

INTERNATIONAL STUDENTS, STEM OPT AND THE  
U.S. STEM WORKFORCE

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**EXECUTIVE SUMMARY**

The Trump administration has put on its regulatory agenda a regulation to be released potentially in 2019 or 2020 that would place new restrictions on the ability of foreign students to work temporarily in the U.S. via the Optional Practical Training (OPT) program.<sup>1</sup> Since the stated purpose of the regulation would be to “improve protections of U.S. workers who may be negatively impacted by” foreign students doing OPT, this economic analysis of the impact of such students on U.S. workers may help policymakers assess whether new restrictions on OPT or even more dramatic steps, such as eliminating the part of the program that extends the eligibility of science, technology, engineering and math (STEM) majors, have a rational basis or are more likely to harm the U.S. economy, technological innovation and American universities.

The Optional Practical Training program offers foreign students an opportunity to work in the United States temporarily during or soon after completing their studies at a U.S. college or university. Eligible students can work for 12 months (OPT), and students with a degree in a STEM field currently have the option to extend their work period by another 24 months (STEM OPT extension), for a total of 36 months.

This study presents and analyzes new data covering a 9-year period (2008 to 2016) on foreign students with STEM majors approved for OPT after they complete their studies (either via the 12-month post-completion OPT component of the program or via the STEM OPT extension component of the program) and their impact on potentially competing workers. It uses data released by U.S. Immigration and Customs Enforcement (ICE) in response to a Freedom of Information Act (FOIA) request.

The study finds:

- There is no evidence that foreign students participating in the OPT program reduce job opportunities for U.S. workers. Instead, the evidence suggests that U.S. employers are more likely to turn to foreign student workers when U.S. workers are scarcer.
- The relative number of foreign students approved for OPT is negatively related to various measures of the unemployment rate among U.S. STEM workers. *A larger number of foreign students approved for OPT, relative to the number of U.S. workers, is associated with a lower unemployment rate among those U.S. workers.*

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<sup>1</sup> “Practical Training Reform,” on Reginfo.gov at <https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201810&RIN=1653-AA76>.

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- Analysis of the data show unemployment rates are lower in areas with larger numbers of foreign students doing OPT as a share of workers in STEM occupations. Comparisons at the state level likewise show a negative relationship.
- The number of foreign students approved for OPT as a share of all new graduates with STEM majors is low, ranging from less than one-half of one percent of students earning a bachelor's degree to 13 percent of PhDs. The number of foreign students approved for OPT as a share of STEM workers is even lower.
- The number and share of foreign students approved for OPT has risen over time. The increase is most notable for students with a master's degree.

The enrollment of new international students declined by approximately 6 percent at both the undergraduate and graduate level in the 2017/2018 academic year when compared with 2016/2017, according to the Institute of International Education.<sup>2</sup> “The number of international students from India enrolled in graduate level programs in computer science and engineering declined by 21 percent, or 18,590 fewer graduate students, from 2016 to 2017,” according to a National Foundation for American Policy analysis of government data.<sup>3</sup> The ability to gain practical experience by working temporarily for a U.S. company makes an education in the United States more valuable to foreign students and puts U.S. universities in a better position to attract students in the competitive international education marketplace. It would be logical to assume new restrictions or an end to either OPT or the STEM OPT extension would have a negative impact on the enrollment of foreign students at U.S. universities.

In addition to the practical training and educational benefits for the students, the OPT program gives employers a way to see whether a foreign student is a good fit before trying to sponsor the student for an expensive and scarce H-1B temporary skilled worker visa. For the last 7 years, the STEM OPT extension has given eligible students multiple chances to win an H-1B visa in the lottery held by the federal government for the oversubscribed program. Those additional opportunities can make the difference between individuals gaining H-1B status or needing to leave the country due to a lack of an immigration status after completing their studies.

By acting as a safety valve for tight labor markets and a source of STEM workers, albeit on a fairly small scale, the OPT program may contribute to economic growth. STEM workers are vital to the U.S. economy, and a substantial share of STEM workers in the U.S. are foreign-born. Areas with more foreign-born STEM workers have higher

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<sup>2</sup> *Open Doors*, Institute of International Education, 2018. <https://www.iie.org/Research-and-Insights/Open-Doors/Data/International-Students/Enrollment>.

<sup>3</sup> *Declining International Student Enrollment at U.S. Universities and Its Potential Impact*, NFAP Policy Brief, National Foundation for American Policy, February 2018.

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patenting rates, faster productivity growth and higher earnings among U.S. natives, among other positive outcomes.<sup>4</sup>

The OPT program is an important way for the U.S. to attract and retain foreign talent. STEM workers are essential to continued robust economic growth, and other countries have stepped up their attempts to recruit them. The OPT program is a small but important way the United States attracts STEM students and enables them to contribute to the U.S. economy after graduation.

The results indicate that the OPT program does not reduce job opportunities for American workers in STEM fields. On the contrary, the results suggest that the program provides a safety valve for employers when they have difficulty hiring STEM workers.

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<sup>4</sup> See, for example, Chellaraj et al. (2005), Peri et al. (2015) and Khanna and Lee (2018) for evidence on foreign-born STEM students' or workers' economic effects.

## BACKGROUND

The Optional Practical Training (OPT) program allows foreign students who meet certain requirements to work legally in the United States for a short period while in school or after graduation. For foreign students, participating in the OPT program may facilitate a career in the U.S. or provide valuable experience before returning home. The program has proven popular with foreign students and employers alike, with the number of foreign students participating in the program rising considerably over the last decade.<sup>5</sup>

To be eligible for OPT, a foreign student must have an F-1 visa—a type of temporary visa issued to foreign students—and have been enrolled in full-time study at a U.S. college or university for at least a year. Foreign students may work in an area directly related to their major for up to 12 months during or soon after completing their studies. In 2008, the Bush administration extended the OPT period to up to 29 months for graduates with a science, technology, engineering, or mathematics (STEM) degree. The Obama administration increased the OPT period for STEM graduates to up to 36 months in 2016. The Obama administration also expanded the list of majors eligible for the STEM OPT extension. The number of STEM graduates enrolled in the program increased by 400 percent between 2008 and 2016.<sup>6</sup>

Strong demand for STEM workers combined with a shortage of visas for foreign workers have likely contributed to the growth in the number of STEM graduates participating in the OPT program.<sup>7</sup> Demand for science and engineering workers has outpaced overall employment growth over the last decade, a pattern that is expected to continue.<sup>8</sup> Almost one-third of STEM workers in the U.S. are foreign-born, yet employers have been unable to hire as many foreign workers as they would like—for the last 6 fiscal years, employers have submitted more applications for H-1B visas for new temporary workers in specialty occupations in the first week than the statutory limit allows for the entire year.<sup>9</sup> For about a decade before that, the supply of visas was exhausted before the end of the year. The number of H-1B visas is so limited, the quota could be filled each year by foreign students earning a degree in a science and engineering field from a U.S. college or university.<sup>10</sup> The number of permanent resident visas is

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<sup>5</sup> Ruiz and Budiman (2018) provide a comprehensive examination of the number of foreign students participating in the OPT program.

<sup>6</sup> See Ruiz and Budiman (2018).

<sup>7</sup> Bound et al. (2015) conclude that limits on temporary worker visas may increase the attractiveness of U.S. higher education as a pathway to the U.S. labor market.

<sup>8</sup> See, for example, National Science Board (2018). Anderson (2017) discusses the shortage of STEM workers.

<sup>9</sup> Only 65,000 H-1B visas are available each year, plus 20,000 to workers who have at least a master's degree from a U.S. university. Universities and non-profit research organizations are exempt from the caps.

<sup>10</sup> In 2015, over 106,000 students earned a bachelor's, master's or doctoral degree in a science and engineering field. See tables 2-22, 2-28 and 2-29 at <https://nsf.gov/statistics/2018/nsb20181/data/appendix?achapter561>.

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limited as well: wait times for Indian nationals for an employment-based immigrant visa exceed a decade or even much longer.<sup>11</sup>

The OPT program has traditionally posed fewer regulatory hurdles than most other foreign worker programs. Most notably, the OPT program does not have a cap on the number of participants. It also does not require that employers have an approved labor condition application, which requires that employers attest that they will pay at least the prevailing wage and that similarly employed workers will not be adversely affected. However, a similar standard applies to employers of STEM OPT extension students. Their jobs must be commensurate with those of similarly situated U.S. workers in duties, hours and compensation, and employers must attest that students will not replace a U.S. worker.<sup>12</sup>

The OPT program imposes several additional requirements on students and employers. Students can be approved for the program before they have a job offer, but they must report changes in their address or employment to their school, which in turn reports the information to the federal government via the Student and Exchange Visitor Information System (SEVIS). Students must pay a filing fee—currently \$410—when they submit their application for employment authorization to U.S. Citizenship and Immigration Services (USCIS). Students cannot begin working until USCIS approves their application. STEM OPT extension employers must be enrolled in the E-Verify program, an electronic system run by USCIS that checks new hires' eligibility to work legally in the United States. STEM OPT extension students and their employers must have a formal training plan. The U.S. Department of Homeland Security (DHS) may conduct site visits of STEM OPT extension employers.

This study examines participation by foreign students with a STEM major in the OPT program between 2008 and 2016. It uses data released by U.S. Immigration and Customs Enforcement in response to a Freedom of Information Act request. It presents data on the number of foreign students with a STEM major approved for OPT by degree level and year. It compares those numbers with the number of students graduating with a STEM major from a U.S. college or university and with the number of U.S. workers with a STEM major and in STEM occupations. It also compares the relative number of foreign students with a STEM major approved for OPT with the unemployment rate among U.S. workers with a STEM major and in STEM occupations. These comparisons give a new perspective on the OPT program and its potential impact on the STEM workforce.

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<sup>11</sup> A maximum of 140,000 permanent resident visas are available to workers sponsored by a U.S. employer and their dependents each year, and the number available to people from an individual country is capped at 7 percent of the total. See the final action dates for employment-based immigrants at <https://travel.state.gov/content/travel/en/legal/visa-law0/visa-bulletin/2019/visa-bulletin-for-february-2019.html>.

<sup>12</sup> See <https://www.uscis.gov/working-united-states/students-and-exchange-visitors/students-and-employment/stem-opt>.

## DATA

Relatively little information is available about the number and characteristics of foreign students participating in the OPT program. Most of the information that is available is from ICE FOIA requests.<sup>13</sup> This report is based on data from such a request. The data are anonymized individual records of students approved for OPT during 2006 to 2016. The data include students' degree and major; their employment start date; their employer's name, city and state; and the type of OPT (pre-completion, post-completion or STEM extension).

This study focuses on the years 2008 to 2016, since the STEM OPT extensions began in 2008, and on students approved for post-completion OPT or a STEM OPT extension who have at least a bachelor's degree in a STEM major.<sup>14</sup> This group accounts for the majority of OPT participants. Participation in pre-completion OPT—while students are still enrolled in school and can work at most 20 hours per week while school is in session—is quite small, and the vast majority of foreign students participating in the OPT program have at least a bachelor's degree. Slightly over one-half of students approved for post-completion OPT who have at least a bachelor's degree majored in a STEM field. STEM majors are the focus here since those students can extend their OPT beyond 12 months and therefore may be more attractive to employers and more competitive with U.S. workers.

The data have a few limitations worth noting. Beginning in 2015, students may appear in the data multiple times if they changed employers. As noted below, this appears to create an artificial increase in the number of students approved for OPT beginning in 2015, but the extent of employer changes is unknown. Prior to 2015, if a student changed employers, their existing record in SEVIS was updated if their school entered that information into SEVIS. If a student had multiple employers, information on only the most recent employer—if any—is available before 2015. Employer information is incomplete or not recorded at all for about one-quarter of records; it is not clear whether those students never actually used their approved OPT to work or if their school never entered their employer information into SEVIS.<sup>15</sup> As a result, the data likely overcount the number of foreign students doing OPT.

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<sup>13</sup> Ruiz and Budiman (2018) is the only other comprehensive examination of the OPT program. They use data from an ICE FOIA request to examine participation in post-completion OPT by foreign students who have at least an associate degree during 2004 to 2016. They present information on the number of OPT participants by origin country, degree-granting institution and metro area, among other facts.

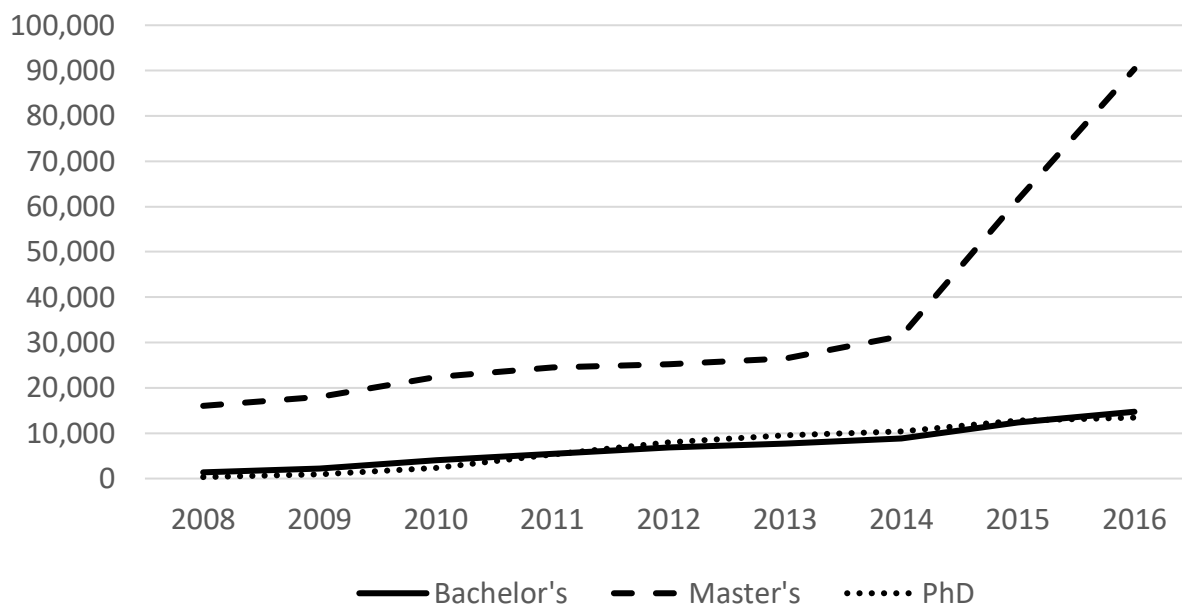
<sup>14</sup> As in Ruiz and Budiman (2018), the most recent—and most inclusive—list of STEM majors is used to classify majors as STEM. The list is available at <https://www.ice.gov/sites/default/files/documents/Document/2014/stem-list.pdf>. Using the most inclusive list leads to overcounting of STEM majors in early years. The results therefore err on the side of overestimating the number of foreign STEM students in OPT in years when unemployment rates were relatively high.

<sup>15</sup> In private communication, the ICE FOIA office noted that employer data was not a required reporting element for OPT in SEVIS for several years. Students without an employer indicated are included in the counts shown except when the data are analyzed by employer location.

## OVERVIEW OF STEM MAJORS IN OPT

The number of foreign students with a STEM major who were approved for OPT has increased over time. Figure 1 shows the number approved for post-completion OPT by degree level and calendar year their employment started. The numbers of foreign STEM graduates with a bachelor’s degree and a PhD approved for OPT have risen slowly but steadily. The number with a master’s degree is consistently higher but also increased at a slow, steady pace between 2008 and 2014. The number of master’s degree recipients with OPT then surged in 2015 and 2016; the surge is likely in part an artifact of the data. Notably, the surge predates the Obama administration’s increase in the length of the STEM OPT extension.

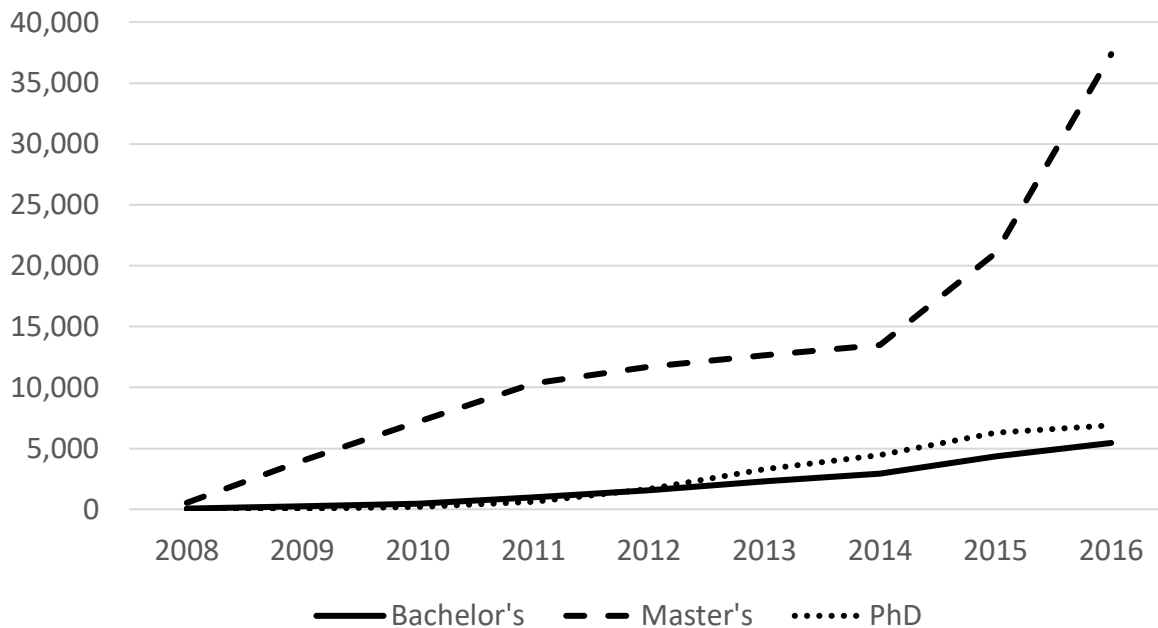
**Figure 1**  
**Number of Foreign Students with STEM Major Approved for Post-Completion OPT, 2008-2016**



Note: Counts are by year employment started, and students may appear in the data multiple times beginning in 2015. STEM majors are based on the STEM-designated degree program list.

The number of foreign students approved for a STEM OPT extension has also risen over time. As figure 2 shows, master’s degree holders account for the majority of students approved for a STEM OPT extension. Their number surged in 2015 and 2016. The numbers of bachelor’s and PhD degree holders approved for a STEM OPT extension have risen at a slow, steady pace.

**Figure 2**  
**Number of Foreign Students Approved for STEM OPT Extension, 2008-2016**



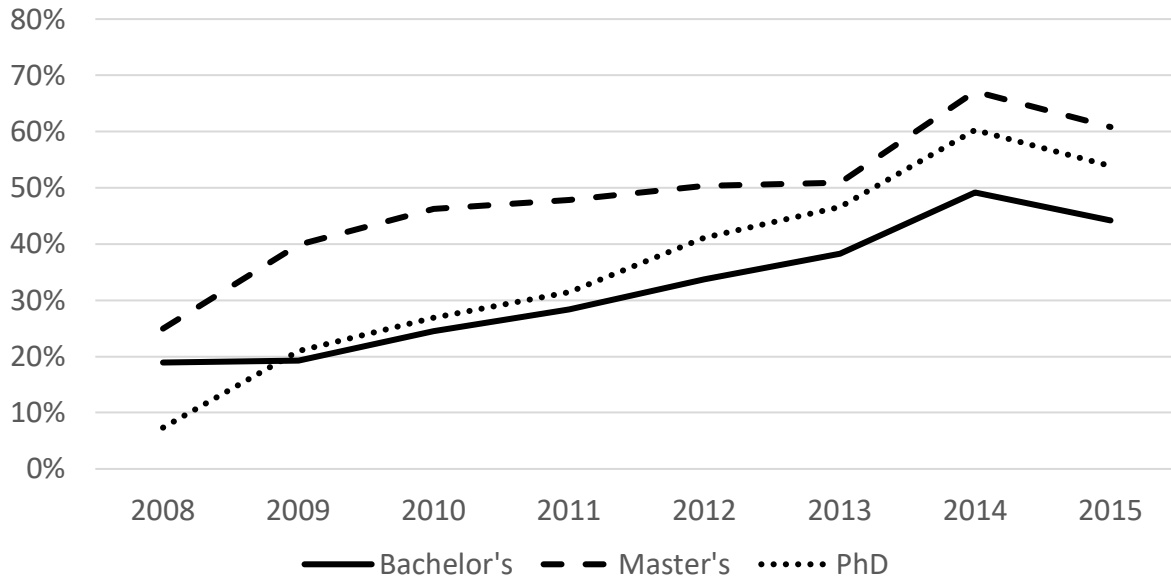
Note: Counts are by year employment started, and students may appear in the data multiple times beginning in 2015.

The share of foreign students approved for post-completion OPT who stayed for a STEM OPT extension appears to have risen over time as well. Figure 3 shows the number of students approved for a STEM OPT extension the next year relative to the number of STEM majors approved for post-completion OPT in a given year.<sup>16</sup> In recent years at least one-half of master's and PhD degree holders who did post-completion OPT appear to have received a STEM OPT extension (i.e., they went on to extend their work period longer than 12 months). The share of bachelor's degree holders is slightly lower.

<sup>16</sup> The calculations are approximations since students may have been approved for a STEM OPT extension in the same year as their post-completion OPT if their post-completion OPT period was less than 12 months.



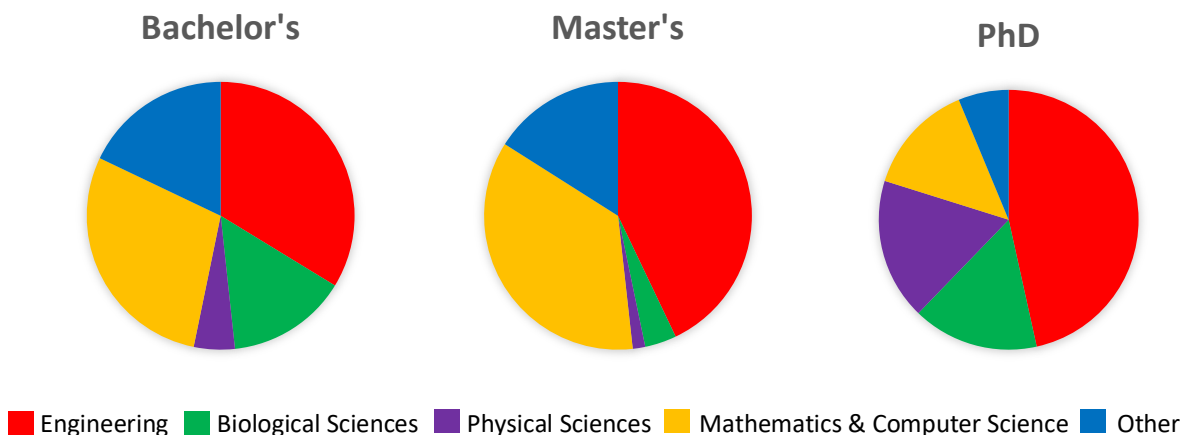
**Figure 3**  
**Share of Foreign Students with STEM Major Approved for Post-Completion OPT with STEM OPT Extension, 2008-2015**



Note: Shown is the number of foreign students approved for a STEM OPT extension the next year relative to the number of foreign students with a STEM major approved for post-completion in a given year.

To complete this initial look at foreign students with STEM majors approved for post-completion OPT, figure 4 shows their distribution across broad areas by degree level for the period 2008 to 2016 as a whole. Engineering is the most common area for bachelor's, master's and doctoral degree holders alike. Mathematics and computer science is the second most common area for bachelor's and master's degree holders. Physical sciences (physics, chemistry and related fields) is the second most common area for PhD degree holders, followed closely by biological sciences and mathematics and computer science. The category "other" includes the social and behavioral sciences majors classified as STEM by the OPT program, such as archeology, social psychology, and econometrics and quantitative methods.

**Figure 4**  
**Distribution of Foreign Students with STEM Majors Approved for OPT**  
**by Major Area, 2008-2016**



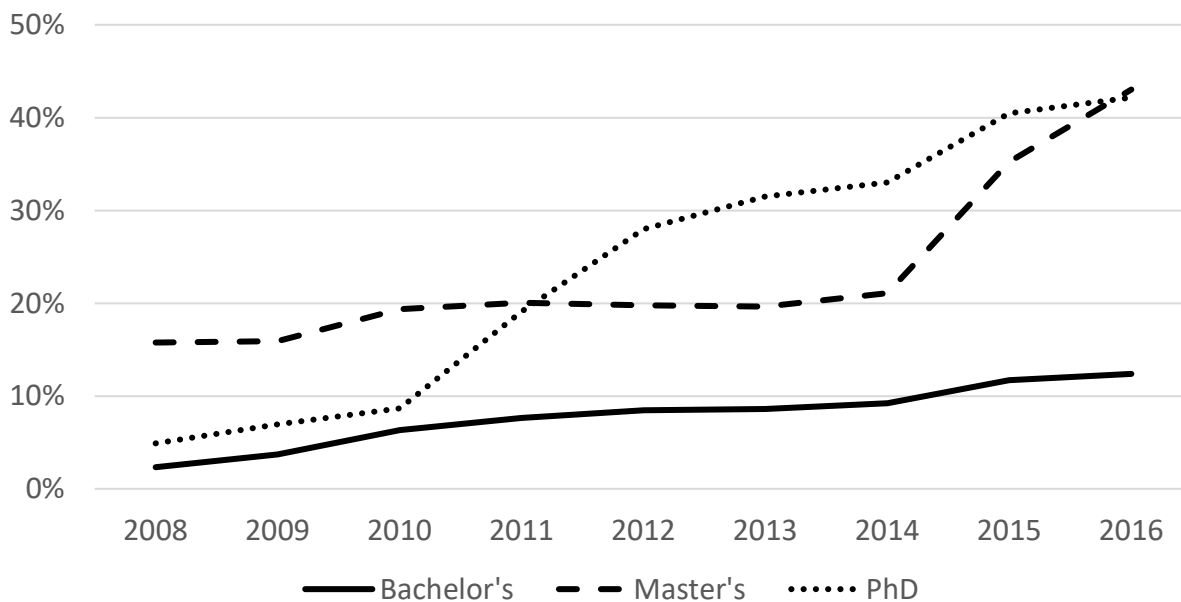
**THE SIZE OF THE OPT PROGRAM: NEW GRADUATES**

While the number of STEM majors approved for OPT has risen over time, particularly among master's degree holders, the number of foreign university students has increased as well. Understanding the relative size of the OPT program therefore requires comparing the number of foreign students with OPT and the number of foreign students earning degrees from U.S. colleges and universities. Figure 5 gives this comparison. Specifically, it shows the shares of foreign students with STEM majors graduating with a bachelor's, master's or doctoral degree in a given year who were approved for post-completion OPT.<sup>17</sup> Again, not all foreign students approved for OPT actually participated in the program, so these shares are overestimates of actual participation rates.

The share of foreign students approved for OPT has increased over time for all three degree levels, but the increase is greatest among master's and PhDs. Over 40 percent of foreign students earning a master's or PhD in a STEM major appear to have been approved for OPT in 2016. However, these shares are likely somewhat inflated by the duplicate records for foreign students who switched employers that began in 2015—the spike among master's degree holders is again evident beginning then. In 2008 to 2014, the share of foreign students earning a master's degree in a STEM major who were approved for post-completion OPT ranged from 16 percent to 21 percent, considerably lower than in 2015 and 2016.

<sup>17</sup> The denominator (the number of foreign students earning a degree in a STEM major from U.S. college or university) is based on data from the Integrated Postsecondary Education Data System (IPEDS) on temporary visa holders.

**Figure 5**  
**Share of Foreign Students with STEM Major Approved for OPT,**  
**2008-2016**

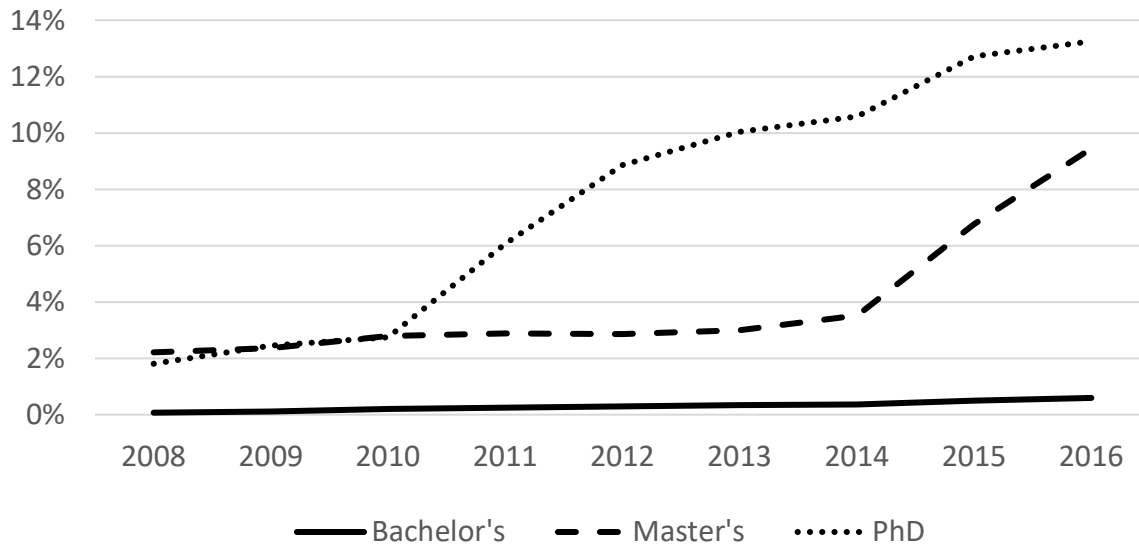


Note: Number of foreign students in STEM approved for OPT is by calendar year; number of foreign students earning degrees is based on IPEDS data by academic year.

A better measure of the relative size of the OPT program is the number of foreign students participating in OPT as a share of all new graduates, not just foreign students. Although foreign students earn a substantial share of STEM graduate degrees awarded by U.S. universities, American students still account for the majority of students graduating with a STEM major overall. The share of master's degrees in STEM majors (as defined by the OPT program) earned by foreign students rose from 14 percent in 2008 to 23 percent in 2016, while the share of PhDs fell from 37 percent to 31 percent during that period. Foreign students earned only between 3 percent and 5 percent of bachelor's degrees in STEM majors during that period.

Foreign students doing OPT are only a small share of all new STEM degree holders, although the share has risen over time. Figure 6 shows the share of all new STEM degree holders approved for post-completion OPT during 2008 to 2016 by degree level. The shares have risen over time, most notably for PhDs. Nonetheless, they remain low. OPT participants account for less than 1 percent of students earning a bachelor's degree in a STEM area, less than 10 percent of students earning a master's degree, and less than 15 percent of students earning a PhD.

**Figure 6**  
**Share of All Students with STEM Major Approved for OPT,**  
**2008-2016**



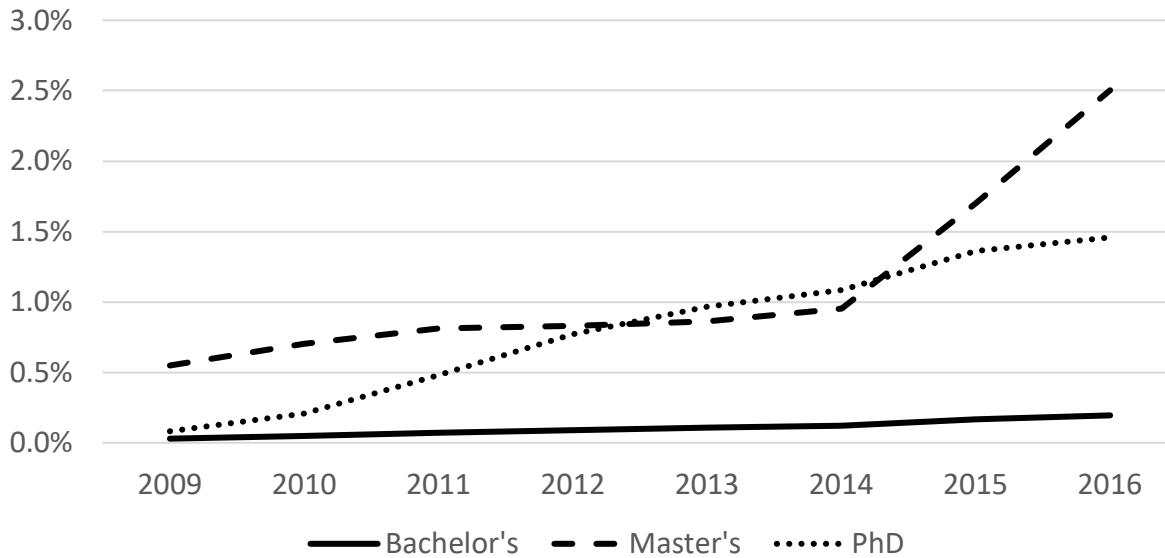
Note: Number of foreign students in STEM approved for post-completion OPT is by calendar year; number of students earning degrees is based on IPEDS data by academic year.

**THE RELATIVE SIZE OF THE OPT PROGRAM: WORKERS**

Another way to gauge the relative size of the OPT program is to compare the number of program participants with the number of U.S. workers. While the OPT program may seem large, the U.S. workforce is enormous—there were over 18 million people with a bachelor’s degree in a STEM major in the U.S. labor force in 2016. The OPT program is a small drop in a very large bucket. Figure 7 shows foreign students with a STEM major approved for post-completion OPT or a STEM OPT extension in a given year as a share of U.S. workers with a bachelor’s degree in a STEM major, by highest degree.<sup>18</sup> The shares have again risen over time, but are very low. In 2016, the OPT program represented less than one-half of 1 percent of STEM graduates with a bachelor’s degree, 1.5 percent of STEM undergraduate majors with a PhD, and 2.5 percent of STEM undergraduate majors with a master’s degree. Overall, OPT participants comprise less than 1 percent of all workers with a bachelor’s degree in a STEM field.

<sup>18</sup> The number of U.S. workers with a bachelor’s degree in a STEM major is calculated from the American Community Survey, which began asking about major in 2009. The survey only asks about major for a bachelor’s degree, not for higher degrees.

**Figure 7**  
**Share of Workers with STEM Bachelor's Degree Approved for OPT, 2009-2016**



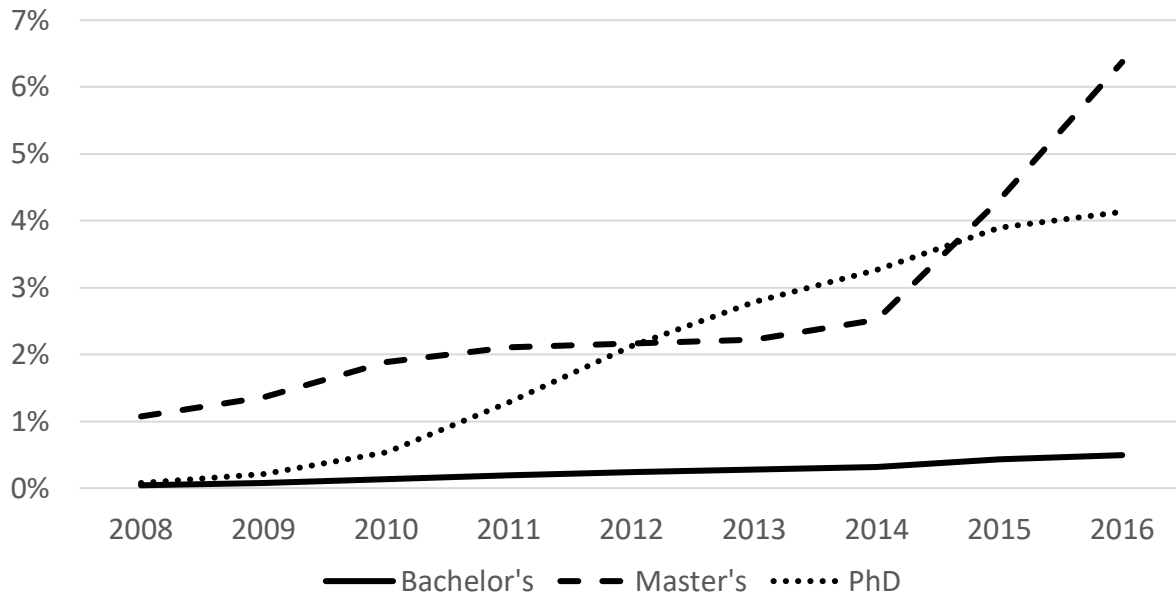
Note: Shown is the number of foreign students with a STEM major approved for post-completion OPT or STEM OPT extension in a given year relative to the number of U.S. workers with a bachelor's degree in a STEM major that year, by highest degree.

Of course, not all workers with a bachelor's degree in a STEM major work in an area directly related to that major. For example, some people with an undergraduate degree in engineering become patent attorneys. Many biology majors become doctors, which is not a STEM occupation.<sup>19</sup> The OPT program requires that foreign students work in a job directly related to their major, so a better gauge of the relative size of the OPT program may be the number of foreign students doing OPT compared to the number of workers in STEM occupations.<sup>20</sup> Figure 8 shows these shares by highest degree. They are again small and increasing over time, particularly for master's degree holders. In 2016, the OPT program represented less than one-half of 1 percent of workers in STEM occupations with a bachelor's degree, 4 percent of workers in STEM occupations with a PhD, and 6.5 percent of workers in STEM occupations with a master's degree. Overall, the OPT program comprised about 2.5 percent of workers in STEM occupations with at least a bachelor's degree that year.

<sup>19</sup> For a visual representation of what occupations STEM majors hold, see <https://www.census.gov/dataviz/visualizations/stem/stem-html/>.

<sup>20</sup> STEM occupations are defined here as all computer and mathematical occupations; all architecture and engineering occupations except surveyors and cartographers; all life and physical sciences occupations; psychologists; economists; computer and information systems managers; architectural and engineering managers; natural science managers; and technicians, except surveying and mapping technicians.

**Figure 8**  
**Share of Workers in STEM Occupations Approved for OPT,**  
**2009-2016**



Note: Shown is the number of foreign students with a STEM major approved for post-completion OPT or a STEM OPT extension in a given year relative to the number of U.S. workers in STEM occupations that year, by highest degree.

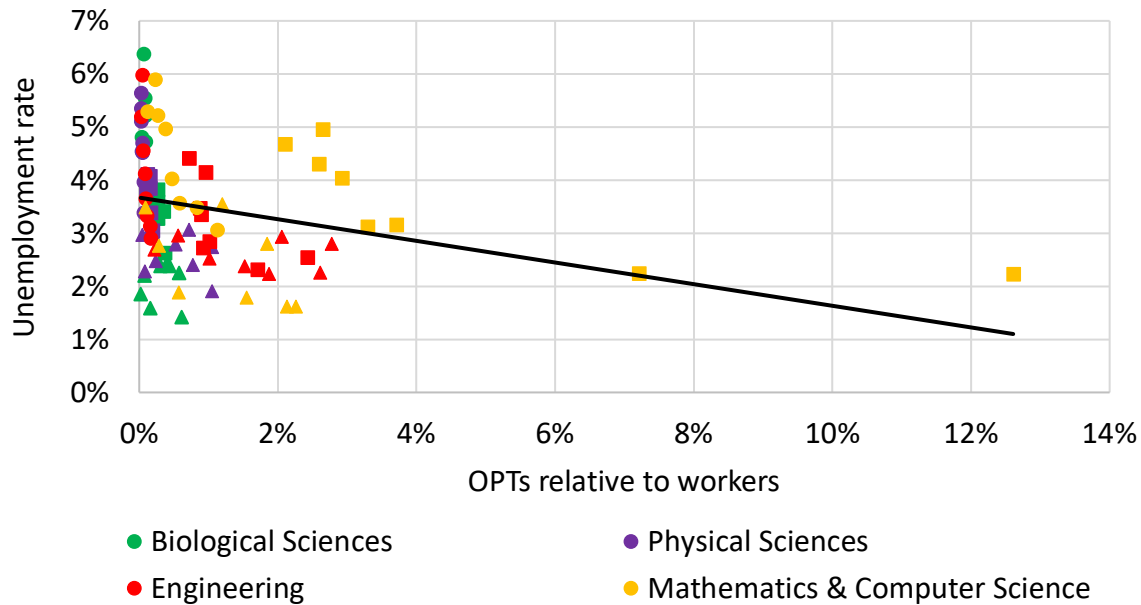
### **THE OPT PROGRAM AND UNEMPLOYMENT RATES**

One of the key questions about the OPT program is whether it reduces job opportunities for American workers. This seems unlikely for several reasons. First, the OPT program is relatively small, as shown above. Second, the labor market for college graduates is strong in the United States. Unemployment rates among college graduates are well below the overall unemployment rate. During 2008 to 2016, the unemployment rate among college graduates averaged 3.6 percent, versus 7.3 percent for all workers.<sup>21</sup> Unemployment rates were similarly low in STEM occupations, ranging from an average of 4.1 percent for architecture and engineering occupations to 3.5 percent for life and physical sciences during that period.

<sup>21</sup> Unemployment rates given in this paragraph are based on data from the Bureau of Labor Statistics, available at <https://www.bls.gov/cps/cpsatabs.htm>. The unemployment rates by degree used in the analysis below were calculated using data from the American Community Survey.

To better understand the relationship between the OPT program and unemployment rates of American workers, this report compares the relative number of foreign students doing OPT with the unemployment rate among similar U.S. workers. The relative number of foreign students doing OPT is measured as the number of foreign students approved for post-completion OPT or a STEM OPT extension divided by the number of U.S. workers, either with a bachelor's degree in a STEM major or working in a STEM occupation, by highest degree and year.

**Figure 9**  
**OPTs and Unemployment among Workers with STEM Bachelor's Degree by Major Area, 2009-2016**



Note: The horizontal axis is the number of foreign students approved for post-completion OPT or a STEM OPT extension by major area relative to the number of workers with a bachelor's degree in that major area, by highest degree and year. The vertical axis is the unemployment rate among workers with a bachelor's degree in that major area, by highest degree and year. Circles represent bachelor's degrees, squares represent master's degrees, and triangles represent doctorates.

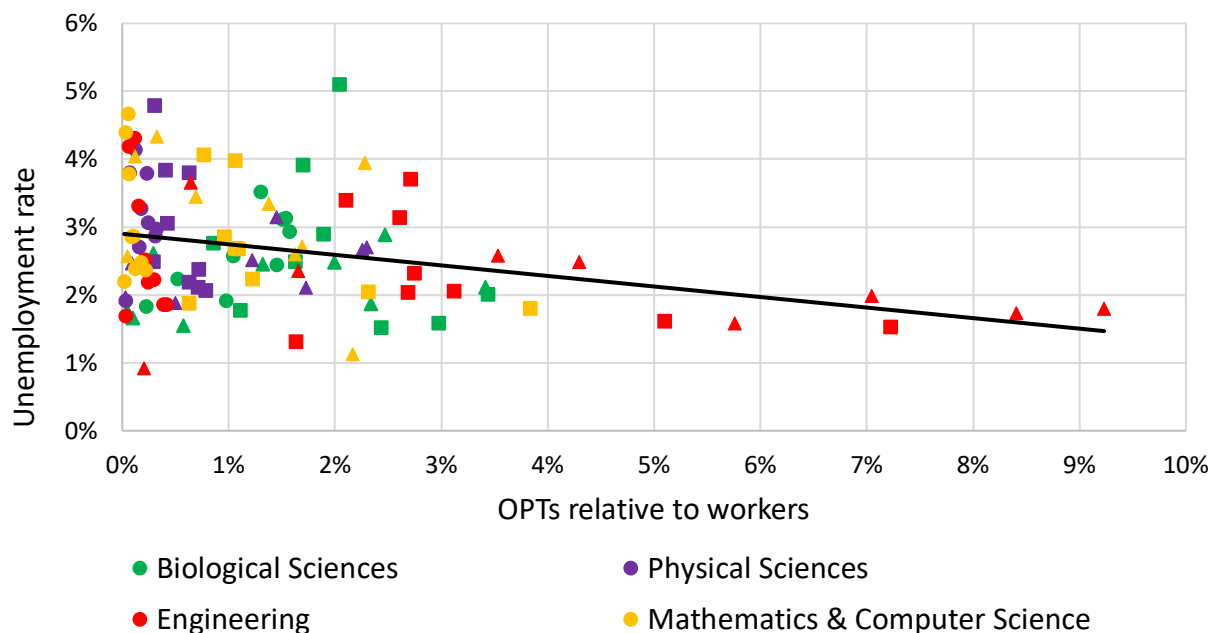
The relative number of foreign students doing OPT is negatively related to the unemployment rate among workers with a bachelor's degree in the same general area, as figure 9 shows. Each symbol in figure 9 represents the relative number of foreign students approved for OPT who majored in a given area and the unemployment rate among U.S. workers whose bachelor's degree was in that area. Four broad areas are included in the figure: biological sciences, physical sciences, math and computer science, and engineering; the social sciences and other

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areas that are included in the STEM OPT extension program are not included here. The line gives the best fit among the data points. Its negative slope means that a larger number of foreign students approved for OPT, relative to the number of U.S. workers, is associated with a lower unemployment rate among those U.S. workers.

Figure 10 shows a similar picture for workers in STEM occupations by broad area. Each symbol represents the relative number of foreign students approved for OPT who majored in a given area and the unemployment rate among U.S. workers in related areas. The four broad areas are again biological sciences, physical sciences, math and computer science, and engineering; managerial occupations, technical occupations and social science occupations are not included. As before, the best-fit line is negatively sloped. A larger number of foreign students approved for OPT, relative to the number of U.S. workers in related occupations, is associated with a lower unemployment rate among those U.S. workers.

Figure 10  
OPTs and Unemployment in STEM Occupations, 2008-2016



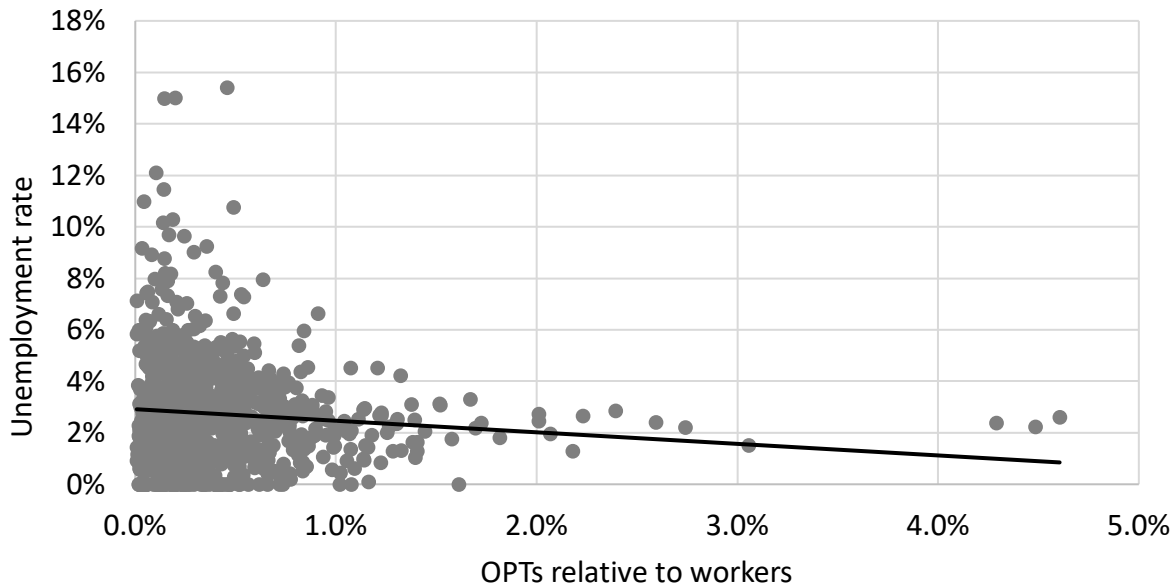
Note: The horizontal axis is the number of foreign students approved for post-completion OPT or a STEM OPT extension by major area relative to the number of workers in occupations related to that major area, by highest degree and year. The vertical axis is the unemployment rate among workers in occupations related to that major area, by highest degree and year. Circles represent bachelor's degrees, squares represent master's degrees, and triangles represent doctorates.



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Another way to measure labor markets besides degree area and occupation area is geographic area. Figure 11 shows the number of foreign students with STEM majors approved for OPT relative to the number of workers in STEM occupations, and the unemployment rate among workers in STEM occupations.<sup>22</sup> Both series are by metro area (for 102 major metro areas) and year. The best-fit line once again shows a negative relationship, or unemployment rates are lower in areas with larger numbers of foreign students doing OPT as a share of workers in STEM occupations. Comparisons at the state level (instead of metro area level) or at the level of students' major (instead of the level of their occupation) likewise show a negative relationship.

Figure 11  
OPTs and Unemployment among STEM Workers by Metro Area, 2008-2016



Note: The horizontal axis is the number of foreign students with STEM majors approved for post-completion OPT or a STEM OPT extension relative to the number of workers in STEM occupations, by metro area and year. The vertical axis is the unemployment rate among workers in STEM occupations, by metro area and year.

The negative relationships between the various measures of foreign students doing OPT and the unemployment rate suggest that the OPT does not reduce job opportunities for U.S. workers. On the contrary, the results are

<sup>22</sup> OPT records with no employer location given are not included in this portion of the analysis.

consistent with employers turning to the OPT program as a source of additional workers when labor markets are tight and American workers are in short supply.

## **DISCUSSION AND CONCLUSION**

The OPT program is a win-win for foreign students and U.S. employers alike. The program offers employers a chance to see if foreign students are a good fit before sponsoring them for a costly—and scarce—H-1B temporary visa. The OPT program gives foreign students (and their employers) multiple shots at obtaining an H-1B visa, particularly if they are eligible for a STEM extension. Another winner is U.S. colleges and universities. The program makes those schools more attractive to foreign students, since it is open only to graduates of U.S. schools.

The OPT program clearly is popular with both foreign students and U.S. employers. The results here, along with those in Ruiz and Budiman (2018), indicate that the program has grown considerably in recent years. The STEM OPT extension may underlie much of this growth, particularly the surge in the number of master's degree holders approved for the program.<sup>23</sup> Even though the program has grown, foreign students working in the U.S. via the OPT program account for a small share of new graduates—from 1 to 13 percent of STEM graduates, depending on degree level—and a far smaller share of U.S. workers.

Consistent with their small share of the labor market, there is no evidence that foreign students participating in the OPT program reduce job opportunities for U.S. workers. Instead, the evidence presented here suggests that U.S. employers are more likely to turn to foreign student workers when U.S. workers are scarcer.

By acting as a safety valve for tight labor markets and a source of STEM workers, albeit on a fairly small scale, the OPT program may contribute to economic growth. STEM workers are vital to the U.S. economy, and a substantial share of STEM workers in the U.S. are foreign-born. Areas with more foreign-born STEM workers have higher patenting rates, faster productivity growth and higher earnings among U.S. natives, among other positive outcomes.<sup>24</sup> At a time when other countries are increasingly vying for foreign students and skilled STEM workers and U.S. firms are turning to offshoring because of a shortage of IT professionals, the OPT program is an important way for America to attract and retain foreign-born talent.<sup>25</sup>

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<sup>23</sup> Besides increasing the share of foreign students who participated in the OPT program, the program may have increased the total number of foreign students in the U.S. or the share of them majoring in a STEM field. Amuedo-Dorantes et al. (2018) find evidence that foreign-born students who remained in the U.S. became more likely to major in a STEM field as a result of the STEM OPT extension.

<sup>24</sup> See, for example, Chellaraj et al. (2005), Peri et al. (2015) and Khanna and Lee (2018) for evidence on foreign-born STEM students' or workers' economic effects.

<sup>25</sup> See, for example, Han et al. (2015), Anderson (2017) and Klimaviciute (2017) for discussion of other countries' initiatives, and Branstetter et al. (2018) for evidence on offshoring.

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