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IMMIGRATION INITIATIVE

# Opportunity Lost: The Economic Benefit of Retaining Foreign-Born Students in Local Economies*

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## Executive summary

The United States, home to many of the world's top universities, is a higher education destination for talented students from across the globe. When foreign-born students are able to find work in local economies after graduation, the positive economic effects extend beyond their incomes, especially since many pursue degrees in sought-after science, technology, engineering, and mathematics (STEM) fields.

Yet the economic contributions of many of today's foreign-born college students are stifled by an outdated immigration system. The temporary nature of F-1 visas, which are not connected to any immigration visa or opportunity, limits international students' ability to work after they have completed their degrees. And undocumented students brought to the United States as children and educated in American schools face uncertain prospects for work and citizenship.

A first-of-its kind analysis of aggregate transition rates from college to work among three groups of foreign-born college students indicates that only one group—lawful permanent residents (LPR)—are fully transitioning to work in local economies. Undocumented college students are 20 to 30 percentage points less likely than their LPR peers to find local work after graduation. Aggregate transition rates for F-1 visa holders were close to zero.[1]

Policies that increase work opportunities for F-1 visa holders and undocumented students to the same levels as their LPR peers would increase employment levels and tax revenues in nearly every state in the country.[2] The 10 states with the most F-1 visa holders stand to gain nearly $8.3 billion in wages and $283 million in state taxes. Among the 10 states with the most undocumented students, those numbers are $1.5 billion and $40 million, respectively.

Programs like Optional Practical Training (OPT) and Deferred Action for Childhood Arrivals (DACA), which offer temporary employment opportunities for foreign-born students, are moving the needle in the right direction. But it falls to Congress to legislate lasting immigration reform, including the following:

- Develop a provisional visa for STEM graduates.
- Allocate H-1B visas for STEM graduates.
- Allow US states to add geographical incentives to work opportunities for F-1 visa holders.
- Facilitate student access to investor visas.

Local economies have much at stake in better retaining talented foreign-born students in their local workforces. But even more important are the longer-term economic effects of fully maximizing foreign-born students' contributions, particularly to critical STEM and innovation fields, driving US global competitiveness.

**This report is based on a technical paper by Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?", University of California, Davis, February 25, 2016. http://giovanniperi.ucdavis.edu/foreign-born-college-students.html*

## Introduction

Home to many of the world's leading universities, the United States is a top destination for higher education for many talented students from across the globe (see figure 1).[3] Almost 600,000 new F-1 student visas were issued in 2014, up from only 110,000 in 2001, more than quintupling in 14 years.[4] In addition, the children of immigrants already based in the United States are also pursuing college degrees at higher rates than ever before.[5]

Immigrants have long driven innovation and growth in the US economy. Over the past 50 years, one-quarter of US-based Nobel laureates were foreign born.[6] Immigrants were behind 25 percent of new high-tech companies founded between 2006 and 2012, generating $63 billion in sales.[7] Immigrants with advanced degrees are three times more likely to file patents than their native-born peers.[8]

Yet despite immigrants' long history of advancing the US economy, the economic contributions of many of today's US-educated foreign-born students are stifled by an outdated immigration system. The temporary nature of F-1 visas limits international students' ability to work after they have obtained their degrees in the United States. Faced with limited visa channels, many return to their countries of origin to build their careers and possibly compete with their US-based peers (see figure 2). Furthermore, undocumented students, brought to the United States as children and educated in American school systems, face uncertain prospects for work authorization and significant barriers to higher education.[9]

Only one group of foreign-born students—lawful permanent residents, many of whom arrived in this country as the children of authorized immigrants and now enjoy a stable and permanent immigration status—are fully putting their college educations to work in the US economy. Their successes illustrate the potential to maximize the economic contributions of all foreign-born students through immigration reform.

While failure to integrate talented foreign-born students is costly at the national level, effects are most acute at the local level. Local universities compete to attract top-tier students, and local economies subsidize their education. The fact that universities are increasingly pioneering programs—offering everything from cultural orientations for international students to in-state tuition and financial aid to the undocumented—suggests that they recognize the value of the human capital of foreign-born students. Yet once this capital is produced at local universities, federal immigration policy causes its dissipation and loss of potential contributions.

This analysis, based on a first-of-its kind quantification of college-to-employment rates, examines how

Figure 1

### Number of Foreign-Born College Students, by Nationality

| | F-1 (ACS) | LPR and undocumented (ACS) |
|---|---|---|
| Canada | 51,466 | 74,735 |
| Mexico | 159,230 | 787,907 |
| Rest of Americas | 359,774 | 1,002,290 |
| Western Europe | 92,486 | 123,387 |
| Eastern Europe | 164,217 | 338,684 |
| China | 146,357 | 196,053 |
| Korea | 130,265 | 155,757 |
| Japan | 93,893 | 45,769 |
| India | 73,211 | 180,296 |
| Oceania | 12,269 | 20,518 |
| Philippines | 32,759 | 154,925 |
| Vietnam | 22,695 | 88,917 |
| Rest of Asia | 158,794 | 231,888 |
| Africa | 255,605 | 335,494 |
| Other | 2,475 | 3,780 |

LPR = lawful permanent residents
Note: Analysis based on American Community Survey (ACS), 2005-2009. For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 33, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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the immigration status of foreign-born students—F-1 visa holders, lawful permanent residents, and undocumented students—affects their transition from college to employment, and at what cost. Policy recommendations offer tangible avenues to better maximize foreign-born students' talents and potential, ensuring that immigrants will continue to have the opportunity to drive the United States' future competitiveness in an increasingly global economy.

## How college graduates benefit local economies

College-educated workers, both native and foreign born, have a positive effect on local economies beyond the direct incomes they earn. By facilitating the adoption of better and more productive technologies and by fostering local learning and increasing local knowledge, college-educated workers positively affect the productivity and average wages of a city.[10] Conversely, their departure from local workforces—due to limited visa channels or uncertain immigration status—could lower the productivity and wages of those left behind.

A high concentration of college-educated workers may also increase the quality of important local amenities of a city, including better schools, medical facilities, and cultural institutions.[11] Cities that lose foreign-born, college-educated workers, therefore, are also less attractive to their native-born peers, as they offer fewer of these amenities.

An often voiced concern is that foreign workers could displace the native-born college-educated or affect their labor market success. A larger supply of college graduates, some people argue simplistically, would reduce their wages. Most economists agree and research confirms, however, that especially for col-

Figure 2

### Labyrinthine Visa Options for F-1 Visa Holders

**There is currently no dedicated visa channel for US-educated international students to stay in the country to work after graduation, leaving them to choose from an overwhelming and often unproductive menu of visa options, many of them temporary. For many students, none offer the right fit, and they are left with few options other than returning home.**

| Visa name | For whom | Description | Limitations | Time |
|---|---|---|---|---|
| F-1 | Trainees | Optional Professional Training (OPT) in career field | Wage disparities | 12-36 months (depending on field) |
| H-1B | Specialty occupation | Employer-sponsored application | Subject to caps & lottery | 3 years |
| E-1 | Treaty trader | Broker trade between US and home country | Must be from treaty nation | 2 years |
| E-2 | Treaty investor | Invest capital in US business | Requires "substantial" cash; must be from treaty nation | 2 years |
| L-1 | Intracompany transfer | Temporary work assignments | Need job at multinational company | 1 year |
| "Green Card" | Legal permanent resident | Family relationship, exceptional professional ability, or lottery | Wait times up to 24 years | Permanent |

Source: International Student, "Visa Options," www.internationalstudent.com/study_usa/graduation/visa-options/; Suzy Khimm, "How Long Is the Immigration 'Line'? As Long as 24 Years," *Washington Post*, January 31, 2013, www.washingtonpost.com/news/wonk/wp/2013/01/31/how-long-is-the-immigration-line-as-long-as-24-years/.

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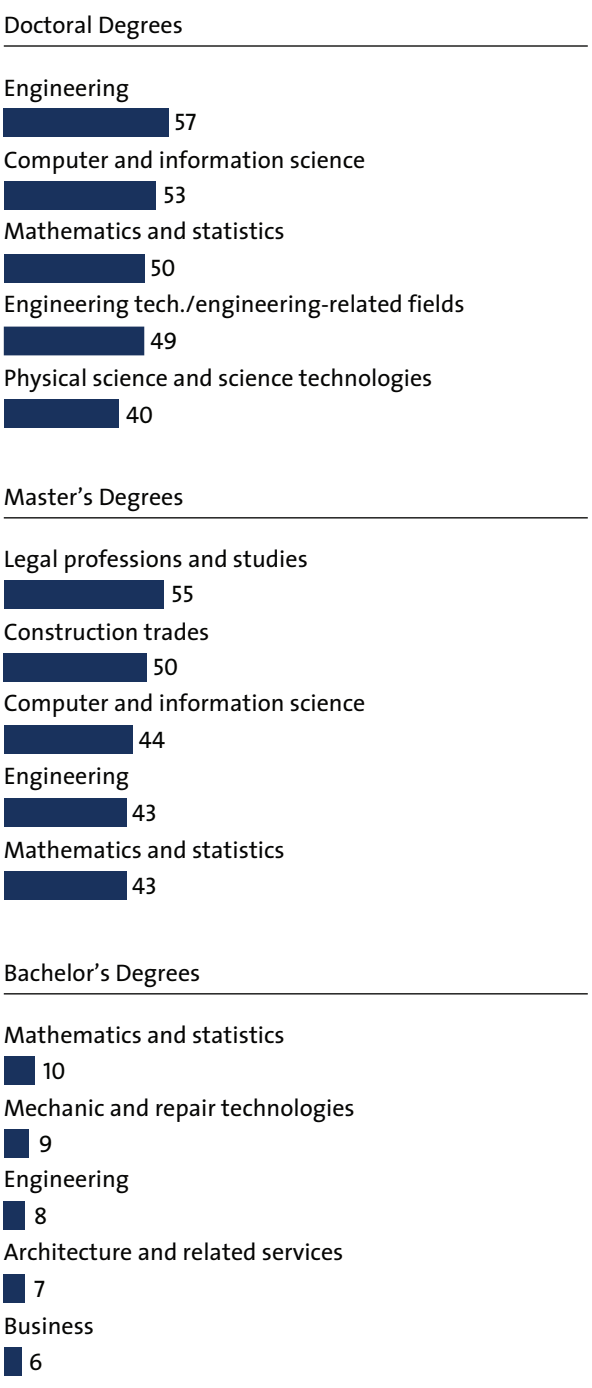
Figure 3

## Foreign-Born Students Earn Large Shares of Advanced STEM Degrees

**Top fields of study by share of degree earned by foreign students, 2012-13 (%)**




Source: Drew Desilver, *Growth from Asia Drives Surge in U.S. Foreign Students,* PEW Research Center, June 18, 2015, www.pewresearch.org/fact-tank/2015/06/18/growth-from-asia-drives-surge-in-u-s-foreign-students/.

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lege-educated immigrants, the positive productivity effects and the local economic growth they bring[12] more than offsets competition, leaving unchanged or increasing the number of jobs and the wages of the native born.[13] While most studies analyze these effects in the long run, in the case under consideration, the four years of college education in the US would allow US companies to invest in productive capacity and plan for hiring foreign-born workers without displacing the native born even in the short run.

International students pursuing degrees in a variety of fields can provide benefits to communities and the economy. Importantly, a large share of foreign-born college students pursue degrees in science, technology, engineering, and mathematics (STEM) fields. As many as half of advanced STEM degrees are awarded to foreign-born students (see figure 3). And because a 1 percent increase in college-educated workers in STEM fields increases the wages of other college-educated workers by 5 to 6 percent in a metropolitan area, local economies have much to gain by retaining these talented foreign-born workers.[14]

Because two-thirds of F-1 visa holders pursue bachelor's degrees in STEM fields,[15] failure to retain these students represents not just a loss of wage income and tax revenues, but also loss of their ideas and innovation. Their departure means fewer scientists and engineers, which implies less innovation, less patenting, and less technological growth,[16] along with lower productivity and wages in these cities. The long-term effects of this loss, accrued over decades, can be significant, in that some cities will grow at a lower rate than they would if they could retain those students.

Business leaders, educators, and policymakers emphasize that limited retention of foreign-born students in local workforces is a drain on US-produced human capital. Some claim that this "brain drain" will drive technological growth and innovation in China, India, and other emerging economies rather than in the United States. Growing international competition for talent may lure these college graduates elsewhere when they are faced with minimal opportunities to remain in the United States.

## Assessing the foreign-born student population

It is not easy to measure how many foreign-born students successfully transition into employment after college. There are no representative datasets that follow individuals from school into the labor market. None collect information on foreign-born students that includes their immigration status along with standard demographic and labor market variables. Only very recently, some studies have started to use administrative data on F-1 visa students to analyze their postgraduation employment, but data are limited.[17]

This analysis attempts to calculate the college-to-employment transition rates for three groups of foreign-born students: F-1 visa holders, lawful permanent residents, and undocumented.

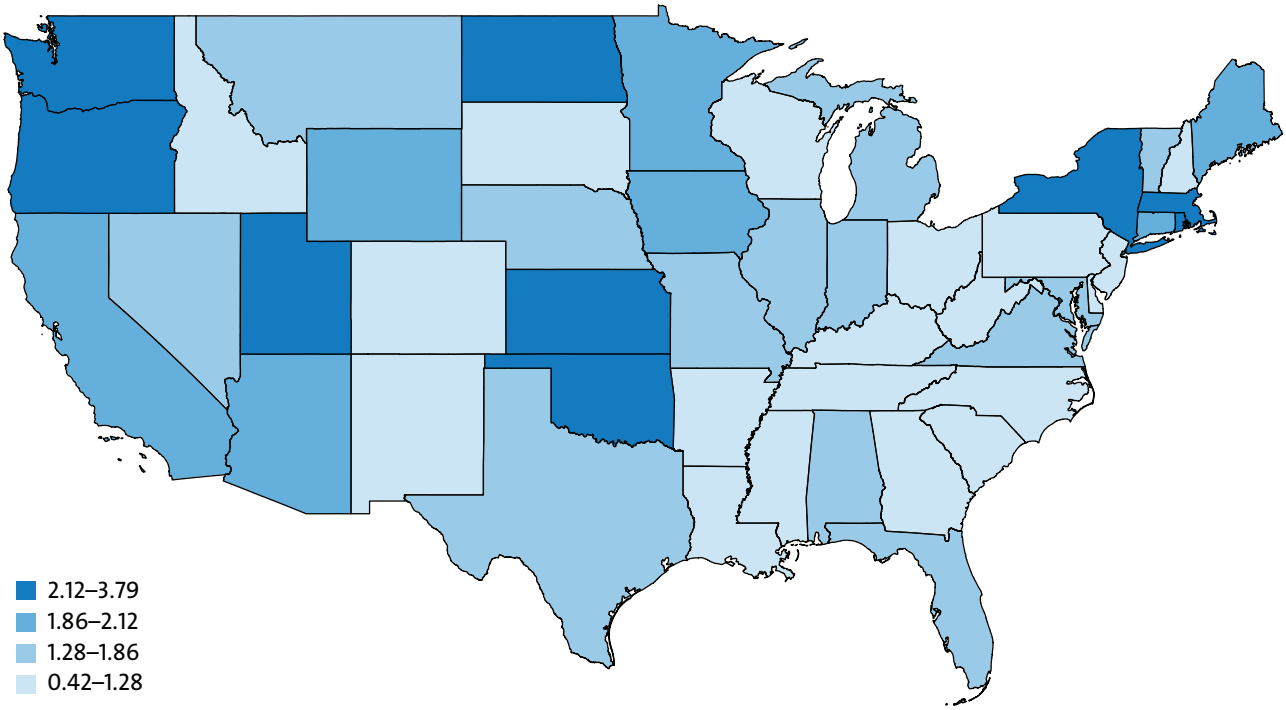
> ***"The country would be well served to attach a green card to every STEM PhD awarded to an international student in the United States."***
> ***—Sally Mason, former president, University of Iowa***

- **F-1 Visa Holders:** Excluding visitors and tourists, the largest and fastest-growing US visa category in recent years has been the F-1 academic student visa. While international students use the visa to study in elementary schools, high schools, seminaries, conservatories, or other academic institutions, many are college students.[18] Approximately half of F-1 visas were given to international students attending community colleges or universities,[19] and several prestigious universities—many of them in the Midwest, including the University of Illinois, University of Michigan, and Purdue University—are among the largest users of those visas. F-1 visa holders are found in every state, with concentrations on the West Coast, in the Northeast, and in some Midwestern states—including North Dakota, Kansas, Minnesota and Iowa—that are not traditional immigration hubs (see figure 4). F-1 visa holders are most likely to come from Asia.

Figure 4

### F-1 Visa Holders as a Percentage of College Students, 2005-2009

**(excluding Alaska and Hawaii)**




Note: Darker color implies larger share of F-1 students. For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 6-8, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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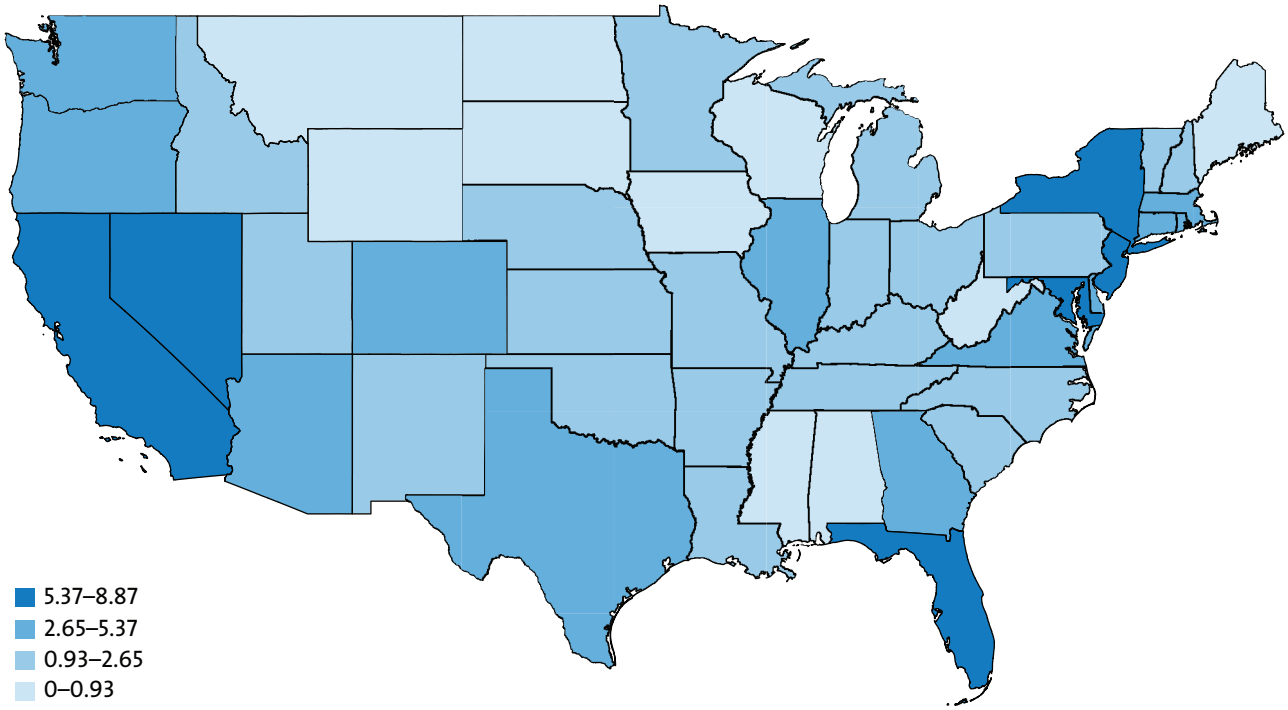
FIGURE 5

## Lawful Permanent Residents and Undocumented Students as a Percentage of College Students, 2005-2009

**(excluding Alaska and Hawaii)**




Note: Darker color implies larger share of LPR and undocumented students. For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 6-8, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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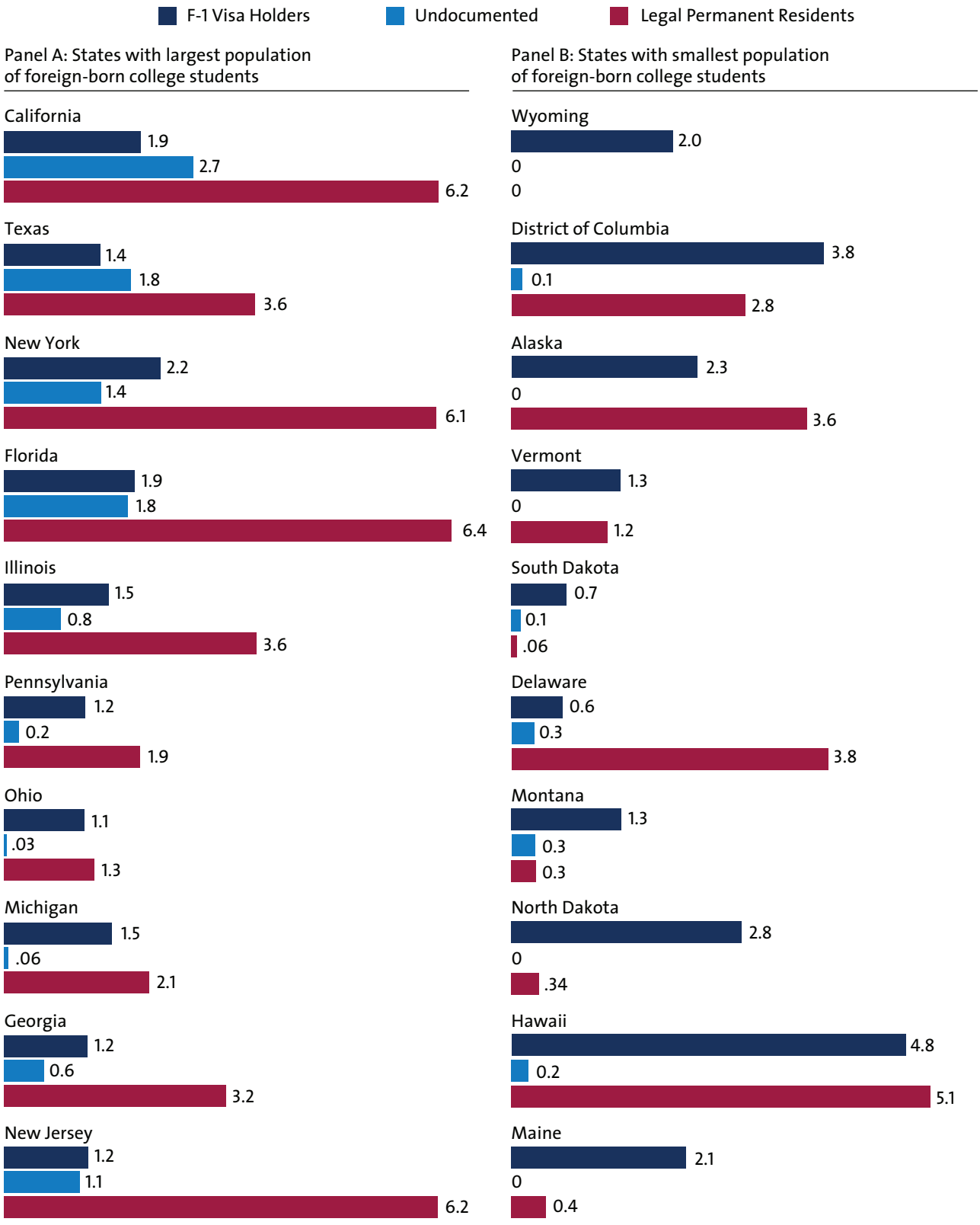
- **Lawful Permanent Residents (LPRs):** A second significant cohort of foreign-born college students is young immigrants who arrived in the United States between preschool and high school and attended college while still non-naturalized citizens. This group usually has a more permanent and stable migration status than its foreign-born peers, obtained from its parents, who have become permanent residents or are on the way to becoming such.[20] Hence, this group of students can legally access almost all employment opportunities postgraduation. Unlike that of F-1 visa holders, the distribution of lawful permanent residents more closely resembles the overall distribution of immigrants in the United States. LPRs, along with their undocumented peers are concentrated in California, Florida, New Jersey, and New York (see figure 5). Most students in this group hail from the Americas (see figure 1).
- **Undocumented Students:** These are children of undocumented immigrants who were also brought to the United States by their parents but do not have a permanent immigration status.[21] While some undocumented students have been granted temporary work authorization through the Deferred Action for Childhood Arrivals (DACA) program (see analysis on page 13), their undocumented status is a substantial hurdle to transition to stable employment, even after college graduation. The distribution of undocumented college students partly mirrors the overall distribution of immigrants and is quite concentrated. This group has sizable presences in California, Florida, Texas, and New York, where they are between 1.5 and 2.5 percent of the

FIGURE 6

## Foreign-Born Students as Percentage of College Students

**College students ages 20-24 (%)**




Note: For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 6-8, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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college student population, and to a lesser extent in Illinois and New Jersey, where they represent about 1 percent of all college students (see figure 6). Outside these six states, the presence of undocumented college students is quite small, especially when compared to F-1 visa holders and other foreign-born students. Nevertheless, fostering undocumented students' access to college education and postgraduation employment can have a significant impact on local communities and economies.

This study analyzed data from the US Census Bureau and the Department of Homeland Security's SEVIS (Student and Exchange Visitor Information System) database. First, the size of each of the three cohorts of students was measured by location and year of graduation (between 2005 and 2009). Then the size of employment for the same cohort in any type of job—in the same state or metropolitan area where they attended college—within five years of graduation (between 2010 and 2014) was measured.[22] Using regression analysis, an aggregate transition percentage from college to employment in the local area for each group of students was estimated.

Namely, for every 100 foreign students of each type (F-1, LPR, and undocumented) attending college in a US state or metro area between 2005 and 2009, the number who were working in that state or metro area five years later (between 2010 and 2014) is estimated. This number is called the aggregate transition percentage from college to employment for that group (see figure 7).

To clarify, the percentage is an average rate nationwide, so it captures the overall tendency of that group and not the exact transition percentage in each state or metro area. Second, it provides a measure of how the aggregate number of the college educated translates into the aggregate number of workers for each group of foreign born. For every 100 foreign-born students educated in local colleges, there will be that many workers five years later. While the method does not follow individual students, it uses aggregate values for the state or metro area to calculate such percentages. Finally and importantly, this analysis does not attempt to calculate the potential impact on the native-born workforce. Previous research has demonstrated that "immigrants expand the US economy's productive capacity, stimulate investment, and promote specialization that in the long run boosts productivity…and there is no evidence that these effects take place at the expense of jobs for workers born in the United States."[23]

***"The need for more young, talented college graduates has perhaps never been more critical to the competitive success of our country. Students and graduates who come from outside the US are not in any way a drain or competition to US residents but in fact complement and contribute to our economic success and quality of life through above average contributions to the tax base and filling of jobs requiring a college education."***
***—Dean Bresciani, president,***
***North Dakota State University***

## Lost opportunities for local economies

While the three groups of students included in the analysis are quite different from each other, they share the reality that their immigration status dramatically affects—and in some cases prevents—their transition to employment in the United States. Low aggregate transition percentages for some groups of foreigners present a calculable lost opportunity for local economies in terms of employment, wages, and tax revenues, in addition to numerous other potential contributions such as increased social diversity, increased consumption, and potential growth opportunities.

### Aggregate transition percentages from college to employment

The aggregate transition percentages are reported in figure 7. In columns 1 and 2, the foreign-born students are partitioned into F-1 and non-F-1 categories, and their respective aggregate transition percentages from college to employment in states (column 1) and in metro areas (column 2) are reported. In columns 3 and 4, the F-1, LPR, and undocumented students are separated out and the percentages for states (column 3) and metro areas (column 4) are again reported. Each entry captures the aggregate transition percentage of the corresponding group, or what number out of 100 foreign-born, college-educated people in the group are employed in the local economy within five years of graduation. The aggregate percentages were highest among lawful permanent residents and lowest among F-1 visa holders, as follows:

FIGURE 7

## Estimated College-to-Employment Transition Percentages for Foreign-Born Students

**A transition percentage measures how many of a certain group of locally educated students stays in the local economy (specified here as either state or metro area) within five years of graduation. A value of 0 means that, on average, no student of that type finds local employment after graduation. A transition percentage of 100, on the other hand, implies that all students transition into employment after graduation. The numbers in parentheses represent standard errors.**

US states, cohort of college students age 20-24 in 2005-2009, and college educated in 2010-2014

| | Foreign-Born Students: F-1 and non-F-1 | | Foreign-Born Students: F-1, LPR, and undocumented | |
|---|---|---|---|---|
| **Transition percentages** | **(1) US states** | **(2) US metropolitan areas** | **(3) US states** | **(4) US metropolitan areas** |
| F-1 visa holders | -4% (16%) | 12% (12%) | -20% (23%) | 17% (17%) |
| Non-F-1 visa holders (LPR + undocumented) | 92% (3%) | 82% (4%) | | |
| LPR | | | 98% (18%) | 83% (10%) |
| Undocumented | | | 77% (38%) | 54% (27%) |
| R-squared | 95% | 82% | 96% | 85% |
| Observations | 51 | 277 | 51 | 277 |

Note: Calculations based on analysis of 51 states (including Washington, DC) and 277 metro areas. Each column shows the transition percentage from college to local employment estimated from a different regression. Columns 1 and 2 show the basic weighted specifications including only two groups, F-1 and non-F-1. Columns 3 and 4 show specifications with three groups, F-1, LPR, and undocumented. For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 18-19, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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- **F-1 Visa Holders:** Estimated aggregate transition percentages reported in the first row were not significantly different from zero (the standard error is in parenthesis). This implies that for every 100 F-1 students educated in a state, none were working in the state five years after graduation. Similarly, for 100 F-1 students educated in a metro area, a number not significantly different from 0 were working there after five years. Hence the area lost close to 100 percent of students within five years.
- **Lawful Permanent Residents:** Unlike the case for their F-1 peers, the transition percentage for LPRs is quite high (third row of figure 7, columns 3 and 4). For every 100 LPR college students in a state, 98 were working there within five years after graduation. And for every 100 educated in a metro area, 83 were working there. In aggregate this implies that a local economy added 83 to 98 college-educated employees for every 100 college-educated LPRs within five years of graduation.[24]
- **Undocumented Students:** The aggregate transition percentages to local employment for undocumented students are shown in the last row of figure 7 (column 3 for states and column 4 for metro areas). They imply that for every 100 undocumented students educated in the state, 77 are working in the state within five years of graduation. For every 100 educated in a metro area, 54 are working there within five years of graduation. The standard errors for two estimates are rather high,[25] so transition percentages should be considered as a point of reference, the exact values are uncertain.

FIGURE 8

## Percentage of College-Educated Workforce Lost by State, Based on Low Transition of F-1 Visa Holders

**Top 10 states, cohort of college students in age group 20-24 in 2005-2009 (%)**

| State | College-educated workforce lost (%) |
|---|---|
| Hawaii | 4.5 |
| District of Columbia | 3.6 |
| Oregon | 3 |
| Rhode Island | 3 |
| Massachusetts | 2.7 |
| Kansas | 2.7 |
| North Dakota | 2.6 |
| Utah | 2.4 |
| Washington | 2.3 |
| Alaska | 2.1 |
| **Average** | **2.9** |

Note: For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 18-19, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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FIGURE 9

## Percentage of College-Educated Workforce Lost by State, Based on Low Transition of Undocumented Students

**Top 10 states, cohort of college students in age group 20-24 in 2005-2009 (%)**

| State | College-educated workforce lost (%) |
|---|---|
| California | 0.58 |
| Texas | 0.39 |
| Florida | 0.38 |
| Nevada | 0.31 |
| Arizona | 0.31 |
| New York | 0.30 |
| New Mexico | 0.24 |
| New Jersey | 0.23 |
| Illinois | 0.17 |
| Massachusetts | 0.17 |
| **Average** | **0.30** |

Note: For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 18-19, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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Overall, the analysis suggests that F-1 students are substantially different from other foreign-born students in their aggregate transition percentages into local employment. While programs like Optional Practical Training (OPT) (see analysis on page 13) allow these students to temporarily remain in the United States to work for a period of one to three years after graduation, these new calculations suggest that the state and metropolitan areas where they study are largely unable to retain them in the five years after graduation.

The scenario is different for other foreign-born students—including, to a more limited extent, undocumented students—who are more likely to become employees in the state or metropolitan area where they study. While undocumented students may have to leave the country to find work, take longer to find a job, or relocate to different states or metro areas to follow the few opportunities available to them, they are still transitioning at higher rates than their peers with F-1 visas. Yet more can—and should—be done to foster their full transition into local economies.

Figure 10

## Estimated Loss of Wages and Income Tax by State Due to Low Transition of F-1 Visa Holders

**Top 10 states in US 2014**

| State | Wage income lost in US 2014 ($) | State tax income lost in US 2014 ($) |
|---|---|---|
| California | 2,010,546,688 | 61,952,719 |
| New York | 1,617,664,000 | 77,433,201 |
| Texas | 887,849,600 | 0 |
| Washington | 702,837,504 | 0 |
| Illinois | 616,624,320 | 29,210,751 |
| Massachusetts | 613,043,328 | 27,460,444 |
| Florida | 560,862,976 | 0 |
| Minnesota | 464,424,416 | 20,465,232 |
| Ohio | 462,027,936 | 10,614,124 |
| New Jersey | 448,070,112 | 11,267,289 |
| **Total** | **8,383,950,880** | **238,403,760** |

Note: For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 18-19, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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Figure 11

## Estimated Loss of Wages and Income Tax by State Due to Low Transition of Undocumented Students

**Top 10 states in US 2014**

| State | Wage income lost in US 2014 ($) | State tax income lost in US 2014 ($) |
|---|---|---|
| California | 632,208,768 | 19,480,797 |
| Texas | 263,711,920 | 0 |
| New York | 228,584,080 | 10,941,702 |
| Florida | 120,121,448 | 0 |
| New Jersey | 91,624,832 | 2,304,022 |
| Illinois | 75,626,536 | 3,583,403 |
| Arizona | 41,419,256 | 973,249 |
| Massachusetts | 37,420,940 | 1,676,220 |
| North Carolina | 27,492,448 | 1,302,036 |
| Washington | 26,050,318 | 0 |
| **Total** | **1,544,260,546** | **40,261,429** |

Note: For a full description of the analysis, see Giovanni Peri and Gaetano Basso, "Foreign-Born College Students: How Much Could They Contribute to the US Economy?" February 25, 2016: 18-19, http://giovanniperi.ucdavis.edu/foreign-born-college-students.html.

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## Wages and tax revenues

While a local economy's inability to retain its college-educated talent within its state is widely understood to be economically harmful, quantifying the loss in terms of wages and state income taxes reveals, at least part of the economic loss. While this quantification captures only the more immediate and easy-to-calculate part of the loss, it provides a useful starting point in evaluating the potential gains from retaining foriegn students.

F-1 visa holders and undocumented students demonstrated the lowest aggregate transition percentages from college to employment in local labor markets. Analysis around the economic impact is based on a hypothetical comparison of the current situation with one in which these groups had the same aggregate transition percentages as LPRs.[26]

Impact varies by state, as these groups of students are concentrated in different areas of the country (see figures 4 and 5). In states such as Massachusetts, Oregon, and Hawaii, the cohort of college-educated lost 2.7 to 4.5 percent of its total because of low aggregate transitions and it would be accordingly larger if F-1 visa holders had the same transition percentages

as lawful permanent residents. The 10 states with the largest populations of F-1 students lost an average of nearly 3 percent of their potential college-educated employees because of low transition percentages (see figure 8).

The lost employment of college-educated, undocumented students is most acutely felt in the traditional immigrant gateway states of California, Texas, and Florida, where these students are most highly concentrated. While the employment loss for undocumented students is smaller in percentage terms than for F-1 students, the impact for top states is still significant, between 0.3 and 0.5 percent (see figure 9).

The economic impact of this lost human capital is perhaps best understood in terms of lost wages and taxes in state and local economies.[27] The 10 states with the most F-1 visa holders stand to gain nearly $8.3 billion in wages and $283 million in state taxes (see figure 10). Among the 10 states with the most undocumented students, those numbers are $1.5 billion and $40 million (see figure 11).

For example, California's annual wage loss associated with the low retention of F-1 students is approximately $2 billion; for New York, the number is $1.6 billion (see figure 10). These states also had a significant aggregate income loss associated with low retention of undocumented students, amounting to more than $600 million and $200 million, respectively. The impact is more limited in smaller states, but Texas, Illinois, and Florida collectively forego more than $2.5 billion in wage income by not retaining F-1 and undocumented students (see figure 11).

In terms of annual state income taxes lost, California and New York gave up respectively $62 and $77 million dollars of revenue associated with the departure of F-1 visa holders (see figure 10). They also missed about $20 and $10 million in wage income, respectively, associated with the lack of employment transition of undocumented college students (see figure 11). States such as Washington, Texas and Florida have no state income tax and hence experienced no tax revenue loss.

## Short-term programs, stalled legislation

From maximizing tax revenues to building a robust workforce to promoting the presence of quality cultural, medical, and educational institutions, much is at stake for local economies in ensuring that foreign-born, college-educated students transition into local workforces at the state level, and occasionally at the city-level as well.

Box 1

### Chinese Students a Boon to Midwestern Universities

The University of Illinois Urbana-Champaign broadcasts its football games in Mandarin, students at Indiana University can pick up a copy of the Chinese-language *Blooming Times* for local news, and Purdue University students annually organize a well-attended Chinese New Year Celebration.[28] These are some of American universities' efforts to attract Chinese students—and their tuition dollars—to local campuses. Hailing from China's growing number of middle-class families, an estimated 60 percent of Chinese students cover the full tuition costs themselves—typically at higher out-of-state rates—and represent a boon for cash-strapped American universities.[29] They also pump funds into the communities surrounding the campuses, having contributed an estimated $22 billion to the US economy in 2014.[30]

Recruitment efforts are paying off. In the 2014–2015 school year, more than 304,000 Chinese students enrolled in American colleges and universities, a fivefold increase from 10 years prior. They now represent more than 30 percent of all international students in the United States, though their presence is especially marked in the Midwest.[31] Analysis by *Foreign Policy* magazine reveals that five of the top 10 "most Chinese" American schools are in the heartland: the University of Illinois Urbana-Champaign, Purdue, Michigan State University, Ohio State University, and Indiana.[32]

"Chinese students bring a rich cultural heritage to Purdue, and since China is a major economic and political force in today's world, American students could benefit from joint learning experiences with Chinese students," said Suresh Garimella, executive vice president for research and partnerships at Purdue University.

The influx of Chinese students is not without challenges—including application fraud and integration on campus[33]—but students and university administrators work hard to foster positive experiences. Purdue, for example, offers a cocurricular volunteer program in the local community, a friendship program with American families, and organized trips with American students to cultural and historical sites throughout the state of Indiana.

"Sharing world views and cultural perspectives both inside and outside the classroom provides an excellent learning environment for Chinese and other international students and American students," said Garimella.

Analysis around programs geared toward temporary employment opportunities for F-1 visa holders and undocumented students—OPT and DACA, respectively—suggest that they are moving the needle in the right direction. But progress on more permanent immigration policy solutions has been limited. Piecemeal policy proposals languish in their respective chambers of Congress, and US House Speaker Paul Ryan has indicated he won't take up immigration reform until at least 2017.[34]

As long as this immigration impasse continues, local economies will continue to shed college-educated immigrants and lose millions in wages and tax revenues. Congress must quickly and decisively update outdated immigration systems to maximize the potential of the foreign-born students being educated in universities across the country.

> ***"The diversity of our graduates continues to strengthen our region both economically and through the richness and depth they bring to our communities as productive citizens. These young people have seized the opportunity to earn an undergraduate degree and are now working as public school teachers, medical interpreters, business and social service professionals. Giving back through service to others is what drives many of these resilient students at Aurora University, and our community is strengthened by what they contribute."***
>
> ***—Theodore C. Parge, executive vice president, Aurora University***

## Optional Practical Training

Optional Practical Training (OPT) allows F-1 visa holders—either undergraduate or graduate students—to extend their postgraduation stay in the United States while gaining practical training in their field. Students on an F-1 visa may enroll for 12 months of full-time OPT after completing their studies at a university in the United States. As of 2008, students enrolled in STEM fields can apply for a 17-month extension, allowing for a total of 29 months of full-time, postgraduate work in the field.

The availability of OPT—especially extended versions of OPT for STEM students—shows promise in boosting college-to-workforce transition rates for students on F-1 visas. Comparing aggregate transition rates for two cohorts of F-1 visa holders—those who graduated before the 2008 extension compared to those who graduated after—suggests that OPT increased workforce transition rates between 7 and 25 percentage points. Namely, the zero aggregate transition percentage between college and employment for F-1 students before 2008 changed into a percentage up to 25 workers per 100 students educated after 2008. While the analysis comes with considerable standard errors, it suggests that further of expansion of the OPT program would further foster F-1 visa holders' contributions to their local workforces.[35]

In March 2016, the US Department of Homeland Security approved a 24-month extension of the OPT program for qualifying STEM students, which would replace the existing 17-month extension, for a total of 36 months of employment.[36] The proposal, which takes effect in May 2016, includes improved oversight of the program, with the introduction of formal mentoring programs and wage regulation.

While more-permanent employment programs would improve F-1 students' ability to find work in local economies, the expansion of OPT shows significant short-term promise.

## Deferred Action for Childhood Arrivals

In June 2012, US President Barack Obama created a new program, Deferred Action for Childhood Arrivals (DACA), which provided relief from deportation and work permits to certain undocumented youth. To be eligible, a person must have arrived in the United States before his or her 16th birthday, have continuously resided in the country since June 2007, be younger than 31 at the time of the announcement, and be enrolled in or have completed high school or military service.

The DACA program shows promise in ameliorating the challenges that undocumented youth, particularly college-educated undocumented youth, face in transitioning into local workforces. DACA provided an initial work permit valid for two years to youth who were previously unable to legally obtain employment because of their immigration status. As of January 2015, more than half of the 1.2 million youth eligible for DACA had applied and were accepted into the program.[37]

Comparing the aggregate college-to-employment transition percentages for two cohorts of undocumented students—graduated in 2010 and 2011 (pre-DACA) and 2013 and 2014 (post-DACA)—suggests that

the program has increased their aggregate transition between 4 and 9 percentage points. Out of 100 undocumented foreign students in a state, 4 to 9 more of them had a job in the state if they graduated two years after DACA compared to those who graduated two years before DACA. While analysis includes significant standard errors, it suggests that DACA represents a step in the right direction in terms of maximizing the employment possibilities of foreign-born college students.[38]

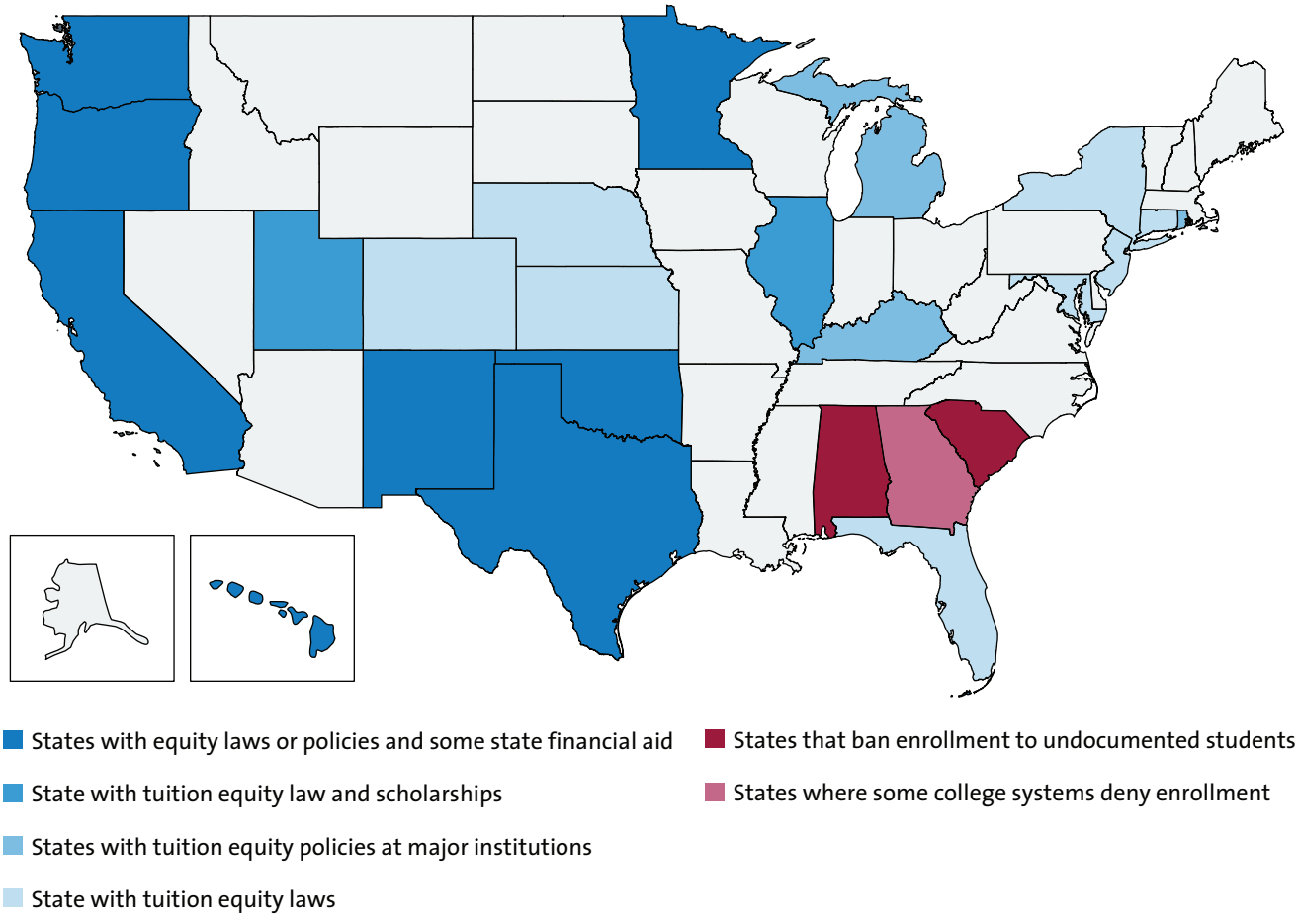
In November 2014 President Obama announced an expansion of DACA as part of his Immigration Accountability Executive Actions. The new version of DACA did away with the age cap and would have increased the number of youth eligible by about 270,000. A companion program, Deferred Action for Parental Accountability (DAPA), provided deportation relief and work authorization to certain parents of US citizens or lawful permanent residents. Implementation of the expanded version of DACA, along with the DAPA program, has been stalled because of legal challenge from 17 states in a case named Texas v. United States. The US Supreme Court is scheduled to hear the case in April 2016.

Until that time, people provided relief under the original version of DACA may continue to renew their work permits. However, as a program born out of executive action, DACA may be amended or revoked when a new administration enters the White House in 2017. It falls to Congress to legislate more permanent solu-

FIGURE 12

## Current State Laws and Policies on Access to Higher Education for Immigrants

**October 2015**




Source: National Immigration Law Center, "Toolkit: Access to Postsecondary Education," October 2015, www.nilc.org/issues/education/eduaccesstoolkit/eduaccesstoolkit2/.

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tions to foster employment for undocumented youth, particularly college-educated youth.

## Tuition equity laws

While federal programs like DACA hold significant promise in improving undocumented students' post-college participation in local workforces, state governments and individual universities are also creating policies that tackle the significant financial barriers that limit these students' enrollment and completion of higher education.

A K–12 public education is guaranteed to all students in the United States regardless of immigration status. But postsecondary tuition policies related to immigration status vary widely by state.[39] Even though a large percentage of undocumented students have either graduated from public high school or obtained a general equivalency diploma, tuition costs may limit their options for postsecondary education if they live in a state that requires that they, as nonresidents, pay out-of-state tuition. During the 2012–2013 school year, the US average in-state costs for tuition, room, and board at a public four-year institution was $17,474 and tuition and associated fees were $21,847 for out-of-state students.[40] But in many states, particularly in the Midwest, the differences were more dramatic. Michigan, for example, averaged $19,865 for in-state versus $31,047 for out-of-state, and Indiana averaged $17,758 for in-state versus $26,538 for out-of-state.

Eighteen states have provisions that allow undocumented students to pay in-state tuition rates, a policy commonly known as "tuition equity." Six also allow undocumented students to receive state financial aid. Conversely, three states—Arizona, Georgia, and Indiana—specifically prohibit in-state tuition for undocumented students, while two states—Alabama and South Carolina—prohibit them from enrolling at a public postsecondary institution (see figure 12).

Until Congress enacts immigration reforms that create uniform federal policies around in-state tuition and immigration status, undocumented immigrants' short-term ability to access higher education—and longer-term contributions to their local workforces—will be shaped by the political landscape of the states in which they reside.

## Legislative proposals

Comprehensive immigration reform proposals, most recently including S.744, which advanced out of the Senate with bipartisan support in 2013 but failed to pass in the House, have attempted to address all aspects of our nation's outdated immigration system, including those related to foreign-born students. Among many other important changes and provisions, S.744 would have allowed PhD-level graduates from STEM fields to more easily apply for limited numbers of permanent employment-based visas, excluding them from country-specific caps and labor-certification requirements if they graduated from an accredited and approved college or university in the United States. The legislation also proposed an increase in the number of H-1B temporary visas available for companies to recruit overseas talent—including former F-1 visa holders who left the country after graduation—to

> ***"Higher education has long been the key to an even better tomorrow for our nation, providing the skilled workforce and pioneering innovation that drive progress and economic growth. Retaining the top minds who come from around the world to study here will lift our future, and broaden the cultural diversity and understanding that is now so crucial in our increasingly global world."***
> ***—Timothy L. Killeen, president, University of Illinois***

Box 2

### Midwestern Legislators Want to "STAPLE" Green Cards to PhD Diplomas

US Representatives Erik Paulsen (R-MN), Mike Quigley (D-IL), and Jim Renacci (R-OH) called on their congressional peers to stop trained-in-America PhDs from leaving the economy ("STAPLE") with the introduction of the STAPLE Act.

"I am proud that America's higher education system draws the best and brightest from all around the world. But right now, those international students who earn advanced degrees in STEM fields are being pushed out of the United States because of our broken immigration system," said Representative Quigley. "Losing these highly qualified, American-educated professionals hurts our national and local economies and puts our companies at a competitive disadvantage. I am proud to support the STAPLE Act, which invests in STEM-educated professionals and our country's future."

a number that would fluctuate between 115,000 and 180,000 based on economic needs.[41]

In recent years, bipartisan congressional cohorts have also introduced stand-alone pieces of legislation aimed primarily at streamlining advanced STEM degree holders' access to permanent immigration status in the United States. While this legislation would primarily benefit F-1 visa holders seeking to stay in the United States to work postgraduation, such proposals could also benefit other groups of foreign-born students. For example:

- **The STAPLE Act:** Sponsored by a bipartisan contingent of US legislators from the Midwest—including Representatives Erik Paulsen (R-MN), Mike Quigley (D-IL), and Jim Renacci (R-OH)—the Stopping Trained in America PhDs from Leaving the Economy (STAPLE) Act, or H.R.2181, essentially awards legal permanent residency to any immigrant who graduates with a PhD in a STEM field from an accredited and qualified university in the United States. The bill would exempt these graduates from the caps governing the number of employment-based green cards awarded each year. The legislation has been introduced multiple times since 2009, most recently in 2015, but has failed to advance for a vote. The website GovTrack.us, which tracks legislation in Congress, gives the bill a 1 percent chance of being enacted.[42]
- **The STEM Jobs Act:** Sponsored by Representative Lamar Smith (R-TX) in 2012, the STEM Jobs Act, H.R.6429, included provisions to create a new visa category for PhD and master's-level students who graduated with STEM degrees from certain US universities, with an allocation of 55,000 visas.[43] However, the legislation also controversially proposed cutting the "diversity" visa category, which sets aside visas for people from countries with low levels of immigration to the United States.[44] The bill passed the House in November 2012 but was never advanced by the Senate. Instead, a more current version of the bill, S.98, was proposed in the Senate by David Vitter (R-LA) in 2015. The bill proposed an allocation of 55,000 visas for immigrants with advanced STEM degrees, also at the expense of diversity visas. The Senate bill included broader provisions related to F-1 and other student visas.[45] According to GovTrack.us, the Senate bill has a less than 1 percent chance of being enacted.[46]

Box 3

## Retaining International Talent in Michigan

Like much of the Midwest, Michigan has seen demographic decline and economic stagnation in recent decades.[47] Technological innovations, trade, globalization, and a myriad of other factors have resulted in a number of the working-age population leaving to seek opportunity elsewhere. The Great Lakes State once ranked near last in the country for its total population age 25–34 and last for that same age cohort born out of state.[48] Because Michigan faced significant challenges in building a pipeline of qualified employees and company leaders, Global Detroit, a regional nonprofit economic development initiative, looked to the more than 32,000 international students studying in the state's universities to fill the gap.[49] Global Detroit's Global Talent Retention Initiative (GTRI) is a first-of-its-kind collaboration between local employers and 32 Michigan higher education institutions. GTRI has developed a robust offering of programs and supports to connect international students interested in working in Michigan with local employers seeking to hire them.

"International students already contribute more than $1 billion in annual economic activity to Michigan, but GTRI is designed to leverage the long-term economic benefits that international students represent by helping employers fill unmet talent needs to grow their businesses, create jobs, and compete," said Global Detroit Director Steve Tobocman. "Given the impressive numbers of international students in high-demand STEM fields, as well as pursuing graduate degrees, this talent pool represents some of the world's most valuable workers. Local communities and employers who don't have a strategy to recruit and retain this talent are leaving themselves at a competitive disadvantage."

- **The Immigration Innovation Act:** Known as "I-Squared," this bipartisan Senate bill (S.153), sponsored by Christopher Coons (D-DE), Orrin Hatch (R-UT), Amy Klobuchar (D-MN), and Marco Rubio (R-FL), aims to "reset the entire construct of high-skilled immigration."[50] Introduced in 2015, the legislation would increase the number of H-1B visas used by US-based employers to sponsor highly skilled immigrant workers from 85,000 (20,000 of which are reserved for applicants with advanced degrees) to 115,000 annually. This sets the cap at a level that more closely matches demand—2015 saw a record 233,000 applications for H-1B visas[51]—but

does not address the fact that visas are awarded via lottery instead of merit, nor does it reform the factors leading to system abuses.[52] More productively, the bill would exclude from the cap foreign-born students with master's- and PhD-level degrees from US schools, which would allow companies to directly offer employment to individuals if they recruit from US-based graduate schools.[53] Despite these benefits, GovTrack.us gives the bill a 1 percent chance of being enacted.

Even though these legislative proposals have enjoyed strong bipartisan support, they remain stalled in their respective chambers, the slow progress symptomatic of a larger stalemate on the issue of immigration. As the House will likely not take on immigration reform until 2017, temporary programs like DACA and OPT may be the only way to boost foreign-born student transition rates in the interim.

## Boosting students' employment opportunities with immigration reform

The United States and local economies have much to gain from better fostering the college-to-workforce transition of foreign-born students. Policies that offer expanded channels for F-1 visa holders to stay in the United States to work, along with eventual pathways to permanent residence for undocumented students, hold much economic promise.

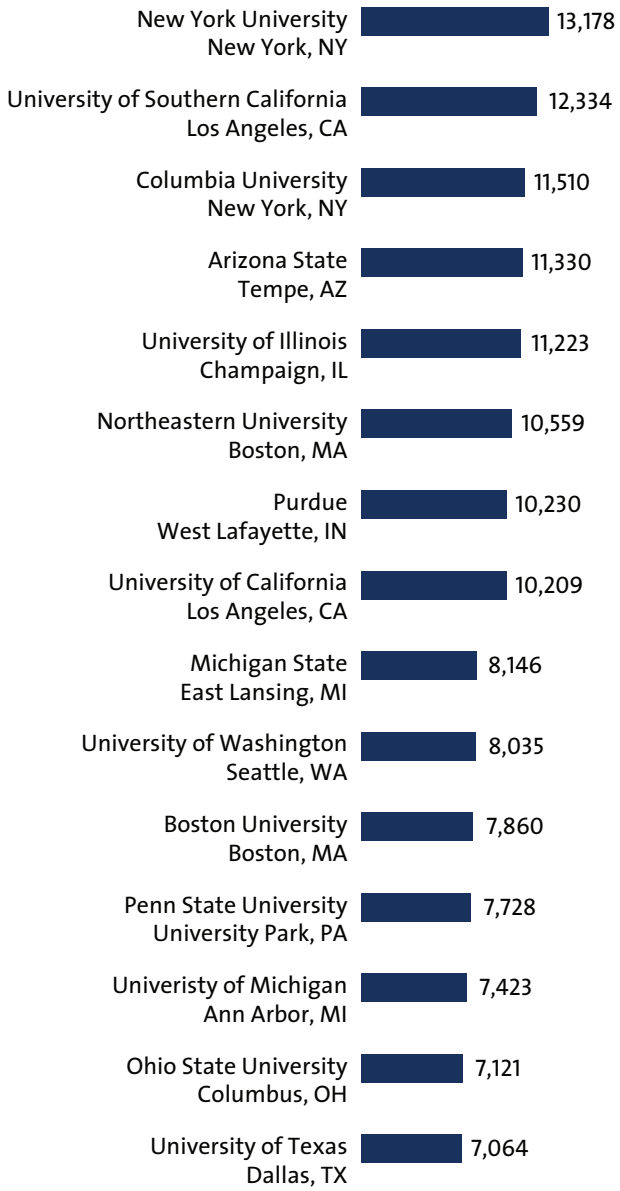
International students are eager to study in top-ranked US-based institutions of higher learning, and universities are happy to admit them (see figure 13). The human capital and tuition dollars they bring to campus are important, as are other assets more difficult to quantify such as ethnic diversity, determination, and cultural heritage. The US STEM sector particularly benefits from the contributions of foreign-born students because they make up majorities of advanced degree holders in the field. These students are future leaders and innovators in the fields, ensuring the United States' continued competitiveness in a global economy.

Local and state economies are poised to gain significant income and job growth if even a fraction of foreign-born students are better retained in some local workforces. Based on these considerations, the following policy recommendations could contribute to the growth of state and local economies and the US economy overall.

FIGURE 13

### Most Popular US Universities for International Students

**The most popular schools for international students are scattered across the US from New York to California to the American Rust Belt.**




Note: Data are from the 2014-2015 school year and include both graduate and undergraduate students.
Source: Institute of International Education Open Doors Report, 2015.

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1. **Develop a provisional visa for STEM college graduates.** Congress should develop a provisional visa, similar to the H-1B, available to students who graduate with a college degree in a STEM field from

an accredited university and have a job offer from a US-based employer. The visa would be valid for three years, renewable for three more, and eventually convertible into legal permanent residence after six years, conditional on an employer sponsoring the applicant and the worker choosing to stay in the country. Legal permanent residency awarded to STEM students after six years would be excluded from yearly and per-country quotas. These visas should not have a formal cap. Students' pre-college immigration status should be irrelevant to eligibility for this visa, thus potentially opening a channel for undocumented students to apply. The STEM focus will direct minority students towards these majors.

2. **Allocate H-1B visas for STEM graduates.** An alternative, less ambitious policy is that Congress should augment the current cap of 85,000 H-1B visas with a market-driven number of visas to be reserved for students who graduate with a STEM degree from an accredited American university. The proposal mirrors the current preference given to applicants with advanced degrees—20,000 visas are reserved for master's-level degrees or higher—and reduces the inefficiency of random lottery allocation, instead of awarding visas on the basis of merit or productivity contributions in specific industries. Setting aside visas for STEM fields frees up visas to be awarded in other critical sectors, such as healthcare. Without modifying the number of permanent resident permits, however, such a policy would still face a bottleneck when H-1B visa workers want to convert their visa into permanent residence.
3. **Allow US states to add geographical incentives to work opportunities for F-1 visa holders.** At the local level, US states could be allowed to offer incentives for work extensions of visas to initially limit the student's employment to a certain geographical area to support the local economy. The proposal recognizes the local economy's investment in international students and fosters college-to-work transition (and coordination between colleges and local employers) within specific metro or state areas, keeping human capital where it was developed. Initial work permits with geographic restrictions would be temporary, and eventually students could seek employment in the open market. While such geographical limitation can be seen as suboptimal, and it would need to be designed and enforced appropriately, it can be attractive because it could align the interest of public universities and local governments to attract highly skilled people to revitalize local economies and colleges.
4. **Facilitate student access to investor visas.** Immigrants are 30 percent more likely to form new businesses than their US-born peers, evidence of the entrepreneurial spirit that drives many foreign-born students' interest in starting a business postgraduation.[54] While various visa channels exist for entrepreneurs with significant start-up capital[55]—an E-2 visa requires an investment of $100,000, whereas an EB-5 visa requires up to $1 million—such financing may be out of reach for recent college graduates. A visa requiring a more modest investment for foreigners educated in American institutions—or a simple business plan and proof of investor backing—would allow more entrepreneurial foreign-born students to contribute to local economies. This proposal could be combined with any of the previous policies.

## Conclusion

The United States is in the enviable position of having some of the most renowned and prestigious universities in the world, and, as a result, a large supply of highly talented foreign-born students who are ready to invest their time and tuition dollars to become highly productive scientists, engineers, business leaders, among other careers.

Yet even as record numbers of foreign-born students are enrolling in US universities, their impact on job creation, productivity, and innovation in local economies is limited by their temporary visa or undocumented status. Under the current immigration system, local economies cannot fully maximize the human capital being developed on their local campuses.

Policies that increase the college-to-employment transition rates of F-1 visa holders and undocumented students would increase employment levels and tax revenues in nearly every state in the country. More important are the longer-term economic effects of fully maximizing foreign-born students' contributions to critical STEM and innovation fields, driving the United States' future global competitiveness. Universities and local governments have an important role to play in driving changes in immigration policy, but it falls to Congress to legislate lasting solutions.

## About the authors

Giovanni Peri is professor and chair of the Department of Economics at the University of California, Davis, and research associate of the National Bureau of Economic Research in Cambridge, Massachusetts. He is editor of the journal *Regional Science and Urban Economics* and is on the editorial board of several academic journals in economics. He is the director of the UC Davis Temporary Migration Cluster, an interdisciplinary group doing research on international migrations. His research has focused on the impact of international migrations on labor markets and productivity of the receiving countries and on the determinants of international migrations. He has published in several academic journals, including *The American Economic Review*, *The Review of Economic Studies*, *The Review of Economics and Statistics*, *The Economic Journal*, the *Journal of the European Economic Association*, the *Journal of International Economics*, and the *Journal of Labor Economics*. His research has been featured in popular blogs and in media outlets, including *The New York Times*, *The Wall Street Journal*, *The Washington Post* and *The Economist magazine*. He has received several grants to study international migrations from foundations and international organizations, including the National Science Foundation, the John D. and Catherine T. MacArthur Foundation, the World Bank, and the Volkswagen Foundation.

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