

By Stuart Anderson



## International Students Are Vital to U.S. Higher Education

**NEW RESEARCH** is bringing to the fore just how important international students are to the United States and its educational system.<sup>1</sup> While the public debate about immigration has focused on the most controversial issues, such as how to address the status of the approximately 11 million unauthorized immigrants in the United States, immigration policies also affect U.S. universities and international students.

International students are crucial to enhancing the ability of U.S. universities to conduct research, recruit and retain teaching talent, and offer high-quality academic programs to U.S. students. International students may make it possible for many universities to offer academic programs in technical fields that otherwise would be of lower caliber or would be unable to attract top-flight faculty without international students.

As Table 1 illustrates, when U.S. employers venture onto college campuses today, they will find that a high percentage of the graduate students in science and engineering are international students. Foreign nationals account for 71 percent of the full-time graduate students in electrical engineering, 65 percent in computer science, 61 percent in industrial engineering, and more than 50 percent in economics, chemical engineering, materials engineering, and mechanical engineering in 2011.<sup>2</sup> In comparison, in 1982, foreign nationals accounted for 44 percent of the full-time graduate students in electrical engineering and 35 percent in computer science.<sup>3</sup>

TABLE 1

**Full-time Graduate Students and the Percent of International Students by Field (2011)**

Field	Percent of International Students	Number of Full-time International Graduate Students	Number of Full-time U.S. Graduate Students
Electrical Engineering	71.4	21,933	8,802
Computer Science	64.5	19,605	10,802
Industrial Engineering	60.6	4,998	3,253
Economics	55.3	7,823	6,335
Materials Engineering	53.8	3,163	2,714
Chemical Engineering	52.8	4,036	3,603
Mechanical Engineering	50.7	8,150	7,934
Mathematics & Statistics	45.6	8,354	9,949
Civil Engineering	45.6	6,554	7,809
Physics	43.6	5,844	7,569
Other Engineering	42.3	7,682	10,499
Chemistry	40.2	8,200	12,203

Source: National Science Foundation, Survey of Graduate Students and Postdoctorates in Science and Engineering, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents.

### International Students Are a Majority in Many U.S. Graduate School Programs

The aggregate numbers on international students portray only part of the story. It does not tell us how international graduate students help the universities they attend. I conducted an analysis to examine the number of schools where international students account for a majority of the full-time graduate students (master's and PhDs). Such an analysis helps illustrate the importance of international students.

In electrical engineering, at 153 U.S. universities, representing nearly 88 percent of the U.S. graduate school programs in electrical engineering, the majority of full-time graduate students are international students. In computer science, at 170 universities, representing 79 percent of the U.S. graduate school programs in computer science, the majority of full-time graduate students are international students.<sup>4</sup> (See Table 2, next page.)



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TABLE 2

## U.S. University Graduate Programs with a Majority of International Students

Field	Number of U.S. Universities with More Than 50 Percent International Students in Graduate School Program (2011)	Percentage of U.S. Universities with a Majority of International Students in Graduate School Program (2011)
Electrical Engineering	153	88 percent
Computer Science	170	79 percent

Source: National Science Foundation, Survey of Graduate Students and Postdoctorate, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents; National Foundation for American Policy analysis.

### Supporting Research, Retaining Faculty

International students are key to supporting research at U.S. universities, which helps retain and attract top faculty. Tables 3 through 7 illustrate that at schools such as Rice University, Indiana University, Purdue University, Ohio State, and others, international students generally comprise 60 to 80 percent of the graduate students in electrical engineering, computer science, chemical engineering, and other fields. In 2010, U.S. universities conducted 51 percent of all basic research performed in the United States, according to the National Science Foundation.<sup>5</sup>

“We are a research university, and in computer science that means that much of the research is done by teams led by professors with experiments carried out by graduate students,” explains Professor Christopher Raphael, chair of the computer science department at Indiana University. “This model only works if we can get high-quality PhD students, and we would be hard pressed to get the number we need solely from the United States.”<sup>6</sup>

The high level of international students plays a role in universities being able to attract and retain faculty, which benefits U.S. students. “If we were not to place such a heavy emphasis on research, we wouldn’t be able to get faculty that teach the wide range of things we do, with the appropriate expertise, so our educational mission would suffer,” said Raphael. “Really the most important part of the educational experience is to work closely with high-quality faculty, as one does directly at the PhD stage. So the research and the education are of a piece.”<sup>7</sup>

Professor Stuart Cooper, department chair of chemical and biomolecular engineering at Ohio State University, also points to the connection between research and teaching at U.S. colleges. “There is a synergy. To get tenure and perform research, professors require a significant number of graduate students and there are not enough domestic students alone in certain fields,” said Professor Cooper. “The advances made by professors and graduate students, including international students and postdocs, provide new knowledge and benefits to society.”<sup>8</sup>

Without the ability to perform high-level research at U.S. universities, many talented

individuals would not take or seek faculty positions, leaving U.S. schools far weaker and unable to educate U.S. students in important fields. Graduate students also directly support the educational mission for undergraduates by serving as teaching assistants. Their duties include conducting study sessions and grading, which “takes some of the burden off the faculty” to focus on teaching, according to Cooper.<sup>9</sup>

### International Students Help Maintain Graduate Programs

Many excellent U.S. universities rely on international students to maintain their graduate school programs. At Rice University, in 2011, 75 of the 117 full-time graduate students in electrical engineering were foreign nationals. In computer science, 46 of the 69 graduate students (67 percent) were foreign nationals. International graduate students accounted for 79 percent of the full-time students (52 of 66) in chemical engineering, and 59 percent (69 of 118) in chemistry.<sup>10</sup>

TABLE 3

## Rice University

Field	Percent of International Students	Number of Full-time International Graduate Students	Number of Full-time U.S. Graduate Students
Computer Science	67	46	23
Electrical Engineering	64	75	42
Chemical Engineering	79	52	14
Chemistry	59	69	49

Source: National Science Foundation, Survey of Graduate Students and Postdoctorate, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents.

TABLE 4

## Indiana University

Field	Percent of International Students	Number of Full-time International Graduate Students	Number of Full-time U.S. Graduate Students
Computer Science	70	359	156
Electrical Engineering	64	81	46
Economics	78	65	18
Physics	42	44	62

Source: National Science Foundation, Survey of Graduate Students and Postdoctorate, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents.

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At Indiana University (all campuses), 359 of the 515 full-time graduate students (70 percent) in computer science were foreign nationals in 2011; in electrical engineering, 81 out of the 127 graduate students (64 percent) were international students; in economics, 78 percent in the graduate program were international students (65 of 83); in physics, 42 percent were international students (44 of 106).<sup>11</sup>

At Purdue University, foreign nationals accounted for 75 percent (177 of 236) of full-time graduate students in computer science, and 49 percent (60 of 122) in chemical engineering.<sup>12</sup> At Ohio State, in 2011, 84 percent of the full-time graduate students (263 of 314) in computer science were foreign nationals. In chemical engineering, international graduate students filled 68 percent of the full-timeslots (60 of 88).<sup>13</sup> At Texas A&M, 77 percent of the full-time graduate students in computer science (197 of 255) and 82 percent of the graduate students in electrical engineering (391 of 480) were foreign nationals in 2011.<sup>14</sup>

## Conclusion

Economists support ways to retain talented international students in the United States, including providing a clear path for permanent residence for graduates of U.S. universities in science and engineering fields. University of California, Davis, economist Giovanni Peri, writes, “The United States has the enormous international advantage of being able to attract talent in science, technology, and engineering from all over the world to its most prestigious institutions . . . The country is certainly better off by having the whole world as a potential supplier of highly talented individuals rather than only the native-born.”<sup>15</sup>

International students are a key source of talented professionals and researchers for U.S. universities and employers. Reforms in Congress that would make it easier for international students to come to the United States and remain, if offered a job, will benefit the U.S. economy. A policy of welcoming international students helps the United States maintain its leadership as a center of learning and innovation. **IE**

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**TABLE 5**

### Purdue University

Field	Percent of International Students	Number of Full-time International Graduate Students	Number of Full-time U.S. Graduate Students
Computer Science	75	177	59
Chemical Engineering	49	60	62

Source: National Science Foundation, Survey of Graduate Students and Postdoctorate, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents.

**TABLE 6**

### Ohio State University

Field	Percent of International Students	Number of Full-time International Graduate Students	Number of Full-time U.S. Graduate Students
Computer Science	84	263	51
Chemical Engineering	68	60	28

Source: National Science Foundation, Survey of Graduate Students and Postdoctorate, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents.

**TABLE 7**

### Texas A&M University

Field	Percent of International Students	Number of Full-time International Graduate Students	Number of Full-time U.S. Graduate Students
Computer Science	72	197	58
Chemical Engineering	82	391	89

Source: National Science Foundation, Survey of Graduate Students and Postdoctorate, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents.

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## ENDNOTES

1 Parts of this article were adapted from Stuart Anderson, *The Importance of International Students to America*, NFAP Policy Brief, National Foundation for American Policy, July 2013. The research was funded by a grant from the Ewing Marion Kauffman Foundation.

2 National Science Foundation, Survey of Graduate Students and Postdoctorate, [webcaspar.nsf.gov](https://ncesdata.nsf.gov/webcaspar/).

3 Ibid.

4 National Science Foundation, Survey of Graduate Students and Postdoctorates in Science and Engineering, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents; National Foundation for American Policy analysis.

5 National Center for Science and Engineering Statistics, National Patterns of R&D Resources: 2010–11 Data Update, National Science Foundation, NSF13-319, April 2013, Table 3.

6 Interview, via email, with Christopher Raphael.

7 Ibid.

8 Interview with Stuart Cooper.

9 Ibid.

10 National Science Foundation, Survey of Graduate Students and Postdoctorate, <https://ncesdata.nsf.gov/webcaspar/>. U.S. students include lawful permanent residents.

11 Ibid.

12 Ibid.

13 Ibid.

14 Ibid.

15 Giovanni Peri, *Immigrants, Skills, and Wages: Measuring the Economic Gains from Immigration*, (Washington, DC: Immigration Policy Center, March 2006), p. 7.