

Interstate Migration Patterns of Recent Recipients of Bachelor's and Master's Degrees in Science and Engineering

Special Report

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National Science Foundation



August 2005

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Suggested Citation

National Science Foundation, Division of Science Resources Statistics, *Interstate Migration Patterns of Recent Recipients of Bachelor's and Master's Degrees in Science and Engineering*, NSF 05-318, Project Officer, John Tsapogas (Arlington, VA 2005).

August 2005

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ACKNOWLEDGMENTS

This report was prepared by Basmat Parsad and Lucinda Gray, Research Analysts at Westat, under the direction of John Tsapogas, Senior Analyst in the Division of Science Resources Statistics (SRS) of the National Science Foundation (NSF). Comments, reviews, and consultations were provided by Mary Golladay, then Program Director of the Human Resources Statistics

Program, SRS; Ronald Fecso, Chief Statistician, SRS; and Mary Frase, Deputy Director, SRS. Tanya R. Gore and Rolfe Larson of the Information Technology Services Program (ITSP) provided editing, processing, and final composition for this report. John R. Gawalt, Director, Information and Technology Services Program, and his Web team handled electronic publication.

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INTRODUCTION

The mobility of educated individuals has been a source of ongoing concern among educators and policymakers (see, e.g., Boyle, Cooke, and Halfacree 2001; Mills and Hazarika 2001; and Woroby 2000). Most attempts to identify factors associated with an individual's decision to migrate are rooted in some version of a human capital approach that emphasizes the influence of economic variables (Mills and Hazarika 2001). The decision to migrate is viewed as a response to constraints at the place of origin and/or perceived incentives at the place of destination. This traditional model also suggests that brain drain is likely to occur when the marginal returns to human capital (e.g., degree earned, years of schooling, field of study) are higher in the destination than the place of origin. In addition, recent multidisciplinary research has emphasized the influence of demographic and cultural factors—rather than strictly economic ones—on migration; these factors include the individual's sex, marital status, race/ethnicity, kinship ties, and social networks (Woroby 2000).

This report examines the extent and patterns of interstate migration of one of the highly skilled segments of the American labor force—recent recipients of bachelor's and master's degrees in the fields of science and engineering (S&E). It describes the characteristics of S&E bachelor's and master's recipients who change states during key periods from birth to postgraduate employment. The report also examines residential stability, i.e., the extent to which S&E bachelor's and master's recipients remain in the same state (or return to prior roots) for postgraduate employment.

The data in this report refer only to S&E graduates who were employed during the survey reference week,¹

regardless of whether they were employed full or part time, held career path jobs, and/or were enrolled as full- or part-time students. The tables present migration rates for various transition periods from birth to postgraduate employment with the primary focus of examining the extent to which S&E bachelor's and master's degree recipients changed states between the receipt of the eligible degree and employment during the survey reference week. For brevity, this transition period is referred to as the transition to postgraduate employment, although the respondents' employment during the survey reference week may not have been his or her initial postgraduate employment. Mobility patterns during the transition to postgraduate employment provide insight into the extent of brain drain and brain gain across states among this highly skilled segment of the U.S. workforce.²

¹ The survey reference week was between 1 and 3 years after degree receipt. The survey reference week for the 1999 NSRCS cycle was the week of April 15, 1999; the reference week for the 2001 cycle was the week of April 15, 2001.

² Because migration between degree receipt and survey reference week employment is a primary focus of the report, the population was limited to those who were employed. However, this analysis included an examination of whether the migration patterns of graduates who were not employed were significantly different than employed graduates (not shown in tables). When comparing migration rates during the time period between degree receipt and the survey reference week, some differences were discovered between employed and not employed graduates. For example, among bachelor's degree recipients who were full-time students, those who were not employed were more likely to migrate than those who were full-time employed (44 percent versus 38 percent). To control for the effect of other characteristics on these rates, a logistic regression was conducted of the migration rates by demographic and educational characteristics (not shown in tables). When controlling for other factors, including student status, there was no significant difference in migration rates between graduates who were not employed and those employed full-time for either the bachelor's or master's degree groups.

OVERVIEW AND TECHNICAL NOTES

This report uses data from the 1999 and 2001 cycles of the National Survey of Recent College Graduates (NSRCG).³ These data were restricted to college graduates who earned an S&E bachelor's or master's degree at a U.S. institution of postsecondary education during the 4 academic years 1996–97 through 1999–2000, completed secondary education at a U.S. high school, were employed during the survey reference week, and reported the state of their principal employer. Graduates also had to be living and employed in the United States (i.e., the 50 states, District of Columbia, and Puerto Rico) during the survey reference week.

This report addresses the following questions:⁴

- To what extent do recent S&E bachelor's degree recipients change states between four life events from birth to postgraduate employment (i.e., between birth and high school graduation, between high school graduation and receipt of bachelor's degree, and between receipt of bachelor's degree and employment during the survey reference week)?
- To what extent do recent S&E master's degree recipients change states between five life events from birth to postgraduate employment (i.e., between birth and high school graduation, between high school graduation and receipt of bachelor's degree, between receipt of bachelor's and master's degree, and between receipt of master's degree and employment during the survey reference week)?
- How stable are the residential patterns from birth to postgraduate employment of recent S&E bachelor's and master's degree recipients? To what extent do these individuals return to prior areas of residence for postgraduate employment?
- How do migration and residential stability patterns vary by selected demographic, educational,

and occupational characteristics—sex, race/ethnicity, marital status, employment and student status, undergraduate grade point average (GPA), parents' education, academic field of degree, employment sector, and occupational category? How does residential stability differ by geographic region?

From the combined 1999 and 2001 sample of recent college graduates, 14,362 received their bachelor's degree in an S&E field at a U.S. institution of postsecondary education during the time period for which they were sampled. Of these respondents, 11,429 met the criteria for inclusion in this study; that is, they completed high school in the United States, were employed during the reference week of the surveys, and reported their employer's state. A total of 5,793 recent college graduates received their master's degree in an S&E field at a U.S. institution of postsecondary education during the time period for which they were sampled. Of these respondents, 3,702 met the criteria for inclusion in this study. The total unduplicated sample of recent bachelor's and master's degree recipients was 15,131.⁵

The findings in this report are estimates based on the samples selected for the 1999 and 2001 NSRCG and, consequently, are subject to sampling variability. The standard error is the measure of the variability of the estimates due to sampling. Estimates of standard errors for the results in this report were computed with a technique known as jackknife replication using WesVar.⁶ All comparisons cited in the report were tested for statistical significance using t-tests and found to be significant at the .05 level.

³ The primary reason for using data from two survey cycles instead of one cycle is to increase the sample size and thereby reduce the sampling error.

⁴ This report was modeled after an InfoBrief on interstate migration of the 1999 S&E doctorate population (Sanderson and Dugoni 2002).

⁵ To obtain unduplicated counts for the analyses of migration patterns among recent S&E bachelor's degree recipients, the number of bachelor's recipients who were eligible for selection in both surveys (15 cases) were excluded from the S&E bachelor's degree subpopulation. Nine cases were excluded from the subpopulation for S&E master's degree recipients because those respondents had earned master's degrees in both the 1999 and 2001 cycles.

⁶ The standard error tables appear in the appendix. The WesVar computer program was developed by Westat.

FINDINGS

MIGRATION FROM BIRTH TO EMPLOYMENT

About one in three of the nation's 1997–2000 recipients of S&E bachelor's degrees changed states at each transition point from birth to postgraduate employment (table 1). Mobility rates among bachelor's degree recipients were slightly higher in the transition to postgraduate employment than they were between high school graduation and degree receipt. Of the 1.2 million employed in a state other than the one in which they earned their degree, 32 percent earned their bachelor's degree in a state other than the one in which they graduated from high school, and 33 percent completed high school in a state other than the one in which they were born.⁷

S&E master's degree recipients exhibited migration rates comparable to their baccalaureate counterparts for most of the transitions from birth to postgraduate employment (table 1). Slightly over one-third (36 percent) of the nation's S&E master's degree recipients were employed in a state other than the one in which they earned their degree, 36 percent changed states between birth and high school graduation, and 34 percent migrated between high school graduation and receipt of their bachelor's degree. However, S&E master's degree recipients were most mobile between the receipt of their bachelor's and master's degrees: 47 percent of the graduates changed states during this transition period.

Although substantial, the interstate mobility rates for S&E bachelor's and master's degree recipients were considerably lower than the migration rates of S&E doctorate recipients. A recent report (Sanderson and Dugoni 2002) indicates that 59 percent of U.S.-born recipients of S&E doctorate degrees in 1999 changed states between completion of their doctorate and their first postdoctoral employment.⁸

⁷ Because 9 percent of the population in this analysis was born outside the United States but graduated from high school in the United States, this mobility rate includes some migration from foreign countries. Among U.S.-born graduates, 27 percent of the bachelor's degree recipients and 29 percent of the master's recipients migrated between birth and high school graduation.

⁸ Sanderson and Dugoni's study population consisted of individuals who were born, completed high school, enrolled in college, and received an S&E doctorate degree in one of the 50 states, the District of Columbia, or Puerto Rico.

MIGRATION BY DEMOGRAPHIC CHARACTERISTICS

This section reports differences in interstate migration of S&E bachelor's and master's degree recipients by selected demographic characteristics—sex, race/ethnicity, and marital status. Findings in the remainder of this report focus primarily on the extent to which S&E bachelor's and master's degree recipients changed states between the receipt of the eligible degree and employment during the survey reference week (i.e., during the transition to postgraduate employment).

SEX

Male and female S&E graduates exhibited similar mobility rates throughout their educational careers, with one exception—a higher proportion of men than women changed states during the transition from degree receipt to postgraduate employment (table 1). These differences by sex were observed for both S&E bachelor's and master's degree recipients. Among S&E bachelor's recipients, 37 percent of men versus 32 percent of women were employed in a state other than the one in which they earned their degree. Among S&E master's recipients, 39 percent of men and 31 percent of women were employed in a state other than that in which they received their degree.

RACE/ETHNICITY

Mobility patterns for S&E bachelor's recipients differed by race/ethnicity (table 1). During their transition to postgraduate employment, white graduates were more mobile than Asian or Hispanic graduates, and Asian and black graduates were more mobile than Hispanics. For example, 36 percent of white S&E bachelor's degree recipients changed states between receipt of their degree and postgraduate employment, compared with 30 percent of Asians and 23 percent of Hispanics. Racial/ethnic groups exhibit different mobility patterns during earlier years. For example, during the transition from birth to high school graduation, Asian students were more mobile than all other racial/ethnic groups (73 percent versus 23 to 37 percent),⁹ and Hispanic students

⁹ This disparity is partly due to the relatively high proportion of Asians who moved to the United States prior to high school graduation. Among U.S.-born Asian bachelor's degree recipients, 36 percent migrated between birth and high school graduation.

TABLE 1. Interstate migration between various life events among 1997–2000 S&E bachelor’s and master’s degree recipients, by demographic characteristics

Demographic characteristic	Bachelor’s degree recipients				Master’s degree recipients				
	Number	Percent that migrated			Number	Percent that migrated			
		Between bachelor’s degree receipt and reference week ^a	Between high school graduation and bachelor’s degree receipt	Between birth and high school graduation ^b		Between master’s degree receipt and reference week ^a	Between bachelor’s degree receipt and master’s degree receipt ^c	Between high school graduation and bachelor’s degree receipt ^c	Between birth and high school graduation ^b
		employment	graduation	graduation ^b		employment	receipt	receipt ^c	graduation ^b
Total	1,175,500	34.6	32.3	33.3	202,700	35.5	47.4	33.5	35.5
Sex									
Male	583,300	37.1	33.2	34.3	108,300	39.4	48.0	33.1	36.3
Female	592,200	32.0	31.3	32.2	94,400	31.0	46.7	34.0	34.5
Race/ethnicity									
White, non-Hispanic	910,600	36.3	33.7	29.4	165,300	35.3	48.7	33.6	32.8
Black, non-Hispanic	83,500	32.6	33.0	30.9	12,600	39.8	48.3	35.9	29.3
Hispanic	85,100	23.2	22.5	37.0	10,900	32.9	39.1	25.9	39.2
Asian/Pacific Islander	87,900	29.8	26.1	72.7	12,800	35.6	36.4	37.5	72.5
American Indian/ Alaskan Native	8,500	28.6	32.5	23.1	S	S	S	S	S
Marital status ^d									
Never married	863,600	37.0	33.3	32.9	95,300	38.5	48.7	34.4	37.2
Married	270,500	29.4	28.6	33.2	94,900	32.6	46.6	32.3	34.2
Widowed/divorced/ separated	41,400	16.5	35.8	42.7	12,500	33.4	42.4	35.5	31.8

S = estimates suppressed for reasons of data reliability because the unweighted sample size of the row total is less than 30.

^a The week of April 15 of the survey year (1999 or 2001) approximately 1 to 3 years after receipt of the eligible S&E bachelor’s or master’s degree.

^b Because about 9 percent of the population was born outside the United States, migration between birth and high school includes some migration from foreign countries.

^c The first bachelor’s degrees. Because less than 1 percent of these degrees was received outside the United States, migration between this degree and other life events includes a small amount of migration to or from foreign countries.

^d Status during the survey reference week.

NOTE: Numbers have been rounded to hundreds and therefore may not sum to totals. Data include persons who earned a U.S. science or engineering bachelor’s or master’s degree during one of the four academic years from July 1996 through June 2000, received a high school diploma or equivalency certificate in the United States, were employed in the United States during the survey reference week, and reported the state of the principal employer.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

were more mobile than American Indians, whites, and blacks (37 percent versus 23 to 31 percent).

Among S&E master’s degree recipients, however, no significant racial/ethnic differences in mobility rates were observed for the transition to postgraduate employment, although there were some mixed findings for earlier transitions (table 1). Between the receipt of a bachelor’s and a master’s degree, for example, white and black graduates were more mobile than Hispanic and Asian graduates; almost half of white and black students

(49 and 48 percent, respectively), compared with 39 percent of Hispanic students and 36 percent of Asian students, changed states during this transition period.

MARITAL STATUS

Mobility patterns for S&E bachelor’s recipients differed by marital status, with the highest mobility rates in the transition to postgraduate employment occurring among graduates who, at the time of the survey reference week, had never married (table 1). During this transition period, S&E bachelor’s degree recipients who had

never married were more mobile than married graduates (37 versus 29 percent); graduates who were widowed, divorced, or separated had the lowest mobility rate (17 percent).

Differences in mobility rates by marital status for S&E master's degree recipients partly resembled the patterns for their baccalaureate counterparts (table 1). At the time of the survey reference week, S&E master's recipients who had never married had higher mobility rates than did married graduates; 39 percent of graduates who had never married and 33 percent of married graduates were employed in a state other than the one in which they had received their master's degree.¹⁰

MIGRATION BY EDUCATIONAL AND EMPLOYMENT CHARACTERISTICS

This section reports differences in interstate migration of S&E bachelor's and master's degree recipients by selected educational and employment characteristics—student enrollment status, undergraduate grade point average (GPA), parents' education, academic field of degree, occupational category, employment status, and employment sector.

STUDENT ENROLLMENT STATUS

Mobility rates during the transition to postgraduate employment varied depending on whether S&E bachelor's recipients were full- or part-time students, or not students at all, at the time of the survey reference week (table 2). Among these graduates, full-time students were more mobile than those who were not students (39 versus 35 percent), while part-time students (25 percent) were the least mobile group during the transition to postgraduate employment.

Differences in mobility rates by student enrollment status for S&E master's degree recipients deviated from the patterns for their bachelor's degree counterparts (table 2). Among S&E master's recipients, interstate migration during the transition to postgraduate employment was more pronounced among graduates who were not students (37 percent) than it was for graduates who were full- or part-time students (28 and 27 percent, respectively) at the time of the survey reference week.

¹⁰Differences for graduates who were widowed, divorced, or separated were not statistically significant because of large standard errors surrounding the estimates.

GRADE POINT AVERAGE

Science and engineering bachelor's degree recipients with high undergraduate GPAs were more mobile than graduates with lower GPAs (table 2). This difference was observed during the transition to postgraduate employment and in the transition from high school to college graduation. For example, S&E bachelor's recipients with high GPAs (i.e., 3.25 or higher) were more likely than those with moderate or low GPAs to be employed in a state other than the one in which they earned their degree (37 percent versus 33 and 32 percent, respectively).

Among S&E master's degree recipients, there were no significant differences in mobility rates by undergraduate GPA during the transition to postgraduate employment or between the receipt of their bachelor's and master's degrees (table 2).

PARENTS' EDUCATION

Interstate migration rates for S&E bachelor's degree recipients varied according to their parents' educational background, with graduates from more highly educated family backgrounds being more mobile than those from less educated backgrounds (table 2). These differences were observed at every transition period from birth to postgraduate employment. For example, between degree receipt and postgraduate employment, interstate migration was more pronounced for bachelor's degree recipients whose parents had a bachelor's or higher degree than it was for graduates whose parents had some college or less education (40 percent versus 26 percent).

The association between migration rates and the parental education of S&E master's degree recipients mirrored the patterns of bachelor's graduates, with one exception (table 2). During the transition to postgraduate employment, interstate migration for S&E master's recipients did not vary significantly according to their parents' educational background.

ACADEMIC FIELD OF DEGREE

Engineering graduates were generally more mobile than science graduates after receiving their degree (table 2). Among S&E bachelor's degree recipients, a little less than half (45 percent) of the engineering graduates and a third of the science graduates changed states during the transition to postgraduate employment. A similar difference was observed for S&E master's degree recipients: 42 percent of engineering graduates and

TABLE 2. Interstate migration between various life events among 1997–2000 S&E bachelor's and master's degree recipients, by educational characteristics

Educational characteristic	Bachelor's degree recipients				Master's degree recipients				
	Number	Percent that migrated			Number	Percent that migrated			
		Between bachelor's degree receipt and reference week ^a	Between high school graduation and bachelor's degree receipt	Between birth and high school graduation ^b		Between master's degree receipt and reference week ^a	Between bachelor's ^c and master's degree receipt	Between high school graduation and bachelor's degree receipt ^c	Between birth and high school graduation ^b
Total	1,175,500	34.6	32.3	33.3	202,700	35.5	47.4	33.5	35.5
Enrollment status ^d									
Full-time student	170,400	39.2	31.1	31.1	29,400	27.7	59.2	40.6	33.1
Part-time student	92,400	24.6	28.2	31.6	10,300	26.9	47.8	32.7	40.5
Not a student	912,700	34.7	32.9	33.9	163,000	37.4	45.2	32.3	35.6
Undergraduate grade point average ^e									
3.25 or higher	577,700	36.5	35.3	34.4	122,500	35.0	48.6	35.2	37.3
2.75 to 3.24	465,900	32.9	29.8	32.3	65,500	36.2	44.5	30.3	32.3
Below 2.75	130,300	31.8	27.6	31.7	14,500	35.3	49.6	33.4	34.2
Parents' education ^f									
Some college or less	473,400	26.3	24.7	27.3	78,800	33.1	40.6	24.6	26.0
Bachelor's degree or higher	702,200	40.1	37.4	37.3	123,900	37.0	51.6	39.1	41.5
Major field of degree ^g									
Science	989,800	32.6	32.0	32.9	150,900	33.3	48.5	32.7	34.2
Computer and information sciences	85,200	31.6	29.6	36.0	16,700	29.2	41.1	34.1	43.7
Life and related sciences	232,000	34.9	32.2	32.5	22,600	42.6	46.6	31.7	34.0
Mathematical and related sciences	39,800	33.9	32.6	28.5	8,000	33.2	44.5	26.4	45.1
Physical and related sciences	54,400	40.6	31.0	31.4	11,400	45.9	59.5	28.9	30.5
Psychology	240,900	25.5	27.2	31.8	52,900	22.3	43.0	28.8	30.9
Social and related sciences	337,600	34.9	36.0	33.9	39,200	40.9	57.6	40.4	33.5
Engineering	185,700	44.9	33.6	35.4	51,800	41.7	44.2	35.7	39.2

^a The week of April 15 of the survey year (1999 or 2001) approximately 1 to 3 years after receipt of the eligible S&E bachelor's or master's degree.

^b Because about 9 percent of the population was born outside the United States, migration between birth and high school includes some migration from foreign countries.

^c The first bachelor's degree. Because less than 1 percent of these degrees were received outside the United States, migration between this degree and other life events includes a small amount of migration to or from foreign countries.

^d Status during the survey reference week.

^e Excludes a small number of people whose undergraduate courses were ungraded.

^f The highest education level of the graduate's mother or father as of the survey reference week.

^g The major field of study for the eligible S&E bachelor's or master's degree received from a U.S. institution during July 1996 through June 2000.

NOTE: Numbers have been rounded to hundreds and therefore may not sum to totals. Data include persons who earned a U.S. science or engineering bachelor's or master's degree during one of the four academic years from July 1996 through June 2000, received a high school diploma or equivalency certificate in the United States, were employed in the United States during the survey reference week, and reported the state of the principal employer.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

33 percent of science graduates migrated during the transition to postgraduate employment.

Interstate migration rates also varied according to the various subfields in science (table 2). During the transition to postgraduate employment, S&E bachelor's recipients who earned degrees in physical and related sciences (41 percent) were more mobile than those who earned their bachelor's degrees in the other science fields (26 to 35 percent). During this transition period, students who received bachelor's degrees in the field of psychology were least likely to change states (26 percent).

During the transition to postgraduate employment, S&E master's recipients who earned degrees in the physical and life sciences (46 and 43 percent, respectively) were more mobile than those who received their master's degrees in the fields of psychology, computer and information sciences, and mathematics (22 to 33 percent; table 2).

OCCUPATIONAL CATEGORY

Mobility patterns for graduates in the different occupations deviated somewhat from the differences by field of study (table 3). This finding may be related to the fact that a large proportion of graduates (68 percent of bachelor's and 41 percent of master's recipients) were working in jobs outside of science and engineering. Overall, bachelor's degree recipients who were employed in science or engineering occupations were more likely than those employed in non-S&E occupations to change states during the transition to postgraduate employment (40 and 42 percent, respectively versus 32 percent). Among S&E master's degree recipients, those employed as engineers were more mobile than those working in non-S&E occupations during this transition period (39 versus 34 percent).

Within the various broad science fields, S&E bachelor's recipients who were employed as physical scientists were more likely than computer scientists to change states during the transition to postgraduate employment (46 versus 39 percent; table 3). Among master's recipients, interstate mobility was also higher for physical scientists (51 percent) than for those graduates employed as psychologists, mathematicians, computer scientists, or life scientists (21 to 39 percent).

EMPLOYMENT STATUS

S&E masters' recipients who were employed full time were more mobile than those employed part time during the transition to postgraduate employment (37 versus 26 percent). Among S&E bachelors' recipients, differences in migration rates by employment status were not significant during this transition period.

EMPLOYMENT SECTOR

S&E bachelor's degree recipients who were employed in the government sector or private industry and business sector were more mobile than those employed in the education sector (table 3). During the transition to postgraduate employment, 37 percent of government employees, 36 percent of employees in private industry and business, and 30 percent of employees in the education sector changed states.

Among S&E master's degree recipients, interstate mobility during the transition to postgraduate employment was most pronounced for employees in the government sector (42 percent); it was least common among employees in the education sector (28 percent; table 3).

RESIDENTIAL STABILITY

The extent to which S&E graduates remain in the same state (or return to the state) for postgraduate employment reflects the retention of highly skilled employees, in contrast to brain drain or the loss of those skills for that state.

Patterns of residential stability indicate relatively high levels of retention of S&E bachelor's degree recipients for postgraduate employment (tables 4 through 6). About two-thirds (65 percent) of these graduates were employed in the same state in which they earned their bachelor's degree. In addition, 61 percent of the graduates remained in (or returned to) the state of their high school graduation for postgraduate employment, and 46 percent were employed in the state of their birth. Overall, a substantial proportion of S&E bachelor's recipients (38 percent) remained in the same state for all four of the life events from birth to postgraduate employment.

S&E master's degree recipients generally exhibited lower rates of residential stability than their baccalaureate counterparts, with one exception—a similar proportion (65 percent) of these graduates were employed in the same state as the one in which they had earned their

TABLE 3. Interstate migration between various life events among 1997–2000 S&E bachelor's and master's degree recipients, by employment characteristics

Employment characteristic	Bachelor's degree recipients					Master's degree recipients				
	Number	Percent that migrated				Number	Percent that migrated			
		Between bachelor's degree receipt and reference week ^a	Between high school graduation and bachelor's degree receipt	Between birth and high school graduation ^b	Between bachelor's degree receipt and reference week ^a		Between master's degree receipt and reference week ^a	Between high school graduation and bachelor's degree receipt ^c	Between birth and high school graduation ^b	
		employment	receipt	graduation ^b	employment		receipt	receipt ^c	graduation ^b	
Total	1,175,500	34.6	32.3	33.3	202,700	35.5	47.4	33.5	35.5	
Occupation										
Scientists ^d	232,200	40.1	32.9	36.3	80,100	35.8	50.1	32.5	35.9	
Computer and information scientists	103,600	39.2	33.1	39.6	23,200	37.6	45.7	34.8	44.6	
Life and related scientists	48,400	38.7	31.7	35.1	11,000	38.7	45.6	34.6	35.5	
Mathematical and related scientists	6,200	42.6	27.7	35.2	4,800	32.3	46.7	29.7	47.1	
Physical scientists	31,700	45.6	29.1	32.5	9,600	50.7	61.6	31.3	33.0	
Psychologists	21,200	33.6	30.5	27.2	20,100	20.6	44.3	25.1	28.3	
Social and related scientists	21,100	44.8	43.9	37.5	11,400	44.8	65.0	40.8	30.0	
Engineers ^d	138,900	41.9	31.6	33.9	38,900	39.1	42.7	32.9	37.9	
Other	804,400	31.7	32.2	32.3	83,700	33.5	47.0	34.7	33.9	
Employment status										
Full-time	1,006,900	34.5	32.3	33.8	178,900	36.8	47.0	33.2	36.1	
Part-time	168,600	35.2	32.2	30.5	23,800	25.6	50.2	35.6	31.0	
Employment sector										
Private industry and business	779,700	35.6	32.8	34.0	112,500	37.7	44.6	33.1	38.2	
Educational institution	267,100	30.3	30.5	31.4	59,800	27.9	47.6	33.4	30.6	
Government	128,800	37.1	32.7	32.8	30,400	42.1	57.3	35.3	35.0	

^a The week of April 15 of the survey year (1999 or 2001) approximately 1 to 3 years after receipt of the eligible S&E bachelor's or master's degree.

^b Because about 9 percent of the population was born outside the United States, migration between birth and high school includes some migration from foreign countries.

^c The first bachelor's degree. Because less than 1 percent of these degrees were received outside the United States, migration between this degree and other life events includes a small amount of migration to or from foreign countries.

^d Science and engineering occupations include postsecondary educators in these fields.

NOTE: Numbers have been rounded to hundreds and therefore may not sum to totals. Data include persons who earned a U.S. science or engineering bachelor's or master's degree during one of the four academic years from July 1996 through June 2000, received a high school diploma or equivalency certificate in the United States, were employed in the United States during the survey reference week, and reported the state of the principal employer.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

eligible degree (tables 4–6). However, S&E master’s recipients exhibited lower stability rates than their bachelor’s degree counterparts relative to earlier life events; the former were less likely to be employed in the state in which they were born (34 versus 46 percent) or graduated from high school (45 versus 61 percent). In addition, S&E master’s recipients, with one more transition than S&E bachelor’s graduates were less likely to remain in the same state for all transitions from birth to postgraduate employment (24 versus 38 percent).

Past research indicates a lower level of residential stability for S&E doctorate recipients; 41 percent of these graduates were employed in the same state as that in which they had received their doctorate (Sanderson and Dugoni 2002).¹¹

Residential stability rates differed by respondent characteristics (tables 4–6), and are consistent with the mobility patterns discussed earlier. For example, among S&E bachelor’s degree recipients, the residential stability rate was lower for men than women, lower for white graduates than for members of other racial/ethnic groups, and lower for graduates who had never married than for other graduates (table 4). Among bachelor’s degree recipients, residential stability rates were highest for graduates with psychology degrees. Among bachelor’s degree recipients residential stability rates were higher for graduates whose parents had less than a bachelor’s degree (table 5).

RESIDENTIAL STABILITY BY GEOGRAPHIC REGION

S&E bachelor’s degree recipients working in the Northeast were less likely than those in the Midwest and West to be employed in the same state where they had received their degree (63 percent versus 67 and 68 percent, respectively; table 6).¹² In addition, S&E bachelor’s recipients working in the South were less likely than those in the West to be employed in the state where they had received their degree (64 versus 68 percent). About 95 percent of those who were employed in Puerto Rico had received their bachelor’s degree in Puerto Rico.

¹¹ Again, these data refer to individuals who were born, completed high school, enrolled in college, and received an S&E doctorate degree in one of the 50 states, the District of Columbia, or Puerto Rico.

¹² Differences for graduates in the South were not significant due to large standard errors surrounding the estimates.

Master’s recipients who were employed in the South (60 percent) were least likely to remain in the same state for postgraduate employment as compared with those who were employed in other regions (65 to 69 percent; table 6). Most of the master’s recipients who were employed in Puerto Rico had also earned their master’s degree in Puerto Rico (81 percent).

MIGRATION DURING THE TRANSITION TO POSTGRADUATE EMPLOYMENT: CONTROLLING FOR SELECTED CHARACTERISTICS

In the preceding sections, several variables were associated with the mobility rates of S&E bachelor’s and master’s degree recipients, and some of these variables may be interrelated. For example, students from highly educated families may earn higher GPAs than students who come from families with less education. To control for the interrelationships among variables, logistic regression techniques were used to analyze the unique relationship of each variable to interstate mobility. Two analyses were conducted for the proportion of S&E graduates who changed states between the receipt of the eligible degrees and employment during the survey reference week (i.e., during the transition to postgraduate employment), one for bachelor’s recipients and the other for master’s recipients.¹³

The results show that most of the associations between interstate mobility rates of S&E bachelor’s degree recipients and the characteristics of those graduates (observed in the preceding sections) remained significant after controlling for the effects of all characteristics (table 7). For example, the odds ratio for engineering versus science graduates indicates that engineering graduates were 1.61 times more likely than science graduates to have moved across states during

¹³ These analyses included all the characteristics discussed in the earlier sections except the occupational category, which was expected to be closely associated with the graduate’s field of degree. In addition, for the regression analysis, a single 6-category variable “employment and student status” replaced the separate student status and employment variables examined in the bivariate analyses. For each variable (row) in table 7, the category in italics is the reference category for comparisons and tests of statistical significance; the asterisks indicate that the percentage of S&E graduates in that category is significantly different from the percentage for the reference category. The odds ratio indicates the propensity of a group to migrate relative to the propensity of the reference group.

TABLE 4. Residential stability of 1997–2000 S&E bachelor's and master's degree recipients, by demographic characteristics

Demographic characteristic	Bachelor's degree recipients					Master's degree recipients					
	Number	Percent with reference week ^a employment in the same state as			Percent with all 4 life events in the same state	Number	Percent with reference week ^a employment in the same state as			Percent with all 5 life events in the same state	
		Bachelor's degree receipt	High school graduation	Birth ^b			Master's degree receipt	Bachelor's degree receipt ^c	High school graduation		Birth ^b
Total	1,175,500	65.4	61.1	45.7	37.9	202,700	64.5	47.2	45.4	34.1	24.1
Sex											
Male	583,300	62.9	58.4	43.7	35.7	108,300	60.6	43.1	41.3	30.8	21.9
Female	592,200	68.0	63.7	47.7	40.0	94,400	69.0	52.0	50.0	38.0	26.6
Race/ethnicity											
White, non-Hispanic	910,600	63.7	59.2	47.4	39.3	165,300	64.7	46.1	44.2	35.3	24.9
Black, non-Hispanic	83,500	67.4	62.9	49.2	38.8	12,600	60.2	48.0	45.3	36.2	25.4
Hispanic	85,100	76.8	73.7	51.1	45.3	10,900	67.1	57.8	57.5	37.2	26.0
Asian/Pacific Islander	87,900	70.2	66.2	19.5	15.1	12,800	64.4	51.4	49.1	13.8	10.2
American Indian/Alaskan Native	8,500	71.4	60.9	50.1	43.0	S	S	S	S	S	S
Marital status ^d											
Never married	863,600	63.0	60.9	45.7	37.0	95,300	61.5	43.7	44.6	32.8	21.9
Married	270,500	70.6	61.8	47.1	41.1	94,900	67.4	49.6	45.8	34.9	25.8
Widowed/divorced/separated	41,400	83.5	58.9	37.4	35.0	12,500	66.6	56.2	47.6	38.2	27.8

S = estimates suppressed for reasons of data reliability because the unweighted sample size of the row total is less than 30.

^a The week of April 15 of the survey year (1999 or 2001) approximately 1 to 3 years after receipt of the eligible S&E bachelor's or master's degree.

^b About 9 percent of the population was born outside the United States.

^c The first bachelor's degree. Less than 1 percent of these degrees were received outside the United States.

^d Status during the survey reference week.

NOTE: Numbers have been rounded to hundreds and therefore may not sum to totals. Includes persons who earned a U.S. science or engineering bachelor's or master's degree during one of the four academic years from July 1996 through June 2000, received a high school diploma or equivalency certificate in the United States, were employed in the United States during the survey reference week, and reported the state of the principal employer.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

the transition to postgraduate employment. Overall, the findings suggest that the propensity for S&E bachelor's degree recipients to change states during the transition to postgraduate employment varied by race/ethnicity, marital status, employment and student status, undergraduate GPA, parents' education, broad field of degree, and employment sector. Thus, during the transition to postgraduate employment, interstate migration was more pronounced among S&E bachelor's recipients who were white, were not married, were part-time employed and full-time students, had high undergraduate GPAs, came from highly educated families, received engineering degrees, and/or were employed in the government sector.

Among S&E master's degree recipients, interstate mobility during the transition to postgraduate employment varied by sex, marital status, employment and student status, and employment sector (table 7). After controlling for other characteristics, interstate mobility rates of S&E master's recipients no longer differed significantly by broad degree field. Thus, during the transition to postgraduate employment, S&E master's recipients who were male, were not married, were full-time employed and not students, and/or were employed in the government sector generally had higher propensities to migrate than did other graduates.

TABLE 5. Residential stability of 1997–2000 S&E bachelor's and master's degree recipients, by educational characteristics

Educational characteristic	Bachelor's degree recipients					Master's degree recipients					
	Number	Percent with reference week ^a employment in the same state as			Percent with all 4 life events in the same state	Number	Percent with reference week ^a employment in the same state as				Percent with all 5 life events in the same state
		Bachelor's degree receipt	High school graduation	Birth ^b			Master's degree receipt	Bachelor's degree receipt ^c	High school graduation	Birth ^b	
Total	1,175,500	65.4	61.1	45.7	37.9	202,700	64.5	47.2	45.4	34.1	24.1
Enrollment status ^d											
Full-time student	170,400	60.8	56.7	42.5	36.4	29,400	72.3	34.1	30.6	24.1	16.9
Part-time student	92,400	75.4	69.4	51.4	45.1	10,300	73.1	47.9	46.1	30.3	23.4
Not a student	912,700	65.3	61.0	45.8	37.4	163,000	62.6	49.6	48.0	36.2	25.5
Undergraduate grade point average ^e											
3.25 or higher	577,700	63.5	56.9	42.3	34.8	122,500	65.0	46.3	42.2	31.5	22.6
2.75 to 3.24	465,900	67.1	64.7	48.8	40.5	65,500	63.8	49.6	50.7	38.3	26.9
Below 2.75	130,300	68.2	66.3	49.6	41.9	14,500	64.7	43.9	48.3	37.4	24.9
Parents' education ^f											
Some college or less	473,400	73.7	68.3	53.3	47.1	78,800	66.9	54.4	50.5	40.2	31.5
Bachelor's or higher	702,200	59.9	56.2	40.6	31.7	123,900	63.0	42.7	42.1	30.2	19.4
Major field of degree ^g											
Science	989,800	67.4	62.9	47.2	39.4	150,900	66.7	48.5	46.6	35.6	25.1
Computer and information sciences	85,200	68.4	61.0	45.7	38.5	16,700	70.8	51.2	40.6	31.6	23.4
Life and related sciences	232,000	65.1	63.2	45.8	37.4	22,600	57.4	44.6	44.3	32.5	22.3
Mathematical and related sciences	39,800	66.1	62.3	52.1	41.8	8,000	66.8	52.0	51.4	30.8	26.1
Physical and related sciences	54,400	59.4	53.1	40.9	34.9	11,400	54.1	38.1	38.9	27.0	18.6
Psychology	240,900	74.5	70.1	52.7	46.1	52,900	77.7	59.4	56.1	44.4	32.9
Social and related sciences	337,600	65.1	59.8	45.2	36.6	39,200	59.1	37.2	39.0	30.9	18.5
Engineering	185,700	55.1	51.2	37.7	29.9	51,800	58.3	43.6	41.6	29.7	21.2

^a The week of April 15 of the survey year (1999 or 2001) approximately 1 to 3 years after receipt of the eligible S&E bachelor's or master's degree.

^b About 9 percent of the population was born outside the United States.

^c The first bachelor's degree. Less than 1 percent of these degrees were received outside the United States.

^d Status during the survey reference week.

^e Excludes a small number of people whose undergraduate courses were ungraded.

^f The highest educational level of the graduate's mother or father as of the survey reference week.

^g The major field of study for the eligible S&E bachelor's or master's degree received from a U.S. institution between July 1996 and June 2000.

NOTE: Numbers have been rounded to hundreds and therefore may not sum to totals. Includes persons who earned a U.S. science or engineering bachelor's or master's degree during one of the four academic years from July 1996 through June 2000, received a high school diploma or equivalency certificate in the United States, were employed in the United States during the survey reference week, and reported the state of the principal employer.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

TABLE 6. Residential stability of 1997–2000 S&E bachelor's and master's degree recipients, by employment characteristics

Employment characteristic	Bachelor's degree recipients					Master's degree recipients						
	Number	Percent with reference week ^a employment in the same state as			Percent with all 4 life events in the same state	Number	Percent with reference week ^a employment in the same state as				Percent with all 5 life events in the same state	
		Bachelor's degree receipt	High school graduation	Birth ^b			Master's degree receipt	Bachelor's degree receipt ^c	High school graduation	Birth ^b		
Total	1,175,500	65.4	61.1	45.7	37.9	202,700	64.5	47.2	45.4	34.1	24.1	
Occupation												
Scientists ^d	232,200	59.9	54.4	39.8	33.2	80,100	64.2	43.3	40.6	30.2	22.1	
Computer and information scientists	103,600	60.8	56.1	40.2	32.8	23,200	62.4	44.7	38.7	28.8	18.9	
Life and related scientists	48,400	61.3	55.2	37.9	32.0	11,000	61.3	40.9	39.1	25.1	19.2	
Mathematical and related scientists	6,200	57.4	51.7	37.5	34.7	4,800	67.7	46.2	44.8	23.7	21.8	
Physical scientists	31,700	54.4	49.9	36.5	31.4	9,600	49.3	30.9	31.4	21.6	13.7	
Psychologists	21,200	66.4	57.4	50.8	46.5	20,100	79.4	56.8	53.4	44.0	36.5	
Social and related scientists	21,100	55.2	48.5	37.1	26.9	11,400	55.2	28.2	29.1	23.9	13.3	
Engineers ^d	138,900	58.1	53.7	41.1	33.0	38,900	60.9	45.0	42.4	31.8	23.3	
Other	804,400	68.3	64.3	48.2	40.1	83,700	66.5	52.0	51.3	38.9	26.4	
Employment status												
Full-time	1,006,900	65.6	61.1	45.6	37.5	178,900	63.2	47.1	45.8	34.4	24.2	
Part-time	168,600	64.8	61.0	46.8	40.1	23,800	74.4	48.1	41.9	32.3	23.7	
Employment sector												
Private industry and business	779,700	64.4	60.9	45.3	36.6	112,500	62.3	46.7	44.6	32.6	23.1	
Educational institution	267,100	69.7	63.4	46.9	41.1	59,800	72.1	50.6	48.2	37.5	27.3	
Government	128,800	62.9	57.4	45.6	38.7	30,400	57.9	42.6	42.6	33.2	21.4	
Geographic region of job												
Northeast	260,300	62.7	61.2	50.4	39.4	42,800	66.6	50.1	50.7	43.4	32.1	
Midwest	257,000	67.0	66.9	56.2	46.5	43,000	68.9	51.2	51.5	41.5	28.8	
South	373,000	63.7	55.0	38.6	33.4	65,300	59.7	41.2	38.7	25.6	18.2	
West	278,700	68.3	62.8	40.1	33.5	50,400	65.0	48.5	43.2	30.0	20.2	
Puerto Rico	6,500	95.4	98.8	92.2	86.9	1,200	80.6	78.7	89.0	75.0	51.3	

^a The week of April 15 of the survey year (1999 or 2001) approximately 1 to 3 years after receipt of the eligible S&E bachelor's or master's degree.

^b About 9 percent of the population was born outside the United States.

^c The first bachelor's degree; less than 1 percent of these degrees were received outside the United States.

^d S&E occupations include postsecondary educators in these fields.

NOTE: Numbers have been rounded to hundreds and therefore may not sum to totals. Includes persons who earned a U.S. science or engineering bachelor's or master's degree during one of the four academic years from July 1996 through June 2000, received a high school diploma or equivalency certificate in the United States, were employed in the United States during the survey reference week, and reported the state of the principal employer.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

TABLE 7. Odds ratio indicating the propensity for 1997–2000 S&E bachelor’s and master’s degree recipients to change states between receipt of degree and employment, by demographic, educational, and occupational characteristics

Characteristic	Bachelor’s degree recipients		Master’s degree recipients	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Sex				
<i>Female</i>	†		†	
Male	1.10	1.00, 1.23	1.31*	1.06, 1.61
Race/ethnicity				
<i>Minority</i>	†		†	
White, non-Hispanic	1.35*	1.18, 1.53	1	0.83, 1.19
Marital status				
<i>Married</i>	†		†	
Not married	1.47*	1.30, 1.67	1.30*	1.09, 1.55
Employment and student status				
<i>Full-time employed and not a student</i>	†		†	
Full-time employed and full-time student	1.26	0.97, 1.63	0.71	0.48, 1.05
Full-time employed and part-time student	0.63*	0.52, 0.77	0.66*	0.46, 0.96
Part-time employed and not a student	0.76	0.53, 1.08	0.57*	0.36, 0.92
Part-time employed and full-time student	1.36*	1.14, 1.61	0.72	0.49, 1.06
Part-time employed and part-time student	0.51*	0.28, 0.93	0.55	0.20, 1.54
Undergraduate grade point average				
<i>Less than 3.25</i>	†		†	
3.25 or higher	1.20*	1.06, 1.35	1.01	0.85, 1.21
Parents’ education				
<i>Some college or less</i>	†		†	
Bachelor’s or higher	1.73*	1.55, 1.93	1.16	0.97, 1.38
Major field of degree				
<i>Science</i>	†		†	
Engineering	1.61*	1.42, 1.82	1.16	0.95, 1.43
Employment sector				
<i>Private industry and business</i>	†		†	
Government	1.21*	1.06, 1.38	1.25*	1.02, 1.52
Educational institution	0.77*	0.67, 0.88	0.77*	0.62, 0.95

† = reference group.

* = category is significantly different than the reference group ($p \leq .05$).

NOTES: The italicized group for each characteristic is the reference group for the comparison. The odds ratio indicates the likelihood that interstate mobility for a specific group will occur relative to its reference group. A ratio greater than 1 indicates a higher propensity to migrate, while a ratio less than 1 indicates a lower propensity to migrate, relative to the reference group. For example, men were 1.12 times than women to change states during the transition to postgraduate employment. Data include persons who earned a U.S. science or engineering bachelor’s or master’s degree during one of the four academic years from July 1996 through June 2000, received a high school diploma or equivalency certificate in the United States, were employed in the United States during the survey reference week, and reported the state of the principal employer.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

SUMMARY AND CONCLUSIONS

Recipients of S&E bachelor's and master's degrees were highly mobile between the receipt of the eligible degree and employment during the survey reference week, and this tendency to change states was also exhibited during earlier transition periods. During the survey reference week, about one in three of the 1997–2000 recipients of S&E bachelor's and master's degrees (35 and 36 percent, respectively) were employed in a state other than the one in which they had received their degree. While the propensity to migrate was strikingly similar through most of the transition periods from birth to postgraduate employment, S&E bachelor's recipients were most mobile between the receipt of their degree and postgraduate employment. S&E master's degree recipients were most mobile between the receipt of their bachelor's and master's degrees.

Interstate mobility during the transition to postgraduate employment was associated with several of the demographic, educational, and occupational characteristics of S&E bachelor's and master's recipients. After controlling for the simultaneous influences of these variables, the findings indicate that interstate migration during the transition to postgraduate employment was most

pronounced for S&E bachelor's recipients who were white, were part-time employed and full-time students, had high undergraduate GPAs, came from highly educated families, received engineering degrees, and/or were employed in the government sector. Among S&E master's recipients, the propensity to migrate during the transition to postgraduate employment was most pronounced for those who were male, were not married, were full-time employed and not students, and/or were employed in the government sector.

Overall, the findings help to address some of the brain drain (and brain gain) concerns across states regarding this highly skilled segment of the U.S. workforce. These data provide insight into the extent to which S&E bachelor's and master's degree recipients change states between the receipt of the eligible degree and employment during the survey reference week, and at earlier points during their education. The findings suggest that the loss (and gain) of highly educated workers from state to state is substantial.

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APPENDIX: STANDARD ERROR TABLES

TABLE A-1. Standard errors for interstate migration between various life events among 1997–2000 S&E bachelor's and master's degree recipients, by demographic characteristics

Demographic characteristic	Bachelor's degree recipients				Master's degree recipients				
	Number	Percent that migrated			Number	Percent that migrated			
		Between bachelor's degree receipt and reference week employment	Between high school graduation and bachelor's degree receipt	Between birth and high school graduation		Between master's degree receipt and reference week employment	Between bachelor's degree receipt and master's degree receipt	Between high school graduation and bachelor's degree receipt	Between birth and high school graduation
Total	17,492	0.71	0.75	0.62	5,543	0.98	1.11	0.75	0.76
Sex									
Male	9,892	0.80	0.77	0.79	2,508	1.02	1.22	1.11	1.16
Female	14,120	0.97	1.01	0.83	4,774	1.78	1.76	1.38	1.23
Race/ethnicity									
White, non-Hispanic	17,767	0.83	0.92	0.70	4,862	1.10	1.24	0.93	0.93
Black, non-Hispanic	3,904	1.70	2.06	1.67	1,023	3.60	3.24	2.42	2.60
Hispanic	2,782	1.35	1.50	1.88	637	3.05	2.92	2.67	2.75
Asian/Pacific Islander	3,958	2.19	1.70	1.83	1,078	3.48	3.58	4.09	3.99
American Indian/ Alaskan Native	1,154	5.60	4.87	4.50	S	S	S	S	S
Marital status									
Never married	14,445	0.76	0.88	0.68	2,856	1.42	1.51	1.02	1.26
Married	8,161	1.16	1.19	1.14	3,546	1.36	1.26	1.20	1.31
Widowed/divorced/ separated	3,028	2.60	3.59	2.97	1,548	3.92	4.45	4.35	3.26

S = estimates suppressed for reasons of data reliability because the unweighted sample size of the row total is less than 30.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

TABLE A-2. Standard errors for interstate migration between various life events among 1997–2000 S&E bachelor’s and master’s degree recipients, by educational characteristics

Educational characteristic	Bachelor’s degree recipients				Master’s degree recipients				
	Number	Percent that migrated			Number	Percent that migrated			
		Between bachelor’s degree receipt and reference week employment	Between high school graduation and bachelor’s degree receipt	Between birth and high school graduation		Between master’s degree receipt and reference week employment	Between bachelor’s degree receipt and master’s degree receipt	Between high school graduation and bachelor’s degree receipt	Between birth and high school graduation
Total	17,492	0.71	0.75	0.62	5,543	0.98	1.11	0.75	0.76
Enrollment status									
Full-time student	6,438	1.58	1.33	1.33	1,600	2.65	2.49	2.40	2.51
Part-time student	4,442	1.64	2.07	1.94	908	2.93	4.03	3.73	4.43
Not a student	14,893	0.79	0.81	0.67	4,753	1.18	1.30	0.85	0.91
Undergraduate grade point average									
3.25 or higher	12,774	1.13	1.09	0.83	3,578	1.15	1.38	1.07	0.96
2.75 to 3.24	8,859	0.85	0.87	0.94	2,720	1.98	1.65	1.54	1.42
Below 2.75	4,205	1.59	1.44	1.56	842	3.09	3.52	3.38	2.98
Parents’ education									
Some college or less	10,347	0.84	0.97	0.91	3,749	1.72	1.68	1.10	1.16
Bachelor’s degree or higher	12,977	0.87	0.85	0.80	3,376	1.11	1.31	1.07	1.10
Major field of degree									
Sciences	19,201	0.80	0.89	0.71	5,879	1.36	1.39	0.97	0.93
Computer and information sciences	4,381	2.45	1.85	2.27	1,167	3.46	3.66	2.94	3.49
Life and related sciences	7,014	1.77	1.60	1.37	1,319	3.00	2.63	2.46	2.55
Mathematical and related sciences	2,107	2.13	2.34	2.12	577	3.58	3.77	3.67	3.48
Physical and related sciences	1,820	1.46	1.44	1.59	543	2.31	2.57	2.87	2.43
Psychology	7,674	1.47	1.78	1.56	4,921	2.61	3.48	1.95	1.93
Social and related sciences	8,427	1.04	1.12	1.05	1,798	2.27	1.71	1.80	1.92
Engineering	4,689	1.25	1.09	0.88	1,736	1.43	1.42	1.59	1.47

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

TABLE A-3. Standard errors for interstate migration between various life events among 1997–2000 S&E bachelor's and master's degree recipients, by employment characteristics

Educational characteristic	Bachelor's degree recipients					Master's degree recipients				
	Number	Percent that migrated			Number	Percent that migrated				
		Between bachelor's degree receipt and reference week employment	Between high school graduation and bachelor's degree receipt	Between birth and high school graduation		Between master's degree receipt and reference week employment	Between bachelor's degree receipt and master's degree receipt	Between high school graduation and bachelor's degree receipt	Between birth and high school graduation	
Total	17,492	0.71	0.75	0.62	5,543	0.98	1.11	0.75	0.76	
Occupation										
Scientists	6,356	1.54	1.34	1.19	2,601	1.40	1.59	1.31	1.23	
Computer and information scientists	4,050	1.98	1.69	2.02	1,361	2.63	3.04	2.50	2.47	
Life and related scientists	2,722	3.02	2.91	2.60	898	3.81	3.81	3.56	3.93	
Mathematical and related scientists	816	6.84	5.66	6.36	447	5.27	5.65	4.77	5.26	
Physical scientists	1,551	2.14	2.16	2.57	591	3.00	3.34	3.06	3.30	
Psychologists	1,987	5.83	4.25	4.12	2,044	3.16	3.87	2.77	2.89	
Social and related scientists	2,099	4.14	5.19	5.01	888	3.48	3.58	3.81	3.79	
Engineers	4,147	1.39	1.15	1.03	1,548	1.63	1.74	1.99	1.75	
Other	15,540	0.81	0.91	0.81	4,354	1.90	2.02	1.60	1.44	
Employment status										
Full-time	15,664	0.72	0.79	0.65	5,246	1.09	1.19	0.77	0.80	
Part-time	5,933	1.63	1.42	1.37	1,419	2.49	2.90	3.17	2.87	
Employment sector										
Private industry and business	12,672	0.82	0.80	0.72	3,636	1.25	1.49	1.12	1.09	
Educational institution	6,814	1.21	1.15	1.06	2,497	1.71	1.94	1.75	1.56	
Government	5,551	1.43	1.73	1.69	1,679	2.26	2.39	2.35	2.45	

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

TABLE A-4. Standard errors for residential stability of 1997–2000 S&E bachelor's and master's degree recipients, by demographic characteristics

Demographic characteristic	Bachelor's degree receipt					Master's degree receipt					
	Number	Percent with reference week employment in the same state as			Percent with all 4 life events in the same state	Percent with reference week employment in the same state as				Percent with all 5 life events in the same state	
		Bachelor's degree recipient	High school graduation	Birth		Master's degree recipients	Bachelor's degree receipt	High school graduation	Birth		
Total	17,492	0.71	0.65	0.63	0.65	5,543	0.98	1.05	1.12	1.01	0.88
Sex											
Male	9,892	0.80	0.74	0.82	0.78	2,508	1.02	1.24	1.26	1.15	1.02
Female	14,120	0.97	0.85	0.81	0.90	4,774	1.78	1.69	1.81	1.64	1.56
Race/ethnicity											
White, non-Hispanic	17,767	0.83	0.80	0.77	0.81	4,862	1.10	1.25	1.31	1.19	1.06
Black, non-Hispanic	3,904	1.70	1.35	1.59	1.53	1,023	3.60	2.99	3.14	3.08	2.65
Hispanic	2,782	1.35	1.47	1.86	1.93	637	3.05	2.99	3.14	2.61	2.45
Asian/Pacific Islander	3,958	2.19	1.81	1.75	1.55	1,078	3.48	3.64	4.06	3.34	3.26
American Indian/ Alaskan Native	1,154	5.60	5.80	5.13	5.68	S	S	S	S	S	S
Marital status											
Never married	14,445	0.76	0.77	0.71	0.75	2,856	1.42	1.28	1.64	1.50	1.21
Married	8,161	1.16	1.09	1.16	1.19	3,546	1.36	1.33	1.41	1.21	1.10
Widowed/divorced/ separated	3,028	2.60	3.71	3.19	3.16	1,548	3.92	3.53	4.16	4.48	4.50

S = estimates suppressed for reasons of data reliability because the unweighted sample size of the row total is less than 30.

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

TABLE A-5. Standard errors for residential stability of 1997–2000 S&E bachelor's and master's degree recipients, by educational characteristics

Educational characteristic	Bachelor's degree receipt					Master's degree receipt					
	Number	Percent with reference week employment in the same state as			Percent with all 4 life events in the same state	Number	Percent with reference week employment in the same state as				Percent with all 5 life events in the same state
		Bachelor's degree recipient	High school graduation	Birth			Master's degree recipients	Bachelor's degree receipt	High school graduation	Birth	
Total	17,492	0.71	0.65	0.63	0.65	5,543	0.98	1.05	1.12	1.01	0.88
Enrollment status											
Full-time student	6,438	1.58	1.60	1.45	1.42	1,600	2.65	2.42	2.24	2.33	2.11
Part-time student	4,442	1.64	2.04	2.13	2.21	908	2.93	4.03	4.18	3.99	3.63
Not a student	14,893	0.79	0.67	0.70	0.70	4,753	1.18	1.19	1.30	1.13	0.96
Undergraduate grade point average											
3.25 or higher	12,774	1.13	0.95	0.89	0.94	3,578	1.15	1.25	1.25	1.15	1.13
2.75 to 3.24	8,859	0.85	0.87	0.94	0.96	2,720	1.98	1.81	1.90	1.80	1.70
Below 2.75	4,205	1.59	1.67	1.83	1.73	842	3.09	3.50	3.27	3.40	3.09
Parents' education											
Some college or less	10,347	0.84	0.91	0.96	1.01	3,749	1.72	1.64	1.76	1.71	1.38
Bachelor's or higher	12,977	0.87	0.78	0.71	0.70	3,376	1.11	1.21	1.21	1.03	0.97
Major field of degree											
Science	19,201	0.80	0.71	0.70	0.74	5,879	1.36	1.30	1.48	1.30	1.16
Computer and information sciences	4,381	2.45	1.75	2.18	2.10	1,167	3.46	3.64	3.19	3.60	3.03
Life and related sciences	7,014	1.77	1.42	1.54	1.43	1,319	3.00	2.57	2.65	2.58	2.14
Mathematical and related sciences	2,107	2.13	2.32	2.40	2.27	577	3.58	4.20	4.05	3.21	3.01
Physical and related sciences	1,820	1.46	1.35	1.59	1.42	543	2.31	2.54	2.81	2.55	2.05
Psychology	7,674	1.47	1.69	1.78	1.79	4,921	2.61	2.48	3.06	2.33	2.42
Social and related sciences	8,427	1.04	1.21	1.03	1.05	1,798	2.27	1.86	1.75	1.96	1.55
Engineering	4,689	1.25	1.42	1.16	1.14	1,736	1.43	1.52	1.78	1.44	1.26

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.

TABLE A-6. Standard errors for residential stability of 1997–2000 S&E bachelor's and master's degree recipients, by employment characteristics

Employment characteristic	Bachelor's degree receipt					Master's degree receipt					
	Number	Percent with reference week employment in the same state as			Percent with all 4 life events in the same state	Percent with reference week employment in the same state as				Percent with all 5 life events in the same state	
		Bachelor's degree recipient	High school graduation	Birth		Master's degree recipient	Bachelor's degree receipt	High school graduation	Birth		
Total	17,492	0.71	0.65	0.63	0.65	5,543	0.98	1.05	1.12	1.01	0.88
Occupation											
Scientists	6,356	1.54	1.31	1.38	1.27	2,601	1.40	1.43	1.49	1.37	1.27
Computer and information scientists	4,050	1.98	1.85	1.91	1.74	1,361	2.63	2.91	2.83	2.81	2.38
Life and related scientists	2,722	3.02	2.77	2.85	2.72	898	3.81	3.82	3.73	3.32	3.09
Mathematical and related scientists	816	6.84	6.42	5.98	5.96	447	5.27	5.77	5.49	3.94	3.73
Physical scientists	1,551	2.14	2.07	2.19	1.93	591	3.00	2.91	3.02	2.66	2.09
Psychologists	1,987	5.83	4.93	4.07	4.19	2,044	3.16	3.83	4.30	3.59	3.12
Social and related scientists	2,099	4.14	5.22	4.53	4.44	888	3.48	3.32	3.89	3.45	2.71
Engineers	4,147	1.39	1.46	1.25	1.29	1,548	1.63	1.90	1.92	1.64	1.49
Other	15,540	0.81	0.77	0.76	0.80	4,354	1.90	1.91	1.87	1.74	1.66
Employment status											
Full-time	15,664	0.72	0.70	0.70	0.71	5,246	1.09	1.15	1.18	1.10	0.96
Part-time	5,993	1.63	1.63	1.44	1.54	1,419	2.49	2.80	2.93	2.42	2.21
Employment sector											
Private industry and business	12,672	0.82	0.80	0.75	0.73	3,636	1.25	1.38	1.54	1.44	1.12
Educational institution	6,814	1.21	1.20	1.14	1.14	2,497	1.71	1.86	1.91	1.77	1.74
Government	5,551	1.43	1.71	1.81	1.72	1,679	2.26	2.75	2.74	2.34	2.12
Geographic region of job											
Northeast	8,266	1.34	1.39	1.37	1.50	1,974	2.27	2.18	1.92	1.83	1.83
Midwest	9,800	1.56	1.37	1.50	1.57	4,503	3.26	2.79	3.65	2.77	2.48
South	13,918	1.25	1.11	1.02	1.01	3,100	1.66	1.56	1.41	1.46	1.16
West	11,541	1.55	1.46	1.13	1.33	2,675	2.07	2.24	2.21	1.73	1.69
Puerto Rico	638	1.78	0.85	1.28	2.22	201	7.60	8.07	4.64	6.20	7.52

SOURCE: National Science Foundation, Division of Science Resources Statistics, National Survey of Recent College Graduates, 1999 and 2001.