. Citizenship and Immigration Services received more than 236,000 such petitions).

Growing Competition Abroad

Slim chances of receiving an H-1B visa and the inability to switch employers without getting reapproved for the visa contrast with policies that favor STEM immigrants in other countries. In New Zealand, most skilled foreign workers apply for permanent residence through the Skilled Migrant Category, a points-based system where candidates can gain almost half the number of points required by having a job offer in a labor shortage field, most typically STEM. In October 2016 Australia announced that STEM master's and doctoral students will be given an additional 5 out of 60 points toward permanent residency. Australia has no quota for temporary skilled workers, and international students who possess critical skills can work in the country for up to four years after graduation. These policies, along with the depreciation of the Australian dollar, have helped increase the number of international students choosing to study in Australia.

A similar policy exists in Canada, where international students can stay for up to three years after graduation as long as they find a job. Creating a path from study to permanent residence helped Canada increase the share of foreign students as a percentage of all students, from just below 5 percent in 2000 to almost 10 percent in 2014; the United States by contrast has held steady at around 4 percent for the last 15 years. China also introduced notable reforms. Whereas a worker's permit in China typically lasts one year, the R visa for talented workers (often researchers and engineers) grants permission to stay in the country for up to five years. China also provides resettlement subsidies through the Thousand Talents Plan (TTP), intended to help fill China's labor shortages in highly skilled occupations. The TTP was initially aimed at recruiting 2,000 skilled professionals within five to ten years, but ended up bringing 4,180 highly skilled workers to China in the first six years, one-third of whom have become permanent residents.

Some countries have gone so far as to actively recruit graduates from top U.S. universities by offering alternatives to the complex U.S. visa system. Switzerland, for example, set up a "science consulate" near MIT and Harvard to promote Swiss firms directly to students. Other countries are launching start-up visas—an immigration route particularly relevant to technology workers. In 2013, Canada launched one of its own, which Citizenship and Immigration Minister Jason Kenney said in part targets entrepreneurs "stuck on temporary visas" in the United States. Chile, too, launched a competition where start-up CEOs compete for capital, office space, and a permit for one year of residence, subject to extension based on the company's performance. Since its launch in 2013, this initiative has attracted more than 1,000 entrepreneurs to Chile—including dozens of international graduates of U.S. schools who have founded at least 47 companies.

As other countries increasingly compete for highly skilled migrants, should there be any cause for concern in the United States? Beyond filling labor market demands, STEM graduates also help the United States remain one of the most innovative countries in the world. The World Bank estimates that for every 10 percent increase in the number of foreign graduate students in the United States, university patent grants increase by 6.8 percent and nonuniversity patents by 5 percent. The United States therefore risks becoming less innovative if fewer STEM students choose it as a study and work destination.

Policy Responses

Recognizing the value of international STEM students to the economy, as well as the growing competition for these specialists abroad, the U.S. government created two incentives for more STEM workers to enter the labor market. In March 2016, the Obama administration increased the STEM OPT extension from 17 to 24 months and expanded the list of eligible study majors. In addition, STEM specialists now can also apply for an extension based not only on the degree they received most recently, but on their previous degrees as well. Furthermore, the Department of Homeland Security proposed the International Entrepreneur Rule in August 2016, which, though still under review, would function similarly to a start-up visa. Under this program, those who launch start-ups that raise \$345,000 from U.S. investors or \$100,000 from the government would be eligible for admission into the country and a two-year stay, subject to a three-year extension based on the company's performance.

Are these incentives appropriate given the current economic outlook? The expansion of fields eligible for OPT extension reflects the reality that students in other majors can develop the skills required to perform well in STEM occupations. This change enables students from a wider range of majors to gravitate toward jobs that most need their skills. The International Entrepreneur Rule, too, serves as a response to growing incentives for start-ups abroad.

However, the OPT extension does little to alleviate students' concerns about staying in the United States long term, particularly regarding the difficulty of securing a visa. In 2008, the majority of the 1,224 international students surveyed by Vivek Wadhwa and his coauthors were either somewhat or very concerned about obtaining a work visa. The extension applies equally to computer science and engineering students, whose skills the economy needs the most, and physical science and biomedicine students, whose skills are in lower demand. Finally, the fastest-growing companies in the United States are funded by personal savings, bank loans, or credit cards, according to the Kauffman Foundation. Therefore, the International Entrepreneur Rule, with its requirement for significant outside investment, may not be helpful to the start-ups likely to generate the most revenue.

Looking Ahead

While competition for STEM specialists is growing abroad, the number of international students in the United States continues to increase, and more science and engineering doctoral graduates are choosing to stay than at any point over the last 15 years. The difficulty is transitioning these students from their universities to long-term work in fields where labor shortages exist. Most of these jobs require advanced degrees in computer science and engineering, so policymakers might consider changes to immigration policy if they seek ways to prioritize these specialists.

With jobs in computer science and engineering projected to grow, labor shortages are likely to persist unless more STEM specialists are trained domestically or brought into the country. In the long run, incentivizing more American students to major in STEM fields could lead to an economic strategy that is less dependent on foreign workers. Given growing concerns over protecting jobs for domestic workers in the United States and abroad, this strategy could also be the most feasible politically. Recognizing highly skilled immigrants as agents of economic growth and innovation could help advance policy changes that benefit both international STEM

students and domestic employers. In the short run, STEM graduates will continue to provide a valuable source of skills and innovation for the U.S. economy, at least until their visas expire.

Sources

Chellaraj, Gnanaraj, Keith E. Maskus, and Aaditya Mattoo. 2008. The Contribution of International Graduate Students to U.S. Innovation. *Review of International Economics* 16 (3): 444-62. **Available online.**

Connolly, Amanda, Parker Emerson, Liz Goss, Maureen Martin, and Tom Thomsen. 2016. Implementing the New Stem Rule. Presentation at Worcester Polytechnic Institute, Association of International Educators, Worcester, MA, July 12, 2016. **Available online.**

Economist, The. 2016. Brains without Borders. *The Economist*, January 30, 2016. **Available online.**

European Commission. 2016. Proposal for a Directive of the European Parliament and the Council on the Conditions of Entry and Residence of Third-Country Nationals for the Purposes of Highly Skilled Employment. Commission Staff Working Document, COM 378 Final, Strasbourg, France, June 7, 2016. **Available online.**

Finn, Michael G. 2014. *Stay Rates of Foreign Doctorate Recipients from U.S. Universities, 2011*. Oak Ridge, TN: Oak Ridge Institute for Science and Education. **Available online.**

Han, Xueying and Richard P. Appelbaum. 2016. *Will They Stay or Will They Go? International STEM Students Are Up for Grabs*. Kansas City, MO: Ewing Marion Kauffman Foundation. **Available online.**

Institute of International Education. 2016. Open Doors 2016 Executive Summary. Press release, November 14, 2016. **Available online.**

National Center for Education Statistics. 2016. Postbaccalaureate Enrollment. Updated May 2016. **Available online.**

National Science Foundation. N.d. Science and Engineering Indicators 2016. Accessed December 6, 2016. **Available online.**

Peri, Giovanni, Gaetano Basso, and Sara McElmurry. 2016. *Opportunity Lost: The Economic Benefit of Retaining Foreign-Born Students in Local Economies*. Chicago: The Chicago Council on Global Affairs. **Available online.**

President's Council of Advisors on Science and Technology. 2012. *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*. Washington, DC: Executive Office of the President. **Available online.**

Salzman, Hal, Daniel Kuehn, and B. Lindsay Lowell. 2013. Guestworkers in the High-Skill U.S. Labor Market: An Analysis of Supply, Employment, and Wage Trends. EPI Briefing Paper no. 359, Economic Policy Institute, Washington, DC, April 2013. **Available online.**

Stangler, Dane and Jason Wiens. 2015. *The Economic Case for Welcoming Immigrant Entrepreneurs*. Kansas City, MO: Ewing Marion Kauffman Foundation. **Available online.**

Sullivan, Kevin. 2013. Other Countries Court Skilled Immigrants Frustrated by U.S. Visa Laws. *Washington Post*, February 18, 2013. **Available online.**

Teaching Institute for Excellence in STEM. N.d. What Is STEM Education? Accessed January 3, 2017. **Available online.**

U.S. Census Bureau. 2014. Census Bureau Reports Majority of STEM College Graduates Do Not Work in STEM Occupations. Press release, July 10, 2014. **Available online.**

U.S. Department of Homeland Security (DHS). 2016. International Entrepreneur Rule. Proposed rule, CIS No. 2572-15, DHS Docket No. USCIS-2015-0006, August 24, 2016. **Available online.**

Wadhwa, Vivek, AnnaLee Saxenian, Richard Freeman, and Alex Salkever. 2009. *Losing the World's Best and Brightest: America's New Immigrant Entrepreneurs, Part V*. Kansas City, MO: Ewing Marion Kauffman Foundation. **Available online.**

Wiens, Jason. 2016. International Entrepreneur Rule: The Good, the Bad and the Unknown. Growthology Blog, Ewing Marion Kauffman Foundation, October 17, 2016. **Available online.**

Xing, Lisa. 2016. Start-Up Visa Program a 'Disappointment,' Says Windsor, Ont. Lawyer. CBC News, February 12, 2016. **Available online.**

Xue, Yi and Richard C. Larson. 2015. STEM Crisis or STEM Surplus? Yes and Yes. *Monthly Labor Review*, May 2015. **Available online.**

IF YOU HAVE QUESTIONS OR COMMENTS ABOUT THIS ARTICLE, CONTACT US AT
Source@MigrationPolicy.org

Source URL: <https://www.migrationpolicy.org/article/stay-or-not-stay-calculus-international-stem-students-united-states>