InfoBrief
NCSES National Center for Science and Engineering Statistics

October 2012 ■ NSF 13-300

International Mobility and Employment Characteristics among Recent Recipients of U.S. Doctorates

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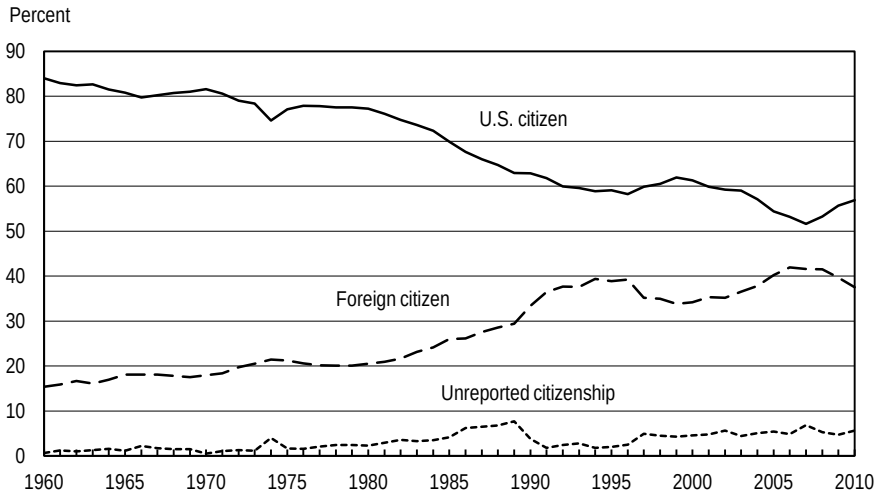
The proportion of foreign nationals among individuals who earned a research doctorate in science, engineering, or health (SEH) in the United States has followed a general upward trend since 1960 (figure 1). Foreign citizens' share of U.S.-earned doctorates in SEH was about 17% during 1961–70 and by 2010 had reached nearly 40%.

At the time of their graduation, most foreign recipients of U.S. doctorates planned to stay in the United States.[2]

Employment characteristics among doctorate recipients are closely related to degree fields and may vary by the location of employment. A large majority (93.5%) of the recent (2001–07) recipients of SEH doctorates who reported working as of 1 October 2008 were working full time.

Data in this InfoBrief are from the 2008 Survey of Doctorate Recipients (SDR) and the 2010 Survey of Earned Doctorates (SED).[3]

FIGURE 1. U.S. research doctorates awarded in science, engineering, or health, by citizenship: 1960–2010



SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Earned Doctorates.

International Mobility

Among recent doctoral graduates (academic years 2001–07) holding a temporary U.S. resident visa, 73.3% reported in the SED that their immediate postgraduation plan was to live in the United States after receiving their degree. However, a significant proportion (23.4%) planned to seek opportunities for employment and postdoctoral (postdoc) study outside the United States. (The remaining 3.3% did not report postgraduation intended location.) In some cases, despite their initial intent to stay, foreign nationals changed their postgraduation plans and left the United States.

Postgraduation Plans versus Actual Outcomes

The current location of residency reported in the 2008 SDR was compared with the location of post-

graduation plans reported in the SED at the time of graduation for the recent doctoral graduates. Overall, 85.7% of recent doctoral graduates reported living in the United States (including Puerto Rico or another U.S. territory) on the SDR reference date of 1 October 2008 (table 1). Among foreign-born graduates who were holding a temporary U.S. visa at the time of graduation, 67.5% reported living in the United States on the 2008 SDR reference date. Within this group of temporary visa holders, the 2001–03 SDR cohorts, when combined, reported a lower stay rate (60.8%) than did the more recent 2004–07 SDR cohorts (71.0%). The 2001–03 SDR cohorts also had a higher rate of leaving the United States despite having plans to stay (16.0%) than did the 2004–07 SDR cohorts (7.9%). The 2001–03 SDR cohorts correspond to doctorate recipients who graduated at least 5 years before the 2008 SDR reference date. One possible factor of the higher emigration rate of the 2001–03 SDR cohorts among those initially planning to stay is that these doctorate recipients stay only temporarily to gain postgraduation experience in the United States before leaving the country.

Popular International Destinations

To study the mobility of recent doctoral graduates, we compared their country of origin to their country of current residency, as reported in the 2008 SDR. Country of origin was defined as the country of citizenship recent doctoral graduates reported in the SED at the time of graduation.[4] Country of current residency was defined as the country of current employment for those who reported working (96.2%) and the country where they were located for those who reported not working (3.8%).

Overall, 20.4% of foreign-citizen graduates reported working or living in their country of origin in 2008, whereas 96.6% of U.S.-citizen graduates reported working or living in the United States. Among foreign graduates who did not return to their country of origin, the United States was the most popular destination, with 88.9% reporting living in the United States. For this group, the European Union was the second most popular destination (3.7%), and Asia and Canada tied for third (2.7% and 2.6%, respectively). Table 2 gives the relative proportions of seven destinations for each country or region of origin. Foreign graduates from China, countries that were part of the former Soviet Union, and India reported distinctly low rates of returning to their home countries (3.7%, 4.1%, and 5.2%, respectively) compared with those from other foreign countries.

Relationship between Degree Field and Emigration

For this and the remaining analyses in this InfoBrief, recent doctoral graduates were divided into four groups (hereafter, analysis groups) defined by U.S. citizenship status at the time of graduation (U.S. citizen or non-U.S. citizen)

TABLE 1. Reported location in 2008 of recent doctoral graduates, by citizenship status, postgraduation plan, and year of doctoral degree: 2001–07
(Percent)

Characteristics	All years	2001	2002	2003	2004	2005	2006	2007
All doctorate recipients	203,400	26,900	26,200	26,200	27,300	31,100	31,000	34,600
Living in United States	85.7	86.0	85.4	83.3	85.5	85.0	86.6	87.0
Planned to live in United States	78.6	78.6	77.2	76.2	77.1	79.8	80.3	79.8
Planned to live abroad	2.1	2.2	2.1	2.8	2.9	1.5	2.0	1.6
Living abroad	14.3	13.7	14.6	16.7	14.5	15.0	13.4	13.0
Planned to live in United States	5.2	6.6	5.7	8.2	4.7	4.7	4.6	3.1
Planned to live abroad	8.1	6.6	7.7	7.9	9.1	8.5	7.6	8.8
All doctorate recipients with a temporary U.S. visa	73,400	8,300	8,300	8,700	9,800	12,100	12,200	14,200
Living in United States	67.5	62.3	61.6	58.5	66.9	68.4	73.3	73.9
Planned to live in United States	61.3	55.8	56.2	53.0	59.2	63.4	67.7	66.5
Planned to live abroad	3.0	3.4	2.6	4.4	3.8	2.6	2.2	2.4
Living abroad	32.5	37.7	38.4	41.5	33.1	31.6	26.7	26.1
Planned to live in United States	10.7	15.9	13.5	18.4	9.2	8.8	7.8	6.4
Planned to live abroad	19.6	20.1	21.8	21.4	22.2	20.0	16.7	17.4

NOTE: Location of recent doctoral graduates (living in United States or abroad) who received doctorate in 2001–07 was reported as of 2008 Survey of Doctorate Recipients reference date of 1 October 2008.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

TABLE 2. Recent doctoral graduates' country or region of origin, by country or region of current employment or residency: 2008
(Percent)

Country or region of origin	Country or region of origin (% distribution)	Country or region of current employment or residency							
		United States	Asia	European Union	Canada	Central and South America	Africa	Other	Return to home country[a]
All	100.0	85.9	6.9	2.9	1.6	1.4	0.4	1.0	65.1
United States	58.7	96.6	0.6	1.5	0.6	0.1	0.2	0.4	96.6
China	10.8	93.1	4.4	0.5	1.7	D	D	0.3	3.7
European Union	4.7	66.9	1.2	26.7	1.3	D	D	3.4	16.6
India	4.2	87.9	5.6	2.5	2.8	D	D	D	5.2
South Korea	3.7	53.9	45.0	D	D	D	D	D	43.5
Turkey	1.6	55.2	37.7	4.5	D	D	D	D	37.3
Taiwan	1.6	51.6	44.9	D	D	D	D	D	42.5
Canada	1.5	66.6	D	D	30.7	D	D	D	30.7
Other Asian countries	5.1	49.6	45.1	1.5	2.5	D	D	1.1	41.6
Former Soviet Union	1.2	83.5	D	4.1	7.0	D	D	5.4	4.1
South America	1.9	47.7	D	5.3	2.4	43.2	D	D	40.2
Central America	0.8	42.4	D	D	3.4	48.2	D	D	48.2
Africa	1.3	74.2	2.9	D	3.6	D	17.9	D	15.9
All other non–United States	3.0	64.7	12.7	6.6	3.9	2.8	D	8.8	6.3

D = suppressed to avoid disclosure of confidential information.

[a] Country of current employment or residency is same as country of origin.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

and their reported residency on the SDR reference date of 1 October 2008:[5]

1. U.S. citizens residing in the United States (estimated population = 114,700),
2. Foreign citizens residing in the United States (estimated population = 59,200),[6]
3. Foreign citizens residing abroad (estimated population = 24,500), and
4. U.S. citizens residing abroad (estimated population = 4,000).

Statistical reports show that foreign recipients of U.S. SEH doctoral degrees focus on different fields of study as compared with their U.S. counterparts.[7] The distributions of overall percentages, by broad field of degree and analysis group, are shown in figure 2. Foreign citizens with degrees in psychology, the social sciences, or health were more likely to leave the United States after graduating than were those with degrees in all the other fields combined (45.7% vs. 25.9%).

Employment Characteristics

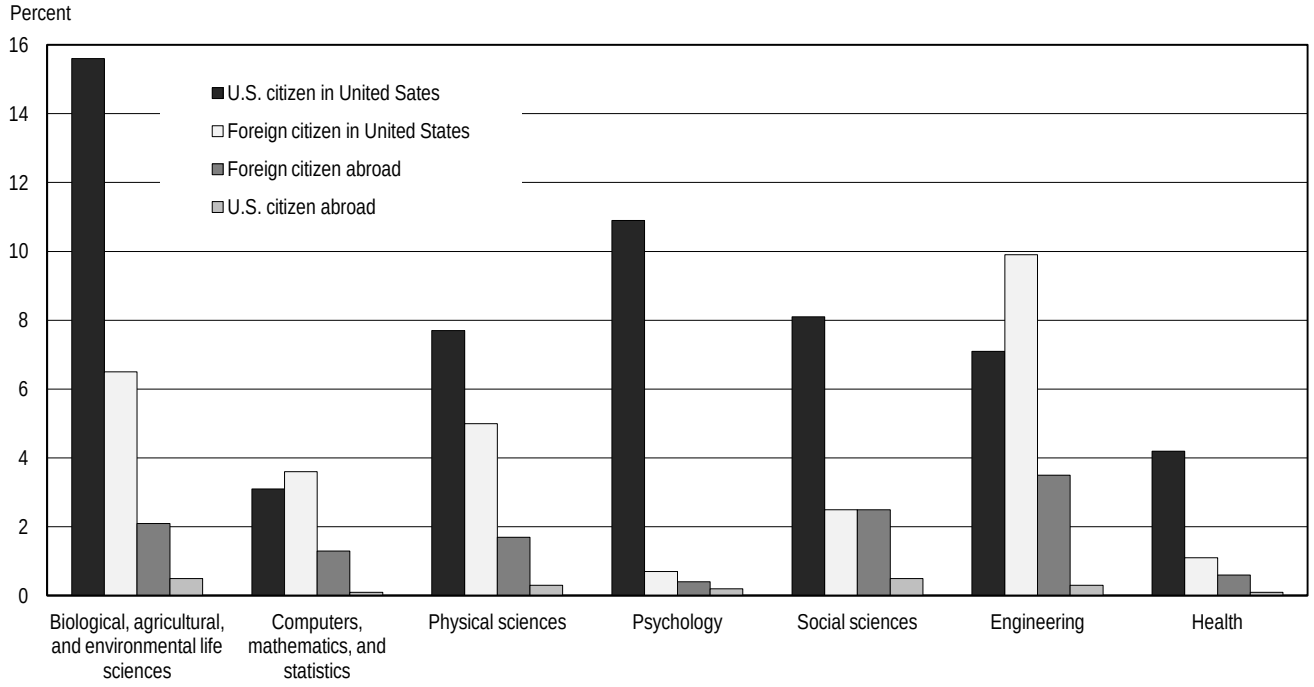
Employment Sector

Four-year educational institutions formed the largest employment sector for all analysis groups with the exception of foreign citizens in the United States, who reported working in private, for-profit industry and in 4-year institutions in equally high proportions (43.5%) (figure 3). In fact, foreign citizens working in the United States were more likely than any of the other analysis groups to report working in the private, for-profit sector. Across the four analysis groups, foreign citizens working abroad reported the highest rate of working in a 4-year university or institution (61.7%), whereas U.S. citizens working abroad reported the highest rate of working in the government sector (20.5%).

Primary Work Activity

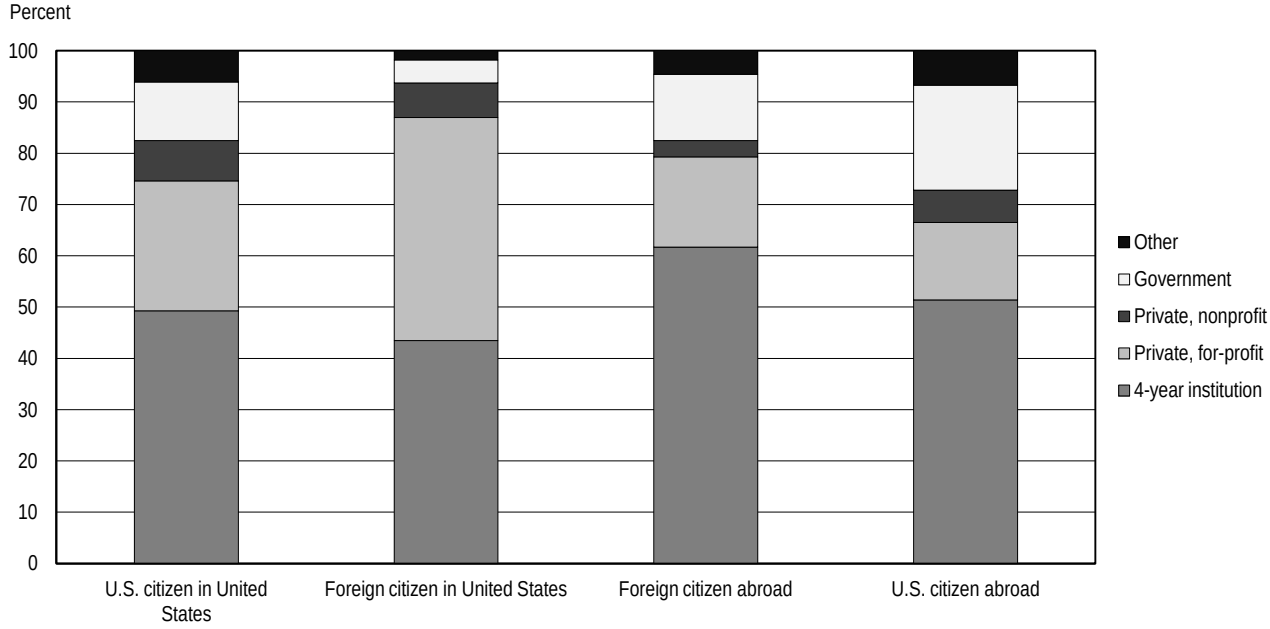
Within 4-year educational institutions, the private, for-profit sector, and government, foreign citizens working in the United States reported higher rates of performing research (basic or applied) and development as their primary work activity than did U.S. citizens working in the United States and foreign citizens working abroad (table 3). U.S. citizens who were working abroad in 4-year institutions reported the highest rate among the analysis groups of working in basic or applied research. (It should be noted, however, that the analysis group of U.S. citizens working abroad has sufficient sample size to provide estimates only for the 4-year institution sector.) In the private, nonprofit sector, the two foreign citizen analysis groups reported similar proportions of having research (basic or applied) and development as their primary activity and had higher rates than the group of U.S. citizens working in the United States.

FIGURE 2. Distribution of field of degree, by citizenship at the time of graduation and current residency: 2008



SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

FIGURE 3. Distribution of employment sector, by citizenship at time of graduation and current residency: 2008



NOTES: Other sector includes 2-year colleges, community colleges, technical institutes, and other precollege institutions; self-employment or business ownership; and other employers not broken out separately. Private, for-profit sector excludes those self-employed in an incorporated business. Four-year educational institutions include 4-year colleges or universities, medical schools (including university-affiliated hospitals or medical centers), and university-affiliated research institutes.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

TABLE 3. Top-ranking primary work activities, by selected employment sectors, citizenship at time of graduation, and current residency: 2008

	U.S. citizen in United States		Foreign citizen in United States		Foreign citizen abroad	
Employment sector	Activity	Percent	Activity	Percent	Activity	Percent
4-year educational institution	Teaching	40.3	Basic research	36.4	Teaching	40.7
	Basic research	23.4	Applied research	25.4	Basic research	26.5
	Applied research	18.1	Teaching	24.9	Applied research	18.7
	Managing/supervising	6.3			Managing/supervising	6.1
	Professional services	6.3				
Private, for-profit	Applied research	29.9	Applied research	28.8	Applied research	29.2
	Managing/supervising	15.1	Development	27.5	Managing/supervising	19.4
	Professional services	14.8	Computer applications	12.9	Development	18.7
	Development	14.3	Design	9.3	Computer applications	7.1
	Computer applications	5.9	Managing/supervising	7.1	Professional services	5.9
Government	Applied research	32.8	Applied research	46.3	Applied research	34.4
	Professional services	19.3	Basic research	30.9	Basic research	31.2
	Managing/supervising	14.2	Development	6.1	Managing/supervising	14.7
	Basic research	13.9			Development	6.0
Private, nonprofit	Applied research	26.5	Basic research	40.2	Applied research	49.6
	Professional services	22.8	Applied research	27.4	Managing/supervising	15.2
	Basic research	17.4	Professional services	10.9	Basic research	15.0
	Managing/supervising	15.6	Managing/supervising	7.8	Development	12.3
	Other	5.1	Development	6.3		

NOTES: Primary work activity is activity that occupied most working hours during typical week on one's principal job. Activities shown include only those reported by at least 5% of graduates in each subpopulation defined by employment sector and citizenship/residency group. More detailed descriptions of type of work activities are in questionnaire. Group of U.S. citizens abroad is not included due to insufficient sample size.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

Academic Positions

Among all recent doctoral graduates, 49.2% reported working in a 4-year university, medical school, or university-affiliated research institute. Of these, 51.4% reported holding a teaching or teaching and research faculty position, 15.8% reported holding a research-only faculty position, and 20.5% reported holding a postdoc position. The distribution of type of academic position within each analysis group is shown in figure 4. The two analysis groups working outside of their home countries (i.e., foreign citizens working in the United States and U.S. citizens working abroad) reported the highest rates of holding postdoc positions.

Postdoctoral Positions

Among all employment sectors, the proportion of doctorate recipients holding a postdoc position on the SDR reference date of 1 October 2008 was highest for the most recent graduates, as might be expected (figure 5). To test for statistically significant differences among the four analysis groups, data were combined from the three latest degree years (2005–07), and the postdoc proportions were compared. Among U.S. citizens working abroad, 44.1% reported holding a postdoc position, which was significantly higher than all other analysis groups. Among the remaining three analysis groups, 26.5% of foreign citizens working in the United States reported holding a postdoc position, which is higher than the rates reported by U.S. citizens working in the United States (21.7%) and foreign citizens working abroad (15.2%).

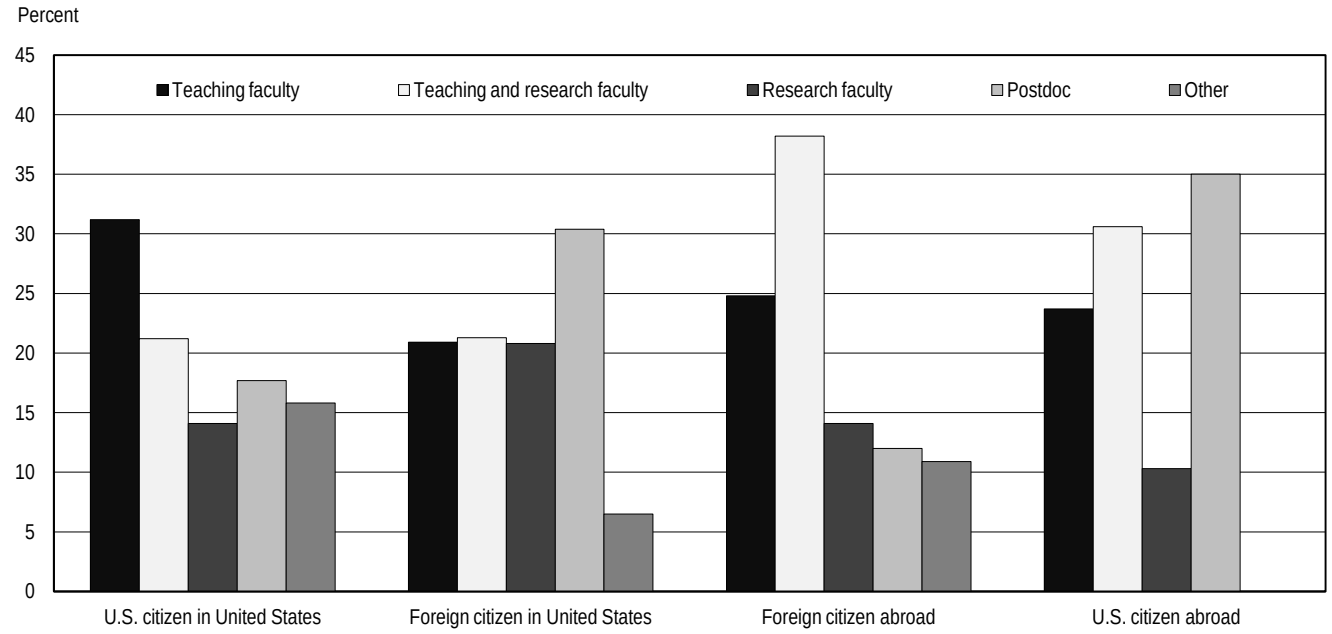
Annual Salary

An estimated median annual salary was calculated for the subset of full-time employed doctorate recipients within each analysis group, by broad degree field and employment sector, whenever sufficient sample size was available (table 4).[8] Those working outside the United States were asked to convert their annual salary to U.S. dollars. The estimated median salaries for foreign citizens working abroad were lower, in general, than the other three analysis groups. The estimated median salaries of the two groups working in the United States tended to be similar. In cases where these two groups had different median salaries, the group of U.S. citizens working in the United States had a higher salary than the group of foreign citizens working in the United States except for in the fields of social science in academic settings and in all sectors combined and health in all sectors combined.

Data Sources and Limitations

Data presented in this report are from the 2008 SDR and 2010 SED. The SDR

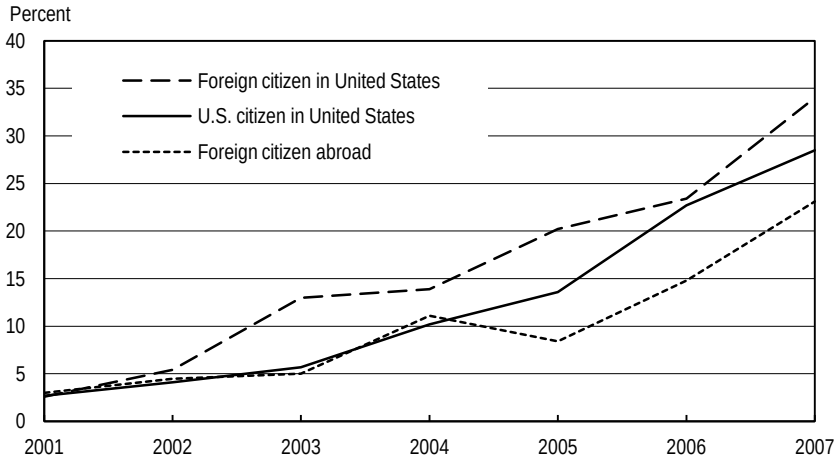
FIGURE 4. Distribution of academic positions for those employed in 4-year institutions, medical schools, or university-affiliated research institutes, by U.S. citizenship at the time of graduation and current residency: 2008



NOTES: Other positions include president, provost, chancellor, dean, department head or chair, and any other position not broken out separately. Other positions in U.S. citizen abroad category suppressed to avoid disclosure of confidential information.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

FIGURE 5. Proportion holding a postdoctoral position on 1 October 2008, by degree year, citizenship at time of graduation, and current residency: 2001–07



NOTE: Group of U.S. citizens abroad is not included due to insufficient sample size for individual years.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

has been conducted every 2 years since 1973 and is sponsored by the National Science Foundation (NSF) in conjunction with the National Institutes of Health and other federal agencies on an occasional basis. The SED, also sponsored by NSF and other federal agencies, provides the sample frame for the SDR. The SED is a census of all individuals who earn a research doctorate from a U.S. educational institution in a given academic year (1 July of one year through 30 June of the following year).

The SDR is a longitudinal study of individuals who received a research doctorate degree from a U.S. institution in an SEH field. The survey follows a sample of individuals throughout their careers from the year of their degree award through age 75. The SDR has

TABLE 4. Median annual salary of doctorate recipients employed full time, by broad field of doctorate, employment sector, and citizenship/residency group: 2008

(U.S. dollars)

Broad field of doctorate	Employment sector	U.S. citizen working in United States (group 1)	Foreign citizen working in United States (group 2)	Foreign citizen working abroad (group 3)	U.S. citizen working abroad (group 4)
Biological, agricultural, and environmental life sciences	All sectors	60,000	52,000 *	35,000 **	45,000 ***
	4-year institution	51,000	45,000 *	30,000 **	52,000
	Private, for-profit	86,000	89,000	55,000 **	S
	Government	68,000	52,000 *	36,000 **	S
Computer and information sciences	All sectors	95,000	87,000 *	43,000 **	S
	4-year institution	81,000	79,000	38,000 **	S
	Private, for-profit	120,000	103,000 *	59,000 *	S
Mathematics and statistics	All sectors	70,000	75,000	40,000 **	S
	4-year institution	59,000	59,000	34,000 **	S
	Private, for-profit	101,000	99,000	77,000 **	S
Physical sciences	All sectors	72,000	72,000	49,000 **	55,000 ***
	4-year institution	55,000	50,000 *	45,000 *	54,000
	Private, for-profit	95,000	94,000	59,000 **	S
	Government	74,000	70,000	45,000 **	S
Psychology	All sectors	65,000	55,000 *	50,000	57,000
	4-year institution	58,000	55,000 *	48,000	S
Social sciences	All sectors	64,000	74,000 *	59,000 **	63,000 †
	4-year institution	60,000	69,000 *	50,000 **	58,000 †
	Private, for-profit	92,000	104,000	80,000 †	S
	Government	86,000	83,000	60,000 **	S
Engineering	All sectors	95,000	89,000 *	50,000 **	60,000 ***
	4-year institution	77,000	73,000	35,000 **	S
	Private, for-profit	102,000	95,000 *	64,000 **	S
	Government	100,000	71,000 *	48,000 **	S
Health	All sectors	77,000	83,000 *	36,000 **	S
	4-year institution	73,000	73,000	37,000 **	S
	Private, for-profit	101,000	94,000	S	S
	Government	88,000	78,000 *	S	S

* = estimate differs statistically from that of group 1 only; ** = estimate differs statistically from that of groups 1 and 2; *** = estimate differs statistically from that of groups 1, 2, and 3; † = estimate differs statistically from that of group 2 only; S = suppressed for reliability or confidentiality.

NOTES: Citizenship is as of graduation date. Salaries are rounded to nearest thousand.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of Doctorate Recipients, 2008.

historically reported only on doctorate recipients who resided in the United States on the survey reference date. In 2003 NSF initiated a feasibility study to extend the coverage of the SDR to include U.S.-trained doctorate recipients residing or working outside the United States. After the success of the 2003 study and a more extensive pilot study in the 2006 SDR, the 2008 SDR was the first round to include a representative international sample for the cohort of doctorate recipients who graduated during academic years 2001–07. The weighted response rate for the national component of the 2008 SDR was 81%, and the response rate for the international component was 68%.

Comparative terms in this report—such as increased/decreased, differed, more/less likely, and higher/lower—are based on statistical tests for significant differences at the 95% level. Percentage comparisons in this report are based on unrounded counts.

Notes

1. Wan-Ying Chang (corresponding author: wchang@nsf.gov; 703-292-2310), Office of the Director, and Lynn M.

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2. National Science Board (NSB). 2010. *Science and Engineering Indicators 2010.* Pages 2-29–2-30. NSB 10-01. Arlington, VA: National Science Foundation. Available at http://www.nsf.gov/statistics/seind/.

3. InfoBrief focuses on data from 2008 Survey of Doctorate Recipients, which includes as its most recent graduates those who earned degrees in academic year 2007 or earlier.

4. If country of citizenship was not reported in Survey of Earned Doctorates (SED), other SED or Survey of Doctorate Recipients (SDR) data were used to infer citizenship (e.g., country of birthplace, country of high school attended, and indication of whether U.S. born). Of 10,190 sampled individuals from academic years 2001–07, total of 99 individuals had unknown citizenship at time of graduation. Of these, 53 individuals had citizenship imputed from other SED or SDR data, and 46 individuals whose citizenship could not be imputed were excluded from all analyses requiring known country of origin.

5. Sample sizes for each of four analysis groups are as follows: (1) U.S. citizens residing in United States = 5,411; (2) foreign citizens residing in United States = 2,748; (3) foreign citizens residing abroad = 1,813; and (4) U.S. citizens residing abroad = 172.

6. Foreign citizens residing in United States includes both those with permanent U.S. resident visas and those with temporary U.S. resident visas.

7. National Science Board (NSB). 2012. *Science and Engineering Indicators 2012.* Pages 2-28–2-31. NSB 12-01. Arlington, VA: National Science Foundation. Available at http://www.nsf.gov/statistics/seind/.

8. Full-time employed doctorate recipients are defined as those who reported working at least 35 hours during typical week on principal job.

NSF 13-300